

OCTOBER 19-23, 2013  
SAN FRANCISCO, CALIFORNIA



CNS

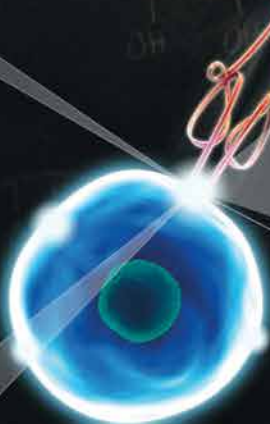
2013 ANNUAL  
MEETING

The  
**EVOLUTION**  
of **NEUROSURGERY**

SCIENTIFIC PROGRAM



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See brief summary on page 155.



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The Congress of Neurological Surgeons exists to enhance health and improve lives worldwide through the advancement of neurosurgical education and scientific exchange.



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# WELCOME

***Welcome to San Francisco!*** On behalf of the Congress of Neurological Surgeons Executive Committee, the Scientific Program Committee, and our 2013 CNS Honored Guests Dr. L. Nelson Hopkins, Dr. Johannes Schramm, and Dr. Andrew Kaye, we welcome you to this outstanding city for the 2013 Annual Meeting!

This year's theme, ***Evolution of Neurosurgery***, focuses on exploring the past, present, and future of neurosurgery and takes an in-depth look at how far we have come, and where we are going. Our daily General Scientific Sessions have been restructured, delivering a more dynamic format that features anatomy lessons, platform debates on controversial topics, and talks by authors of some of the top papers published in *Neurosurgery*® in the past year. We will also be recognizing the contributions and achievements of our three honored guests, in addition to enjoying presentations by our phenomenal lineup of featured speakers.

While here, be certain to reconnect and share knowledge with colleagues and friends from around the world, including our colleagues from the Chinese Neurosurgical Society, our 2013 international partner organization. Through our Original Science Program, General Scientific Sessions, and **Innovation & Technology Symposia**, as well as our exceptional social events including the Opening Reception and the Wine & Cheese Reception, there are plenty of opportunities to make new connections, enhance your skill set, learn scientific advances, help your practice, and improve patient care.

We thank you for joining us and are excited to have you here as we explore the most significant breakthroughs, clinical research, innovative advances and developments in neurosurgery.

Sincerely,



**Ali R. Rezai, MD**  
CNS President



**Alan M. Scarrow, MD, JD**  
Annual Meeting Chair



**Ashwini D. Sharan, MD**  
Scientific Program Chair



**Elad I. Levy, MD, MBA**  
Vice Scientific Program Chairman

# HONORED GUESTS



## **L. NELSON HOPKINS, MD**

Sunday, October 20, 5:00 PM

### **Breaking Down the Silos of Medicine: The Future of Vascular Neurosurgery**

L. Nelson Hopkins, MD, is the Professor and Chairman of Neurosurgery, Professor of Radiology, and Director of the Toshiba Stroke Research Center at the University at Buffalo, State University of New York. He fostered the creation of the Toshiba Stroke Research Center, bringing together physicists, chemists, aerospace engineers, neurosurgeons, cardiologists, and radiologists to study neurovascular circulation and develop innovative technologies and approaches for the diagnosis, treatment, and prevention of neurovascular diseases.



## **JOHANNES SCHRAMM, MD**

Monday, October 21, 10:03 AM

### **Epilepsy Surgery and the Evolution of Clinical and Translational Science**

Johannes Schramm, MD, is a Professor of Neurosurgery at the University of Bonn, Bonn, Germany and retired Chairman Department of Neurosurgery. Dr. Schramm's clinical interests range from glioma surgery to AVMs and epilepsy surgery, as well as spine. His CV lists over 400 publications and over 50 book chapters. He currently is the editor of the book series Advances and Technical Standards in Neurosurgery.



## **ANDREW KAYE, MD**

Tuesday, October 22, 10:05 AM

### **Continuing Evolution: The Biology and Treatment of Gliomas**

Andrew Kaye, MD, is the Director of Neurosurgery at The University of Melbourne, The Royal Melbourne Hospital in Australia and the President of the Asian Australasian Society of Neurological Surgeons. His main clinical and research interest involves neuro-oncology and cerebrovascular disease. In 2011, he was awarded the Medal of Honour from the World Federation of Neurosurgical Societies for "outstanding contribution to neurosurgery."

# FEATURED SPEAKERS



## CHARLES ELACHI, PhD

Sunday, October 20, 5:23 PM

### Evolution of Space Discovery

Charles Elachi, PhD, has been the Director of the Jet Propulsion Laboratory since May 2001. He has been a principal investigator on a number of NASA-sponsored studies and flight projects, including the Shuttle

Imaging Radar series (Science Team Leader), the Magellan Imaging Radar (Team Member), and the Cassini Titan Radar (Team Leader). He is the author of over 230 publications in the fields of active microwave remote sensing and electromagnetic theory, and he holds several patents in those fields.



## ALLAN I. BASBAUM, PhD, FRS

Sunday, October 20, 5:47 PM

### Evolving Science of Pain: Transplants

Allan I. Basbaum, PhD, FRS, is Professor and Chairman of the Department of Anatomy at the University of California, San Francisco (UCSF). Dr. Basbaum's research concerns the transmission and control

of pain messages, and the molecular mechanisms that underlie the development of persistent pain after tissue or nerve injury. Dr. Basbaum is a Fellow of the American Association for the Advancement of Science and of the Royal Society in the United Kingdom.



## STEVEN JOHNSON

Sunday, October 20, 6:10 PM

### Where Good Ideas Come From

Steven Johnson is the leading light of today's interdisciplinary, collaborative, open-minded approach to innovation. He unites a deep understanding of scientific progress with a sharp sensitivity to contemporary

online trends. Together, those traits give him an unmatched insight into how ideas emerge and spread and how they affect the world today.

 6:30 – 7:30 PM • Book Signing • **Steven Johnson**  
Lobby of Yerba Buena Salons 8-15

# FEATURED SPEAKERS



## ITZHAK PERLMAN

Monday, October 21, 10:54 AM

### Featured Speaker

Itzhak Perlman, undeniably the reigning virtuoso of the violin, is beloved for his charm and humanity as well as his talent. A major presence in the performing arts on television, Itzhak Perlman has been honored with four Emmy Awards. His recordings regularly appear on the best-seller charts and have garnered fifteen Grammy Awards. His presence on stage, on camera and in personal appearances of all kinds speaks eloquently on behalf of the disabled, and his devotion to their cause is an integral part of Mr. Perlman's life.



## CLAY MARSH, MD

Tuesday, October 22, 10:30 AM

### From the Blue Zones to the Lab: Secrets to Living Long and Living Well

Clay Marsh, MD, is the Executive Director of the Center for the new IDEa Studio (Innovation, Design and Application) and the first Chief Innovation Officer at The Ohio State University Wexner Medical Center. In the IDEa Studio, he and his team will focus on the discovery and delivery of solutions that will be implemented in the P4 (predictive, preventive, personalized and participatory) medicine program, which he also leads.



## DAVID BROOKS

Tuesday, October 22, 10:55 AM

### Featured Speaker

David Brooks has a gift for bringing audiences face to face with the spirit of our times with humor, insight and quiet passion. He is a keen observer of the American way of life and a savvy analyst of present-day politics and foreign affairs. He holds prestigious positions as a commentator including the Op-Ed columnist for *The New York Times* and is an analyst on PBS *NewsHour* and NPR's *All Things Considered*.

 11:30 AM–12:30 PM • Book Signing • **David Brooks**  
CNS Member Services Booth #1309

# FEATURED SPEAKERS



## BENJAMIN C. WARF, MD

Wednesday, October 23, 7:07 AM

### Three Steps Forward and Two Steps Back: The Echternach Procession Towards Optimal Hydrocephalus Treatment

Benjamin C. Warf, MD is an Associate Professor of Surgery at Harvard Medical School and Director of Neonatal and

Congenital Anomalies Neurosurgery at Boston Children's Hospital. From 2000 to 2006, he and his wife, Cindy, and their six children lived in Uganda, where they helped found the CURE Children's Hospital of Uganda, a pediatric neurosurgery specialty hospital. In 2007, Dr. Warf received the Humanitarian Award from the AANS, and in 2012 he was named a MacArthur Fellow.




## SUSAN HOCKFIELD, PhD

Wednesday, October 23, 10:35 AM

### The 21st Century's Technology Story: The Convergence of Biology and Engineering


Susan Hockfield, PhD is a noted neuroscientist whose research has focused on the development of the brain. She was the first life scientist to serve as

President of the Massachusetts Institute of Technology, where she holds a faculty appointment as Professor of Neuroscience in the Department of Brain and Cognitive Sciences. She serves as a director of the General Electric Company and Qualcomm Incorporated, a trustee of the Carnegie Corporation of New York, and an overseer of the Boston Symphony Orchestra.



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## FELLOWSHIP AWARD RECIPIENTS

### CHRISTOPHER C. GETCH FELLOWSHIP

*Kristopher T. Kahle*

### CNS FUNCTIONAL FELLOWSHIP

*Jonathan P. Riley*

### CNS SPINE FELLOWSHIP

*Andrew T. Healy*

### CNS TUMOR FELLOWSHIP

*Wajd N. Al-Holou*

### CNS TUMOR FELLOWSHIP

*Ali C. Ravanpay*

### CNS SOCIOECONOMIC FELLOWSHIP

*John D. Rolston*

### CNS VASCULAR FELLOWSHIP

*Douglas J. Cook*

### CSNS/CNS MEDICAL STUDENT SUMMER FELLOWSHIP

*Travis R. Ladner*

## Practical Course Moderators

*Dino Terzic*

*Eric M. Jackson*

*Jonathan H. Sherman*

*Sepideh Amin-Hanjani*

*Zachary N. Litvack*

*Jason Heth*

*Daniel J. Hoh*

*Christopher James Farrell*

*John H. Shin*

*John M. Caridi*

*Ketan R. Bulsara*

*Sarah J. Gaskill*

*Marjorie C. Wang*

*Harminder Singh*

*Clemens M. Schirmer*

*Charles A. Sansur*

*Odette Harris*

*Nathaniel P. Brooks*

*Roland A. Torres*

*Gregory J. Murad*

*Chaim B. Colen*

*Holly Gilmer*

*Brian Lim Hoh*

*Patricia B. Raksin*

*Yin C. Hu*

*Stavropoula I. Tjoumakaris*

*John F. Reavey-Cantwell*

*Nader Pouratian*

*Bharat Guthikonda*

# Thank You

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# 2012-2013 CNS EXECUTIVE COMMITTEE


**Back Row:** Nathan R. Selden, Aviva Abosch, Richard W. Byrne, Steven N. Kalkanis, Brian L. Hoh, Brian T. Ragel, Ashok R. Asthagiri, James S. Harrop, Ganesh Rao, Nicholas C. Bambakidis, Michael P. Steinmetz, Mark E. Linskey, Bernard R. Bendok, Elad I. Levy, Shekar N. Kurpad, Charles Y. Liu, Gerald A. Grant

**Front Row:** David A. Westman, Alan M. Scarrow, Christopher E. Wolfla, Daniel K. Resnick, Ali R. Rezai, Jamie S. Ullman, Russell R. Lonser, Zoher Ghogawala, Ashwini D. Sharan  
**Not pictured:** Anil Nanda, Daniel M. Prevedello, Krystal L. Tomei, Michael Y. Wang




# SATURDAY, OCTOBER 19

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
7:00 AM 9:30 AM	<b>AANS/CSNS Caucus</b>	<b>Pacific A</b> San Francisco Marriott Marquis
7:00 AM 9:30 AM	<b>CNS/CSNS Caucus</b>	<b>Pacific B</b> San Francisco Marriott Marquis
7:00 AM 5:30 PM	<b>Registration</b>	<b>Lobby</b> Moscone West Convention Center
7:00 AM 5:30 PM	<b>Sergeant-At-Arms</b>	<b>2024 Overlook</b> Moscone West Convention Center
7:00 AM 5:30 PM	<b>Speaker Ready Room</b>	<b>3000</b> Moscone West Convention Center
7:00 AM 5:30 PM	<b>Association of Neurosurgical Physician Assistants 7th Annual CME Meeting</b>	<b>Golden Gate C1-C2</b> San Francisco Marriott Marquis
7:00 AM 9:30 AM	<b>CSNS NE Quadrant</b>	<b>Sierra I</b> San Francisco Marriott Marquis
7:00 AM 9:30 AM	<b>CSNS NW Quadrant</b>	<b>Sierra H</b> San Francisco Marriott Marquis
7:00 AM 9:30 AM	<b>CSNS SE Quadrant</b>	<b>Sierra K</b> San Francisco Marriott Marquis
7:00 AM 9:30 AM	<b>CSNS SW Quadrant</b>	<b>Sierra C</b> San Francisco Marriott Marquis
8:00 AM 4:00 PM	<b>PC01: NINDS/CNS Workshop on Grant Writing and Career Development</b>	<b>3014</b> Moscone West Convention Center
8:00 AM 4:00 PM	<b>PC02: Brain Tumor Update</b> 	<b>2008</b> Moscone West Convention Center
8:00 AM 4:00 PM	<b>PC03: Minimally Invasive Spinal Surgery (Cadaver Course)</b>	<b>2014-2016</b> Moscone West Convention Center
8:00 AM 5:00 PM	<b>CNS Press Room</b>	<b>3014 Overlook</b> Moscone West Convention Center
8:00 AM 5:00 PM	<b>SYM01: Neurosurgery Innovations</b>	<b>2009</b> Moscone West Convention Center
8:00 AM 5:00 PM	<b>SYM02: Traumatic Head Injury</b>	<b>2001</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC04: So, You Want to be a Neurosurgeon?</b>	<b>2022</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC05: Neurosurgery Oral Board Review</b>	<b>3003</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC06: Cervical Spondylotic Myelopathy and Radiculopathy: Treatment Approaches and Options</b>	<b>2020</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC07: Open Aneurysm Surgery: A 3-D Practical Course</b>	<b>3022</b> Moscone West Convention Center

# SATURDAY, OCTOBER 19

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
8:00 AM 11:30 AM	<b>PC08: Neurosurgical Approaches to the Pain Patient: Patient Selection, Techniques, and Complication Avoidance</b>	3002 Moscone West Convention Center
9:30 AM 12:30 PM	<b>CSNS Plenary Session</b>	Golden Gate B San Francisco Marriott Marquis
11:30 AM 4:00 PM	<b>AAANS/CNS Disorders of the Spine and Peripheral Nerves Executive Committee Meeting</b>	Nob Hill A/B San Francisco Marriott Marquis
12:15 PM 1:30 PM	<b>CSNS Lunch</b>	Golden Gate A San Francisco Marriott Marquis
12:30 PM 4:00 PM	<b>PC09: Using Evidence-Based Medicine to Manage Spinal Disorders</b> 	2022 Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC10: Trauma Update: Spinal Cord Injury Guidelines and Best Practices</b>	3003 Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC11: Masters of Cranial Neuroendoscopy</b>	3002 Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC12: Implementing Quality Improvement in Neurosurgery: Raising Quality, Lowering Cost, and Maximizing Compensation</b>	3022 Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC13: RRC Next Accreditation System, Milestones, and the Neurosurgery Matrix</b>	2024 Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC14: 3-D Anatomy (Supratentorial)</b>	3001 Moscone West Convention Center
1:30 PM 3:30 PM	<b>CSNS Executive Committee Meeting</b>	Pacific J San Francisco Marriott Marquis
2:00 PM 4:00 PM	<b>AAANS/CNS Joint Officers Committee Meeting</b>	Club Room San Francisco Marriott Marquis
3:30 PM 4:30 PM	<b>AAANS/CNS Communications and Public Relations Meeting</b>	Pacific E San Francisco Marriott Marquis
4:00 PM 5:30 PM	<b>Council of Surgical Spine Societies Meeting</b>	Pacific D San Francisco Marriott Marquis
4:30 PM 5:30 PM	<b>Neurosurgery PAC Board Meeting</b>	Pacific A San Francisco Marriott Marquis
4:30 PM 7:00 PM	<b>ASSFN Board Meeting</b>	Pacific I San Francisco Marriott Marquis
5:15 PM 5:45 PM	<b>CNS Publications Committee Meeting</b>	Pacific F San Francisco Marriott Marquis
5:30 PM 8:00 PM	<b>DIN1: Brain Metastases Guidelines</b>	Farallon Restaurant 450 Post St. Business Casual
5:30 PM 8:00 PM	<b>DIN2: Working with Your Hospital</b>	Boulevard Restaurant 1 Mission St. Business Casual
5:45 PM 6:15 PM	<b>CNS Congress Quarterly Meeting</b>	Pacific F San Francisco Marriott Marquis

# SUNDAY, OCTOBER 20

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
6:00 AM 6:00 PM	<b>Speaker Ready Room</b>	<b>3000</b> Moscone West Convention Center
6:30 AM 5:30 PM	<b>Sergeant-At-Arms</b>	<b>2024 Overlook</b> Moscone West Convention Center
6:30 AM 9:00 AM	<b>SNS Web Portal Work Group Meeting</b>	<b>Sierra C</b> San Francisco Marriott Marquis
7:00 AM 4:00 PM	<b>SYM03: Neuromodulation 2013: What Every Neurosurgeon Needs to Know</b>	<b>Golden Gate B</b> San Francisco Marriott Marquis
7:00 AM 4:00 PM	<b>SYM04: Stroke 2014</b>	<b>2001</b> Moscone West Convention Center
7:00 AM 7:30 PM	<b>Registration</b>	<b>Lobby</b> Moscone West Convention Center
8:00 AM 4:00 PM	<b>PC15: Endoscopic and Keyhole Approaches to the Anterior Skull Base (Cadaver Course)</b>	<b>2018-2020</b> Moscone West Convention Center
8:00 AM 4:00 PM	<b>PC16: Simulation Based Neurosurgical Training</b>	<b>2002</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC17: 2013 CPT Coding Update</b>	<b>2008</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC18: Practical Spine Biomechanics for Clinical Practice</b>	<b>2024</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC19: 3-D Anatomy (Infratentorial)</b>	<b>3001</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC20: Surgical Management of Tumors in Eloquent Regions</b>	<b>2022</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC21: Building a Neurosciences Program</b>	<b>3016</b> Moscone West Convention Center
8:00 AM 11:30 AM	<b>PC22: Negotiation Tactics from the Experts – Getting the Best Deal (Hospital Negotiations)</b>	<b>3003</b> Moscone West Convention Center
8:00 AM 6:30 PM	<b>CNS Press Room</b>	<b>3014 Overlook</b> Moscone West Convention Center
9:00 AM 12:00 PM	<b>SNS Summit Meeting</b>	<b>Sierra C</b> San Francisco Marriott Marquis
10:00 AM 11:00 AM	<b>CNS Membership Committee Meeting</b>	<b>Pacific I</b> San Francisco Marriott Marquis
11:00 AM 12:30 PM	<b>AANS/CNS Quality Improvement Workgroup</b>	<b>Pacific E</b> San Francisco Marriott Marquis
11:00 AM 12:00 PM	<b>CNS Information and Technology &amp; Web Editorial Board Committee Meeting</b>	<b>Sierra K</b> San Francisco Marriott Marquis
11:30 AM 12:00 PM	<b>CNS Research Committee Meeting</b>	<b>Pacific F</b> San Francisco Marriott Marquis

# SUNDAY, OCTOBER 20

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
12:00 PM 1:00 PM	<b>SNS Research Meeting</b>	<b>Sierra G</b> San Francisco Marriott Marquis
12:00 PM 2:00 PM	<b>CNS International Division Meeting</b>	<b>Sierra A</b> San Francisco Marriott Marquis
12:00 PM 3:00 PM	<b>SANS Lifelong Learning Committee Meeting</b>	<b>Pacific H</b> San Francisco Marriott Marquis
12:15 PM 12:45 PM	<b>CNS Fellowships Committee Meeting</b>	<b>Pacific F</b> San Francisco Marriott Marquis
12:30 PM 4:00 PM	<b>PC24: My Worst Spinal Complication: What I Learned</b>	<b>3018</b> Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC25: Neurocritical Care and Neurosurgical Emergencies Update</b>	<b>2016</b> Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC26: Innovation and Intellectual Property Development: From Concept to Company</b>	<b>2008</b> Moscone West Convention Center
12:30 PM 4:00 PM	<b>PC27: Cranial Neurosurgery: Complication Avoidance and Management</b>	<b>3002</b> Moscone West Convention Center
		
12:30 PM 4:00 PM	<b>PC28: Cranial and Spinal Radiosurgery Update</b>	<b>2014</b> Moscone West Convention Center
1:00 PM 2:00 PM	<b>AANS/CNS Joint Guidelines Committee Meeting</b>	<b>Pacific B</b> San Francisco Marriott Marquis
1:00 PM 3:00 PM	<b>CNS Education Meeting</b>	<b>Pacific I</b> San Francisco Marriott Marquis
1:00 PM 3:00 PM	<b>CNS Resident SANS Challenge Preliminary Rounds</b>	<b>3020</b> Moscone West Convention Center
1:00 PM 3:00 PM	<b>CNS Resident SANS Challenge Green Room</b>	<b>3022</b> Moscone West Convention Center
1:30 PM 3:30 PM	<b>Section on Disorders of the Spine and Peripheral Nerves Scientific Program Committee Meeting</b>	<b>Sierra I</b> San Francisco Marriott Marquis
2:00 PM 3:00 PM	<b>AANS/CNS Section on Pain Executive Committee Meeting</b>	<b>Sierra G</b> San Francisco Marriott Marquis
2:00 PM 3:00 PM	<b>SNS Resident Courses Meeting</b>	<b>Sierra C</b> San Francisco Marriott Marquis
2:30 PM 4:00 PM	<b>Multidisciplinary Oral Presentations I</b> Moderators: <i>Amir R. Dehdashti, Bharat Guthikonda</i>	<b>3014</b> Moscone West Convention Center
3:00 PM 4:00 PM	<b>SNS CoRE Meeting</b>	<b>Sierra C</b> San Francisco Marriott Marquis
3:00 PM 5:00 PM	<b>SNS CAST Committee Meeting</b>	<b>Sierra B</b> San Francisco Marriott Marquis
4:00 PM	<b>AANS/CNS Cerebrovascular Section Executive Committee Meeting</b>	<b>Pacific J</b> San Francisco Marriott Marquis

# SUNDAY, OCTOBER 20

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
4:30 PM 6:30 PM	<b>General Scientific Session I</b> <b>Presiding Officer:</b> <i>Alan M. Scarrow</i> <b>Moderators:</b> <i>Alan M. Scarrow,</i> <i>Ashwini D. Sharan</i>	Yerba Buena Salons 1-7 San Francisco Marriott Marquis
5:00 PM 5:20 PM	HONORED GUEST <b>Breaking Down the Silos of Medicine: The Future of Vascular Neurosurgery</b> <i>L. Nelson Hopkins, III</i>	Yerba Buena Salons 1-7 San Francisco Marriott Marquis
5:23 PM 5:44 PM	SPECIAL LECTURE <b>Evolution of Space Discovery</b> <i>Charles Elachi</i> Director, Jet Propulsion Lab	Yerba Buena Salons 1-7 San Francisco Marriott Marquis
5:47 PM 6:07 PM	SPECIAL LECTURE <b>Evolving Science of Pain: Transplants</b> <i>Allan Basbaum</i> Professor and Chairman of the Department of Anatomy at UCSF	Yerba Buena Salons 1-7 San Francisco Marriott Marquis
6:10 PM 6:30 PM	FEATURED SPEAKER <b>Where Good Ideas Come From</b> <i>Steven Johnson</i>	Yerba Buena Salons 1-7 San Francisco Marriott Marquis
6:30 PM 7:30 PM	<b>Book Signing</b> <i>Steven Johnson</i>	Yerba Buena Salons 8-15 Lobby San Francisco Marriott Marquis
6:30 PM 8:30 PM	<b>Opening Reception</b>	Yerba Buena Salons 8-15 San Francisco Marriott Marquis



## Opening Reception

Sunday, October 20  
6:30 – 8:30 PM

*Live* music, entertainment and a delicious spread of food and beverages await you at the 2013 CNS Opening Reception. Mingle with colleagues while enjoying a relaxed and festive evening at the San Francisco Marriott Marquis.

**VISIT REGISTRATION** to purchase tickets for optional courses including the Innovation and Technology Symposia, Practical Courses, Luncheon Seminars and Dinner Seminars



# MONDAY, OCTOBER 21

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
6:00 AM 3:00 PM	<b>Speaker Ready Room</b>	<b>3000</b> Moscone West Convention Center
6:30 AM 4:30 PM	<b>Registration</b>	<b>Lobby</b> Moscone West Convention Center
7:00 AM 11:30 AM	<b>General Scientific Session II</b> <b>Presiding Officer:</b> <i>Daniel K. Resnick</i> <b>Moderators:</b> <i>Michael P. Steinmetz, Michael Y. Wang</i>	<b>Ballroom</b> Moscone West Convention Center
7:00 AM 5:00 PM	<b>CNS Press Room</b>	<b>3014 Overlook</b> Moscone West Convention Center
8:00 AM 10:30 AM	<b>CNS Spouse Hospitality Suite</b>	<b>Walnut</b> San Francisco Marriott Marquis
9:00 AM 10:00 AM	<b>Demo Theater and Beverage Break with Exhibitors</b>	<b>Exhibit Hall</b> Moscone West Convention Center
9:00 AM 3:30 PM	<b>Exhibit Hall Open</b>	<b>Exhibit Hall</b> Moscone West Convention Center
10:00 AM 2:30 PM	<b>Sergeant-At-Arms</b>	<b>2024 Overlook</b> Moscone West Convention Center
10:03 AM 10:23 AM	HONORED GUEST <b>Epilepsy Surgery and the Evolution of Clinical and Translational Science</b> <i>Johannes Schramm</i>	<b>Ballroom</b> Moscone West Convention Center
10:26 AM 10:51 AM	<b>Presidential Address</b> <i>Ali R. Rezai</i>	<b>Ballroom</b> Moscone West Convention Center
10:54 AM 11:30 AM	FEATURED SPEAKER Reigning Virtuoso of the Violin <i>Itzhak Perlman</i>	<b>Ballroom</b> Moscone West Convention Center
11:30 AM 12:30 PM	<b>Demo Theater and Break with Exhibitors</b>	<b>Exhibit Hall</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M01: Honored Guest Luncheon</b>	<b>2002</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M02: Cervical Arthroplasty and Lumbar Motion Preservation Technologies</b>	<b>2000</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M03: Radiosurgery in Vestibular Schwannoma Management</b> 	<b>2004</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M04: Innovations in the Management of Intracerebral Hemorrhage</b> 	<b>2005</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M05: Managing Long-term Complications of Cervical and Lumbar Spine Surgery</b> 	<b>2006</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>M06: Managing Pediatric Neurovascular Diseases</b>	<b>2007</b> Moscone West Convention Center

# MONDAY, OCTOBER 21


## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
12:30 PM 2:00 PM	<b>M07: Peripheral Nerve Board Review</b>	2008 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M08: Strategies to Reduce Risk in Surgical Management of Tumors in Eloquent Regions</b>	2009 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M09: Neurosurgical Emergencies: An Update for Allied Health Care Professionals</b>	2010 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M10: Guidelines for Diagnosis and Treatment of Degenerative Lumbar Spinal Disease</b>	2011 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M11: Surgical Management of Meningiomas</b>	2012 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M12: New Technologies and Innovations in Spinal Neurosurgery</b>	2016 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M13: Multidisciplinary Management of Subarachnoid Hemorrhage and Vasospasm</b>	2018 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M14: Management of Complex and Refractory Chiari Malformations and Syringomyelia</b>	2020 Moscone West Convention Center
12:30 PM 2:00 PM	<b>M15: Evidence-Based Management of Brain Metastases</b>	2022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Consensus Session I: Management of Cerebral Gliomas: Building Consensus from Controversy</b>	2001/2003 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Council of State Neurosurgical Societies</b>	3003 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Section on Pediatric Neurological Surgery</b>	3001 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Stereotactic &amp; Functional Neurosurgery</b>	3002 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Section on Tumors</b>	3022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Special Course I: Neurosciences Center and the Neurosurgeon: An Evolving Practice Landscape</b>	2014 Moscone West Convention Center
3:30 PM 5:00 PM	<b>3-D Operative Neurosurgery I: Techniques to Advance Safety and Efficacy in Microneurosurgery</b>	Ballroom Moscone West Convention Center
3:30 PM 5:00 PM	<b>Neurosurgical Forum</b>	3014-3020 Moscone West Convention Center
5:00 PM 6:30 PM	<b>AANS/CNS Joint Military Committee</b>	Yerba Buena Salon 2 San Francisco Marriott Marquis
5:00 PM 6:30 PM	<b>AASAN Meeting</b>	Yerba Buena Salon 1 San Francisco Marriott Marquis
5:00 PM 6:30 PM	<b>International Reception</b>	Yerba Buena Salon 7 San Francisco Marriott Marquis

# MONDAY, OCTOBER 21

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
5:00 PM 7:00 PM	<b>Jannetta Society</b>	<b>Nob Hill B</b> San Francisco Marriott Marquis
5:00 PM 7:00 PM	<b>OHSU Neurosurgery Alumni Reception</b>	<b>Sierra B</b> San Francisco Marriott Marquis
5:30 PM 7:00 PM	<b>University of Utah Neurosurgery Resident Reception</b>	<b>Pacific F</b> San Francisco Marriott Marquis
5:30 PM 8:30 PM	<b>Jefferson Neurosurgery Alumni Reception</b>	<b>Pacific E</b> San Francisco Marriott Marquis
6:00 PM 8:00 PM	<b>CANS-CNS Reception</b>	<b>Sierra I</b> San Francisco Marriott Marquis
6:00 PM 8:00 PM	<b>Mayo Clinic Alumni Association Reception</b>	<b>Sierra E</b> San Francisco Marriott Marquis
6:00 PM 8:30 PM	<b>DIN3: Beyond 'Through the Tube' – When and When Not to Use MIS</b>	<b>One Market Restaurant</b> 1 Market St. Dress Code: Business Casual
6:00 PM 8:30 PM	<b>DIN4: Evolution of the Endovascular Revolution</b>	<b>Epic Roasthouse</b> 369 The Embarcadero Dress Code: Business Casual
6:30 PM 8:30 PM	<b>USC Neurosurgery Alumni Reception</b>	<b>Nob Hill A</b> San Francisco Marriott Marquis
7:00 PM 9:00 PM	<b>University of Wisconsin Neurosurgery Dinner</b>	<b>Sierra D</b> San Francisco Marriott Marquis




*International Reception*

Monday, October 21, 5:00 – 6:30 PM.  
San Francisco Marriott Marquis,  
Yerba Buena Salon 7

Enjoy cocktails and hor d'oeuvres  
while you network with colleagues  
from across the globe.

All international attendees and their  
guests are invited to attend.

**THANK YOU TO MEDTRONIC FOR  
THEIR SUPPORT OF THIS EVENT!**



# TUESDAY, OCTOBER 22

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
6:00 AM 7:00 AM	<b>AANS/CNS Drugs and Devices Committee Meeting</b>	Pacific F San Francisco Marriott Marquis
6:00 AM 3:00 PM	<b>Speaker Ready Room</b>	3000 Moscone West Convention Center
6:30 AM 4:30 PM	<b>Registration</b>	Lobby Moscone West Convention Center
7:00 AM 7:00 PM	<b>CNS Press Room</b>	3014 Overlook Moscone West Convention Center
7:00 AM 11:30 AM	<b>General Scientific Session III</b> Presiding Officer: <i>Jamie S. Ullman</i> Moderators: <i>Steven N. Kalkanis, Ganesh Rao</i>	Ballroom Moscone West Convention Center
8:00 AM 10:30 AM	<b>CNS Spouse Hospitality Suite</b>	Walnut San Francisco Marriott Marquis
9:00 AM 10:00 AM	<b>Demo Theater and Beverage Break with Exhibitors</b>	Exhibit Hall Moscone West Convention Center
9:00 AM 6:30 PM	<b>Exhibit Hall Open</b>	Exhibit Hall Moscone West Convention Center
10:00 AM 2:30 PM	<b>Sergeant-At-Arms</b>	2024 Overlook Moscone West Convention Center
10:05 AM 10:25 AM	HONORED GUEST <b>Continuing Evolution: The Biology and Treatment of Gliomas</b> <i>Andrew H. Kaye</i>	Ballroom Moscone West Convention Center
10:30 AM 10:50 AM	SPECIAL LECTURE <b>From the Blue Zones to the Lab: Secrets to Living Long and Living Well</b> <i>Clay B. Marsh</i>	Ballroom Moscone West Convention Center
10:55 AM 11:30 AM	FEATURED SPEAKER <i>David Brooks</i>	Ballroom Moscone West Convention Center
11:30 AM 12:30 PM	<b>Book Signing</b> <i>David Brooks</i>	CNS Booth #1309 Exhibit Hall Moscone West Convention Center
11:30 AM 12:30 PM	<b>Cervical Spondylotic Investigator</b>	Yerba Buena Salon 5 San Francisco Marriott Marquis
11:30 AM 12:30 PM	<b>Demo Theater and Break with Exhibitors</b>	Exhibit Hall Moscone West Convention Center
12:30 PM	<b>2014 CNS Annual Meeting Scientific Program Committee</b>	2003 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T16: Honored Guest Luncheon</b>	2002 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T17: Surgical Management of Cervical Degenerative Disease</b>	2000 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T18: Skull Base Endoscopy: Utility and Limitations</b>	2004 Moscone West Convention Center

# TUESDAY, OCTOBER 22

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
12:30 PM 2:00 PM	<b>T19: Multimodal Management of Intracranial Arteriovenous Malformations</b>	2005 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T20: The Aging Spine: Considerations in Surgical Management</b>	2006 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T21: Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries</b>	2007 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T22: Pituitary Adenomas: Operative Nuances and Management Considerations</b>	2016 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T23: Advances in the Management of Trigeminal Neuralgia and Facial Pain</b>	2009 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T24: Multidisciplinary Management Strategies for Unruptured Aneurysms</b>	2010 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T25: Managing Complications In Spinal Surgery</b>	2011 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T26: Guidelines for Neurocritical Care Management for Patients with Severe Traumatic Brain Injury</b>	2018 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T27: Controversies in Management of Low Grade Gliomas</b>	2008 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T28: Complication Avoidance and Advanced MIS Applications</b>	2012 Moscone West Convention Center
12:30 PM 2:00 PM	<b>T29: Peripheral Nerve Entrapment Syndromes: Diagnosis and Management</b>	2020 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Council of State Neurosurgical Societies: Enhancing Patient Experience: Impact on Your Practice</b>	3003 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Disorders of the Spine and Peripheral Nerves</b>	3002 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Section on Neurotrauma and Critical Care</b>	3016 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Section on Pain</b>	2024 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Oral Presentations: Section on Cerebrovascular Surgery</b>	3001 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Pediatrics: Tackling Difficult Shunt Problems: Headaches, Slit Ventricles and Their Management Strategies</b>	3022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Stereotactic &amp; Functional Neurosurgery: Advances in Epilepsy Surgery</b>	2022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Tumors: Novel Imaging in Brain Tumor Surgery</b>	3018 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Special Course II: Out of Balance: How Can We Improve Outcomes from Spine Surgery?</b>	2014 Moscone West Convention Center

# TUESDAY, OCTOBER 22

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
3:30 PM 4:30 PM	<b>Annual Business Meeting</b>	2001 Moscone West Convention Center
3:30 PM 5:00 PM	<b>3-D Operative Neurosurgery II: Intraoperative Complication Avoidance and Management</b>	Ballroom Moscone West Convention Center
5:00 PM 6:30 PM	<b>Wine and Cheese Reception</b> 	Exhibit Hall Moscone West Convention Center
5:00 PM 6:30 PM	<b>Resident SANS Challenge Championship Round "Are You Smarter Than....?"</b>	Demo Theater in the Exhibit Hall
6:00 PM 8:00 PM	<b>WINS Reception</b>	Nob Hill A San Francisco Marriott Marquis
6:00 PM 8:30 PM	<b>DIN5: Placing Sports Under the Microscope: Head Injury and CTE</b>	Waterbar Restaurant 399 The Embarcadero South Dress Code: Business Casual
6:00 PM 8:30 PM	<b>DIN6: The Burden of Proof: Quality Improvement Initiatives</b>	Harris' Steakhouse 2100 Van Ness Ave. Dress Code: Business Casual
6:30 PM 7:30 PM	<b>Resident Recruitment Social</b>	Level 2 Lobby Moscone West Convention Center



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**Practical Courses:**

PC02: Brain Tumor Update

PC09: Using Evidence-Based Medicine to Manage Spinal Disorders

PC27: Cranial Neurosurgery: Complication Avoidance and Management

**Luncheon Seminars:**

M03: Radiosurgery in Vestibular Schwannoma Management

M04: Innovations in the Management of Intracerebral Hemorrhage

M05: Managing Long-term Complications of Cervical and Lumbar Spine Surgery

# WEDNESDAY, OCTOBER 23

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
6:00 AM 3:00 PM	<b>Speaker Ready Room</b>	<b>3000</b> Moscone West Convention Center
6:30 AM 3:00 PM	<b>Registration</b>	<b>Lobby</b> Moscone West Convention Center
7:00 AM 11:30 AM	<b>General Scientific Session IV</b> <b>Presiding Officer:</b> <i>Russell R. Lonser</i> <b>Moderators:</b> <i>Elad I. Levy, Nathan R. Selden</i>	<b>Ballroom</b> Moscone West Convention Center
7:00 AM 3:30 PM	<b>CNS Press Room</b>	<b>3014 Overlook</b> Moscone West Convention Center
7:07 AM 7:27 AM	SPECIAL LECTURE <b>Three Steps Forward and Two Steps Back: The Echternach Procession Towards Optimal Hydrocephalus Treatment</b> <i>Benjamin C. Warf</i> MacArthur Fellows Award Winner	<b>Ballroom</b> Moscone West Convention Center
8:00 AM 10:30 AM	<b>CNS Spouse Hospitality Suite</b>	<b>Walnut</b> San Francisco Marriott Marquis
9:00 AM 10:00 AM	<b>Demo Theater and Beverage Break with Exhibitors</b>	<b>Exhibit Hall</b> Moscone West Convention Center
9:00 AM 2:00 PM	<b>Exhibit Hall Open</b>	<b>Exhibit Hall</b> Moscone West Convention Center
10:00 AM 2:30 PM	<b>Sergeant-At-Arms</b>	<b>2024 Overlook</b> Moscone West Convention Center
10:02 AM 10:17 AM	<b>International Lecture</b> <i>Ying Mao</i>	<b>Ballroom</b> Moscone West Convention Center
10:35 AM 10:55 AM	SPECIAL LECTURE <b>The 21st Century's Technology Story: The Convergence of Biology and Engineering</b> <i>Susan Hockfield</i> President Emerita Massachusetts Institute of Technology	<b>Ballroom</b> Moscone West Convention Center
10:55 AM 11:30 AM	<b>Investing in Neurosurgery Innovations</b> <b>Faculty:</b> <i>L. Nelson Hopkins, Fred Khosravi, Hank Plain, Paul York</i>	<b>Ballroom</b> Moscone West Convention Center
11:30 AM 12:30 PM	<b>Demo Theater and Break with Exhibitors</b>	<b>Exhibit Hall</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>2013-2014 CNS Executive Committee Meeting</b>	<b>3018</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>W30: Honored Guest Luncheon</b>	<b>2002</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>W31: Recurrent, Thoracic and Far Lateral Lumbar Disc Herniations</b>	<b>2000</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>W32: Complication Avoidance and Management in Skull Base Surgery</b>	<b>2004</b> Moscone West Convention Center
12:30 PM 2:00 PM	<b>W33: Update on Movement Disorders: Novel Targets, Indications, and Approaches</b>	<b>2005</b> Moscone West Convention Center

# WEDNESDAY, OCTOBER 23

## SCHEDULE OF EVENTS

START END	EVENT	LOCATION
12:30 PM 2:00 PM	<b>W34: Malignant Glioma: Where Are We Now?</b>	2006 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W35: Lessons Learned: Avoidance and Management of Complications of Aneurysm Surgery</b>	2007 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W36: Sagittal Balance in Spine Surgery</b>	2008 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W37: Strategies for Maximizing Compensation for Your Neurosurgical Practice</b>	2009 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W38: Athletic Head Injuries: Return To Play</b>	2010 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W39: Quality and Value in Health Care</b>	2011 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W40: Hematology and Coagulation for Neurosurgeons: Dangers and Solutions</b>	2012 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W41: Managing Metastasis to the Spine</b>	2016 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W42: Open Skull Base Surgery: When is the Traditional Approach Necessary?</b>	2018 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W43: Cellular Therapies In Neurosurgery</b>	2020 Moscone West Convention Center
12:30 PM 2:00 PM	<b>W44: New Technologies and Innovations in Cranial Neurosurgery</b>	2022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Consensus Session II: Acute Cervical Spine and Spinal Cord Trauma: The Medical Evidence and Controversies of Top-flight Care</b>	2001/2003 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Multidisciplinary Oral Presentations II</b> Moderators: <i>Michael R. Chicoine, Kee Kim</i>	3022 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Cerebrovascular Surgery: The Evolution of Neurosurgery</b>	3001 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Disorders of the Spine and Peripheral Nerves: Cervical Spine Surgery: Where We Come From, Where We Are, Where We Are Going</b>	3003 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Neurotrauma and Critical Care: Evolution of Neurosurgery – Translational Research to Clinical Trial</b>	3002 Moscone West Convention Center
2:00 PM 3:30 PM	<b>Section on Pain: The Evolution of Pain Neurosurgery</b>	3016 Moscone West Convention Center



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## INNOVATION & TECHNOLOGY SYMPOSIUM

8:00 AM–5:00 PM

Room 2009, Moscone West Convention Center



### **SYM01: NEUROSURGERY INNOVATIONS**

CME not offered for this course.

**SYMPOSIUM DIRECTORS:** *Brian L. Hoh, Steven N. Kalkanis*

**COURSE FACULTY:** *Susan Alpert, Gene H. Barnett,*

*Claartje Beks-Ympa, Bernard R. Bendok, Bob S. Carter,*

*E. Antonio Chiocca, Brad Clayton, Ralph G. Dacey, Jr.,*

*Adam Elless, Richard G. Fessler, Kevin T. Foley, Douglas Garrabrant,*

*Roger Hartl, Robert F. Heary, William F. Hoffman, Iain H. Kalfas,*

*James McCollough, Quyen Nguyen, Mark L. Rosenblum,*

*Robert H. Rosenwasser, John E. Schellhorn, David Simon,*

*Erol Veznedaroglu, Max Wallace, Tom Wilder, Henry H. Woo*

8:10–10:00 AM

### **Cerebrovascular Neurosurgery Technology and Innovation**

10:00–12:00 PM

### **Spine Neurosurgery Technology and Innovation**

12:15–1:15 PM

#### **Lunch**

Please join Symposia Sponsor, Medtronic, for special lunch presentations:

- ▶ “Emerging Translational Tools for the Exploration of Neurological Disease” by Tim Denison, Ph.D., Director of Neural Engineering and Technical Fellow, Medtronic.
- ▶ “The Future of Brain Targeted Drug Delivery” by Lisa Shafer, Ph.D., Director of Neuromodulation Global Research, Medtronic.

1:15–4:00 PM

### **Brain Tumor Technology and Innovation**

4:00 PM

#### **Closing Remarks and Questions**

**Special Thanks to**  **Medtronic** for providing financial support for SYM01: Neurosurgery Innovations

## **INNOVATION & TECHNOLOGY SYMPOSIUM**

8:00 AM–5:00 PM

Room 2003, Moscone West Convention Center



### **SYM02: TRAUMATIC HEAD INJURY**

**SYMPOSIUM DIRECTORS:** *Raj K. Narayan, Jack Jallo*

**COURSE FACULTY:** *Julian E. Bailes Jr., Randall M. Chesnut, Jamshid Ghajar, Ramona Hicks, Mathew Joseph, Geoffrey T. Manley, Andrew I. Maas, John Povlishock, Andres M. Rubiano, Guy Rosenthal, Lori A. Shutter, Shelly D. Timmons, Jack E. Wilberger, David W. Wright*

8:00–10:00 AM

#### **Hot Topics**

10:00–10:40 AM

#### **Industry Innovation Session with Integra**

10:40 AM–12:00 PM

#### **Controversies In Traumatic Brain Injury**

12:00–1:00 PM

#### **Lunch**

1:00–2:20 PM

#### **Controversies In Traumatic Brain Injury**

2:20–2:50 PM

#### **Industry Innovation Session with Codman**

2:50–4:10 PM

#### **Controversies In Traumatic Brain Injury**

4:10 PM

#### **Closing Remarks and Questions**

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## **PRACTICAL COURSES AND DINNER SEMINARS**

8:00 AM–4:00 PM

Room 3014

### **PC01: NINDS/CNS Workshop on Grant Writing and Career Development**

**COURSE DIRECTORS:** *Steven J. Korn, Russell R. Lonser*

**COURSE FACULTY:** *Aviva Abosch, Edward F. Chang, E. Antonio Chiocca, Aaron S. Dumont, Emad N. Eskandar, Walter J. Koroshetz, Linda M. Liao, David D. Limbrick, Gary W. Mathern, J. Marc Simard, Kareem A. Zaghoul, Gregory J. Zipfel*

8:00 AM–4:00 PM

Room 2008

### **PC02: Brain Tumor Update**

**COURSE DIRECTORS:** *Andrew T. Parsa, Jason P. Sheehan*

**COURSE FACULTY:** *Manish K. Aghi, Nicholas C. Bambakidis, Frederick G. Barker, John A. Boockvar, Franco DeMonte, Michael Lim, Russell R. Lonser, Mark E. Shaffrey, Michael E. Sughrue, Charles Teo, Philip V. Theodosopoulos, Isaac Yang*

# SATURDAY, OCTOBER 19

8:00 AM – 4:00 PM

Room 2014–2016

## **PC03: Minimally Invasive Spinal Surgery (Cadaver Course)**

**COURSE DIRECTORS:** *Richard G. Fessler, John C. Liu*

**COURSE FACULTY:** *Nader S. Dahdaleh, Kurt M. Eichholz, Langston T. Holly, Robert E. Isaacs, Bong-Soo Kim, John E. O'Toole, Alfred T. Ogden, Avelino Parajon, Mick J. Perez-Cruet, Faheem A. Sandhu, Zachary Adam Smith, Trent Lane Tredway, Jean-Marc Voyadzis*

8:00 – 11:30 AM

Room 2022

## **PC04: So, You Want to be a Neurosurgeon?**

**COURSE DIRECTORS:** *Aviva Abosch, Stavropoula I. Tjoumakaris*

**COURSE FACULTY:** *Frederick A. Boop, Susan Chang, Daniel Robert Fassett, Daniel A. Lim, Neil A. Martin, Praveen V. Mummaneni, Nathan R. Selden, Krystal L. Tomei*

8:00 – 11:30 AM

Room 3003

## **PC05: Neurosurgery Oral Board Review**

**COURSE DIRECTORS:** *Allan D. Levi*

**COURSE FACULTY:** *James S. Harrop, Thomas J. Leipzig, Alfredo Quinones-Hinojosa, Robert J. Spinner*

8:00 – 11:30 AM

Room 2020

## **PC06: Cervical Spondylotic Myelopathy and Radiculopathy: Treatment Approaches and Options**

**COURSE DIRECTORS:** *Regis W. Haid, Jr., Michael G. Kaiser*

**COURSE FACULTY:** *Kurt M. Eichholz, James S. Harrop, Langston T. Holly, John E. O'Toole*

8:00 – 11:30 AM

Room 3022

## **PC07: Open Aneurysm Surgery: A 3-D Practical Course**

**COURSE DIRECTORS:** *Michael T. Lawton, Byron Gregory Thompson, Jr.*

**COURSE FACULTY:** *Fady T. Charbel, Ali F. Krisht, Jacques J. Morcos, Troy D. Payner, Howard A. Riina*

8:00 – 11:30 AM

Room 3002

## **PC08: Neurosurgical Approaches to the Pain Patient: Patient Selection, Techniques, and Complication Avoidance**

**COURSE DIRECTORS:** *Julie G. Pilitsis, Joshua M. Rosenow*

**COURSE FACULTY:** *Steven M. Falowski, Krishna Kumar, Jonathan Miller, Sean J. Nagel, Parag G. Patil, William S. Rosenberg*

12:30 – 4:00 PM

Room 2022

## **PC09: Using Evidence-Based Medicine to Manage Spinal Disorders**

**COURSE DIRECTORS:** *Peter D. Angevine, John E. O'Toole*

**COURSE FACULTY:** *Mark H. Bilsky, Andrew T. Dailey, Daniel J. Hoh, Michael G. Kaiser*

12:30 – 4:00 PM

Room 3003

## **PC10: Trauma Update: Spinal Cord Injury Guidelines and Best Practices**

COURSE DIRECTORS: *Michael G. Fehlings, James S. Harrop*

COURSE FACULTY: *Bizhan Aarabi, Sean Peter Barry, Steven Casha, Rajesh Reddy, Christopher I. Shaffrey, Mohammed F. Shamji*

12:30 – 4:00 PM

Room 3002

## **PC11: Masters of Cranial Neuroendoscopy**

COURSE DIRECTORS: *Alan R. Cohen, James M. Drake*

COURSE FACULTY: *Daniel J. Guillaume, Costas George Hadjipanayis, Nakamasa Hayashi, John Anthony Jane, David F. Jimenez, David D. Limbrick, Charles Teo*

12:30 – 4:00 PM

Room 3022

## **NEW PC12: Implementing Quality Improvement in Neurosurgery: Raising Quality, Lowering Cost, and Maximizing Compensation**

COURSE DIRECTORS: *William A. Friedman, Stephen J. Haines, Neil A. Martin, Nader Pouratian,*

COURSE FACULTY: *Anthony Asher, Dong H. Kim, Nancy McLaughlin*

12:30 – 4:00 PM

Room 2024

## **PC13: RRC Next Accreditation System, Milestones, and the Neurosurgery Matrix**

COURSE DIRECTORS: *H. Hunt Batjer, Nathan R. Selden*

COURSE FACULTY: *Pamela L. Derstine, Ann Dohn, Heidi Waldo*

12:30 – 4:00 PM

Room 3001

## **PC14: 3-D Anatomy (Supratentorial)**

COURSE DIRECTORS: *Juan Carlos Fernandez-Miranda*

COURSE FACULTY: *Evandro De Oliveria, Antonio Mussi, Jeffrey M. Sorenson*

5:30 – 8:00 PM

Farallon Restaurant

### **DINNER SEMINAR 1**

#### **Brain Metastases Guidelines**

MODERATOR: *Steven N. Kalkanis*

FACULTY: *David W. Andrews, Clark C. Chen, Timothy C. Ryken*

*Pre-Dinner Reception hosted by Arbor Pharmaceuticals  
Supported by an Educational Grant from BrainLab*

5:30 – 8:00 PM

Boulevard Restaurant

### **DINNER SEMINAR 2**

#### **Working with Your Hospital**

MODERATOR: *Alex B. Valadka*

FACULTY: *Deborah L. Benzil, Robert E. Harbaugh, Edie E. Zusman*

## INNOVATION & TECHNOLOGY SYMPOSIUM

7:00 AM–4:00 PM

Golden Gate B, Marriott Marquis



### **SYM03: NEUROMODULATION 2013: WHAT EVERY NEUROSURGEON NEEDS TO KNOW**

**SYMPOSIUM DIRECTORS:** *Michael G. Kaplitt, Parag G. Patil*

**COURSE FACULTY:** *Aviva Abosch, Ron L. Alterman, Jin Woo Chang, Robert E. Gross, Clement Hamani, Jamie Henderson, Dave Kloth, Peter Konrad, Brian H. Kopell, Paul S. Larson, Robert M. Levy, Alon Y. Mogilner, Joseph Samir Neimat, Julie G. Pilitsis, Lawrence Poree, Jean M. Regis, William S. Rosenberg, Konstantin V. Slavin, Bomin Sun, Takaomi Taira, Donald M. Whiting*

7:00–9:15 AM

### **What Every Neurosurgeon Needs to Know About Pain Neuromodulation**

9:15–9:55 AM

### **Industry Innovation Session with Medtronic Neuromodulation**

9:55–11:10 AM

### **What Every Neurosurgeon Needs to Know about Deep Brain Stimulation**

11:10 AM–12:00 PM

### **Lunch**

12:00–12:45 PM

### **International Session: Ablation Around the World**

12:45–1:25 PM

### **Industry Innovation Session with Boston Scientific**

1:25–4:00 PM

### **What Every Neurosurgeon Needs to Know for the Future**

2:45–3:25 PM

### **Breakout Industry Innovation Session**

3:25 PM

### **Closing Remarks and Questions**

Supported in part by:



**Medtronic**

**Boston  
Scientific**

## INNOVATION & TECHNOLOGY SYMPOSIUM

7:00 AM–4:00 PM

Room 2001, Moscone West Convention Center



### **SYM04: STROKE 2014**

**SYMPOSIUM DIRECTORS:** *Peter Kan, Adnan H. Siddiqui*

**COURSE FACULTY:** *Ali Alaraj, Sepideh Amin-Hanjani, David Fiorella, Ricardo A. Hanel, Brian L. Hoh, Pascal Jabbour, Michael T. Lawton, Elad I. Levy, Demetrius K. Lopes, Cameron G. McDougall, J.D. Mocco, Jacques J. Morcos, Rafael A. Ortiz, Andrew J. Ringer, Lucie Thibault, Aquilla S. Turk, Erol Veznedaroglu*

7:00–7:40 AM

#### **Medical Therapy for Stroke: What is the Evidence?**

7:40–8:40 AM

#### **Interventional Therapy for Stroke: What is the Evidence?**

8:40–9:20 AM

#### **Industry Innovation Session with Covidien**

9:20–11:00 AM

#### **Patient Selection and Advance Imaging for Acute Stroke Intervention**

9:50–10:30 AM

#### **Industry Innovation Session with Microvention**

11:00 AM–12:00 PM

#### **Lunch Break**

12:00–12:15 PM

#### **EC-IC Bypass: What is the Evidence?**

12:15–12:55 PM

#### **Industry Innovation Session with Penumbra**

12:55–1:55 PM

#### **Optimal Treatment of Intracranial Aneurysms**

1:55–2:40 PM

#### **Flow Diversion in the Treatment of Intracranial Aneurysms: When Should We Use It?**

2:40–2:55 PM

#### **Critical Care Management of Aneurysmal Subarachnoid Hemorrhage**

2:55–3:35 PM

#### **Closing Remarks and Questions**

#### **Supported in part by:**



**COVIDIEN**

**CODMAN NEURO**  
DePuySynthes



**Microvention**  
TERUMO


**Penumbra**



## PRACTICAL COURSES

8:00 AM – 4:00 PM

Room 2018-2020

 **PC15: Endoscopic and Keyhole Approaches to the Anterior Skull Base (Cadaver Course)**

**COURSE DIRECTORS:** *Zachary N. Litvack, Charles Teo*

**COURSE FACULTY:** *Garni Barkhoudarian, Sebastian C. Froelich, Jeremy D.W. Greenlee, Caroline Hayhurst, Nikolai J. Hopf, Daniel F. Kelly, Daniel M. Prevedello, Jonathan H. Sherman, Michael E. Sughrue*

8:00 AM – 4:00 PM

Room 2002

**PC16: Simulation Based Neurosurgical Training**

**COURSE DIRECTORS:** *James S. Harrop, Darlene A. Lobel*

**COURSE FACULTY:** *P. Banerjee, Bernard R. Bendok, Mark W. Bowyer, Peter Campbell, Rohan Chitale, Aaron S. Dumont, James Bradley Elder, Aruna Ganju, George M. Ghobrial, Daniel J. Hoh, Pascal Jabbour, Thomas Kerwin, Elad I. Levy, J D. Mocco, Gregory J. Murad, Daniel M. Prevedello, Wilson Zachary Ray, Daniel Refai, Andrew J. Ringer, Ben Z. Roitberg, Clemens M. Schirmer, Nathan R. Selden, Warren R. Selman, Adnan Hussain Siddiqui, Harminder Sing, Erol Veznedaroglu*

*Supported in part by Educational Grants from KLS Martin and Biomet Microfixation*

8:00 – 11:30 AM

Room 2008

**PC17: 2013 CPT Coding Update**

**COURSE DIRECTORS:** *Alexander Mason, John K. Ratliff*

**COURSE FACULTY:** *Kim Pollock, Karin R. Swartz, Luis M. Tumialan*

8:00 – 11:30 AM

Room 2024

**PC18: Practical Spine Biomechanics for Clinical Practice**

**COURSE DIRECTORS:** *Edward C. Benzel, Tyler R. Koski*

**COURSE FACULTY:** *Zoher Ghogawala, Langston T. Holly, John H. Shin*

8:00 – 11:30 AM

Room 3001

**PC19: 3-D Anatomy (Infratentorial)**

**COURSE DIRECTORS:** *Juan Carlos Fernandez-Miranda*

**COURSE FACULTY:** *Evandro De Oliveira, Antonio Mussi*

8:00 – 11:30 AM

Room 2022

**PC20: Surgical Management of Tumors in Eloquent Regions**

**COURSE DIRECTORS:** *Andrew H. Kaye, Guy M. McKhann*

**COURSE FACULTY:** *Giuseppe Barbagallo, Edward F. Chang, Jorge A. Gonzalez-Martinez, Andrew Morokoff*

8:00 – 11:30 AM

Room 3016

 **PC21: Building a Neurosciences Program**

**COURSE DIRECTORS:** *Steven A. Toms*

**COURSE FACULTY:** *P. David Adelson, Megan Brosious, James M. Ecklund, Robert M. Friedlander, John B. Pracyk, Gary K. Steinberg*



8:00 – 11:30 AM

Room 3003



## **PC22: Negotiation Tactics from the Experts - Getting the Best Deal (Hospital Negotiations)**

COURSE DIRECTORS: *Deborah L. Benzil, Alex B. Valadka*

COURSE FACULTY: *James M. Ecklund, Anne McCune, Troy D. Payner, Lawrence H. Pitts, James T. Rutka, Edie E. Zusman*

12:30 – 4:00 PM

Room 3018

## **PC24: My Worst Spinal Complication: What I Learned**

COURSE DIRECTORS: *Charles Kuntz, IV, Christopher I. Shaffrey*

COURSE FACULTY: *Robert Bohinski, Regis W. Haid, Laurence D. Rhines, Michael P. Steinmetz, Vincent C. Traynelis, Juan S. Uribe*

12:30 – 4:00 PM

Room 2016

## **PC25: Neurocritical Care and Neurosurgical Emergencies Update**

COURSE DIRECTORS: *Jack Jallo, Christopher J. Madden*

COURSE FACULTY: *Kamran Athar, Ian E. McCutcheon, John K. Ratliff, Jonathan A. White*

12:30 – 4:00 PM

Room 2008

## **PC26: Innovation and Intellectual Property Development: From Concept to Company**

COURSE DIRECTORS: *Richard G. Fessler, Erol Veznedaroglu*

COURSE FACULTY: *Robert F. Heary, L. Nelson Hopkins, John Kilcoyne, Elad I. Levy, Gwen Watanabe*

12:30 – 4:00 PM

Room 3002

## **PC27: Cranial Neurosurgery: Complication Avoidance and Management**

COURSE DIRECTORS: *William T. Couldwell, Jack P. Rock*

COURSE FACULTY: *Ossama Al-Mefty, Gordon Baltuch, Raj K. Narayan, Robert H. Rosenwasser*

12:30 – 4:00 PM

Room 2014

## **PC28: Cranial and Spinal Radiosurgery Update**

COURSE DIRECTORS: *Randy L. Jensen, Andrew E. Sloan*

COURSE FACULTY: *Steven D. Chang, Michael W. McDermott, Alexander Muacevic, Jason P. Sheehan*

2:30 – 4:00 PM

Room 3014, MOSCONE WEST CONVENTION CENTER

## **MULTIDISCIPLINARY ORAL PRESENTATIONS I**

MODERATORS: *Amir R. Dehdashti, Bharat Guthikonda*

*For a listing of Oral Presentations see pages 54-55.*

# SUNDAY, OCTOBER 20

## GENERAL SCIENTIFIC SESSION I

4:30 – 6:30 PM ▷ San Francisco Marriott Marquis  
Yerba Buena Salons 1-7

**PRESIDING OFFICER:** *Alan M. Scarrow*

**MODERATORS:** *Alan M. Scarrow, Ashwini D. Sharan*

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4:30 – 4:35 PM

**Introduction** – *Ali R. Rezai*

4:35 – 4:55 PM

**The Evolution of Functional Anatomy, the Face as Paradigm** – *Dennis Spencer*

4:55 – 5:00 PM

**Introduction of Honored Guest** – *Robert F. Spetzler*

5:00 – 5:20 PM



HONORED GUEST LECTURE

**Breaking Down the Silos of Medicine:  
The Future of Vascular Neurosurgery**

*L. Nelson Hopkins, III*

5:20 – 5:23 PM

**Introduction of Special Lecture** – *Bernard R. Bendok*

5:23 – 5:44 PM



FEATURED SPEAKER

**Evolution of Space Discovery**

*Charles Elachi*

Director, Jet Propulsion Lab

5:44 – 5:47 PM

**Introduction of Special Lecture** – *Julie G. Pilitsis*

5:47 – 6:07 PM



FEATURED SPEAKER

**Evolving Science of Pain: Transplants**

*Allan Basbaum, PhD, FRS*

Professor and Chairman of the Department of  
Anatomy at UCSF

# SUNDAY, OCTOBER 20 GENERAL SCIENTIFIC SESSION I

4:30 – 6:30 PM ▷ San Francisco Marriott Marquis  
Yerba Buena Salons 1-7

6:07 – 6:10 PM

**Introduction of Featured Speaker** – *Alan M. Scarrow*

6:10 – 6:30 PM



FEATURED SPEAKER

**Where Good Ideas Come From**

**Steven Johnson**

Best-Selling Author

6:30 – 7:30 PM

 **Book Signing**

Yerba Buena Salons 8-15 Lobby Marriott Marquis

## *Opening Reception*

Sunday, October 20  
6:30 – 8:30 PM

*Live* music, entertainment and a delicious spread of food and beverages await you at the 2013 CNS Opening Reception. Mingle with colleagues while enjoying a relaxed and festive evening at the San Francisco Marriott Marquis.



# MONDAY, OCTOBER 21

## GENERAL SCIENTIFIC SESSION II

7:00 – 11:30 AM ▷ Moscone West Convention Center Ballroom

**PRESIDING OFFICER:** *Daniel K. Resnick*

**MODERATORS:** *Michael P. Steinmetz, Michael Y. Wang*

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7:00 – 7:04 AM

**CNS Foundation** – *Richard W. Byrne*

7:04 – 7:18 AM

**Spinal Vascular Malformations Dural AVF – How, When & Why** – *Cameron G. McDougall*

7:18 – 7:32 AM

**Outcomes Research and Patient Access to Spine Care: Lessons Learned and Implications for the Future of Spine Surgery** – *John K. Ratliff*

7:32 – 7:46 AM

**Spinal Oncology: from XRT, Surgery, Radiosurgery** – *Peter C. Gerszten*

7:46 – 8:00 AM

**Spinal Technologies Not in the USA** – *Domagoj Coric*

8:00 – 8:23 AM

**Controversy: Spinal Cord Injury and Steroids: Reality, Data, Guidelines – Now What?**

Moderator: *James S. Harrop*

*R. John Hurlbert versus Michael G. Fehlings*

8:23 – 8:33 AM

**Editor's Choice Spine Paper** – *Daniel K. Resnick*  
**Cancer After Spinal Fusion: The Role of BMP**

8:33 – 8:47 AM

**Operative Pearls: Tackling Challenges in Aneurysm and AVM Surgery** – *Aaron Cohen-Gadol*

8:47 – 9:00 AM

**Introduction of CNS Resident Award and CNS Getch Fellowship Award to HAI SUN** – *Steven N. Kalkanis*

*CNS Resident Award: Electrophysiological Evidence of the Efference Copy in Human Voluntary Movements*

*CNS Getch Fellowship Award: Characterization of Interactions Between Supplementary Motor Area (SMA) and Primary Motor Cortex (M1) During Human Movement Using Electrocorticography (ECoG)*

**9:00–10:00 AM**

**EXHIBIT HALL BEVERAGE BREAK**

# MONDAY, OCTOBER 21 GENERAL SCIENTIFIC SESSION II

7:00 – 11:30 AM ▷ Moscone West Convention Center  
Ballroom

10:00 – 10:03 AM

**Introduction of Honored Guest** – *George A. Ojemann*

10:03 – 10:23 AM



HONORED GUEST

**Epilepsy Surgery and the Evolution of  
Clinical and Translational Science**

*Johannes Schramm*

10:23 – 10:26 AM

**Introduction of CNS President** – *P. David Adelson*

10:26 – 10:51 AM



PRESIDENTIAL ADDRESS

*Ali R. Rezai*

10:51 – 10:54 AM

**Introduction of Featured Speaker** – *Michael L.J. Apuzzo*

10:54 – 11:30 AM



FEATURED SPEAKER

*Itzhak Perlman*

Reigning Virtuoso of the Violin

**11:30 AM – 12:30 PM**

**EXHIBIT HALL BREAK**

## LUNCHEON SEMINARS

Room 2002

### **M01: Honored Guest Luncheon**

*Complimentary to CNS Resident Members!*

FACULTY: *Johannes Schramm*

Room 2000

### **M02: Cervical Arthroplasty and Lumbar Motion Preservation Technologies**

MODERATOR: *Regis W. Haid, Jr.*

FACULTY: *Ricahrd G. Fessler, Praveen V. Mummaneni, Michael Y. Wang*

Room 2004

### **M03: Radiosurgery in Vestibular Schwannoma Management**

MODERATOR: *Steven L. Giannotta, Douglas Kondziolka*

FACULTY: *Antonio DeSalles, Jean M. Regis, Pierre-Hughes Roche*

Room 2005

### **M04: Innovations in the Management of Intracerebral Hemorrhage**

MODERATOR: *Issam A. Awad*

FACULTY: *E. Sander Connolly, Neil A. Martin, Mario Zuccarello*

Room 2006

### **M05: Managing Long-term Complications of Cervical and Lumbar Spine Surgery**

MODERATOR: *William C. Welch*

FACULTY: *Bong-Soo Kim, Michael Y. Wang, Timothy Witham*

Room 2007

### **M06: Managing Pediatric Neurovascular Diseases**

MODERATOR: *Edward R. Smith*

FACULTY: *Peter B. Dirks, Cormac O. Maher, Darren Orbach*

Room 2008

### **M07: Peripheral Nerve Board Review**

MODERATOR: *Lynda Jun San Yang*

FACULTY: *Allen H. Maniker, Rajiv Midha, Robert J. Spinner*

Room 2009

### **M08: Strategies to Reduce Risk in Surgical Management of Tumors in Eloquent Regions**

MODERATOR: *Jeffrey S. Weinberg*

FACULTY: *Edward F. Chang, Florian Ringel, Martin Smrcka*

Room 2010



## **M09: Neurosurgical Emergencies: An Update for Allied Health Care Professionals**

MODERATOR: *Michael P. Steinmetz, Erol Veznedaroglu*

FACULTY: *Ajit A. Krishnaney, Brian T. Ragel, Andrea L. Strayer*

Room 2011

## **M10: Guidelines for Diagnosis and Treatment of Degenerative Lumbar Spinal Disease**

MODERATOR: *Praveen V. Mummaneni*

FACULTY: *Sanjay S. Dhall, Zoher Ghogawala, Daniel K. Resnick*

Room 2012

## **M11: Surgical Management of Meningiomas**

MODERATOR: *Philip H. Gutin*

FACULTY: *Aaron A. Cohen-Gadol, Michael W. McDermott, Daniel M. Prevedello*

Room 2016



## **M12: New Technologies and Innovations In Spinal Neurosurgery**

MODERATOR: *John C. Liu, John E. O'Toole*

FACULTY: *John Adler, Nicholas M. Boulis, Allan D. Levi*

Room 2018

## **M13: Multidisciplinary Management of Subarachnoid Hemorrhage and Vasospasm**

MODERATOR: *Robert H. Rosenwasser*

FACULTY: *C. Michael Cawley, E. Sander Connolly, Luca Regli, Daniel L. Surdell*

Room 2020

## **M14: Management of Complex and Refractory Chiari Malformations and Syringomyelia**

MODERATOR: *Richard G. Ellenbogen*

FACULTY: *Arthur J. DiPatri, David M. Frim, Matthew J. McGirt*

Room 2022

## **M15: Evidence-Based Management of Brain Metastases**

MODERATOR: *Raymond E. Sawaya*

FACULTY: *David W. Andrews, Philippe Metellus, Robert J. Weil*

## AFTERNOON SESSIONS

2:00 – 3:30 PM

Room 2014, Moscone West Convention Center

### SPECIAL COURSE I

#### Neurosciences Center and the Neurosurgeon: An Evolving Practice Landscape

MODERATORS: *Alexander A. Khalessi, P. David Adelson*

FACULTY: *Nicholas M. Barbaro, Bob S. Carter, Brendan Kremer,  
Marc R. Mayberg, Jayme Zage*

2:00 – 3:30 PM

Room 2001/2003, Moscone West Convention Center

### CONSENSUS SESSION I



#### Management of Cerebral Gliomas: Building Consensus from Controversy

MODERATOR: *Mitchel S. Berger*

FACULTY: *Susan Chang, E. Antonio Chiocca,  
Andrew E. Sloan, Ying Mao*

2:00 – 3:30 PM

Moscone West Convention Center

### CNS ORIGINAL SCIENCE 1 – ORAL PRESENTATIONS

Room 3003

#### Council of State Neurosurgical Societies

MODERATORS: *Clement Hamani, Gregory R. Trost*

*For a listing of Oral Presentations see pages 55-57.*

Room 3001

#### Section on Pediatric Neurological Surgery

MODERATORS: *Richard Anderson, Jeffrey R. Leonard*

*For a listing of Oral Presentations see pages 57-58.*

Room 3002

#### Stereotactic & Functional Neurosurgery

MODERATORS: *Robert E. Gross, Michael Gordon Kaplitt*

*For a listing of Oral Presentations see pages 58-60.*

Room 3022

#### Section on Tumors

MODERATORS: *Frederick G. Barker, Ian F. Parney*

*For a listing of Oral Presentations see pages 60-62.*

3:30 – 5:00 PM

Room 3014-3020, Moscone West Convention Center

### CNS NEUROSURGICAL FORUM

#### Council of State Neurosurgical Societies

MODERATORS: *Ajit A. Krishnaney, Gregory R. Trost*

*For a listing of posters see pages 70-71.*

#### Section on Cerebrovascular Neurosurgery

MODERATORS: *Eric Sauvageau, Andrew W. Grande*

*For a listing of posters see pages 71-76.*



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## Section on Disorders of the Spine and Peripheral Nerves

MODERATORS: *Patrick Hsieh, Adam Kanter*

*For a listing of posters see pages 77-83.*

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## Section on Neurotrauma and Critical Care

MODERATOR: *Steven Casha*

*For a listing of posters see pages 83-85.*

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## Section on Pain

MODERATOR: *Andre Machado*

*For a listing of posters see pages 85-86.*

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## Section on Pediatric Neurological Surgery

MODERATORS: *Richard Anderson, Jeffrey R. Leonard*

*For a listing of posters see pages 86-88.*

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## Section on Stereotactic and Functional Neurosurgery

MODERATORS: *Clement Hamani, Peter Konrad*

*For a listing of posters see pages 88-91.*

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## Section on Tumors

MODERATORS: *Frederick G. Barker, Ian Parney*

*For a listing of posters see pages 91-96.*

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## International Forum

MODERATORS: *Shekar N. Kurpad, Charles Y. Liu, Daniel M. Prevedello*

*For a listing of posters see pages 98-99.*

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3:30 – 5:00 PM

Ballroom, Moscone West Convention Center

## 3-D OPERATIVE NEUROSURGERY I

### Techniques to Advance Safety and Efficacy in Microneurosurgery



MODERATORS: *Aaron A. Cohen-Gadol, Aaron S. Dumont*

FACULTY: *Bernard R. Bendok, William T. Couldwell, Steven L. Giannotta, Robert A. Solomon, Robert F. Spetzler, Harry R. Van Loveren*

**MONDAY, OCTOBER 21**

5:00 – 8:30 PM

## **INTERNATIONAL RECEPTION AND DINNER SEMINARS**

5:00 – 6:30 PM

Yerba Buena Salon 7, Marriott Marquis

### **INTERNATIONAL RECEPTION**

Co-Sponsored by  **Medtronic** and the CNS

6:00 – 8:30 PM

One Market Restaurant

### **DINNER SEMINAR 3**

#### **Beyond 'Through the Tube' – When and When Not to Use MIS**

MODERATOR: *Michael Y. Wang*

FACULTY: *Richard G. Fessler, Robert F. Heary, Larry T. Khoo,  
Praveen V. Mummaneni*

6:00 – 8:30 PM

Epic Roasthouse

### **DINNER SEMINAR 4**

#### **Evolution of the Endovascular Revolution**

MODERATOR: *Pascal Jabbour*

FACULTY: *David M. Hasan, Elad I. Levy, Cameron G. McDougall,  
J D. Mocco*

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Spinal Cord Stimulator System

INNOVATION FOCUSED ON PAIN RELIEF™



COVERAGE. FLEXIBILITY.  
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DESIGNED TO PROVIDE MORE PAIN RELIEF  
TO A BROADER SPECTRUM OF PATIENTS.

The Precision Spectra™ Spinal Cord Stimulator System (Precision Spectra System) is indicated as an aid in the management of chronic intractable pain of the trunk and/or limbs, including unilateral or bilateral pain associated with the following: failed back surgery syndrome, intractable low back pain, and leg pain. **Contraindications, warnings, precautions, side effects.** The Precision Spectra System is contraindicated for patients who: are unable to operate the Precision Spectra System, have failed trial stimulation by failing to receive effective pain relief, are poor surgical risks, or are pregnant. Refer to the Instructions for Use provided with the Precision Spectra System or ControlYourPain.com for potential adverse effects, warnings, and precautions prior to using this product. Caution: Federal (U.S.) law restricts this device to sale by or on the order of a physician.

# TUESDAY, OCTOBER 22

## GENERAL SCIENTIFIC SESSION III

7:00 – 11:30 AM ▷ Moscone West Convention Center Ballroom

**PRESIDING OFFICER:** *Jamie S. Ullman*

**MODERATORS:** *Steven N. Kalkanis, Ganesh Rao*

7:00 – 7:05 AM

**Introduction of CNS International Division** – *Anil Nanda*

7:05 – 7:19 AM

**How Radiosurgery Changed Neurosurgery and the Changes that Lie Ahead** – *Douglas Kondziolka*

7:19 – 7:33 AM

**MRI Safety and Neurosurgery: Brain and Spine Implants** – *Frank G. Shellock*

7:33 – 7:47 AM

**Evolution of Brain Tumor Treatment: From Chemo to Vaccines to Viruses** – *E. Antonio Chiocca*

7:47 – 7:57 AM

**Editor's Choice Tumor Paper** – *Philip V. Theodosopoulos*  
Conservative Management of Bilateral Acoustic Neuromas

7:57 – 8:15 AM

**Controversy: Open versus Endoscopic: When to Use Which**

Moderator: *William T. Couldwell*

*Laligam N. Sekhar versus Theodore H. Schwartz*

8:15 – 8:29 AM

**Operative Pearls: Expanding Operative Corridor for Difficult-to-Reach Tumors** – *Aaron A. Cohen-Gadol*

8:29 – 8:33 AM

**Introduction** – *Charles Y. Liu*

8:33 – 8:47 AM



INTERNATIONAL LECTURE

**Status of Neurosurgery in China**

*Professor Bai-nan Xu*

8:47 – 9:00 AM

**Awards Presentations** – *Christopher E. Wolfla*

8:47 – 8:48 AM

**Introduction of Fellowship Award Winners** – *Aviva Abosch*

8:48 – 8:51 AM

**Fellowship Award Winners**

8:51 – 8:54 AM

**Neurosurgical Forum Winners** – *Ashwini D. Sharan*

# TUESDAY, OCTOBER 22 GENERAL SCIENTIFIC SESSION III

7:00 – 11:30 AM ▷ Moscone West Convention Center  
Ballroom

8:54 – 8:57 AM

**Presentation of Distinguished Service Award to Regina Shupak** – *Gerald E. Rodts, Jr.*

8:57 – 9:00 AM

**Presentation of CNS Founder's Laurel to Arthur Day** – *Christopher E. Wolfla*

**9:00–10:00 AM**

**EXHIBIT HALL BEVERAGE BREAK**

10:00 – 10:05 AM

**Introduction of Honored Guest** – *Edward R. Laws, Jr.*

10:05 – 10:25 AM



HONORED GUEST LECTURE

**Continuing Evolution: The Biology and Treatment of Gliomas**

*Andrew H. Kaye*

10:25 – 10:30 AM

**Introduction of Special Lecturer** – *Ali R. Rezai*

10:30 – 10:50 AM



SPECIAL LECTURE

**From the Blue Zones to the Lab: Secrets to Living Long and Living Well**

*Clay B. Marsh*

10:50 – 10:55 AM

**Introduction of Featured Speaker** – *Alan M. Scarrow*

10:55 – 11:30 AM



FEATURED SPEAKER

*David Brooks*

11:30 AM – 12:30 PM

 **Book Signing**

CNS Member Services Booth #1309

**11:30 AM – 12:30 PM**

**EXHIBIT HALL BREAK**

## LUNCHEON SEMINARS

Room 2002

### **T16: Honored Guest Luncheon**

*Complimentary to CNS Resident Members!*

FACULTY: *Andrew H. Kaye*

Room 2000

### **T17: Surgical Management of Cervical Degenerative Disease**

MODERATOR: *Michael P. Steinmetz*

FACULTY: *Ajit A. Krishnaney, Daniel Refai, Gregory R. Trost,*

Room 2004

### **T18: Skull Base Endoscopy: Utility and Limitations**

MODERATOR: *Paul A. Gardner, Charles Teo*

FACULTY: *Juan Carlos Fernandez-Miranda, Fred Gentili, Daniel R. Peiper*

Room 2005

### **T19: Multimodal Management of Intracranial Arteriovenous Malformations**

MODERATOR: *Michael T. Lawton*

FACULTY: *Daniel Barrow, Vladimir Benes, Giuseppe Lanzino, Cameron G. McDougall*

Room 2006

### **T20: The Aging Spine: Considerations in Surgical Management**

MODERATOR: *Christopher P. Ames, Gerald E. Rodts, Jr.*

FACULTY: *Michael W. Groff, Michael Y. Wang*

Room 2007

### **T21: Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries**

MODERATOR: *R. John Hurlbert*

FACULTY: *Sanjay S. Dhall, Mark N. Hadley, Beverly C. Walters*

Room 2016

### **T22: Pituitary Adenomas: Operative Nuances and Management Considerations**

MODERATOR: *James J. Evans, Edward R. Laws, Jr.*

FACULTY: *Manish K. Aghi, James P. Chandler, Fred Gentili*

Room 2009

### **T23: Advances in the Management of Trigeminal Neuralgia and Facial Pain**

MODERATOR: *Kim J. Burchiel*

FACULTY: *Douglas Kondziolka, Jonathan Miller, Konstantin V. Slavin*

Room 2010

## **T24: Multidisciplinary Management Strategies for Unruptured Aneurysms**

MODERATOR: *Robert A. Solomon*

FACULTY: *Robert M. Friedlander, J D. Mocco, Gregory J. Zipfel*

Room 2011

## **T25: Managing Complications in Spinal Surgery**

MODERATOR: *Edward C. Benzel*

FACULTY: *Daniel J. Hoh, Christopher I. Shaffrey, Gregory R. Trost*

Room 2018

## **T26: Guidelines for Neurocritical Care Management for Patients with Severe Traumatic Brain Injury**

MODERATOR: *Shelly D. Timmons*

FACULTY: *Joshua E. Medow, Patricia B. Raksin, Joseph Christopher Zacko*

Room 2008

## **T27: Controversies in Management of Low Grade Gliomas**

MODERATOR: *Michael W. McDermott*

FACULTY: *Gene Barnett, Steven N. Kalkanis, Nader Sanai*

Room 2012

## **T28: Complication Avoidance and Advanced MIS Applications**

MODERATOR: *Richard G. Fessler*

FACULTY: *Larry T. Khoo, Faheem A. Sandhu, Trent L. Tredway*

Room 2020

## **T29: Peripheral Nerve Entrapment Syndromes: Diagnosis and Management**

MODERATOR: *Eric L. Zager*

FACULTY: *Jason H. Huang, Robert J. Spinner, Lynda J. Yang*



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## AFTERNOON SESSIONS

2:00 – 3:30 PM

Room 2014, Moscone West Convention Center

### SPECIAL COURSE II

#### Out of Balance: How Can We Improve Outcomes from Spine Surgery?

MODERATORS: *Edward C. Benzel, Zoher Ghogawala*

FACULTY: *Domagoj Coric, Praveen V. Mummaneni, Christopher I. Shaffrey*

2:00 – 3:30 PM

Moscone West Convention Center

### CNS ORIGINAL SCIENCE II – ORAL PRESENTATIONS

Room 3016

#### Section on Neurotrauma and Critical Care

MODERATORS: *Steven Casha*

*For a listing of Oral Presentations see pages 63-65.*

Room 2024

#### Section on Pain

MODERATORS: *Andre Machado*

*For a listing of Oral Presentations see pages 65-66.*

Room 3002

#### Section on Spine and Peripheral Nerves

MODERATORS: *Bradley Jacobs, Mohammed F. Shamji*

*For a listing of Oral Presentations see pages 62-63.*

Room 3001

#### Section on Cerebrovascular Surgery

MODERATORS: *Andrew W. Grande, Eric Sauvageau*

*For a listing of Oral Presentations see pages 66-68.*

2:00 – 3:30 PM

Room 3003, Moscone West Convention Center

### COUNCIL OF STATE NEUROSURGICAL SOCIETIES

#### Enhancing Patient Experience: Impact on Your Practice

MODERATORS: *Darlene A. Lobel, Gregory R. Trost*

SPEAKERS: *Edward C. Benzel, Adrienne Boissy, Jeff Grossman*

2:00 – 3:30 PM

Room 3022, Moscone West Convention Center

### SECTION ON PEDIATRIC NEUROLOGICAL SURGERY

#### Tackling Difficult Shunt Problems: Headaches, Slit Ventricles and Their Management Strategies

MODERATOR: *Greg Olavarria*

SPEAKERS: *Rick Abbott, Abhaya V. Kulkarni, Harold L. Rekate*

2:00 – 3:30 PM

Room 2022, Moscone West Convention Center

### SECTION ON STEREOTACTIC & FUNCTIONAL NEUROSURGERY

#### Advances in Epilepsy Surgery

MODERATORS: *Aviva Abosch, Michael G. Kaplitt*

SPEAKERS: *Gordon H. Baltuch, Matthew Doring, Emad N. Eskandar, David W. Roberts*



2:00 – 3:30 PM

Room 3018, Moscone West Convention Center

## SECTION ON TUMORS

### Novel Imaging in Brain Tumor Surgery

**MODERATORS:** *Frederick G. Barker, Ian F. Parney*

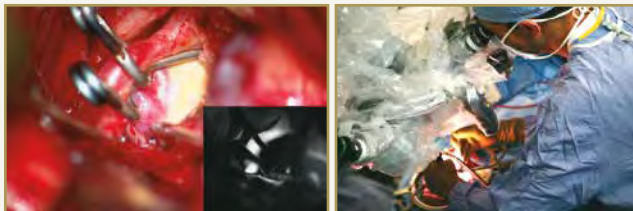
**SPEAKERS:** *Linda M. Liau, Sarah J. Nelson, James T. Rutka, Tal Shahar, Jinsong Wu*

3:30 – 5:00 PM

Ballroom, Moscone West Convention Center

## 3-D OPERATIVE NEUROSURGERY II

### Intraoperative Complication Avoidance and Management



**MODERATORS:** *Aaron A. Cohen-Gadol, Paul Gardner*

**FACULTY:** *Daniel L. Barrow, Ketan R. Bulsara, Richard G. Fessler, Michael T. Lawton, Jacques J. Morcos, Laligham N. Sekhar*

## EVENING EVENTS AND DINNER SEMINARS

5:00 – 6:30 PM

Exhibit Hall

### RESIDENT SANS CHALLENGE CHAMPIONSHIP ROUND

5:00 – 6:30 PM

Exhibit Hall



### WINE AND CHEESE RECEPTION

Co-Sponsored by  and the CNS

6:00 – 8:30 PM

Waterbar Restaurant

### DINNER SEMINAR 5

#### Placing Sports Under the Microscope: Head Injury and CTE

**MODERATOR:** *Richard G. Ellenbogen*

**FACULTY:** *Michael L. Levy, Russell R. Lonser*

6:00 – 8:30 PM

Harris' Steakhouse

### DINNER SEMINAR 6

#### The Burden of Proof: Quality Improvement Initiatives

**MODERATOR:** *Anthony L. Asher*

**FACULTY:** *Kate Chenok, Robert E. Harbaugh, Matthew J. McGirt, Katie O. Orrico, Michael J. Schlosser*

6:30 – 7:30 PM

Level 2 Lobby, Moscone West Convention Center

### RESIDENT RECRUITMENT SOCIAL

# WEDNESDAY, OCTOBER 23

## GENERAL SCIENTIFIC SESSION IV

7:00 – 11:30 AM ▷ Moscone West Convention Center Ballroom

**PRESIDING OFFICER:** *Russell R. Lonser*

**MODERATORS:** *Elad I. Levy, Nathan R. Selden*

7:00 – 7:05 AM

**Introduction of CNS Education Committee** – *Zoher Ghogawala*

7:05 – 7:07 AM

**Introduction Special Lecturer** – *Nathan R. Selden*

7:07 – 7:27 AM



FEATURED SPEAKER

**Three Steps Forward and Two Steps Back: The Echternach Procession Towards Optimal Hydrocephalus Treatment**

*Benjamin C. Warf*

MacArthur Fellows Award Winner

7:27 – 7:37 AM

**Editor's Choice Vascular Paper** – *E. Sander Connolly, Jr.*  
Multi-center Study of Stent-assisted Coiling for Aneurysms

7:37 – 8:07 AM

**LIVE! In the OR – Revascularization of the Carotid: Clinical Equipoise** – *L. Nelson Hopkins, III, Elad I. Levy*

*Supported by an Educational Grant from*  COVIDIEN

8:07 – 8:22 AM

**Endovascular Neurosurgery in Evolution – Flow Divergence** –  
*Ajay K. Wakhloo*

8:22 – 8:42 AM

**Controversy: Open versus Endovascular Approach to Aneurysms**

Moderator: *H. Hunt Batjer*

*Robert F. Spetzler versus Robert H. Rosenwasser*

8:42 – 8:45 AM

**Introduction** – *Russell O. Pieper*

8:45 – 8:55 AM



**Japanese Congress of Neurological Surgeons Presidential Address**

*Yuichi Hirose*

8:55 – 9:00 AM

**AANS President** – *William T. Couldwell*

**9:00–10:00 AM**

**EXHIBIT HALL BEVERAGE BREAK**

10:00 – 10:02 AM

**Introduction** – *Russell R. Lonser*

# WEDNESDAY, OCTOBER 23 GENERAL SCIENTIFIC SESSION IV

7:00 – 11:30 AM ▷ Moscone West Convention Center  
Ballroom

10:02 – 10:17 AM



INTERNATIONAL LECTURE

## Reconsideration of Cavernous Sinus Surgery After 30 Years' Experience

*Ying Mao*

Chinese Neurosurgical Society

10:17 – 10:32 AM

**The Evolution of Clinical Trials** – *Richard E. Kuntz, Senior VP/  
Chief Scientific, Clinical/Regulatory Officer, Medtronic, Inc*

10:32 – 10:35 AM

**Introduction of Special Lecture** – *Zoher Ghogawala*

10:35 – 10:55 AM



SPECIAL LECTURE

## The 21st Century's Technology Story: The Convergence of Biology and Engineering

*Susan Hockfield*

President Emerita

Massachusetts Institute of Technology

10:55 – 11:30 AM



## Investing in Neurosurgery Innovations –

*L. Nelson Hopkins, Fred Khosravi, Hank Plain,  
Paul Yock*

Innovation has been and will continue to be the fuel behind the growth and advancement of Neurosurgery and Neurointervention. But innovation is not just about creative ideas and solutions – that's only the

tip of the iceberg. What make innovations real and present in our day to day work and practices, is the complex web of product development, regulatory challenges, legal considerations, financing obstacles, and people! The success and failure of every innovation, like everything else we do, has more to do with the caliber and quality of the people than anything else. This Plenary session features three of the most renowned Silicone Valley medical-device entrepreneurs in a round-table discussion about challenges and obstacles of technology development process and views on how to navigate and evolve ideas into real products that eventually touch patients by hundreds of thousands. The panelist will be; Paul Yock, who is a world renowned physician, a most impactful innovator in the field of cardiovascular intervention, and founder of the Stanford Bidesign Program; Hank Plain who is the quintessential entrepreneur, turned respected business leader and venture capitalist; and Fred Khosravi who is a respected serial entrepreneur with his innovative impact going back to the early days of stenting & angioplasty over two decades ago. This will be a lively and hopefully enriching window into the mind-set of entrepreneurs and what motivates them to innovate.

11:30 AM – 12:30 PM

EXHIBIT HALL BREAK

## LUNCHEON SEMINARS

Room 2002

### **W30: Honored Guest Luncheon**

*Complimentary to CNS Resident Members!*

FACULTY: *L. Nelson Hopkins*

Room 2000

### **W31: Recurrent, Thoracic and Far Lateral Lumbar Disc Herniations**

MODERATOR: *J. Patrick Johnson*

FACULTY: *John C. Liu, Paul Park, Zachary A. Smith*

Room 2004

### **W32: Complication Avoidance and Management in Skull Base Surgery**

MODERATOR: *Juan Carlos Fernandez-Miranda*

FACULTY: *John G. Golfinos, Carl B. Heilman, Michael J. Link*

Room 2005

### **W33: Update on Movement Disorders: Novel Targets, Indications, and Approaches**

MODERATOR: *Robert E. Gross*

FACULTY: *W. Jeffrey Elias, Michael Gordon Kaplitt, Zelma Kiss*

Room 2006

### **W34: Malignant Glioma: Where Are We Now?**

MODERATOR: *Jeffrey N. Bruce*

FACULTY: *E. Antonio Chiocca, Randy L. Jensen, Andrew T. Parsa*

Room 2007

### **W35: Lessons Learned: Avoidance and Management of Complications of Aneurysm Surgery**

MODERATOR: *Giuseppe Lanzino*

FACULTY: *Ali F. Krisht, Michael T. Lawton, Andreas Raabe*

Room 2008

### **W36: Sagittal Balance in Spine Surgery**

MODERATOR: *Regis W. Haid, Jr.*

FACULTY: *Tyler R. Koski, Juan S. Uribe*

Room 2009

### **W37: Strategies for Maximizing Compensation for Your Neurosurgical Practice**

MODERATOR: *Donald M. Whiting*

FACULTY: *Hooman Azmi, Fernando G. Diaz, Gregory J. Przybylski*

Room 2010



## **W38: Athletic Head Injuries: Return To Play**

MODERATOR: *H. Hunt Batjer*

FACULTY: *Julian E. Bailes, James M. Johnston, Russell R. Lonser, Geoffrey T. Manley*

Room 2011



## **W39: Quality and Value in Health Care**

MODERATORS: *Zoher Ghogawala, Daniel K. Resnick*

FACULTY: *Sigurd Berven, E. Sander Connolly, Matthew J. McGirt*

Room 2012

## **W40: Hematology and Coagulation for Neurosurgeons: Dangers and Solutions**

MODERATOR: *Issam A. Awad*

FACULTY: *Alan S. Hoffer, Maciej S. Lesniak, R. Loch Macdonald*

Room 2016

## **W41: Managing Metastasis to the Spine**

MODERATOR: *Laurence D. Rhines*

FACULTY: *Mark H. Bilsky, Ziya L. Gokaslan, Daniel M. Sciubba*

Room 2018

## **W42: Open Skull Base Surgery: When is the Traditional Approach Necessary?**

MODERATORS: *William T. Couldwell, Ricardo J. Komotar*

FACULTY: *James J. Evans, Jacques J. Morcos, Theodore H. Schwartz, Harry R. Van Loveren*

Room 2020



## **W43: Cellular Therapies in Neurosurgery**

MODERATOR: *Nicholas M. Boulis*

FACULTY: *Nalin Gupta, Gary K. Steinberg, Michael Y. Wang*

Room 2022



## **W44: New Technologies and Innovations in Cranial Neurosurgery**

MODERATOR: *Neil A. Martin*

FACULTY: *Vladimir Benes, David J. Langer, Elad I. Levy, Luca Regli, Gregory J. Zipfel*

## AFTERNOON SESSIONS

2:00 – 3:30 PM

Room 2001/2003, Moscone West Convention Center

### CONSENSUS SESSION II



#### **Acute Cervical Spine and Spinal Cord Trauma: The Medical Evidence and Controversies of Top-flight Care**

MODERATOR: *Mark N. Hadley*

FACULTY: *Sanjay S. Dhall, R. John Hurlbert, Curtis J. Rozzelle, Nicholas Theodore, Beverly C. Walters*

2:00 – 3:30 PM

Room 3022, Moscone West Convention Center

### MULTIDISCIPLINARY ORAL PRESENTATIONS II

MODERATORS: *Michael R. Chicoine, Kee Kim*

*For a listing of Oral Presentations see pages 68-70.*

2:00 – 3:30 PM

Room 3003, Moscone West Convention Center

### SECTION ON DISORDERS OF THE SPINE AND PERIPHERAL NERVES

#### **Cervical Spine Surgery: Where We Come From, Where We Are, Where We Are Going**

MODERATOR: *Michael G. Fehlings*

SPEAKERS: *Edward C. Benzel, Domagoj Coric, Praveen V. Mummaneni, Paul Park, Daniel M. Sciubba, Michael Y. Wang*

2:00 – 3:30 PM

Room 3002, Moscone West Convention Center

### SECTION ON NEUROTRAUMA AND CRITICAL CARE

#### **Evolution of Neurosurgery – Translational Research to Clinical Trial**

MODERATORS: *Odette Harris, David Okonkwo*

SPEAKERS: *Randall M. Chesnut, Graham Creasey, Geoffrey T. Manley, Eve Tsai*

2:00 – 3:30 PM

Room 3016, Moscone West Convention Center

### SECTION ON PAIN

#### **The Evolution of Pain Neurosurgery**

MODERATORS: *Andre Machado, Julie Pilitsis*

SPEAKERS: *Alon Y. Mogilner, Parag G. Patil, Konstantin V. Slavin, Raymond F. Sekula*

2:00 – 3:30 PM

Room 3001, Moscone West Convention Center

### SECTION ON CEREBROVASCULAR SURGERY

#### **The Evolution of Neurosurgery**

MODERATORS: *J D. Mocco, Peter Nakaji*

SPEAKERS: *Robert M. Friedlander, L. Dade Lunsford, Yuichi Murayama, Gary K. Steinberg, Bryon Gregory Thompson, Raymond D. Turner, IV*

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## **MULTIDISCIPLINARY SESSION I** Room 3014 , Moscone West Convention Center Moderators: *Guthikonda Bharat, Amir R. Dehdashti*

2:30–2:37 PM

**100**

### **Utility of Hematologic Labs Following Lumbar Fusion**

*Andrew Y. Yew, Haydn Hoffman, Charles Li, Daniel C. Lu*

2:37–2:44 PM

**101**

### **Clinical Course after Percutaneous Epidural Neuroplasty According to the Type of Single Level Herniated Lumbar Disc with 12 Months Follow-up**

*Ji Gyu Yeul, Oh Chang Hyun, Lee Junho, Kim Jung Hoon, Shin Dong Ah*

2:44–2:51 PM

**102**

### **Validation and Modification of a Predictive Model of Post-resection Hydrocephalus in Pediatric Patients with Posterior Fossa Tumors**

*Paul Foreman, Samuel McCluggage, Robert Partlow Naftel, Christoph Johannes Griessenauer, Benjamin J. Ditty, Bonita Agee, Jay Riva-Cambrin, John C. Wellons, III*

2:51–2:58 PM

**103**

### **Evaluation of the Immediate Role of Decompressive Craniectomy in the Treatment of Refractory ICP in Cases of Traumatic Brain Injury. Experience of a Tertiary Care Trauma Center in Alexandria, Egypt**

*Mohamed E. El-Fiki*

2:58–3:05 PM

**104**

### **Risk Factors and Long-term Survival in Adult Patients with Primary Malignant Spinal Cord Astrocytomas**

*Albert Wong, Rishi R. Lall, Nader S. Dahdaleh, Richard G. Fessler, Zachary A Smith, Sandi Lam*

3:05–3:12 PM

**105**

### **DBS Lead Proximity to DTI-based Sensory Thalamus Correlates with Pain Relief**

*Won Kim, Jason Scott Hauptman, Nader Pouratian*



3:12–3:19 PM

**106**

## **ProvenCare® Lumbar Spine: Re-engineering Care Delivery for Elective Lumbar Spine Fusion (LSF) Surgery**

*Jonathan Slotkin, Mauricio Campos-Benitez, Greg F. Burke, David A. Andreychik, W. Fred Hess, Karen E. McKinley, Michel Lacroix, Steven A. Toms*

3:19–3:26 PM

**107**

## **Dose-finding and Safety Study of an Oncolytic Polio/Rhinovirus Recombinant Against Recurrent Glioblastoma**

*John H. Sampson, Annick Desjardins, Katherine B. Peters, Tulika Ranjan, Gordana Vlahovic, Denise Lally-Goss, Stevie Threatt, James Herndon, Allan H. Friedman, Henry Friedman, Darell Bigner, Matthias Gromeier*

3:26–3:33 PM

**108**

## **Human Electrocorticography-based Stimulation**

*David Keisho Su, Jeremiah D. Wander, Lise Johnson, Devapratim Sarma, Eberhard E. Fetz, Jeffrey G. Ojemann*

3:33–3:40 PM

**109**

## **Submaximal Angioplasty Prospective Registry: Preliminary Report**

*Travis Michael Dumont, Maxim Mokin, Jorge Luis Eller, Grant C. Sorkin, Kenneth V. Snyder, L. Nelson Hopkins, III, Adnan Hussain Siddiqui, Elad I. Levy*

3:40–3:47 PM

**110**

## **A Novel 6-item Outcome Instrument (VNI-6) for Assessing the Effectiveness of Cervical Surgery in Registry Efforts**

*Saniya S. Godil, Matthew J. McGirt*

3:47–3:54 PM

**111**

## **Surgical Outcomes in a Modern Series of Low-grade Gliomas Undergoing Surgical Resection**

*Josiah N. Orina, Shanna Fang, Fredric B. Meyer, Ian F. Parney*



**COUNCIL OF STATE  
NEUROSURGICAL SOCIETIES**  
Room 3003, Moscone West Convention Center

2:00–2:09 PM

**112**

## **Development of a Novel Quality of Life Utility Index Using NDI and VAS in Patients with Multilevel Cervical Spondylosis**

*Jared D. Ament, Zhuo Yang, Kee Duk Kim*

## JULIUS GOODMAN RESIDENT AWARD

2:09–2:18 PM

**113**

### **Cost-effectiveness of CT Angiography in Screening for Aneurysm in Spontaneous Subarachnoid Hemorrhage**

*Pinakin Rameshchandra Jethwa, Ennis J. Duffis, Chirag D. Gandhi, Charles J. Prestigiacomo*

2:18–2:27 PM

**114**

### **A Novel 6-item Outcome Instrument (VBI-6) for Assessing the Effectiveness of Lumbar Surgery in Registry Efforts**

*Saniya S. Godil, Matthew J. McGirt*

2:27–2:36 PM

**115**

### **Utility of Post-operative CT Following Ventricular Catheter Placement: A Prevalence and Cost-effectiveness Analysis**

*Vinayak Nikam, Luke Macyszyn, Robert L. Bailey, Michael Sean Grady, Sherman C. Stein*

2:36–2:45 PM

**116**

### **Mechanical versus Chemical Prophylaxis for Deep Venous Thrombosis in Patients Undergoing Lumbar Spinal Fusion: Comparative Effectiveness and Cost-benefit**

*Saniya S. Godil, Michael C. Dewan, Scott L. Parker, Matthew J. McGirt*

2:45–2:54 PM

**117**

### **Accurately Dead or Alive: A Neurosurgical Review of Quality Patient Care and Outcomes. The Importance of Data Fidelity in Calculating Quality Metrics Utilizing University Health System Consortium (UHC) Clinical Administrative Database**

*John J. Knightly, Scott A. Meyer, Bonnie B. Weiss, Rami Bustami, John J. Halperin, Stuart Fox, Mark Diamond*

2:54–3:03 PM

**118**

### **Impact of Improved Documentation on an Academic Neurosurgical Practice**

*Omar Akram Zalatimo, Robert E. Harbaugh, Mark Iantosca*

3:03–3:12 PM

**119**

### **Cost-utility Analysis of Anterior Cervical Discectomy and Fusion with Plating (ACDFP) versus Posterior Cervical Foraminotomy (PCF) for Patients with Single-level Cervical Radiculopathy**

*Matthew D. Alvin, Daniel Lubelski, Kalil G. Abdullah, Robert G. Whitmore, Edward C. Benzel, Thomas E. Mroz*

# ORIGINAL SCIENCE PROGRAM

3:12–3:21 PM

**120**

## **Follow-up on a National Survey: Neurosurgery Resident Opinions on the 2011 ACGME Implemented Duty Hours**

*Kyle Michael Fargen, Jamie Dow, Krystal Lynne Tomei, William A. Friedman*

## **SAM HASENBUSCH YOUNG NEUROSURGEON AWARD**

3:21–3:30 PM

**121**

## **Cost-consequence Analysis of Antibiotic-impregnated Shunts and External Ventricular Drains (EVDs) in Hydrocephalus**

*Scott L. Parker, Saniya S. Godil, Natalie Edwards, Luella Engelhart, Matthew J. McGirt*



## **SECTION ON PEDIATRIC NEUROLOGICAL SURGERY**

Room 3001, Moscone West Convention Center

2:00–2:09 PM

**122**

## **Pediatric Radiation-associated Meningiomas: Distinct Clinical, Pathological and Cytogenetic Characteristics**

*Samer K. Elbabaa, Murat Gokden, John Crawford, Santosh Kesari, Ali G. Saad*

2:09–2:18 PM

**123**

## **Time to First Blood in Craniostomy Surgery**

*Ruth E. Bristol, Davinder Singh, Nicole Hooft, Richard Cotugno, Stephen Beals, Edward Joganic, Celia Maneri*

2:18–2:27 PM

**124**

## **Symptomatic Recurrence Following the Open Surgical Repair of Nonsyndromic Craniostomy: A Sixteen Year Experience**

*Corey M. Mossop, Gary Rogers, Michael Boyajian, John S. Myseros, Robert F. Keating*

2:27–2:36 PM

**125**

## **Vein Number and Drainage Pattern Predicts Hemorrhage Risk and Outcome in Pediatric Arteriovenous Malformations**

*Michael Maurice McDowell, Christopher P. Kellner, Michelle Q. Phan, E. Sander Connolly, Sean D. Lavine, Phillip M. Meyers, Daniel Sahlein, Neil Feldstein, Richard C. E. Anderson*

# ORIGINAL SCIENCE PROGRAM

2:36–2:45 PM

**126**

**CNS Stem Cell Transplantation for Neuronal Ceroid Lipofuscinoses: Summary of Long Term Follow-up Study Results**  
*Nathan R. Selden, Amira Al-Uzri, Robert Steiner, Stephen L. Huhn*

2:45–2:54 PM

**127**

**Assessment of the Impact of Comorbidities on Perioperative Complications in Pediatric Neurosurgery**  
*Akash J. Patel, Ahilan Sivaganesan, Alison Brayton, Robert John Bollo, Andrew Jea*

2:54–3:03 PM

**128**

**Neoplastic Presentation of the von Hippel-Lindau (VHL) Disease in the Pediatric Population**  
*Jose M. De Campos, Maria Elena Kusak, Daniel Aguirre, Pablo De Andrés, Julia Montoya, Iñigo Jimenez-Alfaro, Jose F. Fabregat*

3:03–3:12 PM

**129**

**Urinary Biomarkers Predict the Onset and Progression of Medulloblastoma in a Spontaneous Murine Model**  
*Edward R. Smith, Rajarshi Majumder, Xuezhe Han, Brendan McNeish, Ayesha Dholakia, Michael Robert Raber*

3:12–3:21 PM

**130**

**Risk of Secondary Malignancy from Computerized Tomography (CT) Scanning in Very Young (< 1 year old) Neurosurgical Patients: A Retrospective Cohort Study with a Minimum of 10-year Follow-up**  
*Ian Kainoa White, Kashif Ajaz Shaikh, Daniel H. Fulkerson, Carli Bullis*

3:21–3:30 PM

**131**

**Pediatric Skull Lesions**  
*Yasser Jeelani, Stephanie L. Da Silva, Grace J. Young, Mark D. Krieger, J. Gordon McComb*



**SECTION ON STEREOTACTIC AND FUNCTIONAL NEUROSURGERY**  
Room 3002, Moscone West Convention Center

2:00–2:09 PM

**132**

**Cortical-spinal Neural Prosthesis for Restoring Volitional Limb Movement in a Paralyzed Primate Avatar**  
*Ziv Williams*

## STEREOTACTIC AND FUNCTIONAL NEUROSURGERY RESIDENT AWARD

2:09–2:18 PM

**133**

**Encoding of Reward Size and Reward Delay by Individual Neurons in the Ventral Striatum in the Non-human Primate Engaged in an Intertemporal Choice Task**

*David Weintraub, Barry Richmond*

2:18–2:27 PM

**134**

**Deep Brain Stimulation of the Medial Septal Nucleus Improves Spatial Working Memory Following Pilocarpine-induced Status Epilepticus**

*Darrin J. Lee, Gene G. Gurkoff, Ali Izadi, Arne D. Ekstrom, Jan Muizelaar Muizelaar, Bruce G. Lyeth, Kiarash Shahlaie*

## CNS RESIDENT AWARD

2:27–2:36 PM

**135**

**Electrophysiological Evidence of the Efference Copy in Human Voluntary Movements**

*Hai Sun, Tim Blakely, Felix Darvas, Jeremiah D. Wander, Lise Johnson, Kai Miller, Jeffery Ojemann*

2:36–2:45 PM

**136**

**Reinstatement of Oscillatory Power and Synchrony During Successful Memory Encoding and Recall**

*Kareem A. Zaghloul, Robert Yaffe, Matthew Kerr*

2:45–2:54 PM

**137**

**Cortical Beta Suppression is Spatially Linked to Beta Coherence Modulation**

*Andrew B. O'Keefe, Christos Tsiokos, Nader Pouratian*

2:54–3:03 PM

**138**

**Beta Suppression in EEG over the Motor Cortex and Simultaneous Tremor Attenuation in Arm EMG after STN Deep Brain Stimulation for Parkinson's Tremor**

*Jayant P. Menon, Makato Mikakoshi, Scott Makeig*

3:03–3:12 PM

**139**

**Brain Extracellular Branched-chain Amino Acids in Medically Refractory Localization-related Epilepsy**

*Caroline Ong, Eyiymisi Damisah, Clayton Haldeman, Tore Eid, Dennis Spencer*

# ORIGINAL SCIENCE PROGRAM

3:12–3:21 PM

**140**

**Cognitive Deficits After Traumatic Brain Injury are Associated with Decreased Hippocampal Bursting and Improved with Burst Stimulation of the Fornix**

*Jennifer A. Sweet, Jonathan P. Miller*

3:21–3:30 PM

**141**

**How Context Influences the Physiology of Perception: The Sub-second Dynamics of Repetition Suppression in Inferior Temporal Cortex**

*Kai Miller, Kalanit Grill-Spector, Adam Olding Hebb, Dora Hermes, Rajesh Rao, Jeffrey G. Ojemann*



## SECTION ON TUMORS

Room 3022, Moscone West Convention Center

### JOURNAL OF NEURO-ONCOLOGY AWARD

2:00–2:09 PM

**142**

**3.0T iMRI Guided Resection in Cerebral Glioma Surgery: Interim Analysis of a Prospective, Randomized, Triple-blind, Parallel-controlled Trial**

*Jin-song Wu, Xiu Gong, Yanyan Song, Dongxiao Zhuang, Chengjun Yao, Tianming Qiu, Junfeng Lu, Jie Zhang, Wei Zhu, Ying Mao, Liang-Fu Zhou*

### STRYKER NEURO-ONCOLOGY AWARD

2:09–2:18 PM

**143**

**Spinal Cord Astrocytomas: A Modern 20-year Experience at a Single Institution**

*Ranjith Babu, Isaac Karikari, Timothy Ryan Owens, Carlos A. Bagley*

### DEPUY SYNTHES CMF SKULL BASE SURGERY AWARD

2:18–2:27 PM

**144**

**Chondrosarcoma Radiosurgery: Report of the North American Gamma Knife Consortium**

*Hideyuki Kano, Jason P. Sheehan, Penny Sneed, Heyoung McBride, A. Byron Young, Christopher M. Duma, David Mathieu, Michael William McDermott, Aditya K. Iyer, L. Dade Lunsford*

# ORIGINAL SCIENCE PROGRAM

## NATIONAL BRAIN TUMOR SOCIETY MAHALEY CLINICAL RESEARCH AWARD

2:27–2:36 PM

**145**

### Natural History of Central Nervous System Hemangioblastomas in von Hippel-Lindau Disease

*Russell R. Lonser, Kristin Huntoon, John A. Butman, Ashok Rajappa Asthagiri, Kamran Bakhtian, Zhengping Zhuang, Edward H. Oldfield*

## INTEGRA FOUNDATION AWARD

2:36–2:45 PM

**146**

### Rate and Course of Improvement in Endocrine Function After Over 1000 Pituitary Operations

*Arman Jahangiri, Jeff Wagner, Sung Won Han, Justin Meyerowitz, Lauren Rose Ostling, Sandeep Kunwar, Lewis Blevins, Manish Kumar Aghi*

2:45–2:54 PM

**147**

### Gamma Knife Treatment Results for Multiple Brain Metastases: A Multi-institutional Prospective Study in Japan (Abbreviation, JLGK0901, UMIN ID, 00001812)

*Masaaki Yamamoto*

2:54–3:03 PM

**148**

### Extent of Resection of Glioblastoma Revisited: Personalized Survival Modeling Facilitates More Accurate Individualized Survival Prediction and Supports a “Maximum Safe Resection” Approach Surgery

*Nicholas Frank Marko, Robert John Weil, Jason L. Schroder, Raymond Sawaya*

3:03–3:12 PM

**149**

### Continuous Dynamic Mapping of the Corticospinal Tract During Surgery of Motor Eloquent Brain Tumors: A Prospective Study

*Andreas Raabe, Jürgen Beck, Philippe Schucht, Kathleen Seidel*

3:12–3:21 PM

**150**

### Gene Expression Analysis Revealed Distinct Physiology in G-CIMP+ and G-CIMP- Gliomas

*Zachary J. Taich, Amit Goyal, David D. Gonda, Eric Marcusson, Vivek Kaimal, Tao Jiang, Bob Carter, Clark C. Chen*

3:21–3:30 PM

**151**

## **Effect Of Pretreatment Lymphopenia On Survival In Patients With Recurrent Glioblastoma Receiving Immunotherapy**

*Orin Bloch, Yelena S. Fuks, Manish Kumar Aghi, Michael William McDermott, Mitchel S. Berger, Andrew E. Sloan, Jeffrey N. Bruce, Andrew T. Parsa*



## **SECTION ON DISORDERS OF THE SPINE AND PERIPHERAL NERVES**

Room 3002, Moscone West Convention Center

2:00–2:09 PM

**152**

## **Minimally Invasive versus Open Posterior Interbody Lumbar Fusion: A Propensity-matched Analysis of Quality Measures**

*Matthew J. McGirt, Scott L. Parker, Jason Lerner, Chris Kozma, Terra Slaton*

2:09–2:18 PM

**153**

## **Cost-utility and Comparative Effectiveness Analyses of Surgery versus Comprehensive Medical Management for Lumbar Spondylosis in Elderly**

*Matthew J. McGirt, Saniya S. Godil, Scott L. Parker, Stephen Mendenhall, Scott L. Zuckerman, David Shau*

2:18–2:27 PM

**154**

## **Outcomes After ALIF versus TLIF For Treatment of Symptomatic L5-S1 Spondylolisthesis: A Prospective, Multi-institutional Comparative Effectiveness Study**

*Owoicho Adogwa, Paul Thompson, Terence Verla, Kemp Knott, Ulysses Null, Kevin T. Huang, Joseph S. Cheng, Robert E. Isaacs*

2:27–2:36 PM

**155**

## **The Implantation of Facet Bone Dowels May Not Provide Adequate Fixation for Fusion**

*Stephen M. Pirris, Ronald Reimer, Hugh Gordon Deen, Robert E. Wharen, Eric W. Nottmeier*

2:36–2:45 PM

**156**

## **Adult Deformity Surgery (ASD) Patients Recall Fewer than 50% of the Risks Discussed in the Informed Consent Process Preoperatively and the Recall Rate Worsens Significantly in the Postoperative Period**

*Rajiv Saigal, Aaron J. Clark, Justin K. Scheer, Justin S. Smith, Shay Bess, Praveen V. Mummaneni, Ian McCarthy, Robert Hart, Khaled Kebaish, Eric Klineberg, Vedat Deviren, Frank Schwab, Christopher I. Shaffrey, Christopher P. Ames, International Study Group*



2:45–2:54 PM

**157**

## Increased Incidence of Pseudoarthrosis After Unilateral Instrumented Transforaminal Lumbar Interbody Fusion in Patients with Lumbar Spondylosis

*Yakov Gologorsky, Branko Skovrlj, Jeremy Steinberger, Marc Arginteanu, Frank M. Moore, Alfred A. Steinberger*

2:54–3:03 PM

**158**

## Dexamethasone's Effect in Multiple-level Anterior Cervical Discectomy and Fusion

*Shiveindra Jeyamohan, Tyler James Kenning, Paul Feustel, Karen Petronis, Darryl J. Dirisio*

3:03–3:12 PM

**159**

## A Blinded, Multi-center Clinical and Radiological Study to Evaluate the Use of OsteoAMP versus rhBMP-2 in TLIF/LLIF Procedures

*Christopher Yeung, Justin Field, Jeffrey Roh*

3:12–3:21 PM

**160**

## Failure of Indirect Decompression with the Extreme Lateral Interbody (XLIF) Approach: A Study of Radiographic Factors

*Isaac Karikari, Owoicho Adogwa, Timothy Ryan Owens, Paul Thompson, Robert E. Isaacs*

3:21–3:30 PM

**161**

## Pain and Functional Outcomes After Incidental Durotomy in Lumbar Spine Surgery: A Propensity Matched Prospective, Multi-institutional Longitudinal Study of 1,741 Patients

*Owoicho Adogwa, Paul Thompson, Terence Verla, Ulysses Null, Kemp Knott, Kevin T. Huang, Joseph S. Cheng, Robert E. Isaacs*



## SECTION ON NEUROTRAUMA AND CRITICAL CARE

Room 3016, Moscone West Convention Center

### DEPUY SYNTHES SPINE AWARD FOR RESIDENT RESEARCH ON SPINAL CORD AND SPINAL COLUMN INJURY

2:00–2:09 PM

**162**

## Clinical Correlates of High Cervical Fractional Anisotropy in Acute Cervical Spinal Cord Injury

*Aditya Vedantam, Gerald Eckardt, Marjorie C. Wang, Brian Schmit, Shekar N. Kurpad*

2:09–2:18 PM

**163**

**Enhancement of Adult Hippocampal Neurogenesis by a Neurotrophic Peptide in Traumatic Brain Injury**

*Muhammad Omar Chohan, Khalid Iqbal, Howard Yonas, Edwin Nemoto*

2:18–2:27 PM

**164**

**Reversal of Pre-morbid Oral Anti-platelet Therapy is Not Associated with a Decrease in Radiographic Progression of Intracranial Injury**

*Joshua S. Bauer, David Michael Panczykowski, Benjamin Zusman, Ramesh Grandhi, Yuefang Chang, Ava Puccio, David O. Okonkwo*

2:27–2:36 PM

**165**

**A Randomized Placebo Controlled Trial of Progesterone With or Without Hypothermia in Patients with Severe Traumatic Brain Injury—Analysis of Preliminary Data**

*Neha Samson, Sumit Sinha, Vivek Tandon, Sanjeev Bhaoi, S. Arulselvi, Pushpa Sharma, A. K. Mahapatra, B.S. Sharma*

2:36–2:45 PM

**166**

**The Role of NgR1 Function in Vivo After Spinal Cord Injury**

*Vassilios Georgios Dimopoulos, Henry N. Kesler, Jason H. Huang*

2:45–2:54 PM

**167**

**Diffusion Tensor Imaging as a Predictor of Experimental Spinal Cord Injury Severity and Recovery**

*Brian Joseph Kelley, Noam Harel, Chang-Yoen Kim, Xing Xing Wang, Omar Hasan, Adam Kauffman, Ronin Globinsky, Lawrence Staib, Xenophon Papademetris, Stephen Strittmatter*

**DEPUY SYNTHES CMF AWARD FOR RESIDENT RESEARCH ON BRAIN AND CRANIOFACIAL INJURY**

2:54–3:03 PM

**168**

**Predictive Value of Somatosensory Evoked Potentials for Patients with Severe Traumatic Brain Injury**

*Yirui Sun*

3:03–3:12 PM

**169**

**Pressure is Only Part of the Story in Traumatic Brain Injured Patients, Focal Cerebral Blood Flow Goes to Zero in Some Patients with Adequate Cerebral Perfusion Pressure**

*George Chovanes, Rafael M. Richards*

# ORIGINAL SCIENCE PROGRAM

3:12–3:21 PM

**170**

## Myelination and Diffusion Tensor Imaging Findings in Mild Traumatic Brain Injury

*Heather Spader, Anna Ellermeier, Lindsay Walker, Jeffrey Rogg, Rees Cosgrove, Sean Deoni*

3:21–3:30 PM

**171**

## Application of the CRASH Score When Using Intracranial Multimodality Monitoring

*Syed O. Shah, Artin Minaeian, Michael F. Stiefel*



## SECTION ON PAIN

Room 2024, Moscone West Convention Center

2:00–2:09 PM

**172**

## Use of Intraoperative Collision Testing versus Electromyography for Predicting Postoperative Foot Paresthesias During Spinal Cord Stimulation

*Vidya Bhalodia, Anthony K. Sestokas, David Glassman, William Loftus, Steven Levin, Joanne Contratti, Richard W. Vogel, Ashwini D. Sharan*

2:09–2:18 PM

**173**

## Nerve Injury Pain: It's All About Glutamate in Peripheral (not CNS) Neurons

*Luc Dupont Jasmin, Kerui Gong, Ling-Hsuan Kung, Peter O'Hara, Aditi Bhargava*

2:18–2:27 PM

**174**

## Association Between Posterior Cranial Fossa Volumetry and CSF Flow Dynamics in Chiari Malformations Type I

*Noam Alperin, Sang H. Lee, Ahmet Bagci, Raymond F. Sekula, Barth A. Green*

## RONALD R. TASKER YOUNG INVESTIGATOR AWARD

2:36–2:45 PM

**176**

## Deep Brain Stimulation of the Anterior Cingulate Cortex: Targeting the Affective Component of Chronic Pain

*Erlick A.C. Pereira, Sandra G. J. Boccard, Liz Moir, James J. Fitzgerald, Alexander L. Green, Tipu Z. Aziz*

2:45–2:54 PM

**177**

**Microstructural Neural Changes Due to Neurovascular Compression in Trigeminal Neuralgia Detected by Diffusion Tensor Imaging (DTI: Correlation with Intra-operative Findings and Possible Clinical Implications)**

*Jan H. Mehrkens, Niklas Thon, Jennifer Linn, Hartmut Brückmann, Joerg-Christian Tonn, Jürgen Lutz*

2:54–3:03 PM

**178**

**Postoperative Intravenous Ketorolac Following Intracranial Surgery: A Retrospective Case Series**

*Patrick R. Maloney, Ravi Kumar, Ross Puffer, Giuseppe Lanzino, Nicholas Michael Wetjen*

3:03–3:12 PM

**179**

**Brief Pain Inventory Facial: Calculation of the Minimal Clinically Important Difference in Trigeminal Neuralgia**

*Casey H. Halpern, Sukhmeet Sandhu, Venus B. S. Vakhshori, Keyvan Mirsaedi-Farahani, Marie Kerr, John Y.K. Lee*

3:12–3:21 PM

**180**

**Long Term Outcomes of Dorsal Root Rhizotomy for Refractory Occipital Neuralgia**

*Abhiram Gande, John Jefferson Moossy, Michael B. Horowitz, William E. Rothfus, Paul A. Gardner*

3:21–3:30 PM

**181**

**Percutaneous Dorsal Root Ganglion Lysis with Phenol for Treatment of Thoracic Compression Fracture**

*Chun-Hsien Lin, Chun-Yu Cheng, Kuo-tai Chen, Martin Hsiu Chu Lin, Ting-Chung Wang, Jen-Tsung Yang*



**SECTION ON CEREBROVASCULAR NEUROSURGERY**

Room 3001, Moscone West Convention Center

2:00–2:09 PM

**182**

**Do Ischemic Stroke Patients Treated at Hospitals That Offer Endovascular Therapy Fair Better at Discharge?**

*Eric M. Deshaies, Mark R. Villwock, David James Padalino, Amit Singla*

2:09–2:18 PM

**183**

**Spinal Cerebrospinal Fluid Drainage for Prevention of Vasospasm in Aneurysmal Subarachnoid Haemorrhage: A Prospective Randomized Controlled Study**

*Sachin A. Borkar*

2:18–2:27 PM

**184**

**Infliximab Suppresses TNF-alpha Induced Inflammatory Phenotype in Cerebral Vascular Smooth Muscle Cells: Implications for Cerebral Aneurysm Formation**

*Muhammad S. Ali, Robert M. Starke, Pascal Jabbour, Stavropoula I. Tjounakaris, L. Fernando Gonzalez, Robert H. Rosenwasser, Aaron S. Dumont*

2:27–2:36 PM

**185**

**Post-conditioning with Isoflurane Reduces SAH-induced Vasospasm and Microthrombosis via Hypoxia-inducible Factor 1 and Nitric Oxide Synthase**

*Eric Milner, Michael D. Harries, Ananth Kesav Vellimana, Jeffrey M. Gidday, Byung Hee Han, Gregory J. Zipfel*

2:36–2:45 PM

**186**

**The THERAPY Trial: A Prospective, Randomized, Concurrent Controlled Trial to Evaluate the Role of Mechanical Embolectomy as Adjunctive Treatment to IV rtPA for Acute Ischemic Stroke**

*J.D. Mocco, Sophia Kuo, Pooja Khatri, Osama O. Zaidat*

**DEPUY SYNTHES CMF CEREBROVASCULAR AWARD**

2:45–2:54 PM

**187**

**A Novel Virtual Reality Simulation for Hemostasis in a Brain Surgical Cavity: Perceived Utility for Visuomotor Skills in Current and Aspiring Neurosurgery Residents**

*Achal Patel, Cristian Luciano, Thomas Jefferson Holbrook, Silvio Rizzi, Patrick Kania, Sohun K. Desai, Dan Branch, Adrian Mzee Smith, P. Pat Banerjee, Ben Z. Roitberg, Jaime Gasco-Tamarit*

2:54–3:03 PM

**188**

**Role of Hyperhomocysteinemia in the Development of Intracranial Aneurysms**

*Masaaki Kohrai, David Kung, Keiko T. Kitazato, Nobuhisa Matsushita, Yoshiteru Tada, Kenji Yagi, Kenji Shimada, Yasuhisa Kanematsu, Junichiro Satomi, Shinji Nagahiro*

3:03–3:12 PM

**189**

## Utility of Monitoring Cerebral Autoregulation After Subarachnoid Hemorrhage. Results from a Prospective Observational Study

*Karol P. Budohoski, Marek Czosnyka, Peter Smielewski, Magdalena Kaspruwicz, Adel Helmy, Diederik Bulters, Mirosław Zabek, John Douglas Pickard, Peter J. Kirkpatrick*

### GALBRAITH AWARD

3:12–3:21 PM

**190**

## Critical Role of TNF-alpha in Cerebral Aneurysm Formation and Rupture

*Robert M. Starke, Nohra Chalouhi, Muhammad S. Ali, Pascal Jabbour, Stavropoula I. Tjoumakaris, L. Fernando Gonzalez, Robert H. Rosenwasser, Gary Owens, Nigel H. Greig, Aaron S. Dumont*

3:21–3:30 PM

**191**

## Heme Induces Microglial CXCL2 Release—A Mechanism of Neutrophil-mediated Injury After Intracerebral Hemorrhage

*David B. Kurland, Volodymyr Gerzanich, J. Marc Simard*



## MULTIDISCIPLINARY SESSION II

Room 3022, Moscone West Convention Center

Moderators: *Michael R. Chicoine, Kee Kim*

2:00–2:07 PM

**192**

## Pediatric Head Injury During Operations Iraqi Freedom and Enduring Freedom

*Paul Klimo, Jr., Brian T. Ragel, Rocco Armonda, Shalece Kofford, Randall R. McCafferty*

2:07–2:14 PM

**193**

## Optogenetic Stimulation of Motor Cortex Neurons Promotes Functional Recovery After Stroke

*Michelle Cheng, Wyatt J. Woodson, Eric Wang, Stephanie Wang, GuoHua Sun, Alex G. Lee, Ahmet Arac, Lief Fenno, Karl Deisseroth, Gary K. Steinberg*

2:14–2:21 PM

**194**

## High Performance Computer Cursor Control Using Neuronal Ensemble Recordings From the Motor Cortex of a Person with ALS

*Jaimie M. Henderson, Vikash Gilja, Chethan Pandarinath, Christine Blabe, Leigh R. Hochberg, Krishna V. Shenoy*

2:21–2:28 PM

**195**

## **What is the Current Practice of Restarting Oral Anticoagulant in Patients with Subdural Haemorrhage?**

*Fahad A. Alkherayf, Philip Wells, Charles B. Agbi, Harrison Westwick*

2:28–2:35 PM

**196**

## **Human Neural Stem Cell Transplantation in Chronic SCI: Interim Results of a Phase I/II Trial**

*Raphael Guzman, Martin Schubert, Dagmar Keller-Lang, Stephen L. Huhn, Armin Curt*

2:35–2:42 PM

**197**

## **C2 Nerve Root Transection During C1 Lateral Mass Screw Fixation: Does it affect Functionality and Quality of Life?**

*Michael C. Dewan, Saniya S. Godil, Matthew J. McGirt*

### **PREUSS AWARD**

2:42–2:54 PM

**198**

## **Of Mice and Men: Matched Observations of Lymphopenia, Splenic Retraction, and the Bone Marrow as Harbor for Lost T-cells in Mice and Patients with Glioblastoma**

*Peter Fecci, Christina Chen, Shohei Koyama, Glenn Dranoff, Robert L. Martuza, William T. Curry, Jr.*

2:54–3:01 PM

**199**

## **Comparison of Plaintiff and Defendant Expert Witness Qualification in Malpractice Litigation in Neurological Surgery**

*James K. Liu, Jean Anderson Eloy, Peter Svider, Adam J. Folbe, William T. Couldwell*

### **SHERRY APPLE RESIDENT TRAVEL SCHOLARSHIP (WINS)**

3:01–3:08 PM

**200**

## **LMP Knockout Mice Have Reduced Spine Trabecular Bone Density on Micro-computed Tomography Due to Decreased BMP Responsiveness**

*Matthew Frank Gary, Manjula Viggeswarapu, Colleen Oliver, Maggie Bargouti, Mesfin Teklemariam, Sree Sangadala, Louisa Titus, Scott Boden*

3:08–3:15 PM

**201**

## **Meningeal Mast Cell-dependent Exacerbation of Brain Injury After Stroke in Mice**

*Ahmet Arac, Michele Grimbaldston, Andrew Nepomuceno, Oluwatobi Olayiwola, Marta P. Pereira, Yasuhiro Nishiyama, Hannes Vogel, Mindy Tsai, Stephen Galli, Tonya Bliss, Gary K. Steinberg*

# ORIGINAL SCIENCE PROGRAM

3:15–3:22 PM

**202**

## Rapid Assessment of Platelet Dysfunction in the Traumatic Brain Injury Patient: Application of Point of Care Assays

*Yair Gozal, Christopher Patrick Carroll, Norberto O. Andaluz*

3:22–3:29 PM

**203**

## Application Accuracy of a Second Generation Interventional MRI Stereotactic Platform: Initial Experience in 101 DBS Electrode Implantations

*Paul Larson, Philip A. Starr, Jill L. Ostrem, Nicholas Galifianakis, Marta San Luciano Palenzuela, Alastair Martin*

**3:30–5:00 PM**



## NEUROSURGICAL FORUM

Room 3014-3020, Moscone West Convention Center



## COUNCIL OF STATE NEUROSURGICAL SOCIETIES

Moderators: *Ajit A. Krishnaney, Gregory R. Trost*

**300**

## Cost-utility Analysis of One and Two-level Dorsal Lumbar Fusions With and Without Recombinant Human Bone Morphogenic Protein-2

*Matthew D. Alvin, Adeeb Derakhshan, Daniel Lubelski, Kalil G. Abdullah, Robert G. Whitmore, Edward C. Benzel, Thomas E. Mroz*

**302**

## Validation Strategies for Neurosurgical Simulation Technologies

*James Bradley Elder, Clemens M. Schirmer, Darlene Angela Lobel*

**303**

## The Impact of Comorbidity on Length of Hospital Stays Following Elective Lumbar Decompression and Fusion

*Mazen Sanoufa, Joe Sam Robinson, Jr.*

**304**

## Neurosurgery Simulation in Residency Training: Feasibility, Cost and Educational Benefit

*Thomas Jefferson Holbrook, Jaime Gasco-Tamarit, Dan Branch, Achal Patel, Juan R. Ortega-Barnett, David Paul Paulson, James Alan Muns, Adrian Mzee Smith, Sohun K. Desai, Marc Daniel Moisi, Yong-Fan Kuo, Joel T. Patterson*



**305**

**Interactive Virtual Skull Base Surgery Training: Translating the Simulation of Procedural Drilling Techniques**

*Daniel M. Prevedello, James Bradley Elder, Don Stredney, Thomas Kerwin, Leo F.S. Ditzel Filho, Ali R. Rezai*

**306**

**The Effect of Duty Hour Restrictions on Outcomes of Neurologic Surgery in Training Hospitals in the United States**

*Kiersten Norby, Farhan Siddiq, Malik Adil, Stephen J. Haines*

**307**

**Implementation of Smart-phone Based Neurosurgical Resident Surgical Competency Evaluation**

*Nathaniel P. Brooks, Christopher Nickele*

**308**

**Fragmentation of Vares and the Utilization of Computed Tomography (CT) in Ischemic Stroke Among Medicare Patients**

*Kimon Bekelis, David W. Roberts, Weiping Zhou, Jonathan Skinner*



**SECTION ON CEREBROVASCULAR NEUROSURGERY**

Moderators: *Eric Sauvageau, Andrew W. Grande*

**310**

**Treatment of IVH with Alteplase (rtPA) According to the Copenhagen Protocol Preliminary Results of a Danish Multicenter Trial**

*Jiri Bartek, Joergen Degn, Tina Obbekjaer, Benedicte Dahlerup, Jane Linnet, Helga Gulisano, Walter Fischer, Bertil Romner*

**312**

**Synaptic Remodeling in the Ischemic Brain is Enhanced by Stem Cell Treatment**

*Takeshi Hiu, Tonya Bliss, Nathan Manley, Eric Wang, Gordon Wang, Kristina D. Micheva, Andrew Olson, Jack Berry, Yasuhiro Nishiyama, Stephen Smith, Gary K. Steinberg*

**313**

**The Role of Changes in Neurophysiologic Monitoring as a Predictor of Neurologic Deficit or Procedural Complication During the Endovascular Treatment of Cerebral Aneurysms**

*Jeffrey Balzer, William J. Ares, Amy He, Nathan Winek, Ramesh Grandhi, Brian T. Jankowitz, Tudor Jovin, Michael B. Horowitz, Miguel Habeych, Donald Crammond, Parthasarathy D. Thirumala*

**314**

**Differing Blood Flow Patterns in Patients With Transient Neurological Deficits After EC IC Bypass: The Role of Local Hypoperfusion**

*Douglas J. Cook, Yaroslav Gelfand, Nitin Mukerji, Gary K. Steinberg*

**316**

**Predicting Inpatient Complications During Cerebral Aneurysm Clipping: The National Inpatient Sample 2005-2009**

*Kimon Bekelis, Symeon Missios, Atman Desai, Todd MacKenzie, Adina Fischer, Nicos Labropoulos, David W. Roberts*

**317**

**Evidence that Ly6Clow Macrophages Contribute to Spontaneous Recovery After Stroke**

*Yasuhiro Nishiyama, Ahmet Arac, Takeshi Hiu, Tonya Bliss, Gary K. Steinberg*

**318**

**Ischemic Postconditioning Facilitates Brain Recovery After Stroke by Promoting mTOR Activity**

*Rong Xie, Peng Wang, Wei Xu, Weimin Bao*

**319**

**The Implication of Persistent Fetal-type Circulation for the Treatment of Intracranial Aneurysms Using the Pipeline Embolization Device**

*Gilberto K. K. Leung, Arthur Fung, Raymand Lee, Kar-ming Leung, Wai-man Lui*

**320**

**Intraoperative Angiography Does Not Lead to Increased Rates of Infectious Complications.**

*William Stetler, Thomas J. Wilson, Wajd Al-Holou, Byron Gregory Thompson, Jr., Aditya S. Pandey*

**322**

**Intraoperative Rupture During Surgical Resection of Arteriovenous Malformations**

*Ramón Torné, Ana Rodriguez-Hernandez, Michael T. Lawton*

**323**

**Long-term Angiographic Follow-up of Pediatric Patients with Cerebral Aneurysms**

*Päivi Koroknay-Pál, Mika Niemelä, Hanna Lehto, Riku Kivisaari, Jussi Numminen, Aki Laakso, Juha Antero Hernesniemi*

**324**

**A New Revascularization Technique for Treatment of Complex Skull Base Lesions Using a Minimally-invasive Keyhole Approach**

*Firas M.G. Hammadi, Philippe Dodier, Ali Ayyad, Emad T. Aboud*

**325**

**Outcome Predictors of Brainstem Cavernous Malformations**

*Roxanna Garcia, Michael Ivan, Michael T. Lawton*

**326**

**A Pilot Study to Assess Microsurgical Skills And Validate An Objective Assessment Tool: The Northwestern Objective Microanastomosis Assessment Tool (NOMAT)**

*Bernard R. Bendok, Salah G. Aoun, Tarek Youssef El Ahmadi, Najib el Tecla, H. Hunt Batjer*

**327**

**Quantifying P450 Eicosanoids Levels Following Subarachnoid Hemorrhage**

*Justin Schultz Cetas, Aclan Dogan, Dominic Siler, Jonathan Ward, Valerie C. Anderson, Jesse Jia-Xin Liu, Nabil Alkayed, Jonathan Nelson*

**329**

**Preliminary In Vivo Evaluation of a Novel Intracranial Cerebral Aneurysm Occlusion Device**

*Roham Moftakhar, Fangmin Xu, Beverly Aagaard-Kienitz, Wendy Crone, Kristyn Masters*

**330**

**Timing and Nature of Immediate Post-operative Events Following Elective Endovascular Aneurysm Treatment**

*Eric J. Arias, Bhuvic Patel, DeWitte T. Cross, Christopher J. Moran, Ralph G. Dacey, Jr., Gregory J. Zipfel, Colin Derdeyn*

**331**

**Apoptosis and Necrosis in the Circumventricular Organs Detected with Annexin V After Experimental Subarachnoid Hemorrhage**

*Nurullah Edebalı, İshak Özel Tekin, Bektas Acikgoz, Serefden Açikgöz, Figen Barut, Nergis Sevinç, Vildan Sümbüloğlu*

**332**

**Long-term Follow-up Angiography is Indicated After Coiling of Intracranial Aneurysms**

*Nohra Chalouhi, Cory Donovan Bovenzi, Vismay Thakkar, Jeremy Dressler, Pascal Jabbour, L. Fernando Gonzalez, Robert M. Starke, Aaron S. Dumont, Robert H. Rosenwasser, Stavropoula I. Tjoumakaris*

**333**

**Management Outcome of Unruptured Cerebral Aneurysms in Japan: Result from UCAS Japan**

*Akio Morita, Shinjiro Tominari, UCAS Japan Investigators*

**334**

**Intraoperative Cerebral Angiography in Intracranial Aneurysm Surgery Reduced Occurrence of Postoperative Cerebral Ischemia and Rebleeding: a Retrospective Study of 155 Patients**

*Yi Jonathan Zhang, Taylor L. Gist*

**335**

**The Role of Mixed V1a/V2 Vasopressin Receptor Antagonist (Conivaptan) in Prevention and Treatment of Brain Edema After Middle Cerebral Artery Occlusion in Mice**

*Saeed Ansari, Peter Cai, Pradeepan Saravanapavan, Michael F. Waters, Sylvain Dore, Vishnumurthy Shushrutha Hedna*

**336**

**Fatty Acid Methyl Esters Provide Neuroprotection After Ischemia**

*Nauman Shaukat Chaudhry, Hung Wen Lin*

**338**

**Microsurgical Resection of Spetzler-Martin Grade III Cerebral Arteriovenous Malformations: Predictors of Outcome and Revision of Grading Scale**

*Robert M. Starke, Thana Theofanis, Richard T. Dalyai, Nohra Chalouhi, Aaron S. Dumont, L. Fernando Gonzalez, Pascal Jabbour, Robert H. Rosenwasser, Stavropoula I. Tjoumakaris*

**339**

**Transfer Function Analysis of Cerebral Pressure-flow Dynamics Following Aneurysmal Subarachnoid Hemorrhage and Delayed Cerebral Ischemia**

*Brett A. Whittemore, Kevin J. Gingrich, Kim L. Rickert, Rong Zhang, S. Scheider, M. Mulindi, E. Malik, Catherine Barden, Ravi Bhoja*

**340**

**Detection of Pulsation in Unruptured Cerebral Aneurysms by ECG-Gated 3D-CT Angiography (4D-CTA) with 320-Row Area Detector CT (ADCT) and Follow-up Evaluation Results: Assessment Based on Heart Rate at the Time of Scanning**

*Motoharu Hayakawa, Teppei Tanaka, Kazuhide Adachi, Akiyo Sadato, Kohei Ishihara, Keisuke Ito, Motoki Oeda, Kazuhiro Murayama, Katada Kazuhiro, Yoko Kato, Yuichi Hirose*

**341**

**Early Experience with Stent-retrievers and Comparison with Previous Generation Mechanical Thrombectomy Devices for Acute Ischemic Stroke**

*Amit Singla, Mark R. Villwock, David James Padalino, Eric M. Deshaies*

**342**

**Aneurysmal Subarachnoid Hemorrhage in Elderly Patients (aged 70-90 years): Critical Age and Clinical Grade to Predict 1-year Functional Outcome**

*Jaechan Park*

**343**

**Results of EC-IC Bypass for Symptomatic Hemodynamically Significant Carotid Occlusion**

*Martin Sames*

**344**

**Seizure Prophylaxis in Aneurysmal Subarachnoid Hemorrhage: A Survey of Leading Cerebrovascular Centers**

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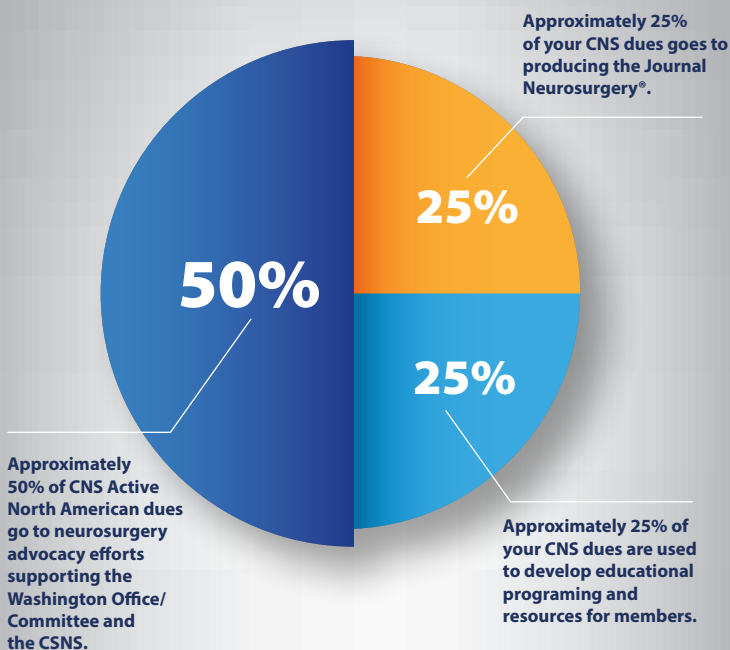
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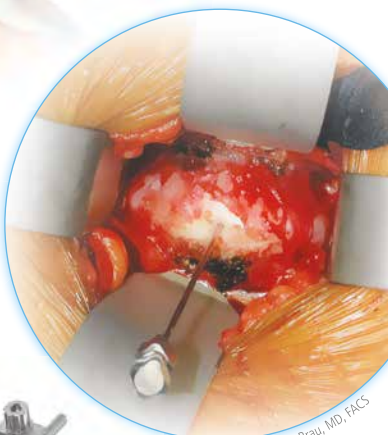


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*Other* – Microvention (6)

**Edward C. Benzel, MD<sup>P, F</sup>**

*Consulting Agreement* – Axiomed Spine (2); *Royalty* – Orthomems (2), Axiomed Spine (2); *Ownership Interest* – Calcitec (6), Axiomed Spine (2), Spine Universe (6), Spinemark (6), Turning Point, LLC (6)

**Mitchel S. Berger, MD<sup>P</sup>**

*Consulting Agreement* – Ivivi Health Sciences LLC (2), Pharmaco-Kinesis Corporation (2)

**Sigurd Berven, MD<sup>F</sup>**

*Consulting Agreement* – Baxano (2), Simpirica (2); *Ownership Interest* – Co-Align (2); *Honoraria* – DePuy Spine (2), Globus Spine (2), Medtronic (2); *Royalty* – Medtronic (2)

**Shay Bess, MD<sup>F</sup>**

*Consulting Agreement* – Allosource (6), Alphatec (6), DePuy Spine (6), Medtronic Sofamor Danek (6); *Royalty* – Pioneer (6)

**Mark H. Bilsky, MD<sup>F</sup>**

*Royalty* – DePuy Spine (6); *Consulting Agreement* – Spine Wave (2)

**Oheneba Boachie-Adjei, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (2), Trans1 Inc (2), K2M (2); *Honoraria* – DePuy Spine (6), K2M (6), Trans1 Inc (6); DePuy Spine (6), K2M (6); *Other* – DePuy Spine (6), K2M (6), Medtronic (6);

**Scott Boden, MD<sup>F</sup>**

*Royalty* – LMP Compound (5)

**Christopher Bono, MD<sup>F</sup>**

*Consulting Agreement* – Harvard Clinical Research Institute (2); *Royalty* – Informa Health Care (6), Wolter Kluwer (6)

**Nicholas M. Boulis, MD<sup>P, F</sup>**

*Consulting Agreement* – Ceregene (2), Medtronic (2); *Other* – NeuralStem (6)

**Keith Bridwell, MD<sup>F</sup>**

*Consulting Agreement* – Depuy/Synthes (2); *Other* – NIH funded study Research Support (6)

**Nathaniel P. Brooks, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic Midas Rex (2)

**Samuel Robert Browd, MD, PhD<sup>P</sup>**

*Ownership Interest* – Aqueduct Neurosciences (8), Echoguide Medical (8)

**Brandon Bucklen, PhD<sup>F</sup>**

*Salary* – Globus Medical Inc (5)

**Douglas C. Burton, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (6); *Royalty* – DePuy Spine (6)

**Jean-Louis Caron, MD<sup>F</sup>**

*Consulting Agreement* – Vycor Medical Incorporated (2)

**Susan Chang, MD<sup>F</sup>**

*Other* – Novartis, Schering Plough (6), Schering Plough (6)

**Jens Chapman, MD<sup>F</sup>**

*Other* – Alseres Pharmaceuticals (6), AOSNA (6), HJ Wyss Foundation (6), Medtronic (6), Stryker (6)

**Fady T. Charbel, MD<sup>F</sup>**

*Consulting Agreement* – Transonic Inc. (2); *Other* – VasSol Inc. (8)

**H. Isaac Chen, MD<sup>F</sup>**

*Other* – Karl Storz (6)

**Peng Roc Chen, MD<sup>F</sup>**

*Honoraria* – Codman Vascular (2)

**John Chi, MD, MPH<sup>P</sup>**

*Consulting Agreement* – Depuy Synthes Spine (2)

**Michael R. Chicoine, MD<sup>F</sup>**

*Other* – iMRIS unrestricted educational grant (6)

**E. Antonio Chiocca, MD<sup>P, F</sup>**

*Consulting Agreement* – Ceregene (2), DNAtrix (2)

**Dean Chou, MD<sup>F</sup>**

*Honoraria* – Depuy (6), Globus (6); *Consulting Agreement* – Stryker (2)

**Chaim B. Colen, MD, PhD<sup>P</sup>**

*Ownership Interest* – Colen Publishing, LLC (1)

**Patrick J. Connolly, MD<sup>F</sup>**

*Consulting Agreement* – Covidien (2)

**Gregory S. Cooper, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic (2)

**Domagoj Coric, MD<sup>F</sup>**

*Consulting Agreement* – Globus Medical (2), Medtronic (2), Pioneer Surgical (2), Spinal Motion (2), Spine Wave (2), United Healthcare (2); *Ownership Interest* – Pioneer Surgical (2), Spinal Wave (2); *Royalty* – Spine Wave (2), Pioneer Surgical (2)

# DISCLOSURE INFORMATION

**John Cummings, MD<sup>F</sup>**

*Consulting Agreement* – SI Bone (2)

**Marek Czosnyka, MD<sup>F</sup>**

*Royalty* – ICM+ Software is licensed by Cambridge Enterprise, Cambridge, UK. MC has a financial interest in a fraction of the licensing fee. (6)

**Andrew T. Dailey, MD<sup>F</sup>**

*Honoraria* – AO North America (6); *Consulting Agreement* – Biomet (2)

**Carlos A. David, MD<sup>P</sup>**

*Consulting Agreement* – Codman Neurovascular (2)

**Timothy T. Davis, MD, DABNM<sup>F</sup>**

*Consulting Agreement* – Medtronic (6), St. Jude (6)

**Mark B. Dekutoski, MD<sup>F</sup>**

*Honoraria* – AO Foundation (6); *Other* – Broadwater Associates CME Group (6), DePuy (6), Medtronic (6), Stryker (6), Synthes (6); *Consulting Agreement* – Mayo Medical Ventures/Medtronic (2)

**Constantine Kyriakos Demetropoulos, PhD<sup>F</sup>**

*Consulting Agreement* – DePuy Synthes Spine (6)

**Eric M. Deshaies, MD<sup>F</sup>**

*Consulting Agreement* – eV3/covidian (2), Integra (2), Microvention (2)

**Vedat Deviren, MD<sup>F</sup>**

*Honoraria* – Guidepoint (6); *Consulting Agreement* – Medtronic (2), Nuvasive (2), Stryker (2)

**Fernando Diaz, MD<sup>F</sup>**

*Ownership Interest* – NOC2 (7), Southeastern Michigan Gamma Knife (7)

**Daniel J. DiLorenzo, MD, PhD, MBA<sup>F</sup>**

*Ownership Interest* – Barinetics Corp. (8), DiLorenzo Biomedical, LLC (8), SHV NeuroNewCo (2)

**Vassilios Georgios Dimopoulos, MD<sup>F</sup>**

*Other* – CNS Functional Fellowship (6)

**Darryl J. Dirisio, MD<sup>F</sup>**

*Ownership Interest* – ReVivo (8)

**James M. Drake, MD<sup>F</sup>**

*Other* – MaRS Innovation grant support (6), MDA, L3MAPPs, Phillips (6), Medical Modeling (6)

**Thomas E. Drochner, MD<sup>F</sup>**

*Salary* – Medtronic (5)

**Aaron S. Dumont, MD<sup>P, F</sup>**

*Consulting Agreement* – ev3 (2)

**James M. Ecklund, MD<sup>F</sup>**

*Ownership Interest* – NeuroStrike, LLC (1)

**Natalie Edwards, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Synthes (2)

**Luella Engelhart, MD<sup>F</sup>**

*Salary* – Depuy Synthes Spine (5)

**Thomas Errico, MD<sup>F</sup>**

*Royalty* – K2M (6)

**James J. Evans, MD<sup>F</sup>**

*Royalty* – Mizuho (6); *Consulting Agreement* – Stryker (2)

**Michael G. Fehlings, MD, PhD, FRCSC, FACS<sup>F</sup>**

*Consulting Agreement* – DePuy, Medtronic (2)

**Richard G. Fessler, MD<sup>F</sup>**

*Royalty* – Depuy (6), Medtronic (6), Stryker (6) *Consulting Agreement* – Lanx (2); *Ownership Interest* – In Queue Innovations (8)

**Kevin T. Foley, MD, FACS<sup>F</sup>**

*Intellectual Fees* – ArthroCare (6); *Consulting Agreement* – ArthroCare (2), Medtronic (2), NuVasive (2); *Ownership Interest* – Discgenics (3), TrueVision (3); *Royalty* – Medtronic (6)

**Don Frei, MD<sup>F</sup>**

*Consulting Agreement* – Reverse Medical (6); *Honoraria* – Abbott (2); *Ownership Interest* – Penumbra (8)

**Anthony K. Frempong-Boadu, MD<sup>F</sup>**

*Honoraria* – Medtronic (6)

**Robert M. Friedlander, MD<sup>F</sup>**

*Other* – Journal of Neuroscience and Neurosurgery (4)

**Kai-Ming G. Fu, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Medtronic (2)

**Douglas Garrabrant<sup>F</sup>**

*Ownership Interest* – Advanced O.R. Technologies (1); *Salary* – IMRIS (3)

**Steven D. Glassman, MD<sup>F</sup>**

*Royalty* – Medtronic (2); *Salary* – Norton Health Care (5); *Other* – Nuvasive-funds to data base (6), SRS-President-Elect (7), Medtronic (6)

# DISCLOSURE INFORMATION

**Ziya L. Gokaslan, MD<sup>F</sup>**

*Honoraria* – AANS; AO Foundation (6); *Other* – AO North America, DePuy and NREF fellowship funding (6); *Ownership Interest* – US Spine Stock: Spinal Kinetics (8)

**John G. Golfinos, MD<sup>F</sup>**

*Honoraria* – Medtronic (2); *Ownership Interest* – Viewray (6)

**Andrew W. Grande, MD<sup>P,F</sup>**

*Consulting Agreement* – Covidien (2); *Other* – Haag-Streit (6), Integra (2)

**Jeremy D. Greenlee, MD<sup>F</sup>**

*Other* – Aesculap, Inc. (2)

**Michael W. Groff, MD, FACS<sup>F</sup>**

*Royalty* – Depuy Spine (2); *Consulting Agreement* – EBI Spine Biomet (2)

**Robert E. Gross, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Boston Scientific (2), Medtronic/Lilly (2), Neuropace (2), St. Judes Medical (2), Visualase (2)

**James D. Guest, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Consultant to FDA (2)

**Munish Gupta, MD<sup>F</sup>**

*Ownership Interest* – Acrotech (6), J&J (6), Pfizer (6), Pioneer (6), Proctor and Gamble (6); *Honoraria* – AO (2); *Consulting Agreement* – DePuy Spine (2); *Royalty* – DePuy Spine (6); *Other* – FOSA (7), Lanx (2), Osteotech (2); *Intellectual Fees* – Medtronic (6)

**Costas George Hadjipanayis, MD PhD<sup>P</sup>**

*Royalty* – Meditech (2); *Intellectual Fees* – Nx Development (6)

**Regis W. Haid, MD<sup>F</sup>**

*Consulting Agreement* – Globus Medical (2), Piedmont Health Care (2); *Royalty* – Medtronic (6); *Ownership Interest* – Spine Universe (4); *Other* Financial or Material Support – Globus Medical (6), Medtronic Sofamor Danek (6); *Other* – Nuvasive (6)

**Clement Hamani, MD<sup>F</sup>**

*Consulting Agreement* – St Jude Medical (2)

**Ricardo A. Hanel, MD, PhD<sup>P,F</sup>**

*Other* – Covidien (6), MicroVention (6)

**James S. Harrop, MD, FACS<sup>P,F</sup>**

*Other* – Axiomed (6); *Consulting Agreement* – Depuy Spine (2), ICON (2); *Honoraria* – Ethicon (6)

**Robert Hart, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (6), Medtronic (6); *Honoraria* – DePuy Synthes Spine (6), Medtronic (6); *Royalty* – DePuy Synthes Spine (6), Seaspine (6); *Other* – Medtronic (6), NREF (6), Spine Connect (6), DePuy Spine (6)

**Roger Hartl, MD<sup>F</sup>**

*Consulting Agreement* – BrainLab (2), DePuy Synthes (2), Lanx (2), SpineWave (2)

**Robert F. Heary, MD<sup>P,F</sup>**

*Royalty* – DePuy Spine (6), Thieme Medical Publishers (6), ZimmerSpine (6)

**Fraser Henderson, MD<sup>F</sup>**

*Ownership Interest* – Computational Biodynamics, LLC. (8), Polaris Biotechnology Inc. (6)

**Jaimie M. Henderson, MD<sup>F</sup>**

*Other* – Circuit Therapeutics (7), Nevro Corp (7), Proteus Biomedical (6)

**Mojgan Hodaie, MD MSc FRCS<sup>P</sup>**

*Honoraria* – Medtronic (6); *Other* – St Jude's (6), Elekta (6)

**Langston T. Holly, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic (6);

**L. Nelson Hopkins, MD<sup>F</sup>**

*Consulting Agreement* – Abbott Vascular (2), Blocade Medical (2), Boston Scientific (2), Cordis (2), Micrus (2), Silk Road (2); *Other* – Toshiba (6)

**Richard A. Hostin, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (6); *Other* – DJO (6)

**Patrick C. Hsieh, MD, MSc<sup>F</sup>**

*Consulting Agreement* – Depuy (2), Medtronic (2)

**Stephen L. Huhn, MD<sup>F</sup>**

*Salary* – StemCells Inc (5)

**Mir Hussain, BS<sup>F</sup>**

*Salary* – Globus Medical Inc. (5)

**Robert E. Isaacs, MD<sup>F</sup>**

*Other* – Nuvasive (2); *Ownership Interest* – Saferay Spine LLC (8), Safewire (8)

# DISCLOSURE INFORMATION

**Pascal Jabbour, MD<sup>P, F</sup>**

*Consulting Agreement* – CNV (2), EV3 (2)

**Michael Janssen, MD<sup>F</sup>**

*Other* – AOSNA (6)

**Randy L. Jensen, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic (6), Pharmo Kinesis (2)

**J. Patrick Johnson, MD<sup>F</sup>**

*Consulting Agreement* – Alphatec Spine, Inc. (2), Spinewave (2); *Ownership Interest* – Pioneer Surgical Technology (2)

**Iain Kalfas, MD F**

*Royalty* – Mako Surgical (6); *Honoraria* – DePuy Synthes Spine (6), Stryker Spine (6)

**Steven N. Kalkanis, MD<sup>P, F</sup>**

*Honoraria* – Biomet Spine (6); *Consulting Agreement* – Ethicon (2)

**Patrick Kania, MD<sup>F</sup>**

*Salary* – ImmersiveTouch (5)

**Adam S. Kanter, MD<sup>F</sup>**

*Royalty* – Lanx (2); *Other* – NuVasive, Inc. (6)

**Katada Kazuhiro, MD<sup>F</sup>**

*Other* – THOSIBA Medical Systems (2)

**Khaled Kebaish, MD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (2), K2M (2)

**Daniel F. Kelly, MD<sup>F</sup>**

*Royalty* – Mizuho (2)

**Alexander A. Khalessi, MD<sup>F</sup>**

*Consulting Agreement* – Covidien-ev3 (2), Stryker Neurovascular (2), Valor Medical (First Degree Relative) (8)

**Pooja Khatri, MD<sup>F</sup>**

*Consulting Agreement* – Penumbra Inc. (6)

**Larry T. Khoo, MD<sup>F</sup>**

*Consulting Agreement* – Aesculap Spine (2), Depuy Spine (6), Globus Medical (6), Trasn1 (6), Zimmer Spine (6)

**Kee Duk Kim, MD<sup>F</sup>**

*Royalty* – LDR Spine (2)

**Zelma H. Kiss, MD<sup>F</sup>**

*Other* – Medtronic (have received grant funding in the past) (6)

**Eric Klineberg, MD<sup>F</sup>**

*Honoraria* – AO (6), DePuy Spine (6)

**Peter Konrad, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Medtronic (2); *Ownership Interest* – Neurotargeting (7)

**Branko Kopjar, MD<sup>F</sup>**

*Consulting Agreement* – Cerapedics (2), Smith & Nephew (2)

**Tyler R. Koski, MD<sup>F</sup>**

*Consulting Agreement* – Globus (2), MB Innovations/Spinewave (2), Medtronic (2), Nuvasive (2)

**Krishna Kumar, MD<sup>F</sup>**

*Honoraria* – Boston Scientific (2); *Consulting Agreement* – Medtronic Inc. (2)

**Charles Kuntz, MD<sup>F</sup>**

*Ownership Interest* – Mayfield Clinic (8), Precision Radiotherapy (8), Priority Consult (8), The Christ Hospital Spine Surgery Center (8); *Salary* – University of Cincinnati (5); *Other* – Synthes/DePuy – Research/Education (6), Neurosurgery (4)

**Richard E. Kuntz, MD<sup>F</sup>**

*Other* – Medtronic Inc. (5)

**Sophia Kuo, PhD<sup>F</sup>**

*Salary* – Penumbra Inc. (5)

**Brian Kwon, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Medtronic (2)

**Aki Laakso, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Orion Pharma, Espoo, Finland (6)

**Virginie Lafage, PhD<sup>F</sup>**

*Honoraria* – DePuy Spine (6), K2M (6); *Consulting Agreement* – Medtronic Sofamor Danek (6); *Ownership Interest* – Nemaris (8)

**Frank LaMarca, MD<sup>F</sup>**

*Consulting Agreement* – Biomet (2), Globus (2); *Royalty* – Globus (6), Stryker (6); *Other* – Globus (6), Lanx (2), NIH (6), NREF (6), DePuy Synthes Spine (6)

**Frederick F. Lang, MD<sup>P, F</sup>**

*Other* – DNAtrix, Inc. (6)

**Giuseppe Lanzino, MD<sup>F</sup>**

*Consulting Agreement* – ev3/ Covidien (2)

**Paul Larson, MD<sup>F</sup>**

*Ownership Interest* – Cranial Medical Systems (8); *Honoraria* – Medtronic (6); *Other* – MRI Interventions (6)

# DISCLOSURE INFORMATION

**Michael T. Lawton, MD<sup>F</sup>**

*Royalty – Mizuho (2); Consulting Agreement – Stryker (2)*

**Thomas Leipzig, MD<sup>F</sup>**

*Other – Lanx (6)*

**Lawrence Lenke, MD<sup>F</sup>**

*Other – Axial Biotech (6), DePuy Spine (6); Royalty – Medtronic (6), Quality Medical Publishing (6)*

**Jason Lerner, MD<sup>F</sup>**

*Salary – Depuy Synthes Spine (5)*

**Eric C. Leuthardt, MD<sup>P</sup>**

*Intellectual Fees – Allied Minds (6); Ownership Interest – General Sensing (8), Neuroolutions (8); Consulting Agreement – Intellectual Ventures (2), Monteris (2)*

**Allan D. Levi, MD, PhD<sup>F</sup>**

*Honoraria – Depuy (6), Medtronic (6)*

**Elad I. Levy, MD, FACS, FAHA<sup>P, F</sup>**

*Honoraria – Boston Scientific (6); Consulting Agreement – Blockade Medical (2), Codman & Shurtleff, Inc. (2), ev3 (2), TheraSyn Sensors (2); Ownership Interest – Intratech Medical Ltd. (8), Mynx/Access Closure (8); Other – Abbott Vascular (6)*

**Michael Levy, MD<sup>F</sup>**

*Consulting Agreement – NFL (2), NFLPA (2)*

**Michael Lim, MD<sup>F</sup>**

*Consulting Agreement – Stryker CMF (2)*

**Zachary N. Litvack, MD, MCR<sup>P, F</sup>**

*Other – Integra LifeSciences Corp (6); Gifts – Medtronic Navigation (6), Stryker CMF (6)*

**John C. Liu, MD<sup>F</sup>**

*Consulting Agreement – Medtronic (2)*

**Darlene A. Lobel, MD<sup>F</sup>**

*Consulting Agreement – St Jude Medical (2)*

**Russell R. Lonser, MD<sup>P, F</sup>**

*Consulting Agreement – Medical Advisory Board GE/NFL (2)*

**Demetrius K. Lopes, MD<sup>F</sup>**

*Consulting Agreement – Covidien (2), Stryker (2); Ownership Interest – Penumbra (2)*

**Timothy H. Lucas, MD<sup>F</sup>**

*Other – Karl Storz (6)*

**Cristian Luciano, MD<sup>F</sup>**

*Salary – ImmersiveTouch, Inc. (2)*

**L. Dade Lunsford, MD<sup>F</sup>**

*Other – AB Elekta (2)*

**R. Loch Macdonald, MD, PhD<sup>F</sup>**

*Consulting Agreement – Actelion Pharmaceuticals (2); Ownership Interest – Edge Therapeutics, Inc. (7)*

**Andre Machado, MD PhD<sup>P, F</sup>**

*Ownership Interest – ATI (6), Cardionomics (6), IntElect (6); Consulting Agreement – IntElect Medical (2), Monteris (2)*

**Adel M. Malek, MD, PhD<sup>F</sup>**

*Consulting Agreement – Codman Neurovascular (2), Stryker Neurovascular (2)*

**Alastair Martin, PhD<sup>F</sup>**

*Other – MRI Interventions (6)*

**Ian McCarthy, PhD<sup>F</sup>**

*Other – Nuvasive (6)*

**Cameron G. McDougall, MD<sup>F</sup>**

*Consulting Agreement – Covidian (2), Covidien (6)*

**Matthew J. McGirt, MD<sup>F</sup>**

*Consulting Agreement – Codman (6), Depuy-Synthes (6), Trans1 (6)*

**Jan H. Mehrkens, MD<sup>F</sup>**

*Honoraria – Medtronic Inc. (2)*

**J D. Mocco, MD<sup>P, F</sup>**

*Consulting Agreement – Actelion (2), Concentric (2), Edge Therapeutics (2), Endeavor Endovascular (2), Nfocus (2); Other – Blockade Medical (6); FEAT – Stryker (6), Lazarus Effect (7), THERAPY-Penumbra (6)*

**Alon Y. Mogilner, MD<sup>F</sup>**

*Honoraria – Intelect Medical (6); Consulting Agreement – Medtronic Neurological (2)*

**Mark Moldavsky, BS<sup>F</sup>**

*Salary – Globus Medical (5)*

**Christopher J. Moran, MD<sup>F</sup>**

*Consulting Agreement – EV3 (2)*

**Thomas E. Mroz, MD<sup>F</sup>**

*Honoraria – AO Spine (6); Consulting Agreement – Globus Medical (2); Ownership Interest – PearlDiver Inc (6)*

**Praveen V. Mummaneni, MD<sup>P, F</sup>**

*Royalty – 2N LLC (Royalty from DePuy Spine and QMP publishers and Thieme medical publishers) (8); Honoraria – Depuy Spine (6), Globus Medical (6)*

# DISCLOSURE INFORMATION

**Gregory Mundis, MD<sup>F</sup>**

*Honoraria* – DePuy Spine (6); *Royalty* – K2M (6); *Consulting Agreement* – Nuvasive (6)

**Yuichi Murayama<sup>F</sup>**

*Consulting Agreement* – Brain Lab (2), Fuji Film (2), Penumbra (2); *Royalty* – Stryker (2)

**Peter Nakaji, MD<sup>P</sup>**

*Consulting Agreement* – Aesculap (2); *Royalty* – AlloSource (2); *Consulting Agreement* – Medtronic Navigation (2)

**Joseph S. Neimat, MD F**

*Consulting Agreement* – Medtronic (2)

**Eric W. Nottmeier, MD<sup>F</sup>**

*Honoraria* – BrainLab (2); *Consulting Agreement* – DePuy/Synthes (2); *Royalty* – Globus (2); *Other* – K2M (4), Medtronic Navigation (4)

**David O. Okonkwo, MD PhD<sup>P, F</sup>**

*Consulting Agreement* – Lanx (6), Nuvasive (6)

**Jeffrey J. Olson, MD<sup>F</sup>**

*Consulting Agreement* – American Cancer Society (6); *Other* – Genentech (6), Merck (6), Millenium (6)

**Jill L. Ostrem, MD<sup>F</sup>**

*Consulting Agreement* – Allergan (6); *Grants* – Ceregene (6), Medtronic (6), St Jude Medical (6), Surgivison (6)

**John E. O'Toole, MD, MS<sup>F</sup>**

*Consulting Agreement* – Globus Medical (2), Pioneer Surgical (2)

**Paul Park, MD<sup>F</sup>**

*Consulting Agreement* – Globus (2), Medtronic (2)

**Parag G. Patil, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Medtronic (2), Neuralstem (2); *Other* – St Jude Neurological (6)

**Troy D. Payner, MD<sup>F</sup>**

*Royalty* – Stryker (6)

**Mick J. Perez-Cruet, MD, MS<sup>F</sup>**

*Ownership Interest* – MI4Spine (1), Thompson MIS (3) *Royalty* – Quality Medical Publishing, Inc (6)

**Daniel R. Pieper, MD<sup>F</sup>**

*Ownership Interest* – Greater Michigan Gamma Knife (8); *Consulting Agreement* – Storz (2), Stryker (2)

**Julie G. Pilitsis, MD PhD<sup>P, F</sup>**

*Consulting Agreement* – Medtronic (2)

**Nader Pouratian, MD PhD<sup>P, F</sup>**

*Other* – Medtronic (6)

**John B. Pracyk, MD, PhD<sup>F</sup>**

*Other* – Marshall Steele-Stryker Performance Solutions (6); *Consulting Agreement* – VegaHealthcare (2)

**Srinivas K. Prasad, MD<sup>P</sup>**

*Honoraria* – Depuy-Synthes Spine (6), Medtronic (6); *Consulting Agreement* – Stryker Spine (6)

**Charles J. Prestigiacomo, MD****FACS<sup>P, F</sup>**

*Consulting Agreement* – Edge Therapeutix (2); *Other* – International Brain Research Foundation (7), Thermopectix (2)

**Themistocles Protopsaltis, MD<sup>F</sup>**

*Other* – K2M (6), Nemaris (6)

**Stephen R. Ramee, MD, FSCAI,****FACC, FSCAI<sup>F</sup>**

*Other* – Abbott (6), Access Closure (6), Boston Scientific (6), Edwards LifeSciences (6), Medtronic (6), Northwind Medical (6); *Honoraria* – Gore Medical (6); *Ownership Interest* – Hot Spur/Teleflex (6), Large Bore, LLC (6), Lazarus Effect (6); *Consulting Agreement* – Maya Medical (6), Neurointerventions (2)

**John K. Ratliff, MD<sup>P, F</sup>**

*Consulting Agreement* – Stryker Spine (2)

**Wilson Z. Ray, MD<sup>F</sup>**

*Consulting Agreement* – Depuy (2), Ulrich (2)

**Jean Regis, MD**

*Other Financial or Material Support* – Accuray, BrainLab, Elekta, Tomotherapy (6)

**Harold L. ReKate, MD<sup>F</sup>**

*Consulting Agreement* – Advisor to Codman for shunt design (2)

**Ali R. Rezai, MD<sup>P, F</sup>**

*Consulting Agreement* – Autonomic Technologies (6); *Ownership Interest* – Autonomic Technologies (3), MRI Interventions (6)

**Laurence D. Rhines, MD<sup>F</sup>**

*Honoraria* – Stryker (2)



# DISCLOSURE INFORMATION

**Howard A. Riina, MD<sup>P, F</sup>**

*Ownership Interest* – eVisio Medical Systems (6), Reach Bionics (8); *Consulting Agreement* – New York Presbyterian Hospital Research Grant (2); *Other* – Tomorrow Foundation Grant (6)

**Andrew J. Ringer, MD<sup>F</sup>**

*Consulting Agreement* – eV3 / Covidien (2), Microvention (2), Stryker (2)

**David W. Roberts, MD<sup>P, F</sup>**

*Consulting Agreement* – Medtronic (6); *Other* – Dusa Pharmaceuticals (6), Medtronic (6), Zeiss (6)

**Gerald E. Rodts, MD<sup>P, F</sup>**

*Consulting Agreement* – Globus Medical, Inc. (2), Medtronic (2), Orthofix, Inc. (2); *Other* – SpineUniverse.com (3); *Royalty* – Globus Medical, Inc. (2)

**William S. Rosenberg, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic, Inc (2), SI-Bone (2), St. Jude Medical (2); *Ownership Interest* – Spine Wave (6)

**Joshua M. Rosenow, MD, FACS<sup>F</sup>**

*Consulting Agreement* – Boston Scientific Neuromodulation (2), Boston Scientific Neuromodulation (2)

**Timothy C. Ryken, MD, MS, FACS<sup>F</sup>**

*Consulting Agreement* – Eisai (2), Medtronic Inc (2), Merck Inc / Schering-Plough Inc (2)

**Arjun Sahgal, MD<sup>F</sup>**

*Consulting Agreement* – Medtronic Kyphoplasty (6)

**John H. Sampson, MD, PhD, MHS<sup>C, F</sup>**

*Consulting Agreement* – Celldex (6)

**Charles A. Sansur, MD MHS<sup>C, F</sup>**

*Honoraria* – DepuySynthes (2); *Consulting Agreement* – Medtronic (2)

**Rick Sasso, MD<sup>F</sup>**

*Other* – Cerapdics (6); *Royalty* – Medtronic (6)

**Michael J. Schlosser, MD<sup>F</sup>**

*Consulting Agreement* – HCA (3)

**Frank Schwab, MD, PhD<sup>F</sup>**

*Consulting Agreement* – DePuy Spine (2), Medtronic (2); *Honoraria* – DePuy Spine (6), Medtronic (6); *Royalty* – Medtronic (6); *Ownership Interest* – Nemaris (8); *Other* – DePuy Spine (6);

**Daniel M. Sciubba, BS, MD<sup>F</sup>**

*Consulting Agreement* – Depuy (2); *Honoraria* – Medtronic (6)

**Laligam N. Sekhar, MD, FACS<sup>F</sup>**

*Ownership Interest* – SpiSurgical Inc (8), Viket Medical Inc (6)

**Nathan R. Selden, MD PhD<sup>P, F</sup>**

*Other* – Committee Chair – Society of Neurological Surgeons (3), NeuroPoint Alliance (3); *Salary* – Regulatory & Clinical Research Institute (Study CEC Chair) (5); *Consulting Agreement* – Shire (2)

**Christopher I. Shaffrey, MD, FACS<sup>P, F</sup>**

*Consulting Agreement* – Biomet (6), Medtronic (6), Nuvasive (6); *Intellectual Fees* – Biomet (6), Medtronic (6), Nuvasive (6); *Royalty* – Biomet (6), Medtronic (6), Nuvasive (6); *Honoraria* – Globus (6), Stryker (6); *Other* – AOSPINE North America (6), Department of Defense (6), Depuy (6), NACTN (6), NIH (6), NREF (6)

**Ashwini Dayal Sharan, MD<sup>P, F</sup>**

*Ownership Interest* – ICP (8), ICVRx (8); *Consulting Agreement* – Medtronic (2), St. Jude Medical (2); *Royalty* – Zimmer (6)

**Frank G. Shellock, PhD<sup>F</sup>**

*Other* – Codman (6), Medtronic (2), W.L. Gore (6); *Consulting Agreement* – Stimwave (2)

**Jonathan D. Sherman, MD<sup>P</sup>**

*Consulting Agreement* – Medtronic (2), Spine Wave (2)

**Adnan Hussain Siddiqui, MD, PhD<sup>P, F</sup>**

*Consulting Agreement* – Codman & Shurtleff, Inc. (2), Concentric Medical (2), ev3/Covidien Vascular Therapies (2), Guidepoint Global Consulting (2), Penumbra (2), Pulsar Vascular (2), Stryker Neurovascular (2); *Honoraria* – American Association of Neurological Surgeons' courses (6), Annual Peripheral Angioplasty and All That Jazz Course (6), Codman – Trainer of *Other* neurointerventionists (6), Codman Speaker's Bureau (6); *Ownership Interest* – Blockade Medical (6), Hotspur (6), Intratech Medical (6), Stimsox (6), Valor Medical (6); *Other* – Abbott Vascular for training *Other* neurointerventionists (6), Codman Advisory Board (6), National Institutes of Health (6), University at Buffalo (6)

# DISCLOSURE INFORMATION

**Konstantin V. Slavin, MD<sup>F</sup>**

*Consulting Agreement* – Greatbatch (2), Medtronic (2), St. Jude Medical (2), Vycor Medical (2); *Honoraria* – Medtronic (2), St. Jude Medical (2); *Other* – Boston Scientific (6), Integra (6)

**Andrew E. Sloan, MD<sup>P,F</sup>**

*Consulting Agreement* – Monteris Medical (2), Nanofiber Solutions (2), RealBio (2), Surgical Theatre (2); *Ownership Interest* – Rubicon Genomics (2); *Other* – Genentech (6), National Cancer Institute (2), Roche Pharmaceuticals, Inc (6)

**Jonathan Slotkin, MD<sup>F</sup>**

*Consulting Agreement* – InVivo Therapeutics (2), Stryker Spine (2)

**Peter Smielewski, MD<sup>F</sup>**

*Ownership Interest* – ICM+ software is licensed by University of Cambridge, Cambridge Enterprise Ltd. PS and MC have a financial interest in a part of the licensing fee (6)

**Justin S. Smith, MD PhD<sup>P,F</sup>**

*Consulting Agreement* – Biomet (2), DePuy Spine (6), Medtronic Sofamor Danek (2); *Honoraria* – DePuy Spine (6); *Other* – DePuy Spine (6)

**Kenneth V. Snyder, MD, PhD<sup>F</sup>**

*Honoraria* – Toshiba (6)

**Teck Mun Soo, MD<sup>F</sup>**

*Intellectual Fees* – Dr. Soo designed the Aleutian cervical and thoracolumbar vertebral interbody spacer for K2M and received compensation of about \$30 K over the last 12 months for intellectual property fee. (1)

**Robert F. Spetzler, MD<sup>F</sup>**

*Ownership Interest* – Boston Scientific (6), DicomGrid (6), EmergeMD (6), iCo Therapeutics (6), Katalyst/Kogent (6), RSB Spine (6), Stereotaxis (6), Synergetics (6); *Consulting Agreement* – Zeiss (6); *Royalty* – Codman (6), Stryker (6)

**Philip A. Starr, MD, PhD<sup>F</sup>**

*Consulting Agreement* – Boston Scientific (6); Grants – Sugivision, Inc. (6)

**Gary K. Steinberg, MD, PhD<sup>F</sup>**

*Honoraria* – Medtronic (2)

**Michael P. Steinmetz, MD<sup>P,F</sup>**

*Consulting Agreement* – Biomet Spine (6)

**Peter Syre, MD<sup>F</sup>**

*Other* – St. Jude Neuromodulation-Grant Support (6)

**Charles Teo, MD<sup>F</sup>**

*Consulting Agreement* – Aesculap (2)

**Nicholas Theodore, MD<sup>F</sup>**

*Royalty* – Depuy Synthes Spine (6), Stryker Spine (6)

**Lucie Thibault<sup>F</sup>**

*Salary* – Microvention Inc (5)

**Shelly D. Timmons, MD PhD<sup>P,F</sup>**

*Honoraria* – Synthes (6)

**Stavropoula I. Tjoumakaris, MD<sup>P,F</sup>**

*Consulting Agreement* – Stryker (2)

**Steven A. Toms, MD, FACS<sup>F</sup>**

*Consulting Agreement* – Medtronic (2), Novocure (2), Stryker (2)

**Vincent C. Traynelis, MD<sup>F</sup>**

*Other* – Globus (6); *Consulting Agreement* – Medtronic (2); *Royalty* – Medtronic (6)

**Trent L. Tredway, MD<sup>F</sup>**

*Honoraria* – Aesculap (6), Synthes (6)

**Eve C. Tsai, MD, PhD, FRCSC, CIP<sup>F</sup>**

*Other* – Synthes/Depuy (6)

**Luis M. Tumialan, MD<sup>P,F</sup>**

*Consulting Agreement* – Medtronic (2)

**Aquilla Turk, MD<sup>F</sup>**

*Consulting Agreement* – Codman (2), Lazarus Effect (2), Microvention (2), Penumbra (2), Stryker (2)

**Raymond D. Turner, MD<sup>F</sup>**

*Consulting Agreement* – Blockade Medical (2), Codman (2), Covidien (2), Microvention (2)

**Juan S. Uribe, MD<sup>F</sup>**

*Consulting Agreement* – NuVasive (2), Orthofix (2)

**Alexander R. Vaccaro, MD<sup>F</sup>**

*Consulting Agreement* – Gerson Lehman Group (2), Guidepoint Global (2), Medacorp (2); *Ownership Interest* – Advanced Spinal Intellectual Properties (6), Bonovo Orthopaedics (6), Computational Biodynamics (6), Cross Current (6), Cytonics (6), Disc Motion Technology (6), Electrolux (6), Flagship Surgical (6), Flow Pharma (6), Gamma Spine (6), Globus Medical (6), In Vivo (6), K2 Medical (6), Location Based Intelligence (6), Neucore (6), Orthovita (6),

Paradigm Spine (6), Progressive Spinal Technologies (6), R.I.S (6), Replication Medica (6), Small Bone Innovations (6), Spine Medica (6), Spinology (6), Stout Medical (6), Syndicom (6), Vertiflex (6); *Royalty* – Stryker Spine (6), Nuvasive (6), K-2 Medical (6), Globus Medical (6), DePuy (6), Aesculap (6), Biomet (6)

**Erol Veznedaroglu, MD<sup>P, F</sup>**  
*Consulting Agreement* – Codman (2), Cordis (2)

**Michael A. Vogelbaum, MD PhD<sup>P</sup>**  
*Ownership Interest* – Infuseon Therapeutics, Inc. (7); *Honoraria* – Merck (6); *Consulting Agreement* – Neuralstem (2), Pharmacokinesis (2)

**Ajay K. Wakhloo, MD, PhD<sup>F</sup>**  
*Consulting Agreement* – Boston Biomedical Associates (2), Stryker Neurovascular (2); *Honoraria* – Harvard Postgraduate Course (6); *Other* – Philips Medical (6)

**Michael Y. Wang, MD FACS<sup>P, F</sup>**  
*Consulting Agreement* – Aesculap Spine (2), Depuy Spine (2), Globus (2)

**Gwen Watanabe<sup>F</sup>**  
*Salary* – Teleflex, Inc. (5)

**Clarence B. Watridge, MD<sup>F</sup>**  
*Other* – Medical Education & Research Institute (7), Medtronic (6), NIH/NINDS (6), Spinal Motion (6)

**Jeffrey S. Weinberg, MD<sup>F</sup>**  
*Ownership Interest* – AiCure (6)

**William C. Welch, MD, FACS, FICS<sup>F</sup>**  
*Consulting Agreement* – Best Doctors (2); *Ownership Interest* – Welch Research and Development (8)

**Robert E. Wharen, MD<sup>F</sup>**  
*Other* – Participating Investigator in RNS Trial (6)

**Donald M. Whiting, MD<sup>F</sup>**  
*Consulting Agreement* – Aesculap (2), Medtronic (2); *Ownership Interest* – Innovative Performance Technologies (8)

**Beth A. Winkelstein, PhD<sup>F</sup>**  
*Other* – St. Jude Neuromodulation-Grant Support (6)

**Timothy F. Witham, MD, BS<sup>F</sup>**  
*Other* – Ely Lilly, Research Support (6)

**Henry H. Woo, MD<sup>P</sup>**  
*Royalty* – Codman and Shurtleff (2); *Consulting Agreement* – ev3 Neurovascular (2); *Other* – Siemens (6); *Ownership Interest* – Vascular Simulations LLC (3)

**Eric J. Woodard, MD<sup>F</sup>**  
*Ownership Interest* – In Vivo Therapeutics (3)

**Osama O. Zaidat, MD<sup>F</sup>**  
*Consulting Agreement* – Penumbra, Inc. (6); *Honoraria* – Penumbra, Inc. (2)

# NOTHING TO DISCLOSE

The following individuals have disclosed that they do not have a relationship with commercial companies whose products may have a relevance to their participation in the Annual Meeting. Planners are designated by P and Faculty by F.

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Bizhan Aarabi, MD <sup>F</sup>  
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Kalil G. Abdullah, MD <sup>F</sup>  
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Emad T. Aboud, MD <sup>F</sup>  
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Manuel Alvarado, MD <sup>F</sup>  
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Kambiz Ansari, MD <sup>F</sup>  
Saeed Ansari, MD <sup>F</sup>  
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Mandana Behbahani, MD <sup>F</sup>

# NOTHING TO DISCLOSE

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Mitchel S. Berger, MD <sup>F</sup>  
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Sanjeev Bhaoi, MD <sup>F</sup>  
Aditi Bhargava, PhD <sup>F</sup>  
Ravi Bhoja, MD <sup>F</sup>  
Darell Bigner, MD <sup>F</sup>  
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Rami Bustami, PhD, MBA <sup>F</sup>  
John A. Butman, MD, PhD <sup>F</sup>  
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Mohamad Bydon, MD <sup>F</sup>  
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Daniel P. Cahill, MD <sup>F</sup>  
Peter Cai, BA <sup>F</sup>  
John Caird, MD <sup>F</sup>  
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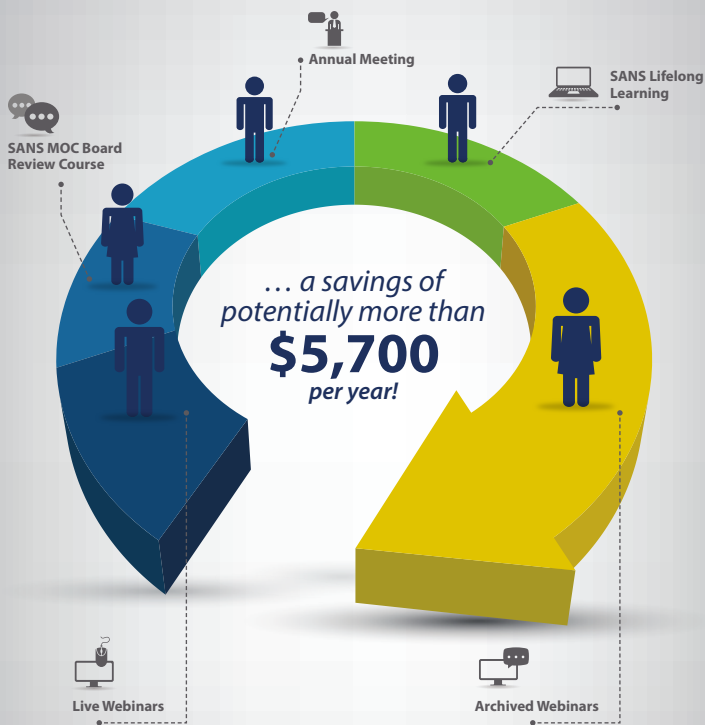
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The CNS disclaims any and all liability for injury or other damages resulting to any individual attending the Annual Meeting, and for all claims which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by physicians or any other person.

No reproductions of any kind, including audiotapes and videotape, may be made of the presentations at the CNS Annual Meeting. The CNS reserves all of its rights to such material, and commercial reproduction is specifically prohibited.

## Exhibit Hall Hours

<b>MONDAY, OCTOBER 21</b>	<b>9:00 AM – 3:30 PM</b>
<b>TUESDAY, OCTOBER 22</b>	<b>9:00 AM – 6:30 PM</b>
<b>WEDNESDAY, OCTOBER 23</b>	<b>9:00 AM – 2:00 PM</b>

Admittance to the Exhibit Hall is by CNS name badge only. Children under the age of 18 are not allowed in the CNS Exhibit Hall.

## Breaks and Demonstration Theater in the Exhibit Hall

Join your colleagues and exhibitors for unopposed networking in the hall. Demonstration theater presentation schedules will be posted in the exhibit hall.

<b>MONDAY, OCTOBER 21</b>	<i>Beverage Break</i> <b>9:00 – 10:00 AM</b> <b>11:30 AM – 12:30 PM</b>
<b>TUESDAY, OCTOBER 22</b>	<i>Beverage Break</i> <b>9:00 – 10:00 AM</b> <b>11:30 AM – 12:30 PM</b>
<b>WINE &amp; CHEESE RECEPTION</b>	<b>5:00 – 6:30 PM</b>
<b>RESIDENT SANS CHALLENGE CHAMPIONSHIP ROUND</b>	<b>5:00 – 6:30 PM</b>
<b>WEDNESDAY, OCTOBER 23</b>	<i>Beverage Break</i> <b>9:00 – 10:00 AM</b> <b>11:30 AM – 12:30 PM</b>

## Member Services Booth

Be sure to stop and visit the CNS Member Services staff in Booth 1309 for demos of our most popular products, or to answer any of your questions about the CNS, your *Neurosurgery*<sup>®</sup> subscription and your CNS membership.

# GENERAL INFORMATION

## Posters

The CNS Neurosurgical Forum features dynamic oral presentations supported by illustrated posters. This interdisciplinary session will be presented on Monday, 3:30 – 5:00 PM in Rooms 3014-3020 on Level 3 of Moscone Convention Center West. Digital Posters will be displayed electronically, Monday – Wednesday in the Exhibit Hall, and can be searched by author, topic or keyword.

## Press

Credentialed members of the media may register to attend the conference and are required to provide CNS staff with a copy of their press credentials and letters of assignment. Qualified media outlets must be represented by editorial staff, not publishers or advertising or marketing staff. Only two registrations are allowed per media outlet.

## Registration

Registration is located in Moscone West Convention Center, Level 1.

<b>SATURDAY, OCTOBER 19</b>	<b>7:00 AM – 5:30 PM</b>
<b>SUNDAY, OCTOBER 20</b>	<b>7:00 AM – 7:30 PM</b>
<b>MONDAY, OCTOBER 21</b>	<b>6:30 AM – 4:30 PM</b>
<b>TUESDAY, OCTOBER 22</b>	<b>6:30 AM – 4:30 PM</b>
<b>WEDNESDAY, OCTOBER 23</b>	<b>6:30 AM – 3:00 PM</b>

## Restaurant Reservations

A Restaurant and Tour desk will be available for your convenience in the lobby of Moscone West Convention Center.

## Shuttle

Shuttle service to Moscone West Convention Center will be available from the Palace Hotel, Westin St. Francis and Courtyard by Marriott. The shuttle service pick up location for Grand Hyatt and JW Marriott is located at the Westin St. Francis on Post Street, as both hotels are in walking distance to the Westin St. Francis. All other hotels are within walking distance from the convention center. A shuttle schedule will be posted at the hotels and convention center.

<b>SATURDAY, OCTOBER 19</b>	<b>7:00 AM – 5:30 PM</b>
<b>SUNDAY, OCTOBER 20</b>	<b>6:00 AM – 9:00 PM</b>
<b>MONDAY, OCTOBER 21</b>	<b>6:00 AM – 5:30 PM</b>
<b>TUESDAY, OCTOBER 22</b>	<b>6:00 AM – 8:00 PM</b>
<b>WEDNESDAY, OCTOBER 23</b>	<b>6:00 AM – 4:00 PM</b>

## Speaker Ready Room

All speakers and abstract presenters should visit the Speaker Ready Room, which is located in Room 3000 at Moscone Convention Center West prior to their presentations.

<b>SATURDAY, OCTOBER 19</b>	<b>7:00 AM – 5:30 PM</b>
<b>SUNDAY, OCTOBER 20</b>	<b>6:00 AM – 6:00 PM</b>
<b>MONDAY, OCTOBER 21</b>	<b>6:00 AM – 3:00 PM</b>
<b>TUESDAY, OCTOBER 22</b>	<b>6:00 AM – 3:00 PM</b>
<b>WEDNESDAY, OCTOBER 23</b>	<b>6:00 AM – 3:00 PM</b>

## Spouse Hospitality Suite

All registered CNS Annual Meeting spouses and guests are invited to visit the Spouse Hospitality Suite, Monday through Wednesday for continental breakfast from 8:00 – 10:30 AM. (Please note that admittance to the Spouse Hospitality Suite is by Spouse/Guest badge only.) The Spouse Hospitality Suite is located in the Walnut Room on the B2 Level at the San Francisco Marriott Marquis.

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<b>St. Mary's Hospital and Regional Medical Center</b>	<b>1153</b>
970-244-7414    www.stmarygj.org	
<b>Steute Meditech, Inc.</b>	<b>1264</b>
203-244-6300    www.steuteusa.com	
<b>Stryker</b>	<b>1337</b>
269-323-7700    www.stryker.com	
<b>Surgical Acuity</b>	<b>1764</b>
888-822-8489    www.surgicalacuity.com	
<b>Surgical Theater</b>	<b>1120</b>
216-452-2177    www.surgicaltheater.net	
<b>SurgiTel / General Scientific Corp</b>	<b>1748</b>
734-996-9200    www.surgitel.com	
<b>TeDan Surgical Innovations, LLC</b>	<b>1109</b>
713-726-0886    www.tedansurgical.com	
<b>The Monumental Group, Inc. (TMG Coins)</b>	<b>1664</b>
877-255-7470    www.tmgcoins.com	
<b>Thieme Medical Publishers, Inc.</b>	<b>1554 &amp; 1555</b>
212-760-0888    www.thieme.com	
<b>Thompson Surgical Instruments, Inc.</b>	<b>1747</b>
231-922-0177    www.thompsonsururgical.com	
<b>US Medical Innovations, LLC</b>	<b>1346</b>
301-270-0147    usmedinnov.com	
<b>Varian Medical Systems, Inc.</b>	<b>1825</b>
650-493-4000    www.varian.com	
<b>Vertebral Technologies, Inc.</b>	<b>1956</b>
952-912-5400    www.vti-spine.com	
<b>VG Innovations, LLC</b>	<b>1065</b>
727-565-1235    www.vginnovations.com	
<b>Visionsense Corp.</b>	<b>1665</b>
845-680-0233    www.visionsense.com	
<b>Weatherby Healthcare</b>	<b>1259</b>
866-906-1637    www.weatherbylocums.com	
<b>X-spine Systems, Inc.</b>	<b>1157</b>
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800-613-6131    www.zimmerspine.com	

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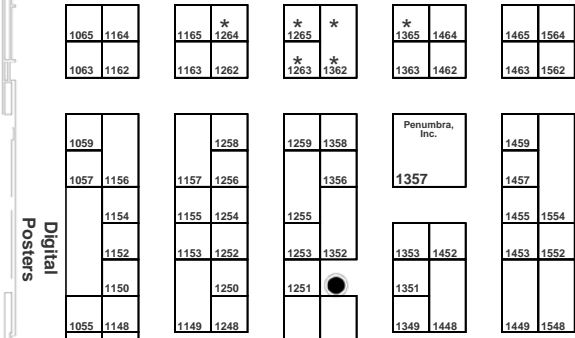
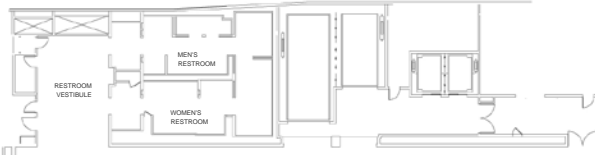
**Accuray**  
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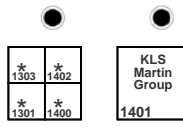
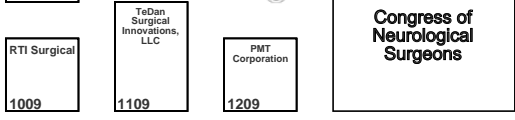
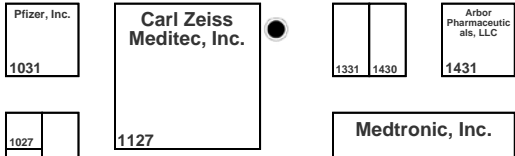
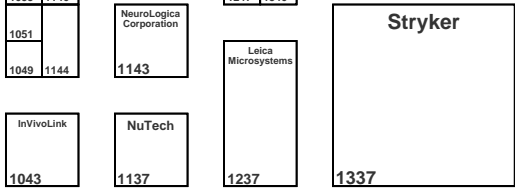
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## LEVEL ONE



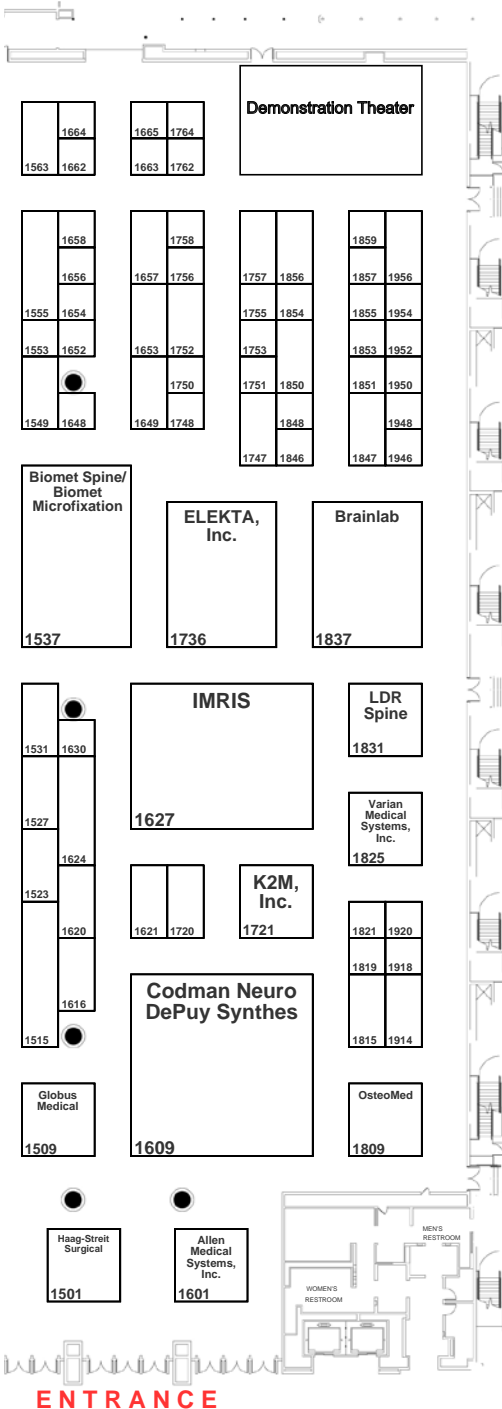
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Registration

# MOSCONE WEST

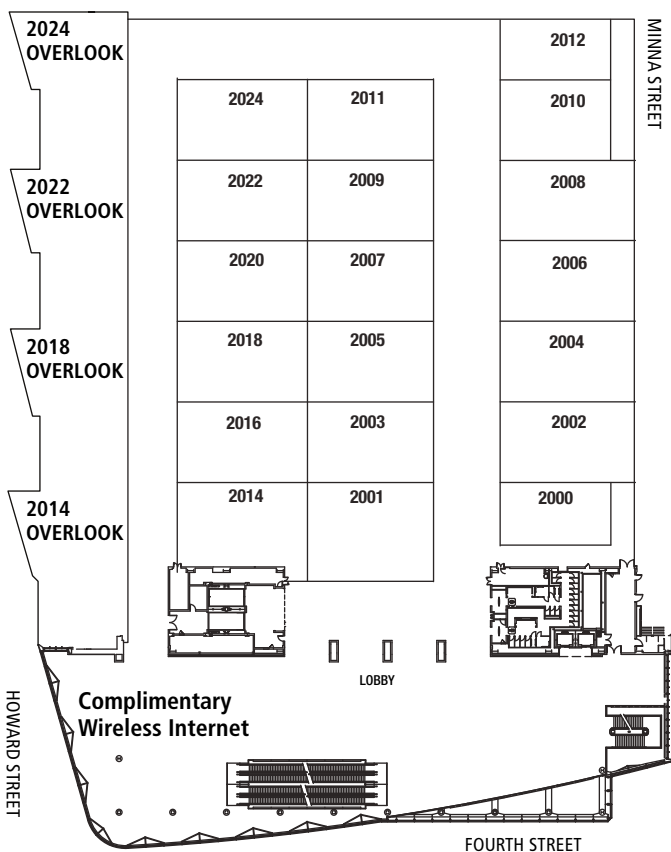
## LEVEL ONE



# LEVEL TWO

## MOSCONE WEST

- ▶ **Innovation and Technology Symposia**
- ▶ **Consensus Sessions**
- ▶ **Special Courses**
- ▶ **Section Sessions**
- ▶ **Oral Presentations**
- ▶ **Practical Courses**
- ▶ **Luncheon Seminars**
- ▶ **Sergeant-at-Arms (2024 Overlook)**
- ▶ **CNS Annual Business Meeting (2001)**
- ▶ **Resident Recruitment Social**

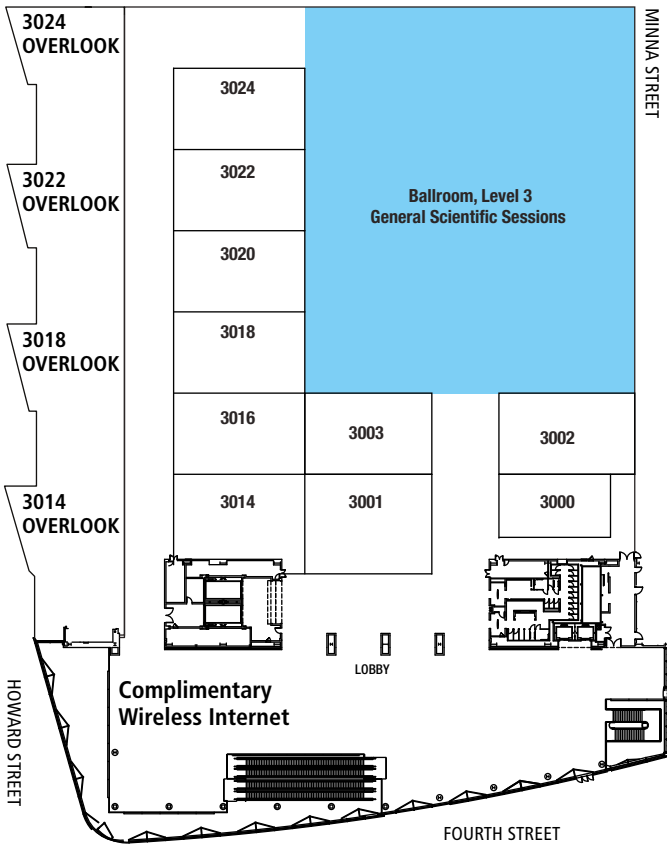




# LEVEL THREE

## MOSCONE WEST

- ▶ **General Scientific Sessions**
- ▶ **Neurosurgical Forum (3014-3020)**
- ▶ **Oral Presentations**
- ▶ **3-D Operative Neurosurgery I & II**
- ▶ **Section Sessions**
- ▶ **Practical Courses**
- ▶ **Luncheon Seminars**
- ▶ **Exhibits**
- ▶ **CNS Resident SANS Challenge Preliminary Rounds (3020)**
- ▶ **Speaker Ready Room (3000)**



# SAN FRANCISCO MARRIOTT MARQUIS

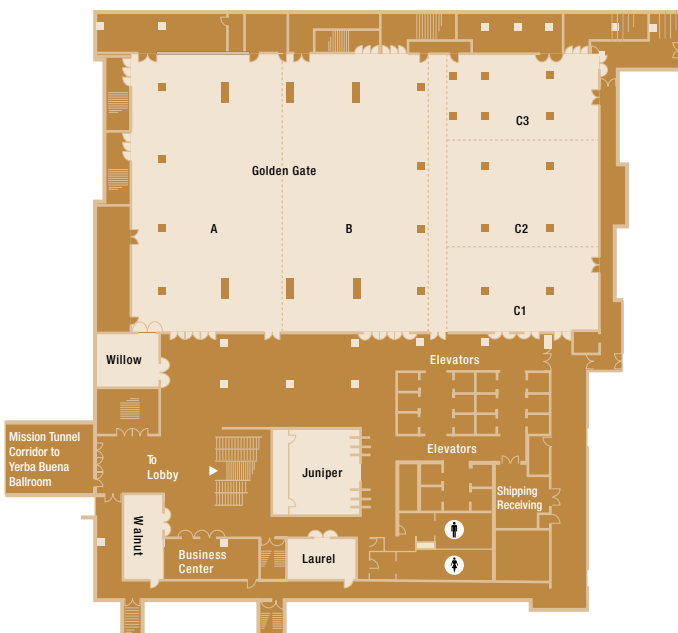
**General Scientific Session I**  
Yerba Buena Salon 1-7

**SYM03: Neuromodulation 2013**  
Golden Gate Ballroom

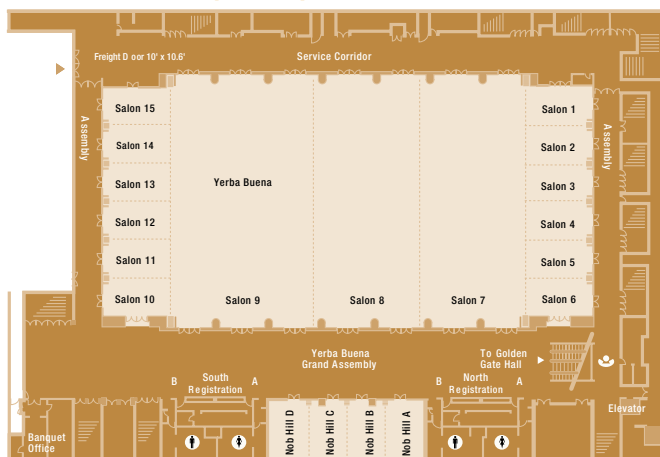
**Opening Reception**  
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**CNS Spouse Hospitality Suite**  
Walnut Room

## LEVEL B2

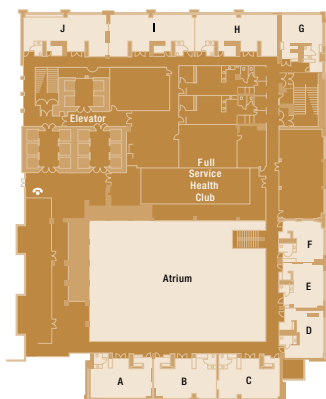


## LEVEL B2 (Lower)



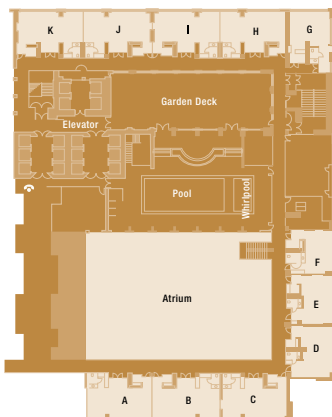
# SAN FRANCISCO MARRIOTT MARQUIS

## LEVEL 2



## LEVEL 4 (Pacific)

## LEVEL 5 (Sierra)





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AND WARNINGS FOR:  
INFUSE® BONE GRAFT/LT-CAGE® LUMBAR TAPERED FUSION DEVICE,  
INFUSE® BONE GRAFT/INTER FIX™ THREADED FUSION DEVICE, INFUSE®  
BONE GRAFT/INTER FIX™ RP THREADED FUSION DEVICE**

The INFUSE® Bone Graft/Medtronic Titanium Threaded Interbody Fusion Device is indicated for spinal fusion procedures in skeletally mature patients with degenerative disc disease (DDD) at one level from L2–S1, who may also have up to Grade I spondylolisthesis or Grade I retrolisthesis at the involved level. The INFUSE® Bone Graft/ LT-CAGE® Lumbar Tapered Fusion Device is to be implanted via an anterior open or an anterior laparoscopic approach. INFUSE® Bone Graft with either the INTER FIX™ or INTER FIX™ RP Threaded Fusion Device is to be implanted via an anterior open approach.

The INFUSE® Bone Graft/Medtronic Titanium Threaded Interbody Fusion Device consists of two components containing three parts— a metallic spinal fusion cage, a recombinant human bone morphogenetic protein and a carrier/scaffold for the bone morphogenetic protein and resulting bone. **These components must be used as a system for the prescribed indication described above. The bone morphogenetic protein solution component must not be used without the carrier/scaffold component or with a carrier/scaffold component different from the one described in this document. The INFUSE® Bone Graft component must not be used without the Medtronic Titanium Threaded Interbody Fusion Device component.**

NOTE: The INTER FIX™ Threaded Fusion Device and the INTER FIX™ RP Threaded Fusion Device may be used together to treat a spinal level. LT-CAGE® Lumbar Tapered Fusion Device implants are not to be used in conjunction with either the INTER FIX™ or INTER FIX™ RP implants to treat a spinal level.

The INFUSE® Bone Graft/Medtronic Titanium Threaded Interbody Fusion Device is contraindicated for patients with a known hypersensitivity to

recombinant human Bone Morphogenetic Protein-2, bovine Type I collagen or to other components of the formulation and should not be used in the vicinity of a resected or extant tumor; in patients with any active malignancy or patients undergoing treatment for a malignancy; in patients who are skeletally immature; in pregnant women; or in patients with an active infection at the operative site or with an allergy to titanium or titanium alloy.

There are no adequate and well-controlled studies in human pregnant women. In an experimental rabbit study, rhBMP-2 has been shown to elicit antibodies that are capable of crossing the placenta. Women of child bearing potential should be warned by their surgeon of potential risk to a fetus and informed of other possible orthopedic treatments. The safety and effectiveness of this device has not been established in nursing mothers. Women of child-bearing potential should be advised to not become pregnant for one year following treatment with this device.

**Please see the package insert for the complete list of indications, warnings, precautions, adverse events, clinical results, definition of DDD, and other important medical information. The package insert also matches the sizes of those sized devices that are indicated for use with the appropriate INFUSE® Bone Graft kit.**

**CAUTION:** Federal (USA) law restricts this device to sale by or on the order of a physician with appropriate training or experience.



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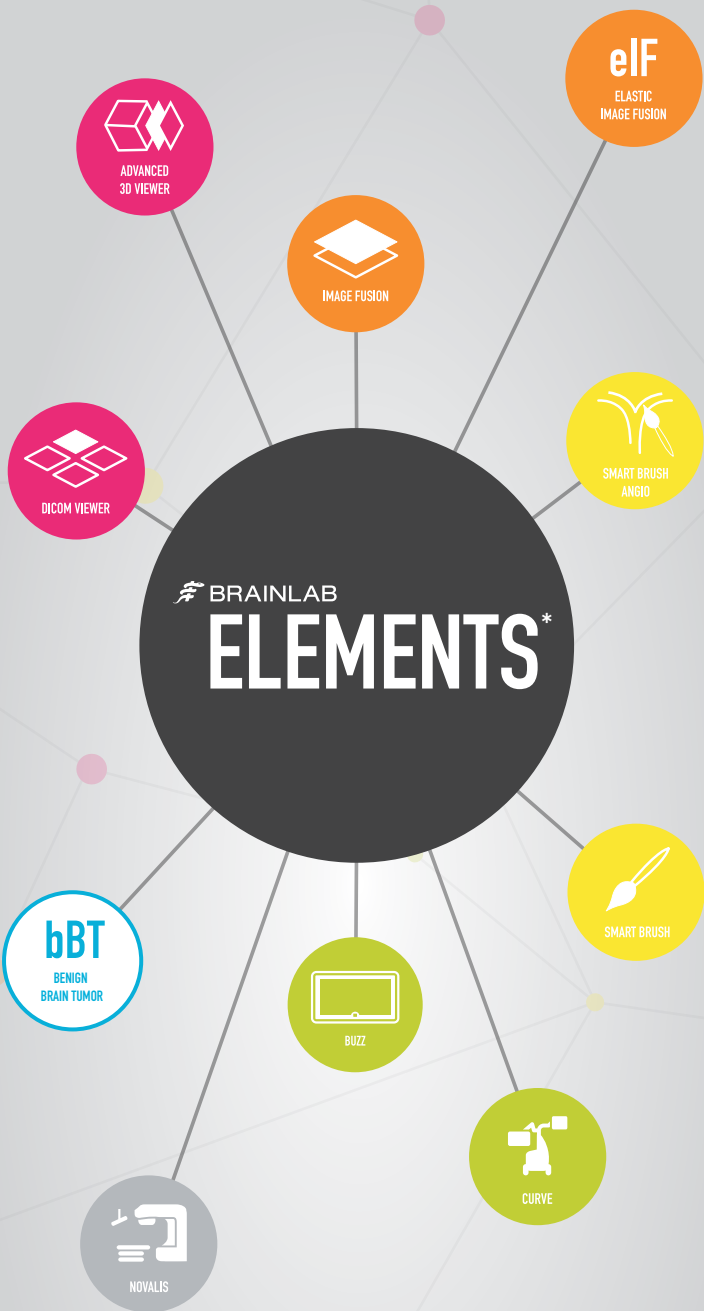
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