

Stereotactic and Functional NEWS



Spring 2015

AANS/CNS Section on Stereotactic and Functional Neurosurgery and American Society for Stereotactic and Functional Neurosurgery

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Message from the President



Aviva Abosch, MD, PhD, FAANS

Dear Colleagues,

As I approach the end of my first year as president of the American Society of Stereotactic and Functional Neurosurgery (ASSFN), I am delighted to report

that our society is on solid financial ground. We owe this financial stability to the hard work and forethought of a succession of ASSFN executive council members and ASSFN leadership, in conjunction with crucial support from our membership. This stability affords us with the opportunity to evaluate options for supporting our goal — which is to promote multidisciplinary collaboration among clinicians, scientists, engineers and others, to advance the field through education, research, innovation and advocacy. Through these efforts, the ASSFN seeks to improve the lives of people suffering from neurological disease, through the application of advances in neurosurgery, technology and translational neuroscience. In the next issue of this newsletter, I will be updating you about new ASSFN initiatives for supporting research, training and advocacy.

The 2015 American Association of Neurological Surgeons (AANS) Annual Scientific Meeting is rapidly approaching, and we anticipate an excellent turnout for the Stereotactic and Functional Section Session, which will be held on Wednesday, May 6, 2015, from 2–5 p.m. In addition to fascinating presentations on the topic of ablation for epilepsy, pain and tremor, Mark R. Witcher, MD, will present his research on recordings from human hippocampal neurons and memory performance, and the implications of these findings for the development and testing

of a human memory prosthetic. Dr. Witcher is the 2015 recipient of the coveted Phillip L. Gildenberg, MD Resident Award.

A new Honor Your Neurosurgical Mentor fund has been established in memory of Roy Bakay, MD, FAANS, who passed away in 2013, at the age of 64. Dr. Bakay completed neurosurgery residency in 1981, at the University of Washington School of Medicine in Seattle. Following residency, he went to the National Institutes of Health (NIH) for fellowship training in neuroplasticity, then joined the faculty at Emory University School of Medicine in Atlanta, where he continued his practice and research. In 2000, he joined the Department of Neurosurgery at Rush University in Chicago. Dr. Bakay had a passion for translational neuroscience research, combined with advancing clinical practice. He enjoyed a long track record of NIH and industry funding, and among other accomplishments in the research arena, was the first to demonstrate the viability of fetal dopaminergic neuronal transplantation in Parkinsonian primates — work that continues to influence research being conducted today. During his long career dedicated to the research and treatment of movement disorders, Dr. Bakay authored four books, 56 chapters and more than 153 journal articles. He was vice chairman of Rush University's Department of Neurosurgery, and the recipient of the A. Watson Armour III and Sarah Armour Presidential Chair. He was a recipient of the coveted Philip Gildenberg Award from the American Society for Stereotactic and Functional Neurosurgery, of which he was a past president, and of the Molly and Bernard Sanberg Memorial Award from the American



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Society for Neural Therapy and Repair. An indication of his deep commitment, Dr. Bakay continued to care for patients throughout his lengthy cancer treatment, and until a month prior to his death. He was an advocate for our field and our patients, and a friend and role model for all of us.

Thank you for considering a donation to the Honor Your Neurosurgical Mentor fund, which will be directed to research in stereotactic and functional neurosurgery. Donations can be made as a one-time gift or as online installments at the following address: <http://www.nref.org/donate.aspx>. I encourage everyone to contribute to this fund, which will be used annually to support research for residents and fellows in the field of functional and stereotactic neurosurgery.

For donations by check or to make a gift of securities, please contact:

Filomena Spero, Associate Director, NREF
5550 Meadowbrook Industrial Court
Rolling Meadows, IL 60008
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Remember that we need your help to carry out the mission of our society. Please consider getting involved. Contact ASSFN secretary-treasurer, Robert Gross, MD, PhD, FAANS, for a full listing of committees and committee chairs, and to participate in areas that are of interest to you.

Finally, planning for the 2016 Biennial ASSFN Meeting in Chicago is going well, thanks to the efforts of society past-

president, Konstantin Slavin, MD, FAANS; and local meeting host, Joshua Rosenow, MD, FAANS. We are looking forward to another spectacular meeting, and hope to see you all in Chicago. In the meantime, I look forward to seeing you in Washington, D.C., during the AANS Annual Scientific Meeting.

Kindest Regards,



Aviva Abosch, MD, PhD, FAANS

*Professor of Neurosurgery and Neurology
Director of Stereotactic and Epilepsy Surgery
Director of Neurosurgery Research
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ASSFN President Aviva Abosch, MD, PhD, FAANS, presents the 2014 CNS resident award in stereotactic and functional neurosurgery to Taylor J. Abel, MD, of the University of Iowa for his abstract, titled “The Physiology of Heteromodal Semantic Representation in the Human Anterior Temporal Lobe.”



Dr. Kim Burchiel: Honored Guest for ASSFN and CNS

by Jonathan P. Miller, MD, FAANS

The American Society of Stereotactic and Functional Neurosurgery is proud to present Kim Burchiel, MD, FAANS, as the honored guest at the 2016 Biennial Meeting in recognition of his tremendous contributions to the specialty of functional neurosurgery.

Kim James Burchiel was born April 23, 1950, in Holyoke, Mass. After grade school education in Massachusetts and Connecticut, he attended high school in Redding, Calif. He graduated with high honors from University of California, Davis with a bachelor's degree in biochemistry and genetics and obtained his medical doctorate from University of California, San Diego. He completed his surgical internship at the University of California, Los Angeles/Harbor General Hospital in Torrance, Calif., and entered neurosurgical residency at the University of Washington under Arthur A. Ward, MD. Under the tutelage of Drs. Ward, Ojemann, Loeser and Wyler, he developed an interest in functional, stereotactic, pain and epilepsy surgery. He joined the faculty after graduation where he expanded the clinical pain neurosurgery program and led laboratory efforts studying mechanisms of peripheral neuropathic pain. In 1988, he was appointed Professor and head of the Division of Neurosurgery at Oregon Health & Science University (OHSU) in Portland, Ore., and in 1997, he established the Department of Neurological Surgery, which he currently leads as the John Raaf Professor and Chairman.

During his career, Dr. Burchiel has published more than 300 peer-reviewed articles and won numerous clinical and scientific awards. Under his leadership, the Neurosurgery Department at OHSU has expanded, and its residency and fellowship training

programs have grown, with a major emphasis on clinical and basic neurosurgical research. In addition to being an active member of ASSFN, Dr. Burchiel is a member of the American Association of Neurological Surgeons (AANS), American Academy of Pain Medicine, Congress of Neurological Surgeons (CNS), International Association of the Study of Pain, and American College of Surgeons, of which he is also a fellow. He has served as president of the Society of University Neurosurgeons, Western Neurosurgical Society, the American Board of Pain Medicine and the Society of Neurological Surgeons; chairman of the AANS/CNS Joint Section on Pain; and director and vice-chairman of the American Board of Neurological Surgery.

Dr. Burchiel and his wife Debra live in Portland and have four children: Jessica, Adrienne, Meredith and Cole. He has many interests outside of neurosurgery, including family, music, running, astronomy and mountaineering.



Kim Burchiel, MD, FAANS.

University of Pennsylvania Awarded DARPA Grant to Study TBI and Memory

by Timothy Lucas, MD, PhD

Traumatic brain injury (TBI) affects 1.7 million U.S. citizens annually. TBI survivors are often plagued with memory impairments that drastically affect their quality of life and ability to return to gainful employment. Despite the prevalence of the condition, few treatments exist. In an effort to accelerate the discovery of new treatments for TBI-related memory loss, the Defense Advanced Research Projects Agency (DARPA) announced the Restoring Active Memory, or RAM, program in 2014.

The goal of this ambitious program is to develop and test a wireless, implantable neural interface for human use. As conceived, the device would tap into impaired memory circuits and jump-start the memory encoding process, thereby boosting the affected individual's ability to recall the encoded events later.

Of the submitted proposals, two teams emerged with winning proposals — the University of Pennsylvania and the University of California at Los Angeles. These teams will work over the course of the next several years in collaboration with industry partners to develop the implantable circuitry of the final cognitive neuroprosthetic system. In parallel, animal and clinical trials will examine the specific neural circuits required to boost memory performance.

A major challenge that faces both teams is characterizing the neural signature of successful memory formation. This memory biomarker will likely take the form of oscillatory rhythms in memory structures that are time-locked to memory formation. Identifying this biomarker is fundamental to understanding the brain state that facilitates (or hinders) memory formation. Armed with a predictive set of biomarkers, the teams will implement closed-loop algorithms to run on the final chip design for human implantation.

Which neural target, oscillatory biomarker, closed-loop algorithm and prosthetic implant proves most successful at restoring memory remains to be seen. One thing is certain, however. DARPA's investment in this prevalent problem has united a large number of scientists and clinicians behind a common cause well beyond what is possible with traditional National Institutes of Health (NIH)-funding mechanisms. With luck, functional neurosurgeons will have a new therapeutic option to treat TBI survivors in the years to come.

Neurosurgeon Research Career Development Program

The Neurosurgeon Research Career Development Program, or K12 Award, is a federally funded program that is specific for the development of neurosurgeon-scientists at the earliest stages of their careers. This award provides two years of salary support and costs for research supplies for those who are able to dedicate 50-percent effort at their institution for neurosurgical research. This is a mentored award where development of the applicant and the training plan is paramount. The program is headed by a functional neurosurgeon, Emad Eskander, MD, from Massachusetts General Hospital. Eligible candidates within one year of finishing their neurosurgical residency or fellowship are encouraged to apply in October 2015. Details regarding the application process and program can be found at <http://neurocdp.org/>.

We are pleased to recognize the following two awardees of 2014:

1. Shahid Nimjee, MD, PhD
Assistant Professor
Ohio State University Wexner Medical Center
Combining Reversible Anti-Von Willebrand Factor Inhibitor with rTPA for Improved Safety in Stroke.
2. Casey Halpern, MD
Assistant Professor
Stanford University Medical Center
Laying the Foundations for a Closed-loop Deep Brain Stimulation Device for Disorders of the Brain that Exhibit Impairing Behavioral Disinhibition.

David Roberts, MD, FAANS, editor of *Stereotactic and Functional Neurosurgery*, presents the rising impact factor of the society's journal to the ASSFN executive committee and board of directors.



K12 Neurosurgeon Research Career Development Award to Stanford Functional Neurosurgeon

Closed-loop nucleus accumbens deep brain stimulation for behavioral disinhibition

PI: Casey H. Halpern, MD

Behavioral disinhibition, defined as an inability to constrain impulses, is one of the most disabling features common to many neurologic conditions, including traumatic brain injury, stroke and frontotemporal dementia, as well as psychiatric disorders and even obesity. Loss of inhibitory control from the prefrontal cortex (PFC) leads to heightened reward sensitivity related to dysregulation of mesolimbic circuitry involving the nucleus accumbens (NAc). The NAc is largely populated by a single (GABAergic) projection neuron group known as medium spiny neurons (MSNs). A subset of NAc MSNs appear to exhibit inhibitions in firing, a “pause,” which begins immediately prior to initiation of an appetitive behavior and continues until completion of that behavior. Moreover, PFC lesions are known to decrease the basal firing rate of pause neurons, further implicating these cell types in behavioral disinhibition. Because this pause appears to reliably precede and accompany disinhibited actions, we propose that it can serve as a biomarker for reactive, neuromodulatory techniques such as closed-loop deep brain stimulation (DBS). Our studies will test efficacy and mechanisms of closed-loop DBS in a mouse model of binge-eating behavior (a disorder common to conditions with loss of inhibitory control). Previous work in this model demonstrated that acute, open-loop DBS (non-reactive, preprogrammed stimulation settings) attenuated binge eating.

One way to translate these findings to humans is to design

a stimulatory device capable of detecting an electrophysiologic biomarker like the pause that reliably precedes such behavior. During this training period, we will determine whether using the pause in firing of NAc neurons can reliably trigger intermittent DBS to ameliorate binge eating in mice. To complement this translational work, I will dissect the underlying circuitry that is likely modulated by NAc DBS in an attempt to better elucidate cellular and molecular mechanisms. Prior work revealed that dopamine type 2 receptor antagonism blocked the effect of NAc DBS, suggesting involvement of MSNs expressing the dopamine type 2 receptor. The basis for this receptor specificity is unclear, as NAc MSNs express either the dopamine type 1 receptor (D1) or the dopamine type 2 receptor (D2). Moreover, both D1-MSNs and D2-MSNs are known to receive unbiased inputs from PFC. One hypothesis supporting D2-dependent effects would be that D2-MSNs but not D1-MSNs, send direct projections to the lateral hypothalamus (LH), a well-known feeding center, which more recently has been suggested to be involved in all motivated behaviors. Thus, what remains to be tested is whether cellular projection specificity to the LH exists. This circuit will be deconstructed using cellular electrophysiologic techniques, to genetically access and segregate D1- and D2-MSN projections. These mechanistic studies are completely independent of the findings of the closed-loop DBS study proposed above, but are necessary to elucidate key substrates of this circuit that potentially are modulated by this intervention. Findings consistent with prior hypotheses would support the development of a closed-loop system for behavioral disinhibition, and provide important insight into its mechanisms.

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Additional Key Society Information

Official Society Journal

Stereotactic and Functional Neurosurgery

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www.assfn.org

Reflections on the Genesis of the BRW and CRW Frames from Michael L.J. Apuzzo

by Craig Rabb, MD, FAANS

Michael L. J. Apuzzo, MD, FAANS(L), is the Edwin M. Todd/Trent H. Wells, Jr., Professor of Neurological Surgery at the University of Southern California (USC) Keck School of Medicine. Dr. Apuzzo has been at USC since completing his residency at the Yale University School of Medicine, and served as editor of Neurosurgery and World Neurosurgery. I recently had the opportunity to sit down with my former professor and discuss some of the origins of the BRW and CRW frames.

Dr. Apuzzo: I began my career out of residency about 40 years ago in 1973. At that point, there had been a dormancy of stereotactic neurosurgery. There had been a great deal of interest beginning in the '50s and the early '60s, from the standpoint of the utilization of stereotactic methods to treat movement disorders. With the advent of various medications, surgical intervention for movement disorders effectively ceased. Even in that state of dormancy, there were people who kept the fires burning. The one I want to single out as being the person who maintained interest in stereotactic neurosurgery was Phil Gildenberg, MD, PhD, FAANS(L), and so he was thus Mr. Stereotaxis. He represented the foundation of the field, and he was at every meeting talking about and representing the concepts of stereotactic neurosurgery.

Things began to move in a more sophisticated way in 1973. As I was finishing my residency, I happened to go up to the Mass General to see the work that William Sweet, MD, DSc, was doing with trigeminal neuralgia. During my visit, there was some equipment being installed in the area where Dr. Sweet did his procedures. This equipment was the first EMI (CAT) scanner in North America. That was the dawn of a new era, as far as I'm concerned.

Around 1974 or 1975, the first CAT scanner went in (at LA County), and it was the first CAT scanner, as I remember, in Los Angeles. It went in virtually 50 feet from my office. I began to do some work in the scanner, in patients with brain tumors. We did some CT-guided biopsies, and we would even do the occasional brachytherapy. It readily became apparent that there needed to be some translation of imaging data into the operating room. Various stereotactic frames were beginning to evolve around that time, and my interest in stereotactic frames was kindled.

Meantime, I made contact with Edwin Todd, MD, FAANS(L), who had been on the USC faculty. He was the creator of the Todd-Wells stereotactic instrument, which was the most prevalent stereotactic system in the '50s, for the treatment of movement disorders, utilizing air studies and various types of atlases. As that activity died down, these frames ceased to be used, and were shelved. I discovered that some of these instruments still existed at USC, and began examining and familiarizing myself with them. I then became friendly with Ed Todd. This relationship was very important, and I got more interested in stereotactic neurosurgery.

During the same period of time, I went to a ski meeting in Utah, when I encountered a plastic prototype of what was to be the Brown-Roberts-Wells frame. There, I became acquainted with Trent Wells, the biomedical engineer, who was from Los

Angeles. He had previously worked with Ed Todd in creating the Todd-Wells frame, and I learned that his company was 10 minutes from the hospital. I let Trent know that I wanted the opportunity to, once an operational prototype of the BRW was ready, to be one of the first get my hands on one to use. I later spent a lot of time at Trent's facility, as it was on my route to and from the hospital.

Ted Roberts, MD, who was at the University of Utah, fundamentally funded the research that resulted in the Brown-Roberts-Wells system. To my knowledge, Russell Brown, who was a medical student at the time at the University of Utah, walked into Ted's office, and said, "I have algorithms for translating imaging data from the scanner into the operating room." So Ted's interest was piqued, and Trent Wells, who had extensive experience with creating the Todd-Wells frame, was brought into the group. They brainstormed, and the Brown-Roberts-Wells system was created based on the work of those three people.

Having that connection with Trent, we were able to get frame Number One. Now three frames went out at that time. One went to the University of Utah, of course, where Ted Roberts and Peter Heilbrun, MD, worked, and one went to David Thomas, MD, at Queens' Square in London. We still have Number One at USC; the markings are on our base ring and on the phantom base. I travelled up to the University of Utah, and we did a series of simulations using melons, with Trent being there, and with Ted and Peter. We put markers into the melons and put them into the scanners, and tested how valid the system was, and subsequently did some patients at the University of Utah, which is where the first patients were done. I then came back home to USC, where we did the first patient in L.A, which turned out to be a lymphoma.

We then went on to do many cases, and published the first paper with the Brown-Roberts-Wells frame, which appeared in 1983. Our first cases were around 1979 or 1980. Having then gone on to do a large number of cases, we went on to publish a second paper in the *Journal of Neurosurgery* with Peter (Heilbrun), which I believe came out around 1984. In addition to biopsies, this instrument was proving itself useful for localization during open surgery, and also for implantation of isotopes for brachytherapy. In fact, I flew up to UCSF and spent some time with Yoshio Hosobuchi, MD, FAANS(L); and Philip Gutin, MD, FAANS, showing them how to use the BRW system.

It eventually became apparent that it was necessary to go on and create a different frame system which could better be used



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for intraoperative localization. There was also a need to be able to secondarily easily manipulate the frame away from the operative field. We worked with Eric Cosman, MD, on that and got the prototype system of the Cosman-Roberts-Wells frame when Bill Couldwell, MD, PhD, FAANS, was a resident. Bill and I did the initial cases with the CRW frame, and then Bill wrote the paper in around 1990. During the same period of time, we published a book with Parakrama Chandrasoma, MD, on the use of stereotactic biopsies and the smear techniques. We popularized the use of this technology for stereotactic biopsies and localizations during the time between 1978 and 1990.

Trent Wells was a genius biomechanical engineer whose college time was cut short by WWII. Trent ultimately became a fighter pilot, flying P-51s, as an escort for the B-17 bombers. He flew more than 50 missions over Europe. When Trent came back, he didn't go back to college, but began to build various laboratory related instruments in his garage, for people at UCLA. He then began building more elaborate instruments that resulted in a factory based in Southgate, Calif. Much of the logic that gave me confidence in frame-based navigation was that Trent was a fighter pilot. Both he and Ted Roberts had a meeting of the minds, as Ted was an avid pilot, and Heilbrun was a pilot as well. Much of the terminology relating to the angulations of the BRW was related to flying (azimuth and declination, etc). This was all very similar to the navigation systems used on the nuclear submarines during my time in the Navy. Once the computer became a neurosurgical tool, that's what accelerated everything that was taking place, and everything folded in together. That's how that came to be.

North American Gamma Knife Consortium Meeting and the Gamma Knife Perfexion Upgrade Course

The second North American Gamma Knife Consortium Meeting and the Gamma Knife Perfexion Upgrade Course will be held in Cleveland from June 26-28, 2015. A follow-up to the inaugural 2011 meeting held in Pittsburgh, it is designed to increase scientific knowledge base and levels of evidence related to the use of the Leksell Gamma Knife. An international faculty of pioneers and leaders will present and discuss their clinical advances and innovative therapies. Meeting co-directors are Gene Barnett, MD, MBA, FAANS (Cleveland Clinic); and Jason Sheehan, MD, PhD, FAANS (University of Virginia).

Abstracts for poster presentation now being accepted through April 15, 2015. Posters will be on display throughout the meeting on June 27-28, 2015. Notification of acceptance, presentation details and poster size will be sent on or before May 15, 2015. Awards will be presented for the best overall abstract and for young investigators (under 30 years).

For complete details and to register, visit www.ccfme.org/NAGKC15.

AANS Preview for Functional Neurosurgery

by Wendell Lake, MD

The 83rd American Association of Neurological Surgeons (AANS) Annual Scientific Meeting will be held in Washington, D.C., from May 2-6, 2015. Stereotactic and functional neurosurgery continues to be one of the most active areas of neurosurgical innovation and research; as a result, our subspecialty will have a substantial footprint at the AANS meeting this spring. A specific CME tract emphasizing stereotactic and functional neurosurgery will be offered. This tract organizes Practical Clinics and Breakfast Seminars into a package specific to our subspecialty. Below we provide a daily listing of activities and events that will be of particular interest to members of the ASSFN.

Saturday, May 2

Registration and Practical Clinics

Practical Clinics

012 Integrating Pain Management into your spine practice

Directors: Julie Pilitsis MD, PhD, FAANS; and William S. Rosenberg, MD, FAANS

019 Brain Mapping and Awake Mapping

Directors: Gerald A. Grant, MD, FAANS; and Guy M. McKhann, MD, FAANS

Advance Practice Providers Plenary Session

Seizure Evaluation and Surgical Treatment

Presented by Ashwini Sharan, MD, FAANS

Sunday, May 3

Registration and Practical Clinics

Practical Clinics

027 Deep Brain Stimulation: Update and New Directions

Directors: Aviva Abosch, MD, PhD, FAANS; and Parag G. Patil, MD, PhD, FAANS

Monday, May 4

Breakfast Seminars, 7-9 a.m.

111 Neurosurgical Management of Intractable Pain

Moderator: Robert M. Levy, MD, PhD, FAANS

112 Stem Cell Therapeutics in Neurosurgery

Moderator: Nathan R. Selden, MD, PhD, FAANS

120 Tumor-Related Epilepsy

Moderator: Mitchel S. Berger, MD, FAANS

127 Emerging Indications in Neuromodulation Surgery

Moderator: Joseph S. Neimat, MD, MSc, FAANS

Scientific Session 3: Stereotactic and Functional Neurosurgery, 2-5:30 p.m.

Moderator: Kevin Tracey, MD

SE133 Dinner seminar, 6:30-8:30 p.m., at the Occidental Grill Contemporary Practice and New Frontiers in Radiosurgery

Moderator: Jason P. Sheehan, MD, PhD, FAANS

Tuesday, May 5

Breakfast Seminars, 7-9 a.m.

217 Contemporary Stereotactic Radiosurgery

Moderator: Jason P. Sheehan, MD, PhD, FAANS

219 Resective Strategies for Epilepsy

Moderator: Gerald Grant, MD, FAANS

AANS/CNS Section on Pain, 2-5:30 p.m.

Moderators: Andre Guelman Machado, MD, PhD; and Julie G. Pilitsis, MD, PhD, FAANS

Wednesday, May 6

Breakfast Seminars, 7-9 a.m.

302 Chiari Malformations: Diagnosis, Treatments and Failures

Moderator: Timothy B. Mapstone, MD, FAANS

307 New Innovations in Epilepsy Surgery

Moderator: Nicholas M. Barbaro, MD, FAANS

318 Functional Mapping of the Cerebral Cortex: Advantages and Limitations

Moderator: Richard W. Byrne, MD, FAANS

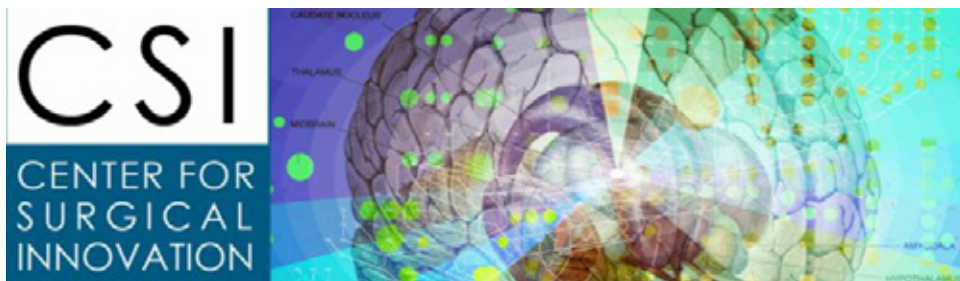
321 Neurosurgery, Psychiatry and Function: The History of Altering Behavior, Thought, and Function Through Neurosurgery

Moderator: Charles G. Prestigiacomo, MD, FAANS

AANS/CNS Section on Stereotactic and Functional Neurosurgery, 2-5 p.m.

We look forward to seeing our ASSFN colleagues in Washington, D.C., this May!

The University of Colorado Department of Neurosurgery
in association with the ASSFN, NREF and AANS, present:



Stereotactic and Functional Neurosurgery

Hands-on Workshop for residents, fellows, and neurosurgeons

November 13-15, 2015

Center for Surgical Innovation

Aurora, Colorado

For more information: SOPHIE.EGGERT@UCDENVER.EDU

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CALENDARS**

**American Society for Stereotactic
and Functional Neurosurgery**

2016 Biennial Meeting

**June 18 – 21, 2016
Intercontinental Hotel Chicago
Magnificent Mile
website www.assfn.org**



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