

Stereotactic and Functional NEUROSURGERY NEWS



Fall 2014

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:

It is indeed an honor to serve as the president of the American Society of Stereotactic and Functional Neurosurgery (ASSFN) for the next two years. I follow

in the footsteps of an august group of leaders in our field and am in the fortunate position of working with some of the brightest and most accomplished people I know. On a personal level, I remember how impressed I was by the first ASSFN meeting I ever attended, in 2003 in New York City. The quality of the presentations at that meeting and the engagement of the ASSFN members was unlike anything I had experienced at other societies' meetings. Over the ensuing decade, this impression has strengthened as I've watched the ASSFN grow and shoulder new challenges. It has been extremely rewarding to contribute to this growth on a personal level.

My tenure as president comes at an exciting time in our field. Several organizations have launched significant, high-profile research funding initiatives in the area of neuromodulation. This issue of the *ASSFN Newsletter* covers recent developments in the Defense Advanced Research Projects Agency (DARPA) Systems-Based Neurotechnology for Emerging Therapies (SUBNETS) and Restoring Active Memory (RAM) Projects. Additionally, the National Institutes of Health (NIH) BRAIN Project is focused on research in this area. Research continues around the world into emerging indications for neuromodulatory technologies. This official sanction on the part of government funding agencies, for the patient populations we all treat — or hope someday to be able to

provide therapies to — is intensely rewarding. Additionally, our clinical armamentarium in the U.S. has broadened with FDA approval in Nov. 14, 2013, for the use of Neuropace™ for the treatment of epilepsy. Finally, interest and enthusiasm for the activities of the ASSFN continue to grow.

Review of the 2014 Biennial ASSFN Meeting Report, contained within this newsletter (see p. 8), demonstrates the largest-ever turnout for one of our meetings. The success of this meeting is due to the efforts of the Scientific Program Committee, chaired by ASSFN past-president, Ali Rezai, MD, FAANS; the staff of the Congress of Neurological Surgeons (CNS) Meetings Management Office, our industry sponsors, and, of course, our membership. In no small part a consequence of the success of the 2014 meeting, the response to the ASSFN leadership's request for volunteers to help with standing committee work has been extraordinary. As you all know, ours is an entirely volunteer organization, with no full-time professional staff. This means that we, the ASSFN membership, through our engagement and efforts, are solely responsible for the success of the society and its vision for the future. And in turn, those members who are actively engaged in the functioning of the ASSFN are subsequently asked to stand for election to the board of directors. If you are interested in ASSFN committee work, please do not hesitate to contact Robert Gross, MD, PhD, FAANS, ASSFN secretary-treasurer.

From an educational vantage, we are all surviving the codification of the medical knowledge and clinical practice aspects of our subspecialty into the Accreditation Council for Graduate Medical Education (ACGME)/ American Board of Neurological Surgery (ABNS)-mandated Milestones Curriculum, along with the Society of Neurological Surgeons (SNS)-

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President continued from page 1

sponsored Matrix Curriculum. We greatly appreciate the efforts of Nicholas Barbaro, MD, FAANS, and Dr. Gross, respectively, in the formulation of the Milestones and Matrix Curricula. There have been some bumps along the way, but the formulation and implementation of the Milestones and Matrix do nonetheless represent progress,

Finally, planning for the 2016 Biennial ASSFN Meeting in Chicago is well underway, 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.

With kindest regards,

Aviva Abosch, MD, PhD, FAANS
University of Colorado School of Medicine



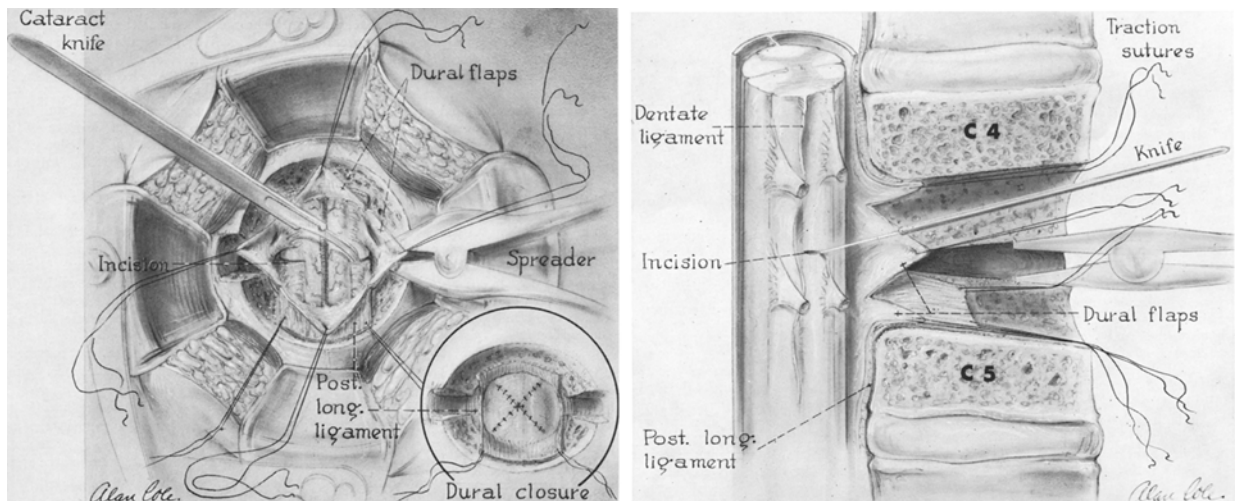
Inaugural Roy A.E. Bakay Lecture

At the ASSFN meeting in Washington, D.C.

ASSFN Past-Presidents, Ali Rezai, MD, FAANS (left); and Konstantin Slavin, MD, FAANS (right), recognize Mahlon DeLong, MD (center), as the inaugural Roy Bakay lecturer.

Fifty Years Ago ...

Cervical Chordotomy by the Anterior Approach



RB Cloward. Journal of Neurosurgery 21: 19-25, 1964.

Functional Neurosurgeons Lead Major BRAIN Initiatives

by Jeff Elias, MD, FAANS

On April 2, 2013, President Obama announced a major national effort to better understand the human brain. The Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative is scheduled to invest more than \$100 million in this first phase with an escalating commitment over the next 10 years. Much like the Human Genome Project of the 1990s, the goal is to map the human brain. Defense Advanced Research Projects Agency (DARPA), a major federal component of the initiative, has launched several programs with an ultimate aim to improve the lives of veterans and civilians. Multidisciplinary projects from University of California, San Francisco (UCSF) and Massachusetts General Hospital, led by functional neurosurgeons, were awarded prestigious funding for Systems-based Neurotechnology for Emerging Therapies (SUBNETS) program. SUBNETS seeks to reduce the burden of post-traumatic stress disorder and mood disorders in veterans by developing a next generation of closed-loop neurostimulation devices for diseased networks of the brain.

The UCSF-based team, led by Edward Chang, MD; and Philip Starr, MD, PhD, FAANS, will develop a closed-loop implantable device whose recording and stimulation capabilities allow the rehabilitation of pathological, symptom-related brain circuitry. As envisioned, this new technology — representing a significant advance on current open-loop DBS — will responsively direct tailored and targeted stimulation that strengthens functional pathways at the expense of pathological activity. The ultimate goal is to facilitate lasting change in relevant circuitry via the brain's natural capacity for plasticity, allowing for the post-therapeutic removal of the device.

By taking a systems-level approach to understanding and addressing the basis for neuropsychiatric disorders, the team hopes to provide an effective alternative to psychotherapy and drug-based treatments, which are ineffective for a significant proportion of the affected population. The five-year, \$26 million project will initially focus on major depression and anxiety disorders in epilepsy and Parkinson's disease patients, as mood disorders are prevalent in these populations, and the standard of care affords the opportunity to potentially identify relevant circuitry.

In addition to Dr. Chang, who serves as the project's principal investigator, the team includes Vikaas Sohal, MD, PhD; Philip Sabes, PhD; and Karunesh Ganguly, MD, all of UCSF; Jose Carmena, MS, PhD; Jon Wallis, PhD; Jan Rabaey, PhD; Elad Alon, MS, PhD; and Fritz Sommer, PhD, all of University of California, Berkeley; Maryam Shanechi, PhD, of University of Southern California; Bijan Pesaran, PhD, of New York University; and scientists at Cortera Neurotechnologies and Posit Science. A research group at Lawrence Livermore National Laboratory, led by Sat Pannu, MS, PhD, will work with the team as close collaborators.

In Boston, researchers across several Harvard institutions are teaming together to develop a sophisticated, next-generation neurostimulation device capable of sensing neural signals from multiple sites of psychiatric networks and then delivering an appropriate treatment based on the biomarkers derived from functional studies. The TRANSFORM DBS project (Transformative Restoration of Affective Networks by Systematic, Function-Oriented, Real-time Modeling and DBS), is led by neurosurgeon Emad Eskandar, MD, FAANS; and psychiatrist Doug Dougherty, and has multiple approaches integrated to achieve this goal.

Clinicians will employ a transdiagnostic approach in the evaluation of psychiatric disease — treating these multi-faceted disorders along multiple functional domains, rather than as a single DSM clinical diagnosis. Behavioral testing and functional imaging from the Martinos Center of Biomedical Imaging will drive target selection. Recordings and signals from multiple nodes of a network will be collected and analyzed from noninvasive (fMRI and MEG) and invasive (microelectrode, depth, and grids and strips) interventions in the early phase of the project. The Draper Laboratory is tasked to build a combined 320 channel recording and stimulation system where software-controlled targeting of cortical and subcortical brain structures can be precisely decoded, modeled and treated.

During this five-year/\$27 million project, biomarkers of psychiatric disease will be refined in complementary ways from clinical, behavioral and functional imaging studies. Ultimately, the goal of the TRANSFORM DBS project is to translate this improved knowledge of psychiatric circuitry to the next generation neurostimulator — a device envisioned as a miniaturized implant capable of recording from 64 channels at five sites using a variety of electrode configurations, and then delivering multiple stimulus patterns to the desired network site(s).

The ASSFN is proud of its members who are leading the scientific advance of brain mapping and stimulation. The next edition newsletter will highlight the pioneering work of functional neurosurgeons, Itzak Fried, MD, PhD, FAANS (University of California, Los Angeles); and Gordon Baltuch, MD, PhD, FAANS (University of Pennsylvania), who are leading the way with another major DARPA initiative: Restoring Active Memory (RAM) program.

Return of Motor Function from Spinal Cord Stimulation After Complete Spinal Cord Injury

Derrick A. Dupré, MD; and Michael Oh, MD

As neuroscientists continue to expand our understanding of spinal cord networks and pathophysiology, novel applications of existing technology may be used to enable physicians to help the most debilitated of these patients. A recent cohort study in *Brain* by Angeli et al. (1) demonstrates how epidural spinal cord stimulation in motor complete cord injury results in return of volitional motor function after chronic stimulation and stand training.

The authors implanted 16 electrode arrays at the T11-12 vertebral level in four patients with complete lower cervical to mid-thoracic (C6-T6) spinal cord injury 2.2-4 years post injury. Two of the patients were motor complete, sensory incomplete (American Spinal Injury Association Impairment Scale, or AIS B), while the other two were motor complete and sensory complete (AIS A). The two AIS B patients demonstrated return of volitional motor function in muscle groups responsible for hip flexion, knee flexion, foot dorsiflexion, toe flexion and extension, as measured by electromyography (EMG) and integrated force measurements. Surprisingly, the AIS A group who were to serve as the control arm of the study also had return of volitional motor functions.

Additionally, none of the patients were able to produce motor results in the absence of epidural stimulation. Interestingly, antagonist muscles were reciprocally inhibited, demonstrating integration of a more complex network than simple direct electrical activation of motor neurons. In the two AIS B subjects, ongoing home-based training and stimulation resulted in increased forces and lower voltages required to reach threshold necessary for motor activation. In addition to pairing motor command with epidural stimulation, the authors measured force and EMG activity when paired to visual and/or auditory input, showing that such cues allowed subjects to alter the degree of excitation in the motor pool.

The age of the subjects in the study ranged from 24 to 32 years, with an average of 26.9. Wirz et al. demonstrated that the chances of recovery of sensorimotor activity after spinal cord injury diminish with age (2), and it is difficult to determine whether the subjects the study by Angeli et al. were destined to recover motor function regardless of SCS with pure motor training (3, 4). Within one year of rehabilitation, 30 percent of AIS A patients will have converted to grade B, 8 percent grade B to C, and 7.1 percent grade C to D5.

Regardless, the results were impressive as displayed by the comparison of EMG activity amongst subjects with and without stimulation. Several muscle groups went from negligible or no activity without stimulation, to robust and sustained activity with epidural stimulation. Further objective data were forces generated across voltage gradients, with more than one subject demonstrating incremental increases in muscle force congruent with paddle voltage and optimization of programming.

The results presented by Angeli et al. are exciting. In future studies, perhaps a combinations of near-circumferential SCS, lumbosacral pharmacotherapeutics and artificial neural connections (used to bridge connections across lesion sites) will combine to give paralyzed patients return of functional movement.

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2. Wirz M, Dietz V. Recovery of sensorimotor function and activities of daily living after cervical spinal cord injury: the influence of age. *J Neurotrauma* 2014;Jun25.
3. Smith AC, Mummidisetty CK, Rymer WZ, Knikou M. Locomotor Training Alters the Behavior of Flexor Reflexes During Walking in Human Spinal Cord Injury. *J Neurophysiol*. 2014 Aug 13.
4. Jones ML, Evans N, Tefertiller C, Backus D, Sweatman M, Tansey K, et al. Activity-Based Therapy for Recovery of Walking in Chronic Spinal Cord Injury: Results from a Secondary Analysis to Determine Responsiveness to Therapy. *Arch Phys Med Rehabil*. 2014 Aug 4.
5. Marino RJ, Burns S, Graves DE, Leiby BE, Kirshblum S, Lammertse DP. Upper- and lower-extremity motor recovery after traumatic cervical spinal cord injury: an update from the national spinal cord injury database. *Arch Phys Med Rehabil*. 2011 Mar;92(3):369-75.

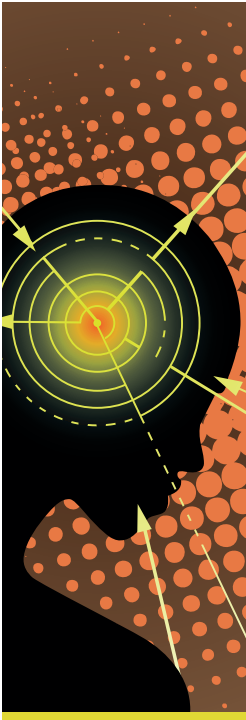
Second Annual Stereotactic and Functional Neurosurgery Hands-On Workshop Scheduled

by Jonathon Miller, MD, PhD

The vast and growing array of methodologies, techniques and tools used by functional neurosurgeons present a challenge to residents and fellows since there are few venues to learn these skills. During the first Stereotactic and Functional Neurosurgery Hands-On Workshop, held Nov. 15-17, 2013, more than 30 participants had the opportunity to interact with expert faculty, learn state-of-the-art targeting techniques and utilize stereotactic devices in a simulated operating room environment. Based on popular demand and positive feedback from participants, the second workshop has been scheduled for Nov. 7-9, 2014, in Atlanta.

This three-day course will include multiple didactic sessions, a microelectrode recording lab, a stereotactic planning lab and a DBS programming/ablation training session. The curriculum has been updated and expanded with the latest technical achievements in functional neurosurgery. Participants will learn a variety of neuromodulation and ablative techniques, including the use of standard stereotactic frames, as well as new skull-mounted frames and other "frameless" devices, neurophysiological and MRI-guided targeting techniques, intraoperative imaging, stereotactic radiosurgery, radiofrequency lesioning and laser ablation. This experience will provide an unparalleled opportunity to obtain a comprehensive understanding of functional and stereotactic techniques.

The workshop is jointly sponsored by the American Society for Stereotactic and Functional Neurosurgery and Emory University School of Medicine. Up to 27 *AMA PRA Category 1 Credits*[™] are available for participation. For more information, and to register online, please visit www.emory.edu/CME.



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Emory University School of Medicine
Department of Neurological Surgery
in association with the
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and Functional Neurosurgery
presents

**Stereotactic and
Functional Neurosurgery
Hands On Workshop
November 7-9, 2014**

**The Loews Hotel and T-3 Labs
Atlanta, Georgia**

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Additional Key Society Information

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Stereotactic and Functional
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ASSFN Membership Update

by Craig Rabb, MD, FAANS

Membership in the Society has held fast in recent years in the mid-300s, once all categories are accounted for. Numbers-wise, while not necessarily one of the largest of the Joint Sections, it remains one of the most robust. To continue to build on this strength, residents remain the future of the Society. For those of us in academic practice, it is incumbent upon us all to promote the benefits of membership among our residents, including the exceptional value of becoming a resident member. Moreover, new resident members should all be encouraged and supported to attend our biennial meetings and to become actively involved. The future of our unique field is bright, and we should all help to commensurately secure the bright future of our Society by recruiting new members.

ASSFN Membership Statistics as of August 2014

Active Members	266
Associate	23
Lifetime	44
Honorary	3
Resident/Fellow	35

Fee Description

Category	Yearly Fee	Description
Active	\$300	For practicing neurosurgeons in the United States or Canada who have completed residency/fellowship
Resident/fellow	No fee	One-time fee (not yearly). For neurosurgical trainees currently in residency or fellowship
Senior/Lifetime	No fee	For neurosurgeons who are retired and over 65 years old
Associate	\$160	For non-neurosurgeons

The benefits of active membership include:

- Membership in the AANS/CNS Section on Stereotactic and Functional Neurosurgery
- Membership in the World Society for Stereotactic and Functional Neurosurgery
- Reduced fees for the biennial ASSFN meetings
- Eligibility for election to hold leadership positions in ASSFN
- Complimentary online access to *Stereotactic and Functional Neurosurgery* and eligibility to subscribe to *Stereotactic and Functional Neurosurgery* journal at a reduced rate of \$172

The benefits of all other membership categories are:

- Membership in the AANS/CNS Section on Stereotactic and Functional Neurosurgery
- Reduced fees for the biennial ASSFN meetings
- Complimentary online access to *Stereotactic and Functional Neurosurgery* and eligibility to subscribe to *Stereotactic and Functional Neurosurgery* journal at a reduced rate of \$172

A Preview of the CNS Meeting • October 18-22, 2014

by Wendell Lake, MD

As one of the fundamental subspecialties of neurosurgery stereotactic and functional neurosurgery continues to play an integral role in national neurosurgical meetings. This year, the annual Congress of Neurological Surgeons (CNS) meeting is taking place in Boston from Oct. 18-22, 2014. As one of the most technologically progressive and fastest growing areas of neurosurgery, we are well-represented at this meeting by courses, general scientific sessions, lunch seminars, the Neuro-variation symposium, choice abstracts and late-breaking science presentations. In an effort to assist ASSFN members in planning their attendance at this year's CNS meeting, we provide a summary of events that could be of particular interest to our members:

Saturday, Oct. 18, 2014

- **PCO6 Course: Controversies in Neuromodulation.** Course Directors: Emad Eskandar, MD, FAANS; and Parag Patil, MD, PhD, FAANS. All day.
- **PC11 Course: Update in Epilepsy Surgery (Pediatric).** Moderated by William Bingaman Jr., MD, FAANS. Morning.
- **PC15 Course: Cranial and Spinal Radiosurgery Update.** Course Directors: Randy Jensen, MD, PhD, FAANS; and Andrew Sloan, MD, FAANS. Afternoon.

Sunday, Oct. 19, 2014

- **Symposia 02: Neuro-variation.** Nicholas Boulis, MD, FAANS, will present on nerve stimulators, and Brian Litt will present on biodegradable ECoG arrays.
- Choice abstracts will be presented, including a presentation on Stereotactic Laser Amygdalohippocampectomy (1:48-1:54 p.m.) and an abstract on Fully Endoscopic MVD for trigeminal neuralgia (3:18-3:24 p.m.)
- **General Scientific Session 1:** Held from 4:15-6:40 p.m.

Monday, Oct. 20, 2014

- **Section on Pain. Management of Cancer pain.** Moderated by Jason Schwalb, MD, FAANS; and Ashwin Viswanathan, MD. Held from 7-8:30 am.
- **Section on Stereotactic and Functional Neurosurgery.** Innovations in DBS. Moderated by Kathryn Holloway, MD, FAANS; and Joseph Neimat, MD, MSc, FAANS. Held from 7-8:30 a.m.
- **General Scientific Session 2:** Held from 9-11:30 a.m.
- **M05 Lunch seminar: Advances in Management of Trigeminal Neuralgia and Facial Pain.** Course Director Kim Burchiel, MD, FAANS.

Tuesday, Oct. 21, 2014

- **Section on Pain.** Moderators: Erika Petersen, MD; and Jason Schwalb, MD, FAANS. During this session the Ronald Tasker Young Investigator Award will be presented. Held from 7-8:30 a.m.
- **Section on Stereotactic and Functional Neurosurgery.** Moderator: Karl Sillay, MD, FAANS. During this session the Resident Award for Stereotactic and Functional Neurosurgery will be presented. Held from 7-8:30 a.m.
- **General Scientific Session 3:** Held from 9-11:30 a.m.
- **T15 Lunch seminar. New Frontiers in Radiosurgery.** Course Director Douglas Kondziolka, MD, FAANS.
- **Neurosurgical Forum. Section on Pain.** Moderators: Jeffrey Arle, MD, PhD, FAANS; and Parag Patil, MD, PhD, FAANS. Held from 4:15-5:30 p.m.
- **Neurosurgical Forum. Section on Stereotactic and Functional Neurosurgery.** Moderators: Francisco Ponce, MD, FAANS; and Nader Pouratian, MD, PhD, FAANS. Held from 4:15-5:30 p.m.

Wednesday, Oct. 22, 2014

- **General Scientific Session 4:** Held from 8-10:30 a.m.
- **Late Breaking Science. Functional Neuronal Connectivity in Epilepsy.** Presented by Emad Eskandar, MD, FAANS. Held at 8:04-8:19 a.m.
- **Late Breaking Science. Temporal Lobectomy or Laser Ablation versus Medication Management.** Presented by Robert Gross, MD, PhD, FAANS. Held at 8:34-8:47 a.m.
- **Hot Topic 6. Balancing the Future of Neurosurgery in 2025.** Jaimie Henderson, MD, FAANS, will present: The Development of Functional Neurosurgery. Menashe Zaaroor will present: Focused Ultrasound and its Use in Movement Disorders. This Hot Topic session will be held at 1-2:15 p.m.

We hope this summary will help you organize your trip to the conference. See you at the CNS meeting in Boston!

Congratulations CNS award winners:

Ronald R. Tasker Young Investigator Award

Kristopher Thomas Kahle: *Promoting endogenous GABAergic analgesia via kinase modulation of neuronal ion plasticity*

Stereotactic and Functional Neurosurgery Resident Award

Taylor J. Abel: *The physiology of heteromodal proper naming in the human anterior temporal lobe*



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**MARK YOUR
 CALENDARS**

American Society for Stereotactic
 and Functional Neurosurgery

2016 Biennial Meeting

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

2014 Biennial ASSFN Meeting Summary Highlights

Total number of registrants 2014	524
Total number of registrants 2012	367
Number attending workshops	121
Number of exhibitors and sponsors	21
Number of abstracts submitted	178
Number of abstracts accepted for oral presentation	52
Number of abstracts accepted for poster presentation	84