



Stimulating Science in a Unique Setting



RESEARCH UPDATE IN NEUROSCIENCE FOR NEUROSURGEONS (RUNN)

OCTOBER 28 - NOVEMBER 4, 2012

SPONSORED BY

**The Society of
Neurological Surgeons**

CO-DIRECTORS

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Issam A. Awad
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Antonio Chiocca**

COURSE DIRECTORS

**Allan H. Friedman, M.D.
Robert M. Friedlander, M.D.**

COURSE COORDINATOR

Karen Koenig

Mission Statement

The Mission of the course, Research Update in Neuroscience for Neurosurgeons (RUNN), is to provide an introduction to and update of the latest concepts, hypotheses and methods of neurobiology and neuroscience relevant to neurological surgery. These are presented by accomplished neuroscientists in an atmosphere emphasizing scientific rigor, highlighting models of career development for neurosurgeon-scientists, and illustrating potential future neurosurgical applications. A milieu of total immersion in scientific discourse is designed to foster creative discussions among neurosurgical trainees and faculty. Participants are instructed on selecting a research topic, identifying a mentor, designing hypothesis driven experiments and writing grants. The course is designed to stimulate neurosurgical trainees to participate in basic, translational, and clinical research relevant to the practice of neurological surgery.

Historical Background and Setting

The RUNN course was the brainchild of Henry Schmidek, formerly of Harvard University and the University of Vermont. The course was conceived in response to the anticipated expansion of

neurosciences, which he predicted in the early 1980's.

The course was to combat what he perceived as potential illiteracy in basic neurobiology that he feared would weaken the specialty of neurosurgery. Dr. Schmidek's RUNN Course has been instrumental in setting the course of academic neurosurgeons.



As with so many neuroscientists from New England, Dr. Schmidek was very familiar with the Marine Biological Laboratory (MBL) at Woods Hole, Massachusetts.

Established in 1888 as a non-profit institution devoted to research and education in basic biology, the MBL has been called “the uniquely national center for biology in this country” (Lewis Thomas, *The Lives of a Cell*).

Scientists and students throughout the world come to the

MBL to conduct research, teach, study and collaborate. They often use the diverse and abundant organisms found in surrounding waters as model systems.

Here research ships leave everyday to study the pristine waters around Martha's Vineyard sound and to collect and maintain more than 200 species of marine life. There are 230,000 square feet of research space and a splendid library with an extraordinary repository of books and journals and incredible electronic connectivity to everything biological. It is here that the giant squid axon was (and continues to be) so closely studied unfolding the splendid story of molecular mechanisms of neural function. There are incredible microscopy facilities, numerous amphitheatres and teaching facilities, a quintessential scientific community in true life and work, and a magnificent setting for

creativity and scholarly productivity. And there is Swope Hall, a simple dormitory sleepily straddling a quaint harbor, with a friendly staff that knows how to host students and scholars. It is all in Woods Hole, that lovely little spot and ideal gateway, along the magnificent coast of Cape Cod and nearby islands. With miles of bicycle trails and nearby ferries, the only competition to diligent scholarship at Woods Hole is the inspiring call of nature.



It is here that Henry Schmidek cast his RUNN course, and lobbied other residency program directors to send their trainees once a year. By the mid-1980's it was an established offering for two weeks each fall, immersing neurosurgery residents from New Orleans to Saint Louis, from Minnesota to Maryland, and from San Francisco to New York City. The faculty included scientists from the MBL, demonstrating microscopy and dissection and scientists from the New England universities who would drive to the MBL for one or two days to participate in RUNN. There would also be neurosurgery's rising academic stars as role models, and wiser icons telling their tales of successes and challenges in the laboratory.

There was nothing like it in neurosurgical education, and there still is not. The founding mission of the RUNN course remains relevant today, and its culture and milieu remain as appealing. This



crown jewel of American neurosurgical education was adopted in the late 1980's by the American Association of Neurological Surgeons (AANS) and later by the Joint Committee on Education of the AANS and the Congress of Neurological Surgeons (CNS). This endorsement and administrative oversight by organized neurosurgery heralded an era of expansion and uninterrupted success under the Directorship of Charles Hodge, of Syracuse, New York, with his lovely wife Cathy shepherding the Course as its coordinator. In the mid 1990's Dr. Hodge became Co-Director, passing the helm of

Directorship to Cordell Gross, of Burlington, Vermont. Linda Gross served as Course Coordinator.

During this period, Charlie and Cordell cultivated a core of devoted faculty from the MBL, Syracuse, Vermont, Harvard, Brown, the National Institutes of Health (NIH), and other institutions who would participate on a regular basis as faculty. A requirement for faculty participation



remains—that the individual be an active and accomplished scientist, speaking on topics he/she actively investigates, and that he/she be an effective speaker. Only those who are highly rated by the neurosurgical trainees would be invited again. Many would dazzle and inspire casting truly unforgettable lectures or discussions. The days would be filled with

lectures, unhurried, with plenty of time for discussion. There would be long blocks of time for reading in the library, or for creative and vivid discussions with beer, wine and snacks late into the night. Friendships would be forged among attendees, and research ideas and even an occasional scholarly career would be hatched. All attendees stay at the dorm at Swope Hall, where the legendary cafeteria is like no other, and the views from each simple bedroom (many shared by two residents) as memorable.

Because of untimely illness in 1998, Dr. Gross asked to step down from the Directorship of the RUNN Course which he had grown to love so much. The opportunity of change of leadership allowed a re-examination and re-commitment to the Mission and core values of the RUNN Course. The AANS and CNS asked the Society of Neurological Surgeons (SNS) to assume sponsorship and oversight of the course. Established in 1920 the SNS is known in neurosurgical lore as the “Senior Society” or organization of North American Chairmen and Residency Program Directors. The SNS would insure Program Directors’ continued commitment to this unique educational offering, and ensure residents’ continued participation.

In 1999, the leadership of the RUNN Course was entrusted to Issam A. Awad. Dr. Awad broadened the goals of the RUNN Course to educate neurosurgical residents in formulating hypothesis driven experiments, establishing laboratories and writing grants. To this end, several neurosurgeons who headed successful basic science laboratories were added to the faculty. The Society owes a debt of gratitude to Cathy Awad who administered the Course during Dr. Awad’s tenure. Cathy coordinated everything from “T” shirts to accommodations to finances.

RUNN Course Leadership

In 2004, Dr. Awad passed the baton of leadership to Allan H. Friedman (Duke University) and Robert M. Friedlander (Harvard) as the new Directors of the Course. The Co-Directors of the Course are Issam A. Awad (Northwestern), Bruce Andersen (Idaho Neurological Institute), Henry Brem (Johns Hopkins), Robert J. Dempsey (University of Wisconsin) and Charles Hodge, Jr. (SUNY at Syracuse). Dr. Andersen works closely with Jim Gailbraith and Paul Gallant (both of the National Institutes of Health) on the squid lab and microscopy workshop. Course Coordinator, Karen Koenig, works throughout the year to insure RUNN is executed flawlessly, managing the organization, administration and accounting of the Course.

The 2012 RUNN Course Curriculum: Tradition and Innovation

In 2012, the good Lord threw the RUNN Course a curve ball in the form of Hurricane Sandy. All power was lost for 24 hours and there was a hiatus in internal service. The closure of Logan Airport in Boston and Providence Airport in Rhode Island barred most of the speakers scheduled during the first four days from attending the course.

We persevered with a rewarding academic experience. The residents were terrific and the hardship resulted in a strong sense of camaraderie's. Special thanks to Dr. Dempsey, Benzel, Schneider and Awad for pitching in and sustaining the course.

The founding mission and core values of the RUNN Course remained unchanged. The SNS Executive Committee (representing North American Residency Program Directors) rearticulated its commitment to the course and its leadership.

In response to recent course evaluations and discussions with Program Directors and residents, the course was shortened in 1999 from two weeks to one week with travel days on adjacent weekends. The one and one-half hour length of individual lectures allows for stimulating interaction between

the lecturer and the participants. Two such lectures are given each morning, two each afternoon, and one each evening. Curriculum content was reshaped to include lectures covering the spectrum of molecular, cellular and systems neuroscience. Lectures covered topics on molecular genetics, signaling and receptors, stem cells, cell death, regeneration, oncogenesis, glial barriers, vascular tone and phenotype, cognitive information science, circuit modeling, and higher cortical function. Although many of the lecturers return,

their material is surprisingly fresh reflecting new discoveries made in their labs. Many of the lectures were given by practicing neurosurgeons with active funded laboratories. There were tours of the MBL laboratories and the very popular microscopy seminar. There were discussions on academic career development, grantsmanship, history and philosophy of science and the scientific method, and history of the MBL. And there were the traditional opening get-acquainted reception and Course Orientation, and the farewell Clambake and certificate ceremony.



New Lectures Presented at the 2012 Course:

1. **Michael D. Taylor, M.D., Ph.D.**, from the University of Toronto, “Clinical Implications of Paediatric Brain Tumor Molecular Genetics.”
2. **Michel Modo, Ph.D.**, from the McGowan Institute for Regenerative Medicine at the University of Pittsburgh, “The Use of Stem Cells in Neurosurgical and Neurological Applications.”
3. **Emad Eskandar, M.D.**, from Harvard Medical School, “Neurophysiology of Learning, Motivation, and Impulsivity.”
4. **Louis J. Ptáček, M.D.**, John C. Coleman Distinguished Professor of Neurology, Department of Neurology Howard Hughes Medical Institute, University of California, San Francisco, Keynote Speaker: “Human Neurogenetics: Using Human Families to Find Genes, Understand Basic Biology, and Move Toward Better Treatments for Patients.”
5. **Mark Bevan, Ph.D.**, from the Feinberg School of Medicine at Northwestern University, “Mechanisms Underlying Motor Dysfunction in Parkinson’s Disease and the Therapeutic Efficacy of DBS.”



The collegial atmosphere at Swope Hall remained unchanged, as were the memorable late night sessions with snacks, beer and wine and the very late night sessions at Captain Kidd’s where residents discussed everything from research topics and career paths, to residency training, to NFL football. Each attendee received a complimentary copy of the *Fundamental Neuroscience*, Edited by Squire, Berg, Bloom, du Lac and Ghosh. This book is a magnificent reference to the topics covered in the lectures, and it is an outstanding resource for future study. The books were funded by a grant from Synthes Spine Corporation.

A Splendid Cast of Faculty

The faculty are world-class scientists who are able to present their work in a stimulating fashion. There were 30 faculty and 8 directors, representing an extraordinary student/faculty ratio of 2/1. Attendees were mesmerized by the dynamic speakers and post lecture discussions were lively and probing. The residents discussed personal choices in research commitments and career direction with the invited speakers. Many faculty members had participated in the RUNN Course for several years, and all promised to come again if invited. The Course evaluations filled out by the attendees are used to make modifications in the course’s speakers and structure.

An Enthusiastic Cast of Attendees

There were **91** attendees (see list) representing programs throughout the **United States and Canada**. The reshaped course is ideal for young attending neurosurgeons just embarking on their academic career. Our goal is to attract one neurosurgeon from each neurosurgical program in North America.

Our participants continue to be enthusiastic. It is exciting to see the participants swept up in the lectures and spontaneously confronting the lecturers with insightful questions. If this group is representative of neurosurgical residents, the future of neurosurgery looks very bright.

Course Report by Kyle Halvorson

Neurosurgical Resident, Duke University Hospital

The 2012 RUNN course was filled with excitement right from the beginning! With Hurricane Sandy's giant waves crashing along the breakwater outside the Marine Biological Laboratory, and the locals of Woods Holes running for cover, we bunkered down in Swope Hall (protected from floods by walls of sand bags) to learn some of the most interesting neuroscience applicable to the field of Neurosurgery. Although Mother Nature left the town without power for a several days, she did not stop the MBL generators from powering Dr. Benzel and his spirited lecture on spine biomechanics. This was followed by a captivating lecture by Dr. Schneider on fiber tracking in neurosurgical TBI patients. The quality of this imaging modality is near anatomical dissection. These images are clinically essential, demonstrating the degree of injury and disruption of normal brain circuitry to patients and their families. This Apple iPad based multimedia format will provide us, neurosurgeons, with an accessible and powerful, patient friendly method to improve communication amongst each other, our patients and nonsurgical colleagues.

After what seemed like only a single action potential, the power returned and the weather improved in Woods Hole. However, as many of our esteemed speakers were grounded hundreds of miles away, we again looked to technology to bridge the distance: videoconferencing. Some of the crowd favorite lectures included Dr. Michael Taylor's update on the advances in pediatric brain tumor genetics as well as Dr. Andres Lozano's description of novel functional neurosurgical targets for treating depression and obsessive compulsive disorder. Dr. Reggie Edgerton followed, examining the current state of rehabilitative therapy and brain machine interface prosthetics for patients who have suffered spinal cord injuries. The week showcased breakthroughs in neuroscience, highlighting where the field is headed. Outside of the Speck Auditorium, one of the highlights of the course was the tour of the Marine Biology

We acknowledge generous grants from:



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These grants paid for the purchase of textbooks for each participant and subsidized faculty travel and honoraria costs.

Each of our world renowned and highly respected speakers shared impressive state-of-the-art research in neuroscience. As an added bonus to those of us fortunate enough to be there, many also shared their unique perspectives on a career in neurosurgery. It may come as no surprise, however, that significant learning occurred outside Speck Auditorium, wherein we as residents were able to interact with colleagues and mentors from around the country. Many insightful conversations were had at Captain Kidd's Pub, as often we made up the only, and entire, crowd brave enough to weather the storm.

Even in the middle of a hurricane, the RUNN Course was an irreplaceable opportunity to learn about cutting edge science from the talented individuals at the forefront. The acknowledgement of the importance of learning in this forum by programs across the country, free from pagers and clinical duties, will provide the hypotheses to tomorrow's research questions. This balance will not only improve clinical acumen, but will bring patient care to new heights.

Course Report by Steven Cook

Neurosurgical Resident, Duke University Hospital

As the start of the 2012 RUNN course approached, residents across the country were preparing to travel to Woods Hole for a week of presentations that not only enlightened and inspired us, but challenged us to become the next generation of physician scientists. At the same time, Mother Nature was also preparing to challenge us with wind and water in an attempt to cut short this unique experience. The RUNN course this year covered a wide range of topics including new applications in functional neurosurgery, advances in brain imaging, development of novel brain tumor therapies, and advances in brain controlled prosthetics. There was mentoring and discussions on developing research projects, critically evaluating clinical data, and grant writing which allowed us to directly learn from some of the leading clinician scientists in Neurosurgery



Dr. Allan Friedman and Dr. Robert Friedlander were an intricate part of the week as they not only kept us engaged mentally, but also established an atmosphere encouraging interaction with all the faculty and residents present. These conversations, whether about neurosurgery, politics, or college football, accomplished one of the most important goals of the RUNN course encouraging us to meet our future collaborators at a point in our training where many are just starting to pursue their own research interests.

Woods Hole had a lot to offer and the Course gave us time to recharge our engines away from the hustle of residency. Whether it was dining in Martha's Vineyard, jogging to the Nobska lighthouse, fishing in the bay, or taking in Halloween at Salem, all of the residents received a chance to get a breath of fresh air before returning home. The weather may have been worrisome, but in the end it did little to impede our learning and fellowship. In fact, it likely strengthened the social and educational impact of the RUNN course and ensured that it was a great experience for all the residents present.

Toward RUNN 2013 and Beyond!

We have finalized space contract with the MBL for the years 2013 through 2015. RUNN 2013 will take place from October 26, 2013 – November 2, 2013. The SNS and the Course Co-Directors and Coordinator are committed to maintaining the best of the RUNN Course, while continuing to strive to enhance curriculum content and value to each registrant. We continue to call on Residency Program Directors to support this unique gem of North American Neurosurgical Education, by providing their residents the opportunity of exposure to, and update on the best of neurobiology. We hope that future courses will also attract fellows and young faculty at formative states of their academic careers, and to practicing neurosurgeons who want to get reacquainted with the future of neurosurgery!

Future Course Dates

Marine Biology Laboratory
Woods Hole, MA

Oct. 26—Nov. 2, 2013

Oct. 24—Nov. 1, 2014

Oct. 25—Nov. 1, 2015

RUNN Web Site

<http://www.societyns.org>

RUNN Course Attendees

Arias, Eric	Washington University St. Louis
Arnaout, Omar	Northwestern University
Aronson, Joshua	Massachusetts General Hospital
Baggott, Christopher	University of Wisconsin
Bentley, Jessica	University of Michigan
Bi, Wenya Linda	Brigham and Women's Hospital
Bowers, Christian	University of Utah
Branch, Byron	University of Texas, San Antonio
Brown, Christopher	University of Maryland
Buchholz, Avery	University of South Carolina
Chaichana, Kaisorn	Johns Hopkins
Choi, Hoon	Syracuse University New York, Upstate
Choudhry, Osamah	New York University
Church, Ephraim	Penn State Hershey
Cook, Steven	Duke University
Crabtree, Kelli	University of Kansas
Das, Paramita	University of Minnesota
Deibert, Christopher	University of Pittsburgh
Dowdy, Justin	University of Arkansas
Everson, Richard	University of California Los Angeles

RUNN Course Attendees *continues*

Farooqui, Ali	University of Missouri-Columbia
Feldman, Lisa	Virginia Commonwealth University
Freeman, Jacob	University of Colorado, Denver
Gimbel, David	Yale University
Gordon, Amber	University of Alabama
Grant, Ryan	Yale University
Greissenauer, Christoph	University of Alabama
Groves, Mari	Johns Hopkins
Gupta, Gaurav	Columbia University, New York Presbyterian
Halvorson, Kyle	Duke University
Harwell, Daniel	University of Cincinnati
Ho, Dorothy	University of Michigan
Hooten, Kristopher	University of Florida
Jaleel, Naser	University of Buffalo
Josiah, Darnell	West Virginia University
Kalra, Ricky	University of Utah
Kashlan, Osama	University of Michigan
Khoury, Laith	University of Kentucky
Kim, Won	University of California Los Angeles
Kimmell, Kristopher	Universtiy of Rochester
Kinon, Merritt	Albert Einstein College of Medicine
Kulwin, Charles	University of Indiana
Labagnara, Michael	New York Medical College
Lee, Michaela	George Washington Unviersity
Lewis, Evan	University of Maryland
Lin, Chih-Ta	University of Vermont
Manjila, Sunil	Case Western Medical
Marcus, Joshua	Weill-Cornell, New York Presbyterian
Marupudi, Neena	Wayne State
McCrea, Heather	New York Presbyterian
McEvoy, Sean	University of Washington
Miller, Catherine	University of Minnesota
Miller, Joseph (Jody)	University of Alabama
Mohyeldin, Ahmed	Ohio State University
Morr, Simon	University of Pittsburgh
Morrison, John	Brown University
Natarjan, Sabareesh	SUNY Buffalo
Nater, Anick	University of Toronto
Ng, Jane	University of Wisconsin
Oh, Gerald	University of Illinois, Chicago
Onwuzulike, Kaine	Case Western
Pang, Priscilla	Oregon Health and Science University
Patel, Akil	University of Maryland
Quinn, John	UMDNJ
Raber, Michael	Brigham and Women's / Harvard



RUNN Course Attendees *continues*

Rao, Abigail	Oregon Health and Science University
Reddy, Gaddum	Baylor College of Medicine
Richardson, Marlin	University of Colorado
Roguski, Marie	Tufts Medical Center
Sawvel, Michael	Carilion Clinic
Shah, Kunal	Wake Forest University
Shaikhouni, Ammar	Ohio State University
Shakur, Sophia	University of Chicago
Simplicio, Hougelle	Brazil
Sinclair, George	UMDNJ
Stone, Jonathan	University of Rochester, NY
Storey, Christopher	Louisiana State University, Shreveport
Sukul, Vishad	Temple University
Tackla, Ryan	University of Cincinnati
Tempel, Zachary	University of Pittsburgh
Valle, Edison	Tulane University
Virk, Michael	New York Presbyterian
Vogel, Todd	Indiana University
Weaver, Kristen	University of Florida, Gainesville
Whitson, Wesley	Dartmouth-Hitchcock Medical Center
Witcher, Mark	Wake Forest University
Woodhall, Michael Neil	Medical College of Georgia
Yi, Juneyoung	SUNY Upstate Medical University
York, Jonathan	University of Cincinnati
Yun, Jonathan	Columbia University, New York Presbyterian
Zwagerman, Nathan	University of Pittsburgh

Faculty and Topics

Bruce Andersen, Ph.D., M.D.

Idaho Neurological Institute
"Squid Lab"

Issam A. Awad, M.D., MSc, FACS

Northwestern University
Lecture Title: "Philosophy of Science and Neurosurgery" and "Translational and Integrational Research: Cavernous Angioma as a Paradigm"

Larry Benowitz, Ph.D.

Harvard University
Lecture Title: "Rewinding the Injured CNS"

Edward Benzel, M.D.

Cleveland Clinic
Lecture Title: "Spine, Biomechanics, Clinical Practice, and the Quest of Academic Excellence"

Kerry Bernstein, Ph.D., CPT(VT)

Vermont State Guard
Lecture Title: "On The Evolution of an Electronic Species"

Mark Bevan, Ph.D.

Northwestern University
Lecture Title: "Mechanisms Underlying Motor Dysfunction in Parkinson's Disease and the Therapeutic Efficacy of DBS"

John Bookvar, M.D.

Cornell University
Lecture Title: "Intra-arterial Chemotherapy to Target the Glioma Stem Cell Niche in Malignant Brain Tumors"

Mark P. Burns, Ph.D.

Georgetown University
Lecture Title: "Acute CNS Injury and Chronic Neurodegenerative Disease: Common Pathways and Therapeutic Targets"

E. Antonio Chiocca, M.D., Ph.D.

Ohio State University
Lecture Title: "Translational Therapeutics for Brain Tumors: From the Lab to the Clinic and Back"

Robert Dempsey, M.D.

University of Wisconsin
Lecture Title: "Inspiration and Neurosurgical Research – How to Start a Project, Grant or Paper"

V. Reggie Edgerton, Ph.D.

UCLA Medical Center
Lecture Title: "Activity Dependent Mechanisms that Enhance Sensorimotor Function Following Spinal Cord Injury"

Emad N. Eskandar, M.D.

Harvard Medical School
Lecture Title: "Neurophysiology of learning, motivation, and impulsivity"

Thomas Freeman, M.D.

University of South Florida
Lecture Title: "Neural Transplantation for the Treatment of Parkinson's and Huntington's Diseases: What We Have Learned and Implications for Future Therapies"

Faculty and Topics continues

Robert M. Friedlander, M.D.

University of Pittsburgh

Lecture Title: "Mechanisms of Cell Death in Neurologic Diseases"

Michael M. Haglund, Ph.D., M.D.

Duke University

Lecture Title: "Optical Imaging of Epileptiform Activity: From Brain Slices to the Operating Room"

Robert E. Harbaugh, MD, FACS, FAHA

Penn State University

Lecture Title: "Issues in Neurosurgical Clinical Research"

Jeff W. Lichtman, M.D., Ph.D.

Harvard University

Lecture Title: "Connectomics"

Andres M. Lozano, M.D., Ph.D., FRCS, FRSC

University of Toronto

Lecture Title: "Adjusting the Activity in Human Brain Circuits"

Joseph R. Madsen, M.D.

Harvard University

Lecture Title: "Signals and Systems in the Human Brain: Water and Electricity"

Michel Modo, Ph.D.

University of Pittsburgh

Lecture: "The Use of Stem Cells in Neurosurgical and Neurological Applications"

Louis J. Ptáček, M.D.

University of California, San Francisco

Keynote Lecture: "Human Neurogenetics: Using Human Families to Find Genes, Understand Basic Biology, and Move Toward Better Treatments for Patients"

Walter Schneider, Ph.D.

University of Pittsburgh

Lecture Title: "Clinically Actionable Fiber Tracking in Neurosurgery & Traumatic Brain Injury: MRI Tract Visualizations with Quality Exceeding Microdissection"

Andrew B. Schwartz, Ph.D.

University of Pittsburgh

Lecture Title: "Advances in High Performance Brain-Controlled Prosthetics"

Michael Taylor, M.D., Ph.D., FRCS(C)

University of Toronto

Lecture Title: "Clinical Implications of Paediatric Brain Tumor Molecular Genetics"