Reading Your Mind
Understanding Your Brain Through Physical Responses

Cognition, attention, memory, emotion, thought, willful control, and language straddle the continuum between brain and mind.

We will explore breakthrough science uncovering secrets of these functions and how they can be controlled.

Program Description
At this forum, “Reading your Mind”, we will explore how the newest techniques are enhancing our understanding of how the brain functions and how this understanding is being applied to allow beneficial manipulation of these functions.

At MIT two exciting brain technologies are being researched, one a new brain imaging system and the another called Optogenetics, which has the ability to control specific brain cells with light. These new physical and chemical techniques allow understanding of how the brain is wired and real-time evaluation and manipulation of brain functions including cognition, attention, memory, emotion, thought and language.

A new perspective will be gained on general anesthesia. Anesthetics induce unconsciousness by creating oscillations in key brain circuits that impair the ability of these regions to communicate. Knowing this it is now possible to have a detailed neurophysiological understanding of the brain under general anesthesia, and this can be used to monitor the anesthetic state more accurately, making it safer, more predictable, and potentially opening up new anesthetic technologies.

Atentiv focuses on treating children struggling with attention through the use of computer games. Each game motivates a child to raise their attention to achieve their highest performance level while being challenged with one or more tasks that teach other unique cognitive skills. An algorithm converts the child’s attention level into a numerical value, enabling the child to use their attention to control the speed of the game.

Recently our understanding of how our brains encode space and time have become much better understood. These have been used to model episodic memory for events and to model mechanisms of goal directed spatial navigation that may be relevant to algorithms for robot navigation. The same structures implicated in coding space and time for memory are the first structures to degenerate in Alzheimer’s disease.

Premier Sponsor
BBA

For more information, go to mdgboston.org

Easy Online Registration www.mdgboston.org

Upcoming Events
Sept 28 5:30 - 8:30
10th Annual Networking Event: Transitioning Into and Within the Medical Device Industry (Fine Arts Center, Regis College)

Forum
Oct 5 5:30 - 8:30
Medical Device Security in a Connected World (Fine Arts Center, Regis College)
Presenters

Emery Brown, M.D., Ph.D.

Abstract:

Deciphering the Dynamics of the Unconscious Brain Under General Anesthesia

General anesthesia is a drug-induced, reversible condition comprised of five behavioral states: unconsciousness, amnesia (loss of memory), analgesia (loss of pain sensation), akinesia (immobility), and hemodynamic stability with control of the stress response.

The mechanisms by which anesthetics induce unconsciousness relate to the extent to which these agents create oscillations in key brain circuits that impair the ability of these regions to communicate.

These oscillations which are readily discernible in the EEG recorded from patients under general anesthesia and sedation. The oscillations change systematically with drug class and with patient age.

Our results show that it is now possible to have a detailed neurophysiological understanding of the brain under general anesthesia, and that this understanding, can be used to monitor the anesthetic state more accurately and design more principled strategies for creating the state of general anesthesia.

Biosketch:

Emery Brown is the Warren M. Zapol Professor of Anaesthesia at Harvard Medical School and anesthesiologist at Massachusetts General Hospital. He is the Edward Hood Taplin Professor of Medical Engineering and Computational Neuroscience at MIT.

Dr. Brown received his B.A. (magna cum laude) in Applied Mathematics from Harvard College, his M.A. and Ph.D. in Statistics from Harvard University and his M.D. (magna cum laude) from Harvard Medical School. He completed his internship in internal medicine at the Brigham and Women’s Hospital and his residency in anesthesiology at MGH.

Dr. Brown’s experimental research has made important contributions towards understanding the neuroscience of how anesthesia works.

His research has established that a primary mechanism through which anesthetics work is by creating and maintaining oscillations which disrupts information transmission among different brain areas. His statistics research has developed signal processing algorithms to help understand how the brain represents and transmits information.

Dr. Brown served on the NIH BRAIN Initiative Working Group. He is the recipient of an NIH Director’s Pioneer Award, an NIH Director’s Transformative Research Award, and the 2015 American Society of Anesthesiologists Excellence in Research Award. Dr. Brown is a Fellow of the American Academy of Arts and Sciences, a 2015 Guggenheim Fellow in Applied Mathematics and a Fellow of the National Academy of Inventors. He is a member of the National Academy of Medicine, National Academy of Science, and the National Academy of Engineering.
**Presenters**

**Eric Gordon AMP (finance)**

**Abstract**

‘A Novel Feed-forward Modelling System for the Treatment of ADHD and Significant Improvement in Academic Performance’

ADHD is associated with multiple cognition-related phenotypic characteristics in children and adults. It will review the role of cognition in ADHD, prevailing treatment effectiveness in reducing the core symptoms and training the underlying core component cognitive skills.

It will describe and demonstrate a novel feed-forward modeling system (FFM) for the treatment of ADHD. It will present the Ph. II study results tested in clinics and schools, including the randomized, controlled, parallel design comparing FFM to a standard of care non-pharmacological intervention using parent- and clinician-rated scales of ADHD symptomology and on academic performance tests completed by the participant.

It will present the design of a study to support FDA clearance of the first nonpharmacological treatment of ADHD for significant and sustained reductions in the symptomology of ADHD and improved academic performance.

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**Jodi Gilman, Ph.D.**

**Abstract:**

‘Can We Look in the Brain to Detect Drug Intoxication?’

The wave of legalization of medical and recreational marijuana (MJ) has brought increasing prevalence of driving while intoxicated with MJ. However, unlike the breathalyzer test for alcohol, there is no instant, non-invasive and easy method for detecting MJ intoxication. Since MJ rapidly leaves the bloodstream and settles in the brain impairment does not match up with blood or urine tests.

Therefore, we must look for manifestations of mind-altering effects of MJ to develop a DUI test for MJ. We will present preliminary findings that indicate that brain-based measures may be a novel and promising way to detect impairment from cannabis based on Functional near infrared spectroscopy (fNIRS) techniques.

fNIRS is a non-invasive, safe technique that capitalizes on differences in the absorption spectra of deoxygenated and oxygenated hemoglobin (Hb), allowing the measurement of relative changes in Hb concentration through the use of light attenuation at multiple wavelengths. fNIRS imaging can be performed at relatively low cost, and has the potential to measure brain response in real-world settings.

Preliminary results suggest that acute cannabis intoxication is detectable by looking into the brain, and this or similar physical methods may become efficient, reliable roadside tests of impairment for MJ and other psychoactive substances.

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**Biosketch:**

Mr. Gordon, Founder, Chairman and CEO of Atentiv, has a successful track record of identifying and bringing emerging medical and healthcare technologies into the clinic, industry and major market dominance. For over 30+ years, he has initiated, driven and managed through full development and/or full global commercialization seven startup companies in pediatric, adult and traveler’s vaccines (Connaught Labs - now Sanofi-Pasteur, and Virogenetics); in combinatorial chemistry for drug discovery (ArQuile); in clinical genomics (Ardais); in drug-delivery for endometriosis (Combient); in HDL/CHDtherapeutics (Cardium); and in behavioral health/ADHD diagnostics (BioBehavioral Diagnostics).

He began his career with Arthur Andersen & Co., and served as VP and CFO at Sterling Drug. Eric holds business degrees from Syracuse University, the University of Pennsylvania, The Wharton School.
**Presenters**

**Michael E. Hasselmo, Ph.D.**

**Abstract:**
Data shows that neurons in entorhinal cortex and hippocampus code space and time for memory function in behavioral tasks.

The 2014 Nobel prize was awarded to May-Britt and Edvard Moser and John O'Keefe for the discovery of the coding of spatial dimensions by grid cells and place cells in these structures.

Other data shows that neurons code head direction, boundary location and time intervals during behavior.

These neural responses properties have been used to model episodic memory for events and to model mechanisms of goal directed spatial navigation that may be relevant to bio-inspired algorithms for robot navigation.

The same structures implicated in coding space and time for memory are the first structures to degenerate in Alzheimer’s disease, potentially due to a breakdown in the fundamental network processes of memory function.

**Biosketch:**
Michael E. Hasselmo is the Director of the Center for Systems Neuroscience at Boston University and a Professor in the Department of Psychological and Brain Sciences and the Graduate Program for Neuroscience.

He is principal investigator on two NIMH R01 grants and an ONR MURI award. Research in his lab includes intracellular recording of intrinsic dynamics and cholinergic modulation in entorhinal brain slices, and extracellular recording of unit activity including grid cells and head direction cells, linking network models to the mechanism of grid cell firing and the encoding of information.

Prof. Hasselmo graduated summa cum laude from Harvard College, completed a D.Phil. at Oxford University on a Rhodes scholarship and performed a post-doctoral fellowship at the California Institute of Technology.

He is on the editorial boards at Science, Journal of Neuroscience, Neurobiology of Learning and Memory, Behavioral Neuroscience, Frontiers in Systems Neuroscience, Brain Structure and Function and Hippocampus.

**Piali De, Ph.D.**

**Abstract:**
‘Overcoming Cognitive Barriers to Improve Self-Management in Mind Disorders’

Impaired cognitive ability is often manifested by inadequate self-management of health care and daily activities.

Since each individual suffering from impaired cognition manifests their disability in a unique manner, having fixed protocols to handle all situations places unattainable burdens on the sufferer.

Through learning about the habits and traits of individuals with cognitive impairment, artificial intelligence in Senscio Systems’ Ibis platform creates meaningful interaction with technology tailored to the abilities of each individual.

From the data captured by Ibis, we reports insight into the cognitive confusion associated with mental diseases and how technology augments cognition even in the presence of dementing disease states.

**Biosketch:**
Piali De is a co-founder and CEO of Senscio Systems where she brings her passion for a world made better through intelligent information systems.

Previously Dr. De was an Engineering Fellow at Raytheon’s Integrated Defense Systems where she invented ConfluenceTM, a system designed to deliver knowledge-based decision support in military and public safety missions.

Prior to joining Raytheon, Dr. De was a member of the research team at Spectral Sciences, Inc where her primary focus was on physics based modeling of infrared atmospheric emissions and aircraft signatures.

Dr. De is a member of Phi Beta Kappa, Sigma Xi and Sigma Pi Sigma honor societies and recipient of multiple awards, including the National Women of Color 2009 Technology Innovation award, the Raytheon CEO Award, Raytheon IDS President’s Award and Raytheon Business Development Excellence Award, for her work on profiling Marine Corps missions.

**Co-Champions**

**Peter Madras, M.D.**
President MDG Boston

**Geoff Moodie, Ph.D.**
Medical Device and Combination Product Specialist
Maquet Getinge Group

**Co-Moderators**

**Bertha Madras, Ph.D.**

Dr. Madras is a professor of psychobiology in the Department of Psychiatry at Harvard Medical School. She was a Deputy Director in the White House Office of National Drug Control Policy, holds 19 patents for novel brain imaging agents and therapeutics, delivered 250+ presentations globally, and received an NIH MERIT award, NIDA Public Service Award, and an American Academy of Addiction Psychiatry Founders’ Award. The Better World Report listed her imaging agent al tropane as “one of 25 technology transfer innovations that changed the world”.

**Bernie Gordon, Ph.D.**

As one of the world’s preeminent engineers and inventors, he holds over 100 U.S. patents, many more worldwide, for breakthroughs including instant imaging CT scanning, the fetal heart monitor, and digital Doppler radar.

He was awarded the National Medal of Technology by President Reagan and established the National Academy of Engineering’s Bernard M. Gordon Prize for Engineering Leadership Education. He created Engineering Leadership programs at Tufts, M.I.T., Northeastern, The Technion, The Citadel, and the University of California, San Diego.
Sept 14 FORUM

Reading Your Mind
Understanding Your Brain Through Physical Responses

AGENDA
4:00  Arrival, Networking
4:20  President, MDG Boston
      Peter N. Madras, MD
4:30  President, Regis
      Antoinette M. Hays, Ph.D., RN

SESSION ONE
4:40  Scientific Breakthroughs
      Dr. Bertha Madras, Moderator
4:45  Technologies for Mapping and Repairing the Brain
      Prof. Ed Boyden
5:05  Deciphering the Dynamics of the Unconscious Brain Under General Anesthesia
      Dr. Emery Brown
5:25  Memory for Space and Time
      Dr. Michael Hasselmo
5:45  Q&A
6:00 – 6:45  DINNER

SESSION TWO
6:45  Applied Science
      Dr. Bernie Gordon, Moderator
6:50  A Novel Feed-forward Modelling System for the Treatment of ADHD and Significant Improvement in Academic Performance
      Mr. Eric Gordon
7:10  Portable Imaging To Determine Mental Impairment
      Dr. Jodi Gilman
7:30  Understanding the Aging Mind
      Dr. Piale De
7:50  Q&A
8:10  Networking
8:30  Departure

Member News
MDG welcomes these new members:

Bruce Ackman  Heinz Bachmann  Thomas Ferree  Kevin Riley
Petro Arvanitis  Roger Begin  sue finneran  George Romanski
Irving Burdary  W. Burke Bero  Richard Foote  Ed Ross
Dee Cleary  Alan Bertman  Betsy Goodrich  Daniel Silber
Alperpen Degirmenci  barry braunstein  Elizabeth Goodrich  Jeffrey Thumm
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Alex Goddard  Ernest Carabillo  Chris Kokkinos  Peter Vandermeulen
Bill Harris  Annette Coleman  Tony McCook  David Vogel
Rui Liu  Carmel Denis  Rosemary Pelletier  Alex Wallace
Carol Maloney  Leslie Stern  Lawrence Victor  Steve Porcaro
Peter Reinhart  Ken Steinberg  Ann Marie Wright  Thomas Williams

In addition, we welcome back those who have renewed their MDG membership:

Heinz Bachmann  Thomas Ferree  Kevin Riley
Roger Begin  sue finneran  George Romanski
W. Burke Bero  Richard Foote  Ed Ross
Alan Bertman  Betsy Goodrich  Daniel Silber
barry braunstein  Elizabeth Goodrich  Jeffrey Thumm
Michael Burka  David Hamacher  Barbara Turkington
Ernest Carabillo  Chris Kokkinos  Peter Vandermeulen
Annette Coleman  Tony McCook  David Vogel
Carmel Denis  Rosemary Pelletier  Alex Wallace
Ann Marie Wright  Steve Porcaro  Thomas Williams
MDG Boston

We would like to thank the hundreds of volunteers who help to make this organization a success.

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About MDG Boston

MDG is the professional association for career building, knowledge acquisition and mutual support for New England medical technology professionals.

MDG sponsors Forums, Networking, SIGs (Special Interest Groups), Workshops and Special Events where diverse industry leaders can share their experience and knowledge as presenters and through peer-to-peer communications.