General anesthesia is a neurophysiological state in which a patient is rendered unconscious, insensitive to pain, amnestic and immobile, while being maintained physiologically stable. General anesthesia has been administered in the U.S. for more than 170 years, and daily, more than 700,000 people worldwide receive general anesthesia for surgery and diagnostic procedures. The advent of general anesthesia transformed surgery from trauma and butchery to a humane and often life-saving therapy. The mechanism by which anesthetic drugs create the stated general anesthesia has been considered one of the most significant mysteries of modern medicine.

## Save the Date:

October 10 at 4:30 p.m.

### **Lecture Title:**

The Dynamics of the Unconscious Brain Under General Anesthesia

2018 Recipient of the Dickson Prize in Science

# **EMERY N. BROWN**

Edward Hood Taplin Professor of Medical Engineering and Computational Neuroscience at MIT, Warren M. Zapol Professor of Anaesthesia, Harvard Medical School and anesthesiologist at Massachusetts General Hospital

Statistician Anesthesiologist Neuroscientist



Dr. Emery Brown is one of the world's leading physicianscientists. He directs an interdisciplinary team comprised of anesthesiologists, neuroscientists, bioengineers, mathematicians, neurologists and a neurosurgeon from Massachusetts General Hospital (MGH), MIT and Boston University that is studying the neuroscience of general anesthesia. Brown also directs the Neuroscience Statistics Research Laboratory at MGH and MIT, where the research develops statistical methods and signal processing algorithms to analyze data collected in neuroscience experiments.

Brown served on President Obama's NIH Brain Initiative Working Group. He is a fellow of the IEEE, the American Statistical Association, the Institute of Mathematical Statistics, the American Academy of Arts and Sciences and the National Academy of Inventors. Brown is one of 21 people who are currently members of the National Academy of Medicine, the National Academy of Sciences and the National Academy of Engineering.

Brown has received an NIH Director's Pioneer Award, the National Institute of Statistical Sciences Sacks Award and the American Society of Anesthesiologists Excellence in Research Award.

"My goal is to provide every patient requiring surgery precisely controlled, side-effect free general anesthesia."

### **GENERAL ANESTHESIA RESEARCH**

His 2010 *New England Journal of Medicine* article established a systems neuroscience framework for understanding how anesthetics drugs create the altered states of arousal that comprise general anesthesia.

His research combining human, animal and modeling studies has discovered that maintenance of extracellular current oscillations in brain circuits is a primary mechanism through which anesthetics create the states of general anesthesia. These insights have led to new paradigms for monitoring the brain states of patients receiving general anesthesia, as well as neurophysiologically based strategies for anesthetic drug dosing and for controlling precisely the anesthetic state.

#### **NEURAL DATA ANALYSIS RESEARCH**

His statistics research is developing signal processing algorithms and statistical methods to characterize accurately the dynamic properties of neuroscience data.

The problems studied have ranged from measuring the period of the human biological clock and characterizing how rat hippocampal neurons maintain a dynamic representation of the animal's location in its environment, to characterizing the dynamics of human heart beats in physiological and pathological states, and tracking and controlling the state of general anesthesia in real time.