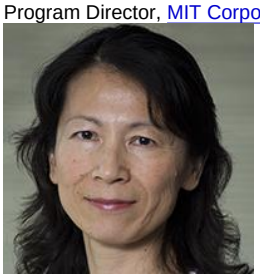
MIT Industrial Liaison Program Faculty Knowledgebase Report

BrainTech

June 8, 2023 10:00 am - 12:00 pm

10:00 AM

Welcome & Introduction
Hong Fan
Program Director, MIT Corporate Relations



Hong Fan
Program Director
MIT Corporate Relations

Hong Fan is a Program Director at the Office of Corporate Relations at MIT. She joined OCR in August 2016, brought with her 20+ years of international work experience across semiconductor, consumer electronics, telecom, and higher education.

Prior to joining OCR, Hong spent 12 years in the semiconductor industry with executive functions in strategic marketing, business development, corporate strategy, product management, and product marketing at Analog Devices and MediaTek. During those years, Hong played instrumental roles in identifying emerging business opportunities related to wireless communication networks, smartphones, wearable devices, Internet of Things (IoT), and medical devices and applications. She led cross-functional teams in defining and driving product and market strategy for businesses with annual revenue ranging from $30 million to $100 million.

Prior to joining the semiconductor industry, Hong spent 6 years in the telecommunications and electronics industry, leading engineering teams at companies such as Lucent Technologies and Watkins-Johnson Company for the development of digital signal processing, wireless communications, and micro-controller software.

Before coming to US, Hong was a strategic research staff at the President Office of Shanghai Jiao Tong University, one of the oldest universities in China. She was the first woman to hold this highly selective position.

Hong has a B.S in Electronic Engineering from Shanghai Jiao Tong University, an M.S. in Electrical Engineering from University of Maryland at College Park, and an MBA from Sloan School of Management at MIT. She received numerous academic honors and awards including the McKinsey & Co. Scholarship, the NSF Graduate Research Fellowship, and the Shanghai Outstanding College Graduate Award.

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10:05 AM

New Therapeutic Strategies for Brain Disorders Enabled by Breakthrough Technologies

Guoping Feng
Associate Director, McGovern Institute for Brain Research at MIT
Director of Model Systems and Neurobiology, Broad Institute of MIT and Harvard
Poitras Professor of Neuroscience
The MIT Department of Brain and Cognitive Sciences

Brain disorders including psychiatric disorders and neurodegenerative disorders are some of the most common and debilitating health issues, yet we don't have effective treatments for most of them, despite intensive research and drug development efforts. In fact, few mechanistically new therapeutics have been developed in the past 60 years. However, recent development of breakthrough technologies including genome-editing, single cell transcriptomics and functional actuators of cells and circuits has revolutionized our ways of studying brain function and dysfunction. I will use psychiatric disorders as an example to illustrate how these new technologies are fueling the development of new therapeutics for brain disorders.

10:40 AM

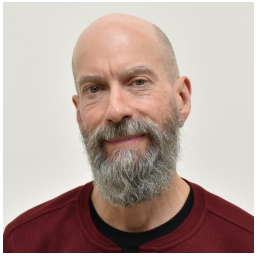
POINT Therapy, New Progress for Treating Brain Disorders

Coach Wei
Co-founder and CEO
Neural Galaxy Inc

This talk will introduce Parcellation-Oriented Individualized Neuromodulation Therapy (POINT), an innovative therapeutic approach to treat brain disorders. The talk will explain the scientific progress for brain functional parcellation, individualized neuromodulation, and clinical results.

11:00 AM

From Clockwork to Emergence: A New View of the Brain
Earl K. Miller
Professor, MIT Department of Brain and Cognitive Sciences
Picower Professor of Neuroscience, The Picower Institute for Learning and Memory



Earl K. Miller
Professor, MIT Department of Brain and Cognitive Sciences
Picower Professor of Neuroscience
The Picower Institute for Learning and Memory

Earl K. Miller is the Picower Professor of Neuroscience in The Picower Institute for Learning and Memory at the Massachusetts Institute of Technology. He received his B.A. (summa cum laude, with honors) in Psychology from Kent State University in 1985. He received an M.A. (in 1987) and Ph.D. (in 1990) in Psychology and Neuroscience from Princeton University. Professor Miller was awarded an honorary doctorate (Doctor of Science, honoris causa) from Kent State University in 2020. Professor Miller studies the neural basis of executive brain functions, the ability to carry out goal-directed behavior using complex mental processes. Research topics include working memory, attention, decision-making and learning. The Miller Lab has shown how categories and concepts are learned, how multifunctional “mixed-selectivity” neurons endow the cortex with computational horsepower and flexibility, and how neural oscillations regulate neural communication and consciousness. This work has established a foundation upon which to construct more detailed, mechanistic accounts of cognition and its dysfunction in diseases such as autism, schizophrenia, and attention deficit disorder. Professor Miller is the recipient of a variety of awards and serves as editor, and on the editorial boards of, major journals in neuroscience, and on international advisory boards. His paper with Jonathan Cohen, (Miller and Cohen, 2001), which presented a new framework for understanding the prefrontal cortex, ranks fifth all-time in citations in neuroscience.

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For a long time, the brain was believed to function like a clock, with specialized parts working together due to physical connections. However, in recent decades, our understanding has undergone a major shift. While the individual parts and anatomical connections are still important, we now know that many cognitive functions are driven by emergent properties – higher-level properties that arise from the interactions between the parts. One property is brain waves – oscillating rhythms of electrical activity that allow millions of neurons to self-organize and control our thoughts, much like a crowd doing "the wave." This new perspective has led to a deeper appreciation of the complexity of the brain and the importance of understanding how its various parts work together to create emergent properties and complex behaviors.

11:35 AM

The Cognition of Situational Awareness and Performance

Joshua Sarmir
Co-founder and CEO
SplitSage

Many real-world situations require processing multiple pieces of visual information simultaneously. Drivers, pilots, mechanics, soldiers, and athletes must allocate attentional resources to crowded scenes or cluttered displays and extract relevant information from them. Discoveries by Earl K. Miller’s lab at MIT has shown that individuals have different visual perception capacities, or "bandwidths," in different parts of their visual field. The patented SplitSage process measures and maps each person's areas of high perceptual capacity, or "sweet spots," as well as areas of lower capacity, or "weak spots." By leveraging each person's unique cognitive profile, this approach can help them see more and miss less. In addition, SplitSage's approach can reflect an individual's cognitive state, providing a "breathalyzer for the mind" that assesses their current level of cognitive function. This can be particularly useful in situations where high cognitive function is essential, such as during critical decision-making or in safety-critical roles.

12:00 PM

Adjournment