



BBI
Brain and Behavior Initiative

BBI-Kavli
Distinguished Speaker Series

Brain-machine interfaces: from basic science to neurological rehabilitation



Miguel Nicolelis

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Engineering, Psychology, and Neuroscience

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Miguel Nicolelis received his M.D. from the University of Sao Paulo (Brazil) in 1984 and his Ph.D. from University of Sao Paulo (Brazil) in 1988. Nicolelis is best known for pioneering studies in neuronal population coding, Brain Machine Interfaces (BMI) and neuroprosthetics in human patients and non-human primates. His approach allows for the integration of molecular, cellular, systems, and behavioral data in the same animal, producing a more complete understanding of the nature of the neurophysiological alterations associated with these disorders.

State-of-the-art research on brain-machine interfaces makes it possible for the brains of primates to interact directly and in a bi-directional way with mechanical, computational and virtual devices without any interference of the body muscles or sensory organs. This presentation reviews a series of recent experiments using real-time computational models to investigate how ensembles of neurons encode motor information. These experiments have revealed that brain-machine interfaces can be used not only to study fundamental aspects of neural ensemble physiology, but they can also serve as an experimental paradigm aimed at testing the design of novel neuroprosthetic devices. The talk also describes evidence indicating that continuous operation of a closed-loop brain-machine interface, which utilizes a robotic arm as its main actuator, can induce significant changes in the physiological properties of neural circuits in multiple motor and sensory cortical areas. This research raises the hypothesis that the properties of a robot arm, or other neurally-controlled tools, can be assimilated by brain representations as if they were extensions of the subject's own body.

2204 Edward St. John Center | May 1, 2019 | 2:00 p.m.

Reception to follow, featuring graduate student
and post-doc research related to the brain and behavior.

Ground Floor Concourse | 3:30 p.m.

