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Modular organization of the control of human locomotion

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RESEARCH SUMMARY

The goal of our research is to understand how visual information is perceived, learned and used to guide behavior. These visually-based processes rely on activation patterns in neural circuits distributed across more than 20 distinct regions of the primate brain. Therefore to fully understand the neural mechanisms of vision, it is essential to study networks of neurons. Although these issues have long been appreciated as fundamental, research examining the properties of networks of neurons in primates has only recently become possible with the advent of techniques like chronic multi-electrode recordings. For our studies, we use chronic multi-tetrode recordings which enable us to record simultaneously from many neurons across multiple brain areas in awake, behaving primates. Chronic tetrode recordings provide us with a unique opportunity to study learning since we can record from the same neurons across multiple days. These experiments are done in combination with behavioral, fMRI and computational approaches. Improved understanding of how visual perception and learning are accomplished through computations distributed across neuronal populations will help us understand the principles of neural coding. It is also likely to have important implications for the theory of artificial intelligence and robotics and, eventually, for the successful development of brain-machine interface systems including visual prostheses.

Selected Publications

Ecker AS, Berens P, Keliris GA, Bethge M, Logothetis NK, Tolias AS. Decorrelated neuronal firing in cortical microcircuits. Science. 2010 Jan 29;327(5965):584-7.