

Tkach, Colleen

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From: Soto, Lauran

KECK SCIENCE DEPARTMENT SEMINAR

"Using Brain Waves to Read Neural Circuits"

Gautam Agarwal
Keck Science Department

Friday, October 20th, 2023
12:15PM - 1:15PM
Keck Science Department
Burns Lecture Hall, Room B31

ABSTRACT: Action potentials isolated from single neurons ("spikes") are thought to provide the most accurate readout of brain activity. In contrast, local field potentials (LFPs, or "brain waves"), which reflect pooled electrical activity of thousands of nearby neurons, are easier to measure than spikes but seem to offer only coarse-grained readouts of behavior. In this talk, I will describe how patterns in brain waves can be used to gain an astonishingly precise view of the contents of a neural circuit, using multi-electrode recordings from the hippocampus of rats navigating a maze. First, I will describe a simple algorithm that we have designed to identify informative spatial patterns in the LFP, allowing us to track the animal's changing position within its environment. Next, I will describe two student projects that build on this work. The first uses our algorithm to demonstrate that rather than being fixed, a rat's internal map of space is constantly shifting in a coordinated manner. The second work suggests that hippocampal oscillations carry information through phase, rather than temporal, offsets. Together, these studies show how brain waves grant efficient and complete access to a neural code.

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