



PRINCETON
Neuroscience
INSTITUTE

Seminar

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Hosted by Sam Wang

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10:00am

PNI 230

“Simultaneous spatio-temporal dendritic voltage/calcium mapping and somatic recording from Purkinje neurons in awake mice”

Abstract: Spatio-temporal patterns of dendritic signaling and their relationship with somatic output is fundamental to information processing in the brain, and yet remain to be explored in awake animals. Therefore, we combined simultaneous sub-millisecond voltage and calcium two-photon imaging from spiny dendrites, with somatic electrical recording from spontaneously active cerebellar Purkinje neurons (PN) in awake mice. Discrete 1-2 ms supra-threshold voltage spikelets were detected during dendritic complex spikes in the distal spiny dendrites. Spikelets were highly heterogeneous in number, timing and spatial distribution within single complex spikes and between complex spikes. This heterogeneity was reflected by spatio-temporally variable dendritic calcium signals. Sub-threshold voltage imaging detected highly attenuated back-propagating action potentials, and spatio-temporal voltage maps revealed highly variable 5-10 ms sub-threshold ‘hotspots’ localized to fine dendritic processes, which were reduced in size and frequency by lidocaine and CNQX. “Hotspots” correlated with somatic output but also, at high frequency, triggered purely dendritic calcium spikes. Spatio-temporal maps of sub- and supra-threshold dendritic signaling in PNs is surprising complex and dynamic, even in resting animals.