



Dr. CARRILLO REID Luis

Invited by: Pr. Alessandro TORCINI

*Neuro Technology Center
Columbia University
Department of Biological Sciences and Neuroscience
550 W120th Street, 901B NWC Building
10027 New-York (USA)*

lc2998@columbia.edu

Imprinting and recalling cortical ensembles with two-photon optogenetics

Cortical ensembles in primary visual cortex are groups of neurons with coordinated activity. The functional connectivity of these ensembles gives rise to activity patterns that generate an internal representation of the surrounding world. In this way neuronal ensembles recalled by sensory stimulation make use of imprinted patterns of activity stored in the cortical circuitry. However, whether it is possible to imprint and recall artificially created neuronal ensembles has been difficult to investigate. We used simultaneous two-photon optogenetics and imaging of neuronal populations in vivo to activate artificial ensembles whose members can be identified and manipulated with single cell resolution. Recurrent activation of the same ensembles imprinted them in cortical microcircuits. Artificially imprinted ensembles alternate their activity with visually evoked ensembles without interfering with endogenous circuitry. Moreover, imprinted ensembles remained coactive on consecutive days and single neuron photostimulation is able to recall a complete ensemble. Our findings demonstrate the possibility to reprogram neuronal ensembles and observe behavioral correlates of cortical manipulation.