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Stéphane Dieudonné is a cellular and systems neurobiologist with expertise in both electrophysiology and imaging of neuronal activity. Since 2005, he has been heading a research team at the Biology Institute of the Ecole Normale Supérieure (IBENS), investigating the function of inhibitory neurons in neuronal homeostasis and computation. He is involved in several international training courses in optics for the neurosciences and acts as scientific director of the imaging facility at IBENS.

S2-L5 '*Imaging with genetically encoded voltage sensitive probes.*'

Optical recordings of cellular and subcellular membrane potential in vivo in defined neuronal populations with genetically encoded voltage indicators (GEVIs) would open a window on the representation, processing and propagation of information in the brain. Cellular voltage imaging in vivo, however, suffers from limitations of both speed and sensitivity inherent in current indicators and imaging modalities. In vivo 2P excitation of membrane proteins like voltage sensors or optogenetic actuators has been limited by three main factors: the low number of membrane proteins within a 2P focal volume, the low frame rate of standard 2P imaging and the possible imaging artefacts linked to brain motion in awake behaving mice. To address these three issues, we have developed light patterning strategies based on the acousto-optic technology. These strategies combine fast scanning (resonant rate), fast pointing (100 kHz) or so-called random-access, holographic shaping of the focal volume and beam multiplexing. We demonstrate 10 kHz random-access recordings from ensembles of neurons in awake behaving mice. Using ASAP3, a newly developed fast GEVI displaying 50 % fluorescence change in the physiological voltage range, we report single spike detection with sub-millisecond precision and subthreshold membrane potential oscillations with cellular resolution deep in the cortex of awake mice. Finally, we propose new strategies for 3D voltage imaging of neuronal populations at high speed