

ACTIVITY CORRELATION IMAGING: VISUALIZING FUNCTION AND STRUCTURE OF NEURONAL POPULATIONS

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For the analysis of neuronal networks it is an important yet unresolved task to relate the neurons' activities to their morphology. Here we introduce activity correlation imaging to simultaneously visualize the activity and morphology of populations of neurons. To this end we first stain the network's neurons using a membrane permeable $[Ca^{2+}]$ indicator (e.g., Fluo-4/AM) and record their activities. We then exploit the recorded temporal activity patterns as a means of intrinsic contrast to visualize individual neurons' dendritic morphology. The result is a high-contrast multi-color visualization of the neuronal network. Taking the *Xenopus* olfactory bulb (OB) as an example we show the activities of the mitral/tufted cells of the OB as well as their projections into the olfactory glomeruli. This method, yielding both functional and structural information of neuronal populations, will open up unprecedented possibilities for the investigation of neuronal networks.