

S IV.2 Mesoscopic deep-brain mapping of multimodal stimulus selectivities in cats

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Linking specific brain functions to their neuronal implementation is a central avenue of neuroscience. In transparent, small organisms the whole nervous system can be studied at single cell level by light microscopy. Brain-wide access to neuronal activity has remained challenging in mammals, especially in large-animal preclinical species. Putting single cell function into the context of the whole brain remains difficult as the dominant whole-brain imaging technique, fMRI, precludes simultaneous multielectrode recordings or fluorescence imaging. Functional ultrasound imaging has emerged recently as a mesoscale imaging technique that can be applied to image whole-brain dynamics in head-fixed mice. We present our preliminary data on mesoscale multimodal imaging performed in awake cats without head fixation. Functional ultrasound imaging enables us to record from unprecedentedly large brain volumes in awake, behaving animals or during anesthesia with high spatio-temporal resolution. We use this tool to investigate the mapping of visual feature spaces onto subcortical and cortical visual areas during behavior. Our results demonstrate the great potential of functional ultrasound imaging for linking neuronal function to mesoscopic brain activity in awake, behaving animals.

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