LES SÉMINAIRES DE L'INMG

A framework for the study of behaviour and plasticity in the adult brain using light sheet microscopy

par

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Abstract :

There has been over the past 6 years a convergence in the fields of optics, biochemistry and computing leading to dramatic improvements in light sheet microscopy, tissue clearing protocols and image analysis algorithms. The convergence of these different fields has the potential to streamline brain studies by accelerating data acquisition speed and reliability over the current whole brain analysis pipelines based on serial sectioning methods. We previously developed the iDISCO+[1] protocol for immunostaining and imaging intact adult mouse brains. As a companion tool, we also developed and distribute ClearMap[2,3], an open source environment to segment objects and map them onto reference atlases optimized for large 3D datasets. We used this pipeline as a discovery tool to find brain regions active in correlation with various behaviors by mapping neuronal activity landscapes derived from Fos expression[4,5]. Here, I will present recent unpublished projects made possible by our upcoming brain mapping pipeline ClearMap 2, expanding the repertoire of applications derived from intact whole brain preparations. We hope that ongoing developments in light sheet microscopy and image analysis pipelines will facilitate our understanding of individual variations in brain activity, connectivity and structure.

Selected Publications:

1. Renier, N. *et al.* iDISCO: a simple, rapid method to immunolabel large tissue samples for volume imaging. *Cell* **159,** 896–910 (2014).

2. Renier, N. *et al.* Mapping of Brain Activity by Automated Volume Analysis of Immediate Early Genes. *Cell* **165,** 1789–1802 (2016).

3. Liebmann, T. *et al.* Three-Dimensional Study of Alzheimer's Disease Hallmarks Using the iDISCO Clearing Method. *Cell Rep* **16,** 1138–1152 (2016).

4. Renier, N. *et al.* A mutant with bilateral whisker to barrel inputs unveils somatosensory mapping rules in the cerebral cortex. *Elife* **6,** 700 (2017).

5. Nectow, A. R. *et al.* Identification of a Brainstem Circuit Controlling Feeding. *Cell* **170,** 429–442.e11 (2017).