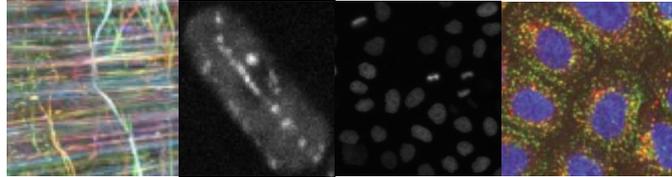


## Low level Deep Filters for large microscopy volumes



*A random assortment of fluorescence microscopy images (l to r: axons, yeast MT associated protein, nuclear DNA dividing, intracellular trafficking. Various scales)*

Thanks to advances in microscopy, we are able to acquire larger volume of samples with higher resolution for longer time with sophisticated contrast strategies. A key challenge of current biology is to make sense of all that data and integrate it into larger biological projects. To cope with the number and variety of acquisitions, experimental conditions and even biological projects in several biological fields, we need versatile, generic but specific algorithmic methods.

Vision problems used to be separated into 'high-' and 'low-level' vision. Deep learning methods are effectively 'solving' high-level vision problems like objects recognition/segmentation or scene labeling. But fluorescence images are arguably mainly made of geometrical objects -such as spots, lines or homogeneous shapes-, and in practice low-level filters still form the basis of the biological image analysis toolbox. Deep learning gives us an opportunity to revisit those issues to learn filters that will be generic and versatile. Since the training set defines in a large part the task a deep network is tackling, with a wide and generic enough training set truly generic filters could be trained. The project would involve looking into using deep convolutional networks to build generic low-level vision filters using simulations and/or an assortment of training fluorescence microscopy datasets. Applications include axon tracing in multi-color fluorescence microscopy volumes of mouse brain for developmental neurobiology.

The project will take place in a strongly interdisciplinary environment, in contact with microscopists and biologists, at the Laboratory for Optics and Biosciences (LOB) in Ecole polytechnique in Palaiseau, near Paris, France. We are looking for motivated candidates with a strong applied mathematics/computer science/machine learning/computer vision background, decent coding skills and a keen interest in interdisciplinarity; knowledge/interest in microscopy or biology is a plus. Continuation with a PhD thesis is possible.

Contact:

Send CV+cover letter to

**Anatole Chessel**, Laboratory for Optics and Biosciences, Ecole polytechnique, Palaiseau  
anatole.chessel@polytechnique.edu