

Shareable microscopy: a robust and compact platform adaptable to a multitude of applications

Despite the successes of entry-level open source projects, with new frontiers for light sheet imaging apparent, the demand for the technology outstrips supply. Furthermore, these projects are in need of rejuvenation, do not reflect the state of the art and remain dependent on an abundance of adventurous life-scientists capable of tackling the technical challenges. Similarly, commercial platforms are, by their nature, costly and generic

To overcome these challenges, we hope to foster a new model of advanced microscopy, based on shareable, modular instruments configurable to a broad range of applications. Employing modularity in the design facilitates reconfiguration and allows easy upgradability and an expandable functional palette. In turn, shareability provides financially prudent widespread access to cutting edge technologies.

The virtues of light sheet fluorescence microscopy justify its primacy as the foundation of this effort. Nevertheless, the core values of shareability and multi-applicability are inherently linked to the underlying microscopy platform, which must be robust, reconfigurable and compact, besides the more usual performance requirements. Light sheet microscopes capable of imaging samples spanning many orders of magnitude in size can be constructed from a remarkably small set of components. This ensures that any one microscope can be dismantled and reconfigured and that the obsolescence of one component does not result in expensive technologies languishing.

We report a compact, reconfigurable microscopy platform realized by a confluence of optical modelling, bespoke embedded control, and rapid prototyping that can be adapted to a plurality of applications. We illustrate how different microscope geometries, sample sizes and mounting methods can be accommodated within the framework of this platform, discuss specifics of the first implementations rolled out and provide a roadmap for future refinements and additions to the technology.

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