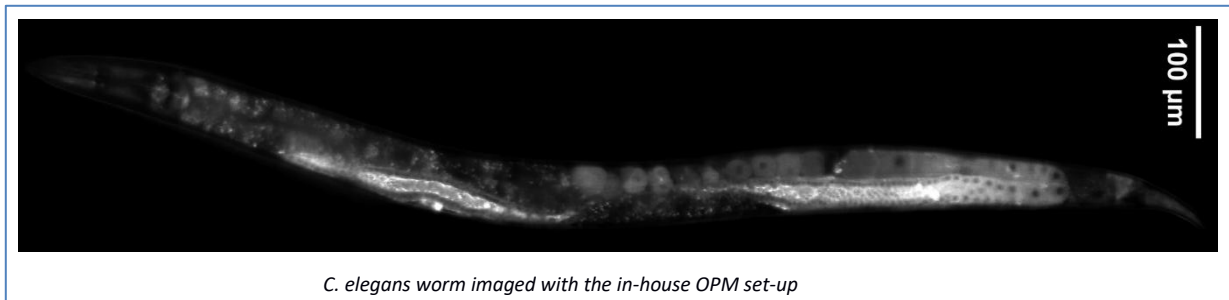


High-speed spectral imaging with Oblique Plane Microscopy

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Context:

Oblique plane microscopy (OPM) [1] is a light sheet technique allowing the **fast acquisition of fluorescence in 3D with high sample throughput**, using a single objective. Indeed, light sheet microscopy has enabled fast imaging of live samples, but the need for two objectives near the sample limits its practicality when imaging bigger samples or multiple samples in parallel. Oblique Plane Microscopy allows the use of standard sample mounting techniques such as coverslips and multi-well plates, with minimal use of light dose compared to confocal techniques. It also allows unencumbered access to the sample, permitting in situ imaging of specific parts of larger samples. The perspectives of this method are promising for multiple biomedical applications such as organoid imaging or zebrafish imaging [2], which are pursued in particular in collaboration with researchers in biology on the hospital campus where the research will take place.

Spectral imaging allows the collection of information from more than one fluorescent probe. For example, multi-fluorescent probe expression can allow to trace the lineage of cells in an organism.

An OPM set-up has been developed at the IPB [3] and demonstrated on live biological samples, in particular *C. elegans* nematode worms (Fig. [1]) and zebrafish embryos. The internship will focus on the **spectral imaging capabilities of OPM**, following work on image processing tools to allow for the reconstruction of large volumes of images by stitching. It will involve the exploration of new illumination strategies in Oblique Plane Microscopy, in particular in the infrared domain, and the set-up of a multi-channel, multi-camera detection.

The internship will cover adapting the OPM set-up to image multispectral images, designing the sample mounting, optimising the acquisition conditions and performing the image processing to obtain the final sample information. This masters research internship is proposed in the IPP team of the ICube laboratory as part of the optical pole for biomedical research at the Institute of Biological Physics (IPB) in Strasbourg. Depending on the student's profile and personal interests, the internship could also have a component of developing the image acquisition for *C. elegans* neural imaging, in collaboration with researchers at the IGBMC.

Skills: Optical development and alignment, image processing

Supervisor: Dr Vincent Maioli

Wages: as per national rules (~600€/month)

PhD possibility: possible

If you are interested do not hesitate to contact Vincent Maioli (maioli@unistra.fr)

References:

- [1] C. Dunsby, "Optically sectioned imaging by oblique plane microscopy," Opt. Express 16, 20306-20316 (2008)
- [2] Maioli et al., *Fast in vivo multiphoton light-sheet microscopy with optimal pulse frequency*, Biomedical Optics Express Vol. 11, Issue 10, pp. 6012-6026 (2020).
- [3] Bécar Q, Montgomery P, Nahas A, Maioli V. *PyRFTL: an open source Python tool for custom tube lens generation from off-the-shelf optics*. Opt Lett. 2025 Oct 1;50(19):5993-5996. doi: 10.1364/OL.571058. PMID: 41032773.
- [3] Maioli et al., *Time-lapse 3-D measurements of a glucose biosensor in multicellular spheroids by light sheet fluorescence microscopy in commercial 96-well plates*. Sci Rep 6, 37777 (2016)