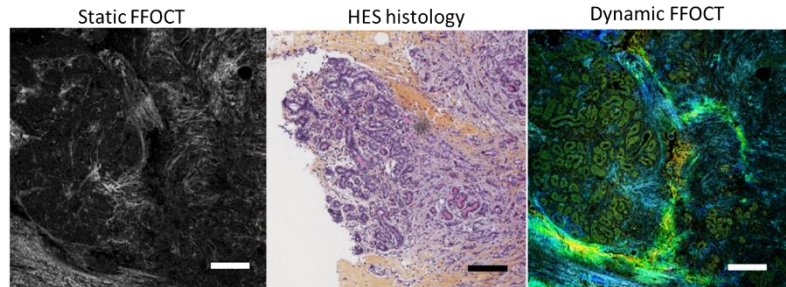


## Measuring cell motility in vivo by SO-FFOCT

Laboratoire ICube, Strasbourg, France

### Internship Subject

The IPP team of the ICube laboratory, located at the Civil Hospital of Strasbourg, is offering a project on the theme of 'Biomedical Optics.' The goal of the project will be to develop a new approach to measure cell motility (i.e. intracellular movement) using full-field OCT (FF-OCT), compatible with in vivo imaging.



Full-field OCT is an imaging technique that enables 3D microscopy in scattering media, such as biological tissues [1]. One of the most interesting applications of FF-OCT is intraoperative imaging, which allows providing images close to histopathological results in just a few minutes during surgery, without the need to prepare biopsies. This allows to perform diagnosis during surgery, without having to wait for histopathological analyses, whose results are typically available only after the surgery.

FF-OCT, combined with motility contrast, has recently shown excellent results, including a 100% correct diagnosis rate for breast cancer reported in 2020 [2]. However, conventional methods are limited to ex vivo samples, restricting their use to freshly excise biopsies performed during surgery.

To overcome these limitations, our team has developed a new approach of FF-OCT, enabling the reconstruction of a FF-OCT image from a single interferogram, allowing for in vivo full-field OCT imaging [3]. However, to achieve diagnostic precision equivalent to the one obtained with traditional FF-OCT, a new approach for cell motility contrast compatible with in vivo imaging still needs to be developed.

In practice, the first part of this project will involve familiarizing the student with algorithms for measuring cell motility in traditional FF-OCT. The second part will focus on adapting this approach for in vivo imaging. Additionally, the intern will have the opportunity to collaborate with our surgeon colleagues from the IHU and IRCAD in Strasbourg throughout the project, whose feedback will guide the development of a clinical-use-adapted approach.

Desired skills: To better approach this project, it is preferable that the student has initial skills in Matlab or Python programming.

If you are interested, feel free to contact Amir Nahas ([amir.nahas@unistra.fr](mailto:amir.nahas@unistra.fr))

## Références :

- [1] Dubois, A., Grieve, K., Moneron, G., Lecaque, R., Vabre, L., & Boccara, C. (2004). Ultrahigh-resolution full-field optical coherence tomography. *Applied Optics*, 43(14), 2874-2883.
- [2] Scholler, J., Mandache, D., Mathieu, M. C., Lakhdar, A. B., Darche, M., Monfort, T., ... & Thouvenin, O. (2023). Automatic diagnosis and classification of breast surgical samples with dynamic full-field OCT and machine learning. *Journal of Medical Imaging*, 10(3), 034504-034504.
- [3] Seromenho, E. M., Marmin, A., Facca, S., Bahlouli, N., Perrin, S., & Nahas, A. (2022). Single-shot off-axis full-field optical coherence tomography. *Applied Physics Letters*, 121(11), 113702.