Title: Corneal Transparency Diagnostics By Smart OCT and Deep Learning

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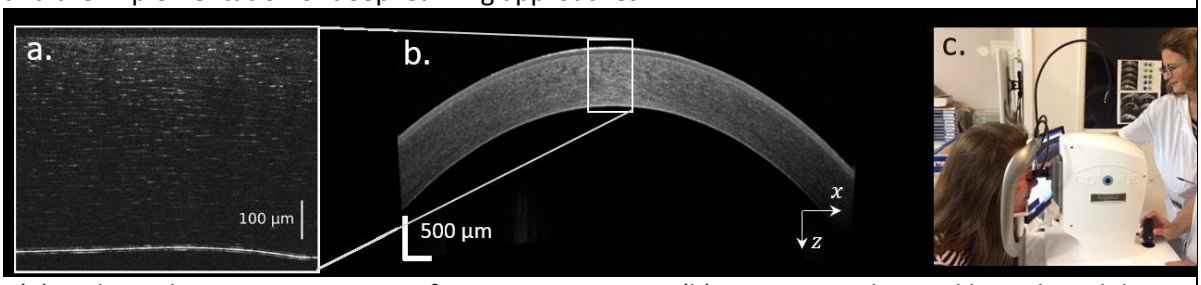
Research Area: Optics, Biophysics

Methods: optics of complex media, optical coherence tomography (OCT), deep learning

PhD track subject Our research focusses on cornea, which is the first lens of the eye. Different pathologies can disrupt its tissular structure causing a loss of its transparency. In close collaboration with the *Quinze-Vingts* national eye hospital, we study the measurement and diagnostics of corneal transparency using physical modelling, imaging, and data processing.
Future work in which the student may participate will address the extension of the approach to a full characterisation of the tissular quality by refined measurements, advanced tissular modelling, and the implementation of deep learning approaches.



(a) High resolution ex vivo image of a cornea specimen; (b) OCT image obtained by a clinical diagnostic device, (c) clinical OCT device available at Quinze-Vingts national eye hospital.

References:

Maurice DM, (1957), The structure and transparency of the cornea. The Journal of Physiology, 136 doi: 10.1113/jphysiol.1957.sp005758.

Plamann K, Aptel F, Arnold C, Courjaud A, Crotti C, Deloison F, Druon F, Georges P, Hanna M, Legeais J-M, Morin F, Mottay E, Nuzzo V, Peyrot D, Savoldelli M. (2010). Ultrashort pulse laser surgery of the cornea and the sclera. Journal of Optics. 12. 084002. 10.1088/2040-8978/12/8/084002.

Bocheux R, Pernot P, Borderie V, Plamann K, Irsch K (2019) Quantitative measures of corneal transparency, derived from objective analysis of depth-resolved corneal images, demonstrated with full-field optical coherence tomographic microscopy. PLoS ONE 14(8): e0221707. doi.org/10.1371/journal.pone.0221707