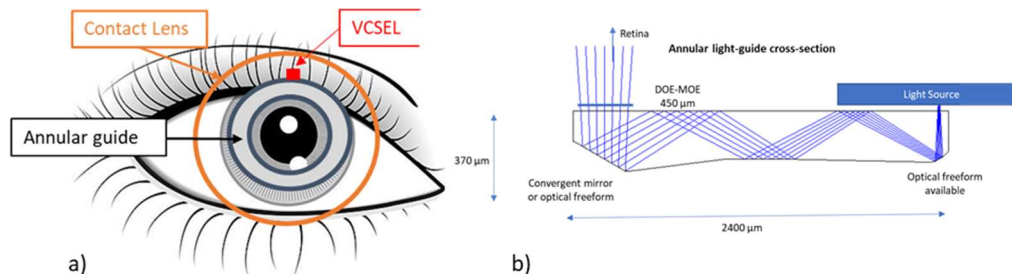


PhD subject: Integration of retinal imaging optics in an instrumented contact lens.

Context: the PhD student will reinforce a research team within the Optics department of IMT Atlantique collaborating with the Pittsburgh-based company Cylensee (www.cylensee.com), which designs and manufactures instrumented contact lenses for healthcare and professional applications linked to augmented reality. A PhD student is completing his thesis in this field, and the future PhD student will be working with him.

Scope of work: The heart of the device is a contact lens including at least one source (laser), combined with retinal projection optics located at the periphery of the pupil to avoid obstructing the visual field. This optic (see principle below) also includes a light guide, optional freeform corrective optics and diffractive or holographic optics, depending on the nature of the source and the intended projection mode. The volume and size constraints of the imager give rise to a number of optical problems that need to be solved as a whole. A significant part of the work will involve building a complete model (in Zemax) of the lens associated with the eye, in order to dimension the components and study and optimize the tolerancing of the assembly before manufacturing a prototype. The student will contribute to the development of a phantom eye and a radiometric measurement bench integrating the constraints of retinal imaging. These miniature optics will be manufactured using the Optics department's technological resources (clean rooms-Arago platform). These will be encapsulated in contact lenses and used to facilitate the development of Preferred Retinal Loci in the treatment of certain age-related macular degenerations, and the subsequent projection of icons for navigation assistance (as part of a collaboration with the Institut de la Vision (Paris) and in Pittsburgh, USA).



The student will be required to spend frequent periods in the USA, in Pittsburgh at the Vision Institute of the University of Pittsburgh Medical Center (UPMC) and at the Optics Institute of the University of Rochester (NY). This Cifre PhD will be an opportunity to join a multidisciplinary environment and gain experience in the optical design of miniaturized intra-ocular medical devices, for example for the treatment of retinopathy, made possible by the miniaturization of micro-optics, and the realization of meta-forms, in particular the design of freeforms in collaboration with CeFO in Rochester (Prof. J. Rolland). To do this, the candidate will need to combine solid knowledge of optics (instrumental and theoretical) with autonomy and curiosity. A good command of English is essential. Possible contacts: antoine.pielot@imt-atlantique.fr (IOGS 2021), currently completing a Cifre PhD in the Optics Department.

Skills required: optics engineer, proficiency in Matlab, Zemax, desirable.

Location: The thesis will be carried out at IMT-Atlantique (Brest campus), with frequent visits to Rochester.

Desired start date: October 2025.

Supervisor: JL de Bougrenet de la Tocnaye (jl.debougrenet@imt-atlantique.fr).