



Technology Opportunity, Ref. No. UZ-15/445

Multi-Immersion Microscope Objectives for Bioimaging

We offer a novel approach to design cost-efficient high-NA multi-immersion microscope objectives with long working distances. These objectives are especially well suited for deep imaging in cleared tissue, for example by multiphoton microscopy.

Keywords Optical design, microscope objective, tissue clearing

Inventors Dr. Fabian Voigt, Prof. Fritjof Helmchen

Background Over the past decade, there have been extensive developments of sample processing techniques to allow deeper imaging by tissue clearing. Samples processed with such techniques usually require mounting media with refractive indices between $n = 1.33$ (water) to $n = 1.56$ for organic solvents such as ethyl cinnamate (ECI). As a result, designing high-NA microscope objectives with long working distances that deliver excellent image quality for all immersion media is highly challenging and very few have reached the market, all of which are highly expensive (>15-20 k€).

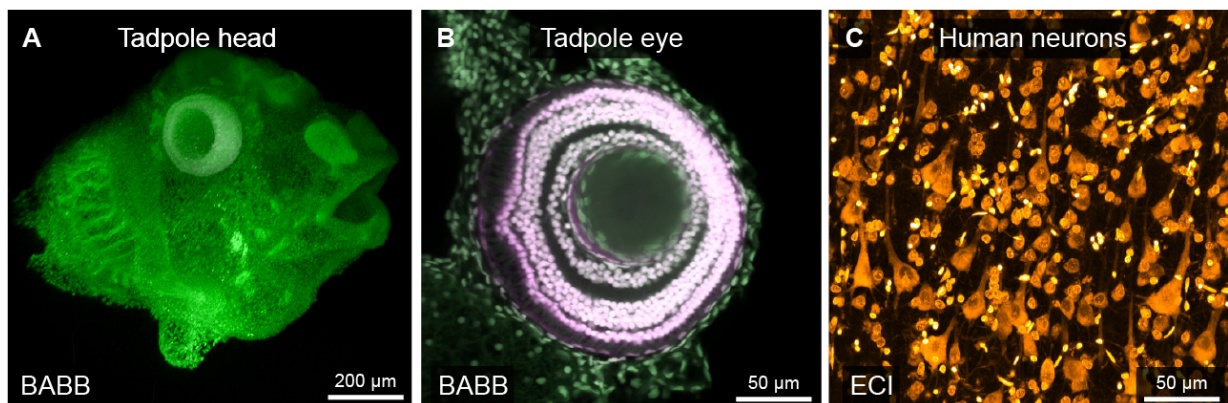


Figure 1: Example images taken with the multi-immersion objective: (A) 3D-rendering of nuclei in the head of a *Xenopus* tadpole stained with DAPI and cleared using BABB. (B) DAPI-stained nuclei in the developing eye of a *Xenopus* tadpole. (C) Neurons and glia labeled with Acridine Orange in the cortex of an ECI-cleared human brain.

Invention Through a clever combination of aspherical surfaces, we arrived at a design that combines an immersion chamber and high-NA imaging system into one device. Currently, realized prototypes operate as multiphoton objectives and achieve a maximum NA of 1.08 at $n = 1.56$. Adapting the design to other modalities such as confocal, light-sheet, and widefield microscopy is feasible as well.

Fields of Use Developmental biology, neuroscience, biophysics, cell biology, pathology, and many other fields.

Patent Status Patent filed

Contact *Unitectra, Technology Transfer University Zurich, Dr. Wolfgang Henggeler, Scheuchzerstrasse 21, CH-8006 Zürich, +41 44 634 44 01, mail@unitectra.ch*