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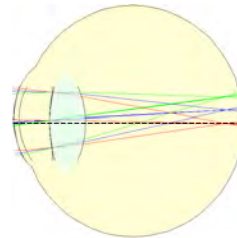


Research Cluster and Interests: Applied Optics Group

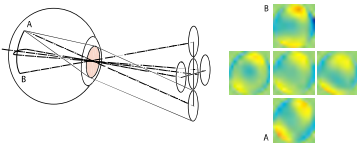
Keywords: Optical imaging, adaptive optics, 3D modeling of the human eye and vision correction

Research Interests

Observational astronomy has been the main driver in developing new ideas in adaptive optics since its inception and this continues today with current plans to build the 42m European Extremely Large Telescope. This creates very fertile ground for adjacent fields in optical imaging, where adaptive optics can be efficiently used such as medical and industrial applications. With a strong emphasis on visual science in the Applied Optics Group, ophthalmic adaptive optics has become a new area of research. We have a particular interest in developing new methods and techniques for high-resolution retinal imaging. Using adaptive optics one could compensate the optical errors introduced by the human eye. This technique has a great potential for various challenging problems in ophthalmology, including wide field imaging and vision correction.



Reconstructed eye model



Optical tomography in the human eye

In addition we have a research effort that is focused on 3D modeling of the optical structure of the eye and vision simulation for people with different quality of vision. This area is aimed at getting a better understanding of psychophysical nature of vision, the origin of ocular aberrations and finding new ways to improve vision by introducing new types of contact and intra-ocular lenses. Finally, the Applied Optics Group collaborates with several vision-related research groups and ophthalmic centres in Europe.

Selected Recent Publications:

A. V. Goncharov, M. Nowakowski, M. T. Sheehan, and C. Dainty, "Reconstruction of the optical system of the human eye with reverse ray-tracing," *Opt. Express* **16**, 1692-1703 (2008).
A.V. Goncharov and C. Dainty, "Chromatic Wide-Field Eye Models with a GRIN Lens," in *Frontiers in Optics*, OSA Technical Digest (CD) (Optical Society of America, 2008), paper FThG2.
A. V. Goncharov and C. Dainty, "Wide-field schematic eye models with gradient-index lens," *J. Opt. Soc. Am. A* **24**, 2157-2174 (2007).
A.V. Goncharov, A. Burvall, and C. Dainty, "Systematic design of an anastigmatic lens axicon," *Appl. Opt.* **46**, 6076-6080 (2007)