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## Development of a Dichoptic Chromatic Pupillometer

Chromatic pupillometry is a well-established method for assessing photoreceptor function across a wide spectrum of ophthalmic and neurological conditions. This work presents the integration of tailored light stimuli with advanced pupillary response assessments. To this end, we developed an innovative pupillometer, retinaWISE, designed to enhance pupillometric evaluations by enabling independent and simultaneous stimulation of both eyes. The system employs a dichoptic Maxwellian-view optical layout and delivers spectrally calibrated chromatic stimuli to each eye, while pupil dynamics are recorded in real-time using cameras arranged in a triangulation-based configuration. Dedicated stimulation protocols were designed and optimized to selectively activate rods, cones, and intrinsically photosensitive retinal ganglion cells (ipRGCs), while a robust pupil-tracking algorithm ensures reliable, high-quality data acquisition. The device generates chromatic stimuli via six custom LEDs covering the visible and near-infrared range (420–630 nm), provides a configurable retinal stimulation field of up to 35°, and enables adjustable retinal luminance across five orders of magnitude. Real-time pupillometry is achieved through 50 Hz imaging with 940 nm infrared illumination. Chromatic pupillometry continues to demonstrate strong potential for detecting and characterizing pupillary dysfunction associated with diverse pathologies. Ongoing clinical studies aim to validate its role in the early diagnosis and monitoring of neuro-ophthalmologic disorders. Preliminary results indicate that the combination of targeted chromatic stimulation and precise pupillary measurements offers a powerful framework for evaluating visual pathway function.

**Keywords:** Chromatic pupillometry, Retinal assessment, Selective Photoreceptor stimulation, Pupillary response.

**Biography**

Sébastien Buchwalder is the Head of Product at Oculox Technologies, where he leads the development of innovative ophthalmic diagnostic solutions. He has several years of experience in product/solution development, including roles in strategy and business development. He holds a PhD in Biomedical Engineering from the University of Bern, Switzerland, working previously on implantable barrier coatings in collaboration with industries.



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