Department of
Biomedical Engineering
UNIVERSITY OF WISCONSIN–MADISON

Fall 2019 Seminar Series

Hacking the Human Visual System

Austin Roorda, PhD
Professor of Optometry and Vision Science, University of California, Berkeley

Humans infer the luminance and color across a scene based on how the image of that scene excites the S, M and L cones on their retina. If we could hack the photoreceptor cells directly and control each individual cell's output signal over space and time, could we elicit identical visual experiences? Systems that combine adaptive optics, high-speed tracking, and precise aberration-corrected stimulus delivery allow us to do just that. I will describe our most recent system, its capabilities and applications. Specifically, I will focus on our most recent color vision studies, where we deliver carefully controlled micro-doses of green light stimulation to each cone across a field and are able to elicit visual percepts that span a spectrum of different colors.

The technology facilitates a host of new opportunities for understanding vision. For example, if we drove retinal sensory outputs in a dichromat that are consistent with trichromatic vision, would they experience trichromatic vision? If we drove sensory inputs in a trichromat that went beyond what natural scenes could produce, could we elicit color sensations never before experienced?

ABOUT the SPEAKER

Austin Roorda received his Ph.D from the University of Waterloo in 1996 with joint degrees in Vision Science & Physics. Since that time, Dr. Roorda has been pioneering applications of adaptive optics and ophthalmoscopy, including mapping of the human trichromatic cone mosaic while a postdoc at the University of Rochester, designing and building the first adaptive optics scanning laser ophthalmoscope (AOSLO) at the University of Houston, tracking and targeting light delivery to individual cones in the human eye at UC Berkeley, and being part of the first team to use AO imaging to monitor efficacy of a treatment to slow retinal degeneration. Since 2005, he's been at UC Berkeley where he is a member of the Vision Science, Bioengineering and Neuroscience graduate programs. He is a Fellow of the Optical Society of America, the Association for Research in Vision and Ophthalmology and the American Academy of Optometry. Notable awards are the Distinguished Alumni Award from the University of Waterloo School of Optometry (2007), the Glenn A. Fry Award from the American Academy of Optometry (2009), a John S. Guggenheim Fellowship (2014) and an Alcon Research Institute Award (2016).

Monday, September 23
12 PM in Tong Auditorium (1003 Engineering Centers)