An Alternative Method to Classify Cones in the Living Human Eye

Christy Sheehy

University of Rochester, Rochester, NY
Principle Investigator: David Williams
Research Supervisor: Li Chen and Joe Carroll
Home Institution: University of Rochester

Color vision depends on three different classes of cones: the short- (S), middle- (M), and long (L)- wavelength cones, each sensitive to a different portion of the visible spectrum. High resolution retinal imaging with adaptive optics combined with retinal densitometry makes it possible to resolve individual cones in the living human eye and to identify the type of photopigment in each cone. This type of retinal imaging is important because it helps us to further examine retinal diseases and the potential for improving human vision. The current method of retinal imaging has relied on comparing sequential images of the cones taken one at a time with a single CCD camera. Unfortunately, the reflectivity of cones changes dramatically in time, and these changes make it difficult to identify the pigment in each cone with certainty. This change in reflectivity has limited characterization of the trichromatic cone mosaic to the fovea, where the cones are long and contain large amounts of photopigment. This reveals the need to develop a quicker and more accurate way to identify cones by simultaneously imaging them with two CCD cameras, each sensitive to a different wavelength range. A quantitative description of the spectral performance of this new system has been developed. This predicts the differential reflectance of L and M cones for comparison with experimental observations. The alternative method will be used to examine for the first time the topography of the three cone classes in human peripheral retina.