

Beating the Diffraction Limit in Retinal Imaging Using Structural Illumination

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There are two things that hinder the image quality in retinal imaging in vivo. The first is aberrations, which can be compensated for with Adaptive Optics. The second is diffraction, which there is no way around. Even with perfect optics, the diffraction limit is a seemingly ironclad barrier. An imaging technique called structured illumination can beat the diffraction limit, and when combined with Adaptive Optics, can give us a super resolution image of the retina. When you impose a high frequency grating on the retina, a low frequency moiré pattern will result which contains high frequency information about the image. This moiré pattern has been shown through psychophysical experiments only and has never been captured as an image. This experiment will try to imprint a high frequency grating onto the retina and capture the resulting moiré pattern. If this is successful, the moiré image can be processed for a higher frequency image and produce a super resolution image. This can be helpful in the future for taking high quality images of the central foveal cones.



Li Wei is currently a freshman at Monroe Community College. His major is Mathematics and he is particularly interested in its applications to all sciences. He hopes to obtain at least a Masters degree in mathematics and build mathematical models of various things in science. Li works as a chemistry lab assistant and a math and physics tutor at Monroe Community College. In his spare time, he likes to play soccer, tennis and ski.