

# **Undergraduate Mathematics Colloquium**

**Casey Douglas**  
St. Mary's College / Rice

**“Non-Euclidean Photography”**  
**Or, How Best To Redirect Bent Light**

**Friday March 23**

Talk at 4:00 in Herman Brown 227

Tea & cookies at 3:30 in Herman Brown 438

ABSTRACT: Technological advances have made it easy for everyone to produce photographs featuring large fields of view: one need only activate a smart phone's "panoramic" setting and click. Optical engineers have spent the past few decades studying related problems, only their approach has (largely) focused on stationary cameras combined with curved mirrors. These camera-mirror pairs are used to produce similarly informative pictures by redirecting large collections of light-rays in desirable ways. In this talk we will review such applications and methods, keeping an eye on opportunities for meaningful generalization. How do our photographs depend on the presumed behavior of light rays? What geometric information can be recovered or even redefined by means of these optical experiments? Under what conditions, if any, can we take a "perfect photograph?"

This talk will be most accessible to those familiar with some multivariable calculus. Some concepts from Differential and Riemannian Geometry will be introduced along the way, but no knowledge of either subject is presumed or needed.

**Rice University Department of Mathematics**