## 

WESLEYAN UNIVERSITY

# SUMMER RESEARCH POSTER SESSION

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Poster Title: If You Give the Sun a Telescope: Imaging Alien Earths with Einstein Rings as Seen by the Solar Gravitational Lens

Abstract: Contemporary methods of directly imaging exoplanets have yielded the first images of their kind, though none have yet allowed humanity to view the surface of an alien world. Resolving the fine structure of objects as small and distant as exoplanets requires a telescope the proportions of which current technology is incapable of producing. One solution, a telescope concept known as the Solar Gravitational Lens (SGL), consists of a modest optical telescope aligned with the Sun at a heliocentric distance of ~550au. When a target exoplanet is aligned in syzygy with the SGL, it will produce a perfect Einstein ring about the Sun — contained within this distorted image will be high-resolution optical and spectroscopic data from the planet’s surface and atmosphere.Though the geometrical and optical and properties of the SGL have been well-determined in the literature, no method has yet been presented for reconstructing source images from the Einstein rings the SGL will produce. Here we present SunTracer, a general-relativistic lensing simulation which produces images with the same properties as the SGL, meant to provide a means of generating a set of test images for a forthcoming reconstruction method. Creating such a set of images is an important first step towards solving the problem of deconvolution, as the pristine alignment conditions required of the SGL result in a relatively constrained parameter space. These conditions are too perfect to have been observed naturally, thus no astronomical images yet exist that could serve as realistic test data for SGL reconstruction. We anticipate that SunTracer will aid our own future work in this area.