Abstract: Finding and characterizing habitable planets outside our solar system is a key goal in exoplanet science. Ensuring a confirmed detection of such a planet relies on not only observing signals consistent with such a world, but also ensuring that that apparent signatures of habitability are not due to other sources. Space telescopes such as that recommended by NASA’s 2020 Astrophysics Decadal Survey have a diffraction-limited resolution that effectively spreads light from a source in a region around the source point. This diffraction limit of a 6 m space telescope results in a point-spread function of an Earth-like planet that may contain additional unanticipated bodies for systems at distances relevant to searches for Earth twins [1]. These unexpected objects include other planets and moons and can influence obtained spectra for a putative habitable planet by producing spurious features and increasing uncertainty to the spectra. I’ll discuss a model of Earth observed by a 6 m space telescope as though it was an exoplanet and how light from the Earth would be blended with the Moon, Mercury, Venus, and Mars in various combinations and at different times for numerous combinations of distance to the system and wavelength. I’ll also discuss how such an effect may be an even more significant issue when system inclination is considered. Given the high priority of extricating the true spectra of a potentially habitable planet to search for biosignatures, I’ll highlight the need to account for this effect during the development of relevant telescopes and suggest some potential means of accounting for this photobombing effect.

References: