

"Spatially Resolved Spectroscopy of Galaxies in the Early Universe Using Adaptive Optics"

Recent advances in diffraction-limited techniques on 8-10m telescopes using adaptive optics (AO) and integral field spectrographs (IFS) have led to significant scientific achievements and are stimulating the design of future instrumentation. My talk will focus on development and use of current near-infrared AO instruments to study galaxies in the early universe, as well as the design and capabilities of AO instrumentation for the future Thirty Meter Telescope (TMT). I will present our team's work on the recent upgrade of OSIRIS at Keck Observatory, which has doubled the sensitivity of the IFS. With this gain in performance, I will present preliminary results of our spatially resolved observations of intermediate redshift ($z \sim 1$) star forming galaxies. I will also present a powerful method that utilizes IFS and AO observations to reveal high-redshift QSO host galaxies. Lastly, IRIS (InfraRed Imaging Spectrograph) is a near-infrared instrument being designed to sample the diffraction-limit of the Thirty Meter Telescope, which will yield revolutionary capabilities on a range of science cases. There are several instrumental and observational challenges that need to be overcome in order to exploit the diffraction-limit of a 30m telescope. I will discuss IRIS's instrument design, diverse science cases, and our current efforts in the laboratory to maximize the instrument's sensitivities.