

Next Generation Science using Adaptive Optics



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Current ground-based optical observatories use adaptive optics (AO) to overcome the effects of Earth's turbulent atmosphere. The development of these systems has taken decades of research, culminating in the ability to undertake diffraction-limited science at infrared wavelengths from the ground. While traditionally focused on imaging, this capability is now beginning to be used for spectroscopy which offers the possibility of new instrument designs, additional observing capabilities and the ability to study previously unexplored parameter spaces.

I will present *iLocator*, an AO-fed spectrograph under development at Notre Dame for the Large Binocular Telescope, AZ, USA. The instrument will obtain precision near-infrared (NIR) radial velocity measurements of stars in the night sky in search of exoplanet signatures. Adaptive optics allows *iLocator* to use small, single-mode optical fibers to illuminate the instrument spectrograph, overcoming intrinsic effects which limit the current generation of instruments. The unique design and capabilities of *iLocator* will advance the exoplanet field by delivering simultaneous high-spatial and high-spectral resolution observations.

All AO-fed instruments, whether imaging or spectroscopy, are limited by the performance of the adaptive optics system which feeds them. While current adaptive optics systems have delivered significant scientific breakthroughs, these systems have not yet reached the theoretical limit of their capabilities. I will discuss strategies to overcome their limitations, both in the context of *iLocator* and more generally, including optimization of AO systems, improved wavefront sensing techniques and combining AO with other correction techniques. Together, these strategies will offer enhanced scientific capabilities for ground-based astronomical instruments which will be particularly important for maximizing the scientific output from the next generation Extremely Large Telescopes (ELTs).

Wednesday

March 29

4:00 P.M.

Rm 118 NSH

Refreshments
in Rm 202 NSH
@ 3:30 pm