Laboratory Activity Descriptions

The CfAO Summer School includes laboratory activities produced with support from the Laboratory for Adaptive Optics and the Center for Adaptive Optics / Institute for Scientist and Engineer Educators (ISEE) Professional Development Program. The activities are staffed with instructors from several institutions associated with the Center for Adaptive Optics. The three activities are described below.

Adaptive Optics Demonstrator

We have three similar Adaptive Optics Demonstrators; each one is a stand-alone, self-contained adaptive optics system that corrects a dynamic input laser at 30 Hz with a 37-actuator deformable mirror. Guided by an 8x8 Shack-Hartmann sensor, the AO Demonstrator is robust to misalignment and permits easy user interaction. In this activity, students will learn basic optical alignment techniques by realigning several of the AO Demonstrator's components. Following realignment, the students will interact with the graphical user interface (GUI) to calibrate the system and run it closed-loop.

Staff: Rosalie McGurk (lead) – UC Santa Cruz
Marc Reinig – UC Santa Cruz
Srikar Srinath – UC Santa Cruz

Vision Science Activity

The quality of retinal imaging in the living eye can be greatly improved by the use of adaptive optics. This activity will provide participants with first-hand experience of the eye's imperfections that can be corrected by adaptive optics. The Zernike polynomial description of the wavefront aberrations and the corresponding point spread functions will be used to explore the relationships among Zernike order, pupil size, and image quality. We will also investigate the variability of ocular quality in people, some of whom may have had refractive surgery.

Staff: Christy Sheehy (lead) – UC Berkeley
Laura Green – UC Riverside
Will Tuten – UC Berkeley

Wavefront Sensor Activity

This activity enables students to design and construct various types of wavefront sensors using a tabletop optical setup consisting of a computer-controlled detector illuminated by a laser source. You will work in small groups to design and align your system, and then introduce aberrations and corrections into the light path. In the process of building your setup, you will be considering plane conjugation and other concepts from geometric and Fourier optics.

Staff: Anne Medling (lead) – UC Santa Cruz
Rachel Rampy – UC Santa Cruz
Kerri Cahoy – MIT