LAB 4: DUE FEBRUARY 27TH

ADAPTIVE OPTICS

SEEING AND AIRY DISK

- Fluctuations in our atmosphere can cause light coming from space to diffract (seeing).

- This can cause images to become distorted and blurry.

- Point sources, such as stars, are perceived as airy disks when looking through a single circular aperture.
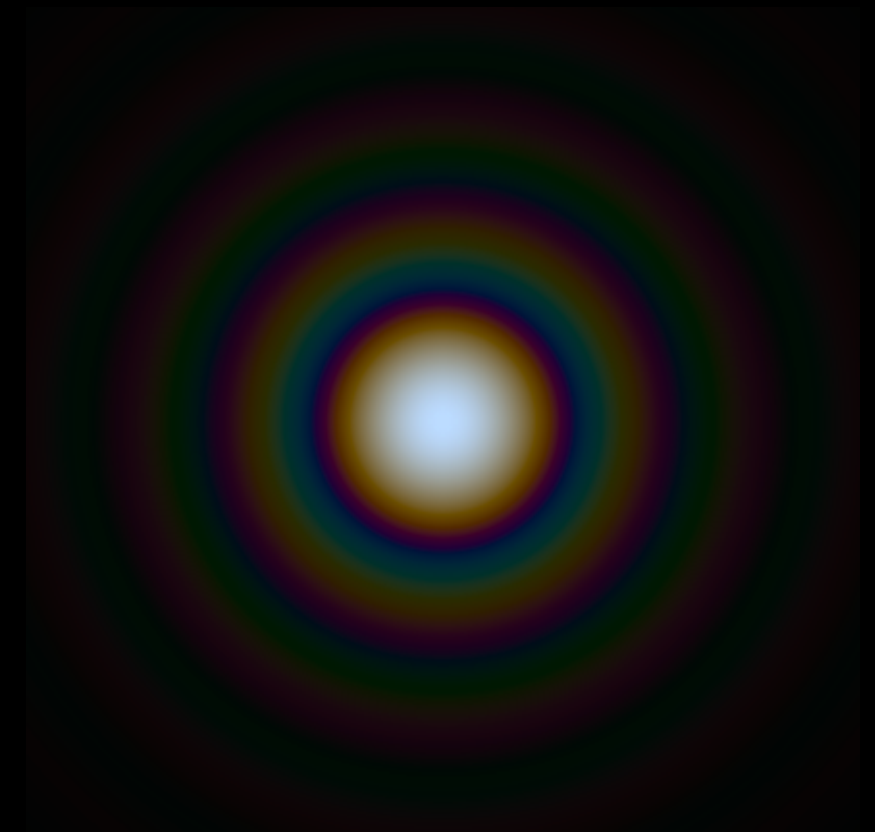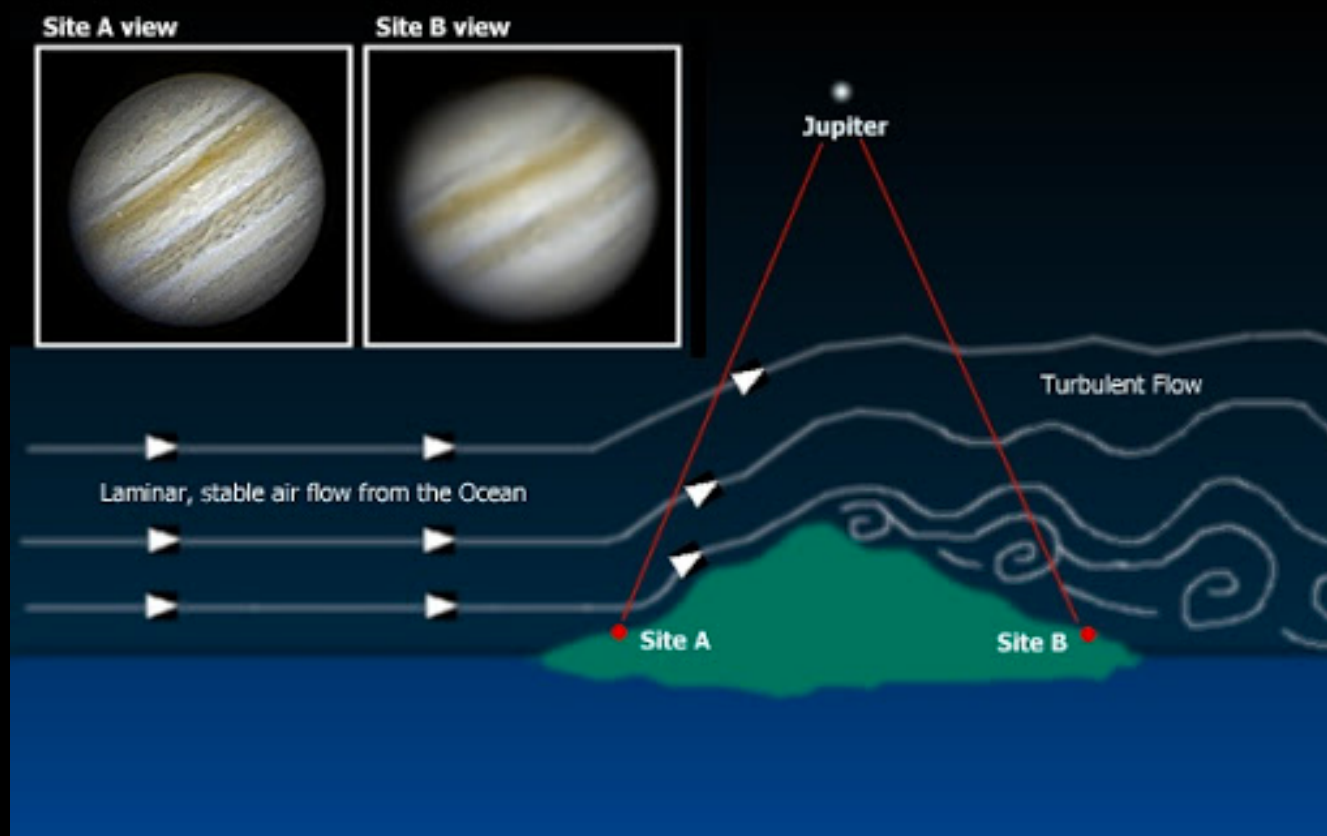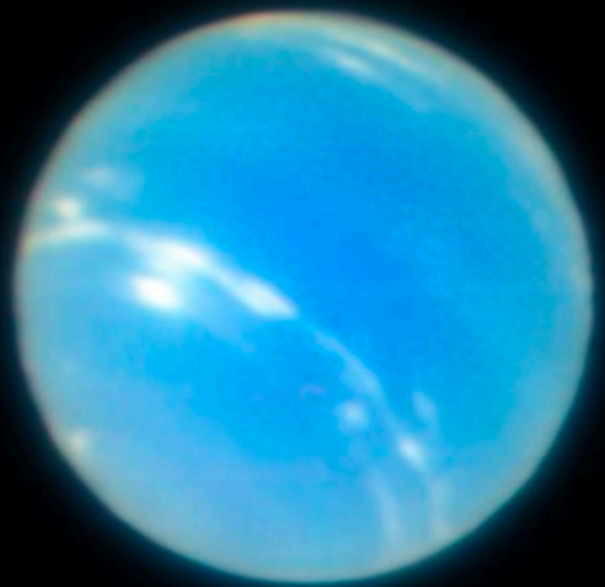
ADAPTIVE OPTICS

- To mitigate distortion, a deformable mirror is used.

- This mirror changes shape based on distorted light waves.

- When light reflects off of the mirror, the distortion is corrected.
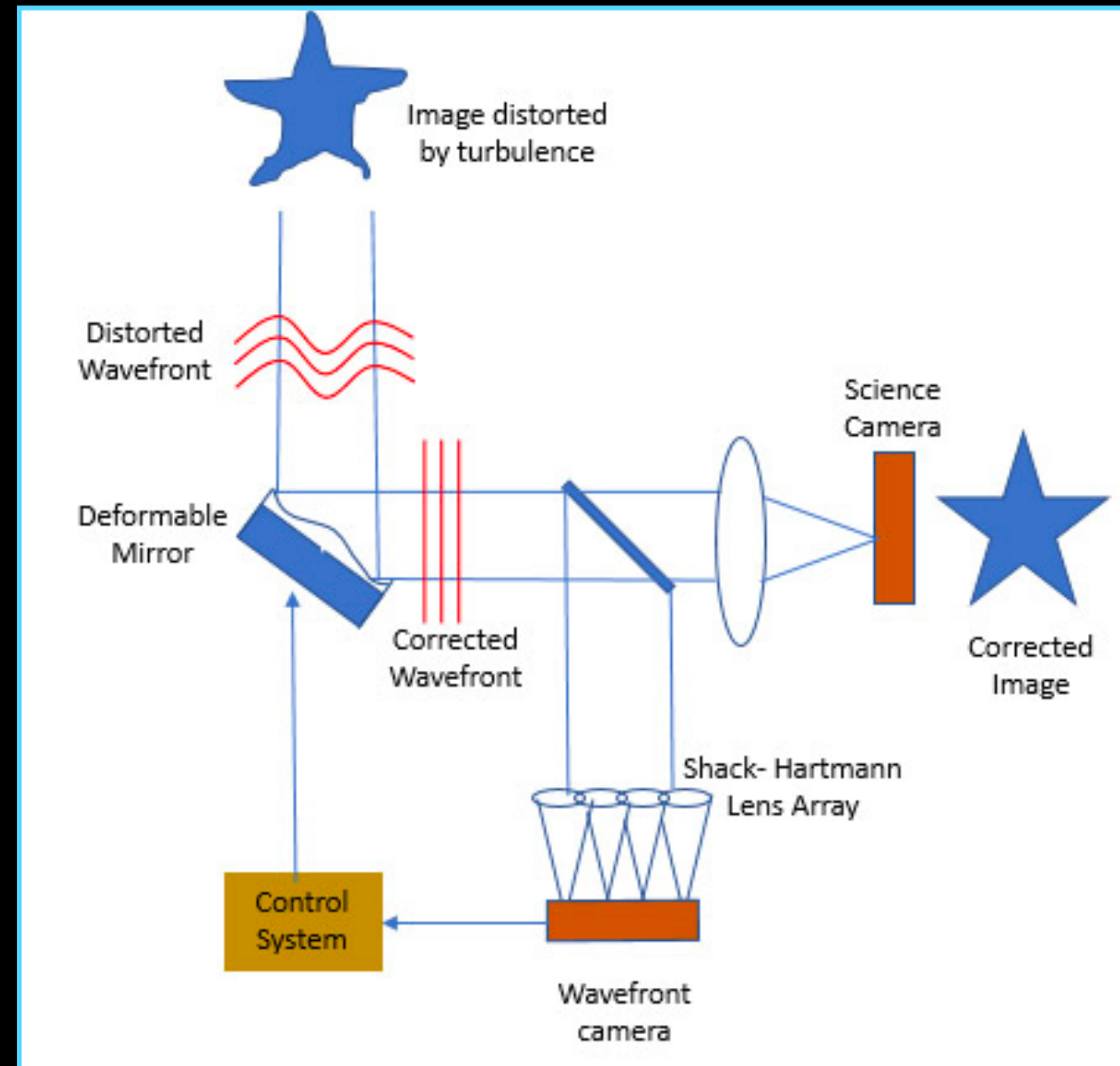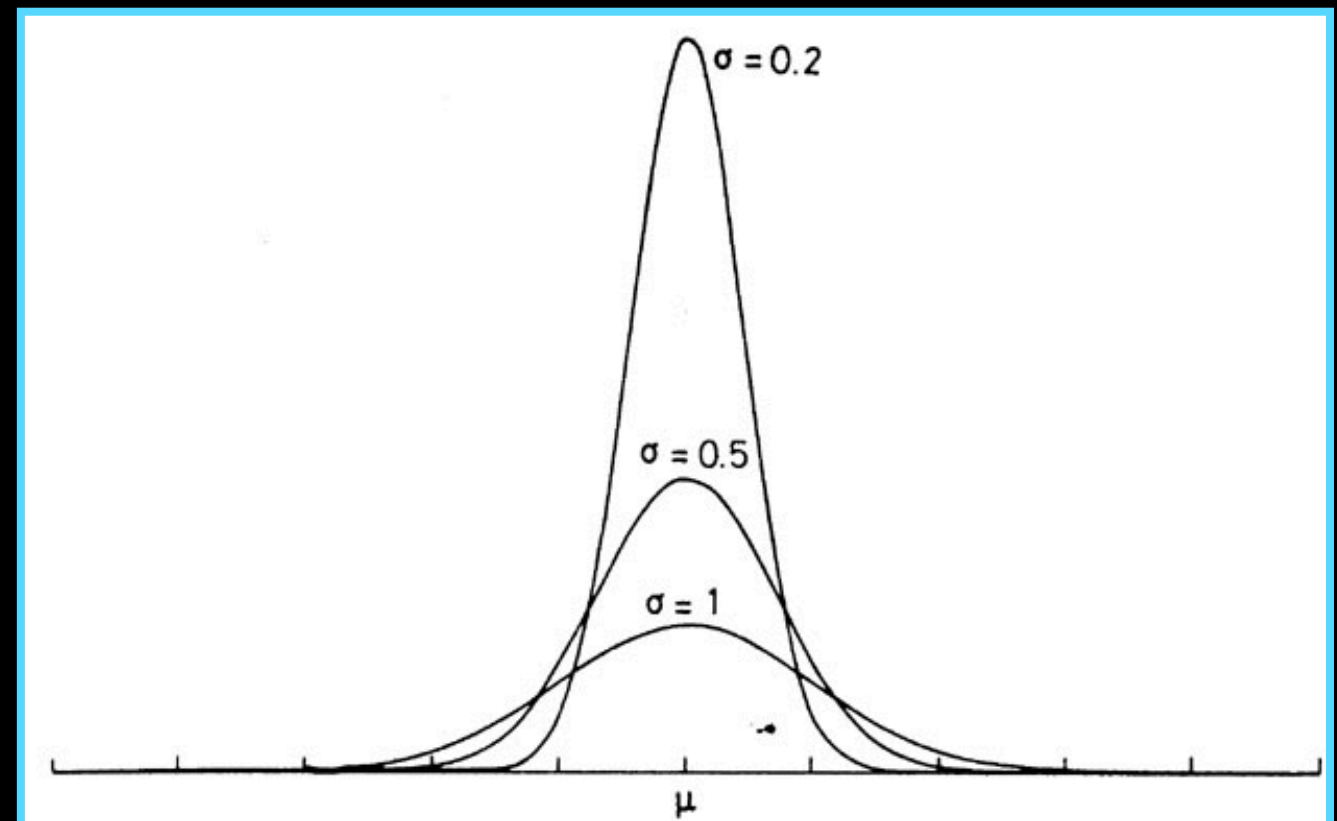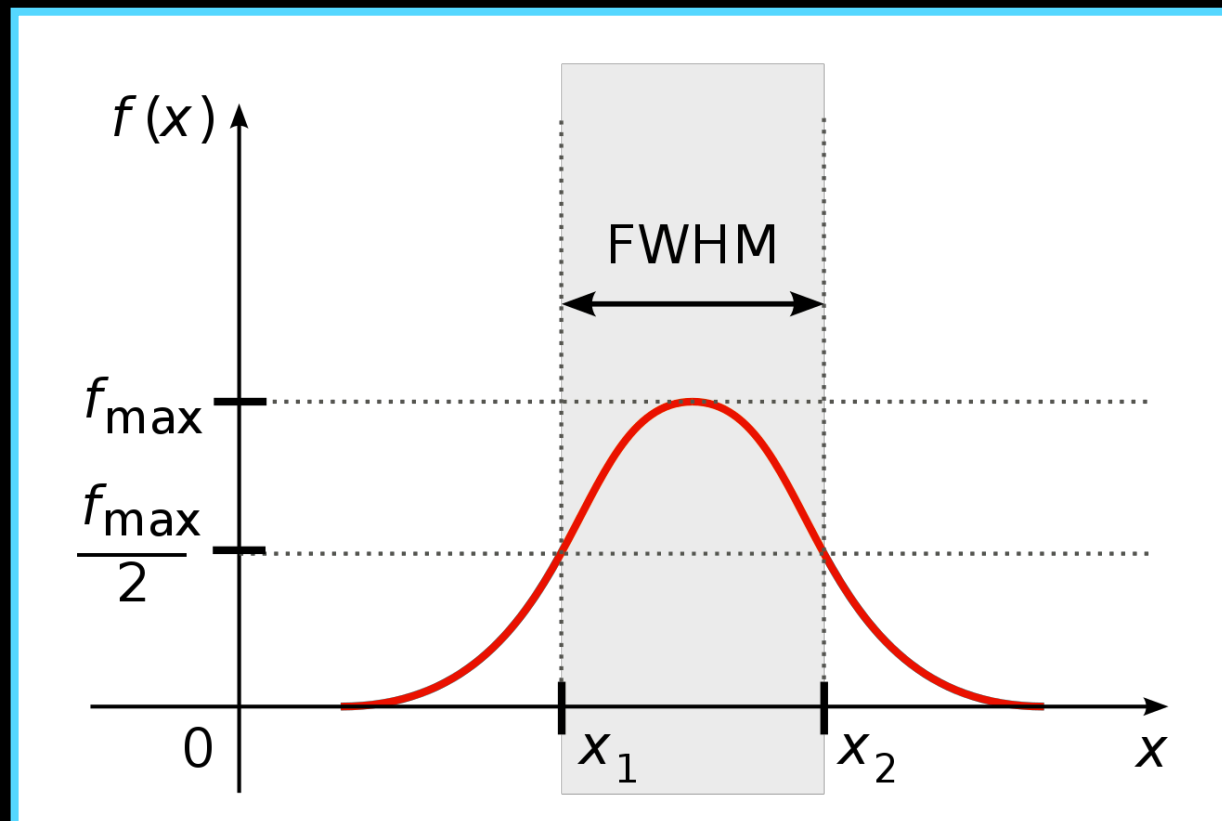
ADAPTIVE OPTICS

Adaptive optics

No Adaptive optics

GAUSSIAN AND FWHM

- The brightness profile of a star resembles a gaussian distribution.

- The width of the gaussian is called the full width half max (FWHM).

- A smaller FWHM = a gaussian that is less wide and has a higher peak.

- Better resolved stars will have a smaller FWHM.

ANGULAR RESOLUTION

- Tells us the limit a telescope can resolve two close objects.

- Is related to the FWHM.

- The smaller theta is the better you can resolve.

$$\theta = \frac{1.22\lambda}{d}$$

STREHL RATIO

- The Strehl ratio compares the observed peak brightness and the theoretical peak brightness (w/o an atmosphere).

- Is used to compare the performance of AO systems.

$$\text{Strehl Ratio} = \frac{Peak_{f_{obs}}}{Peak_{f_{th}}}$$

FOR THIS LAB

- **First:** We will be finishing optics lab with Ramsden Eyepiece. We will then look at an AO demonstration.

- **Second:** Will again be using a Python notebook.

  1. Log into Syzygy and upload materials. Check available space in your home directory beforehand!

  2. Go through notebook to understand process and importance of AO.

  3. Answer questions in Lab manual.