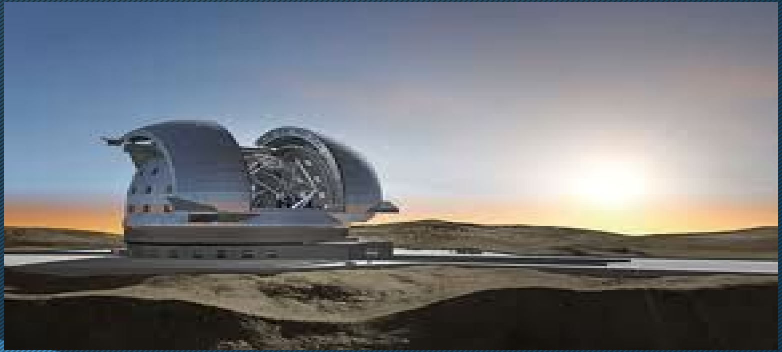
Topic 4: Bigger and smarter telescopes

Most astronomers today use spectroscopy to examine stars and determine their composition.

In order to collect enough light though, astronomers have had to build bigger and bigger telescopes.



Bigger telescopes can help us to find new objects further away.

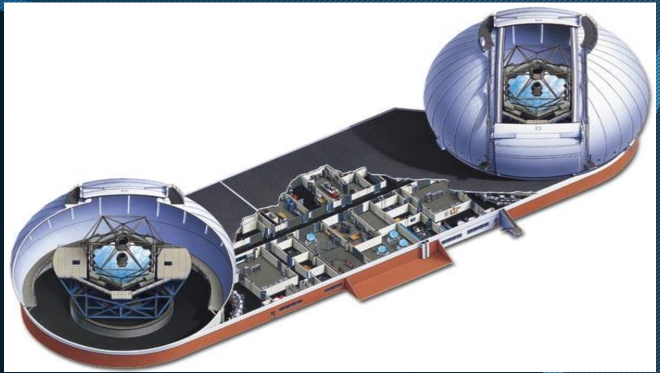
In 1773, using newer and larger telescopes, astronomers were able to discover Uranus.

Combining Telescopes

-Newer telescopes use powerful computers which can take images from two or more telescopes and combine them.

This creates the equivalent of one telescope the size of the total distance between the two.

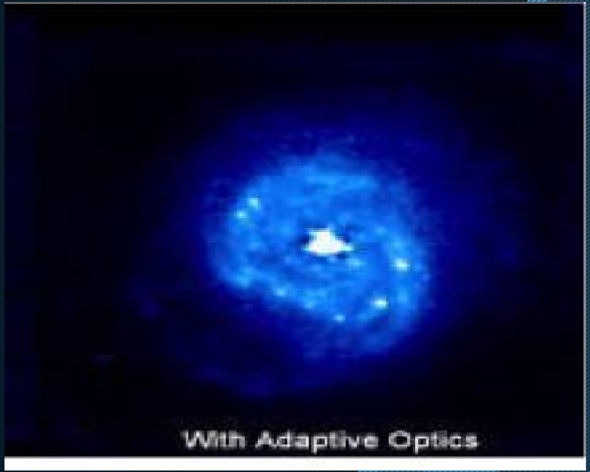
This is called: interferometry



★★★★★★★★★★

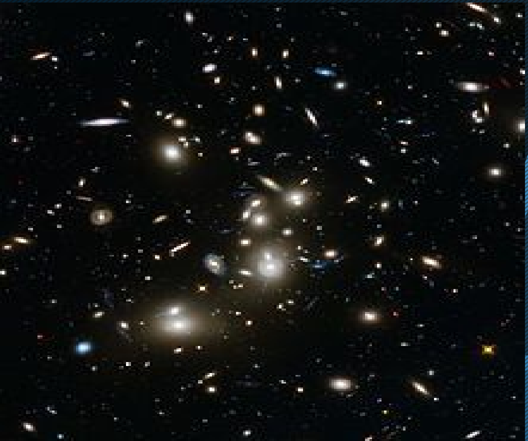
The Keck Telescope in Hawaii. Combing their images together has a resolving power that is able to distinguish each headlight on a car 800km away!

★★★★★★★★★★



Adaptive Optics

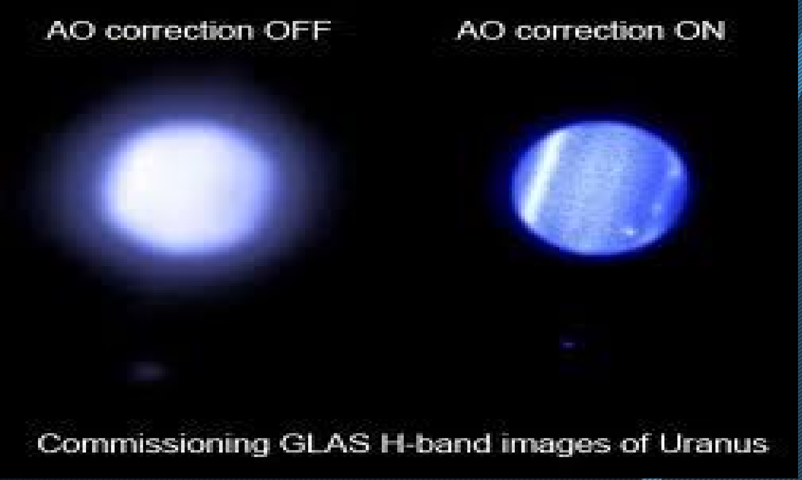
The stars twinkle because Earth's atmosphere refracts and distorts the light they produce



There are two ways to fix this distortion:

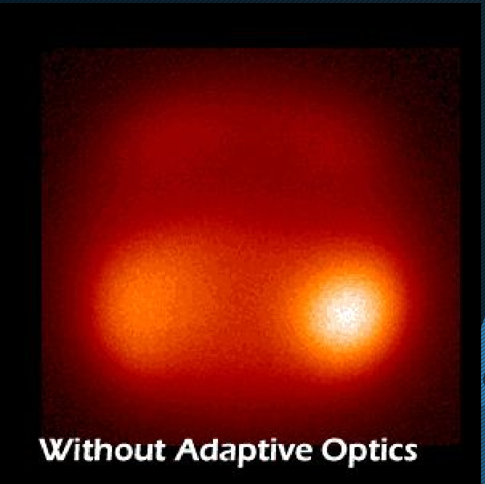
1. Space telescope (ex. Hubble)

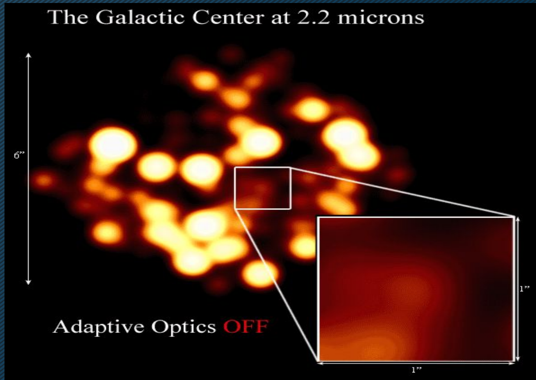
-if a telescope is above the atmosphere, then it doesn't have to worry about the distortion caused by the moving atmosphere

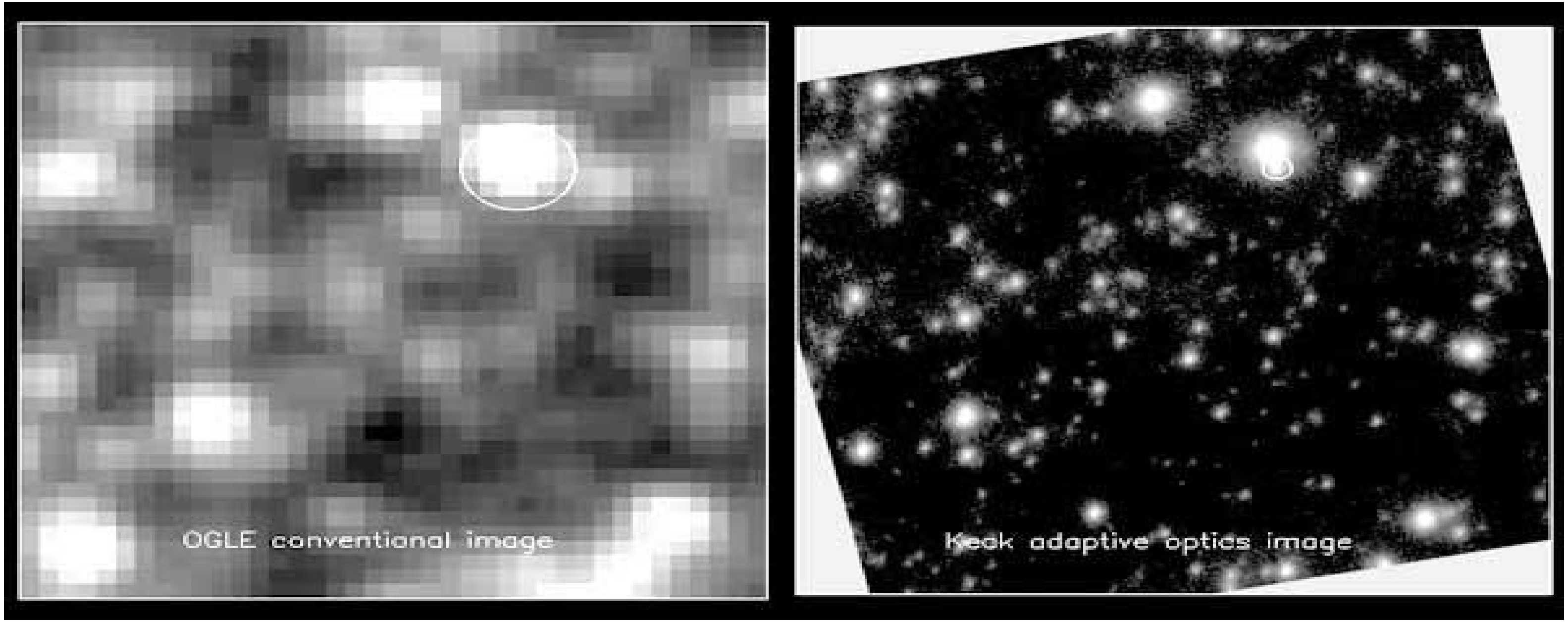


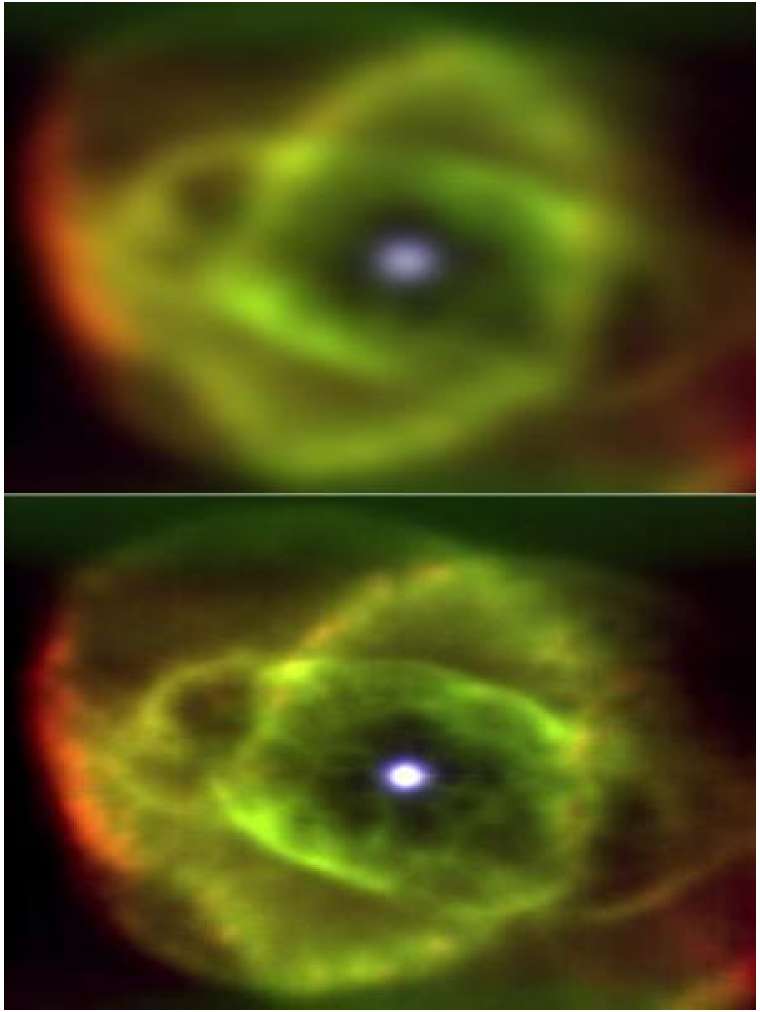
2. Adaptive optics

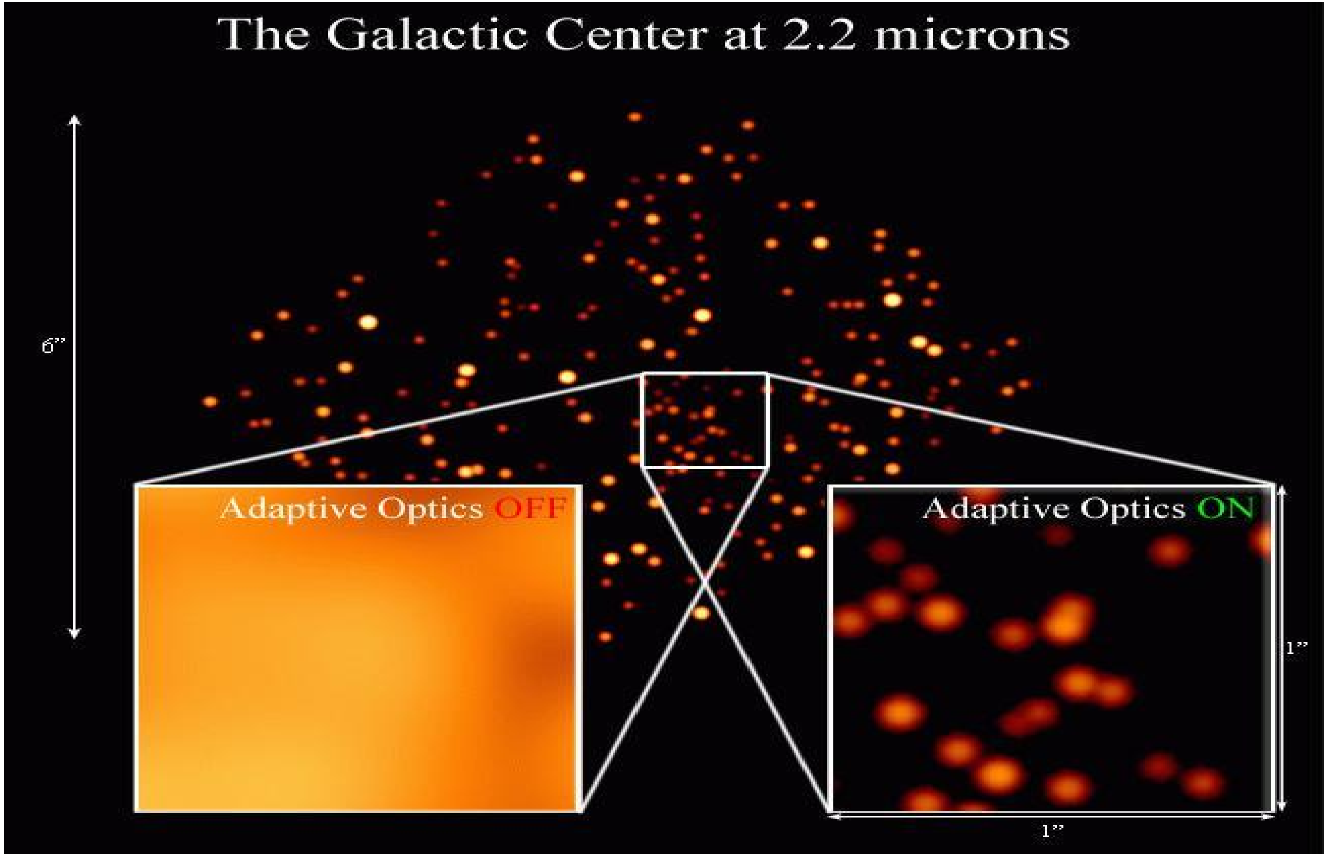
Using a computer to focus an image and make up for distortions caused by the atmosphere

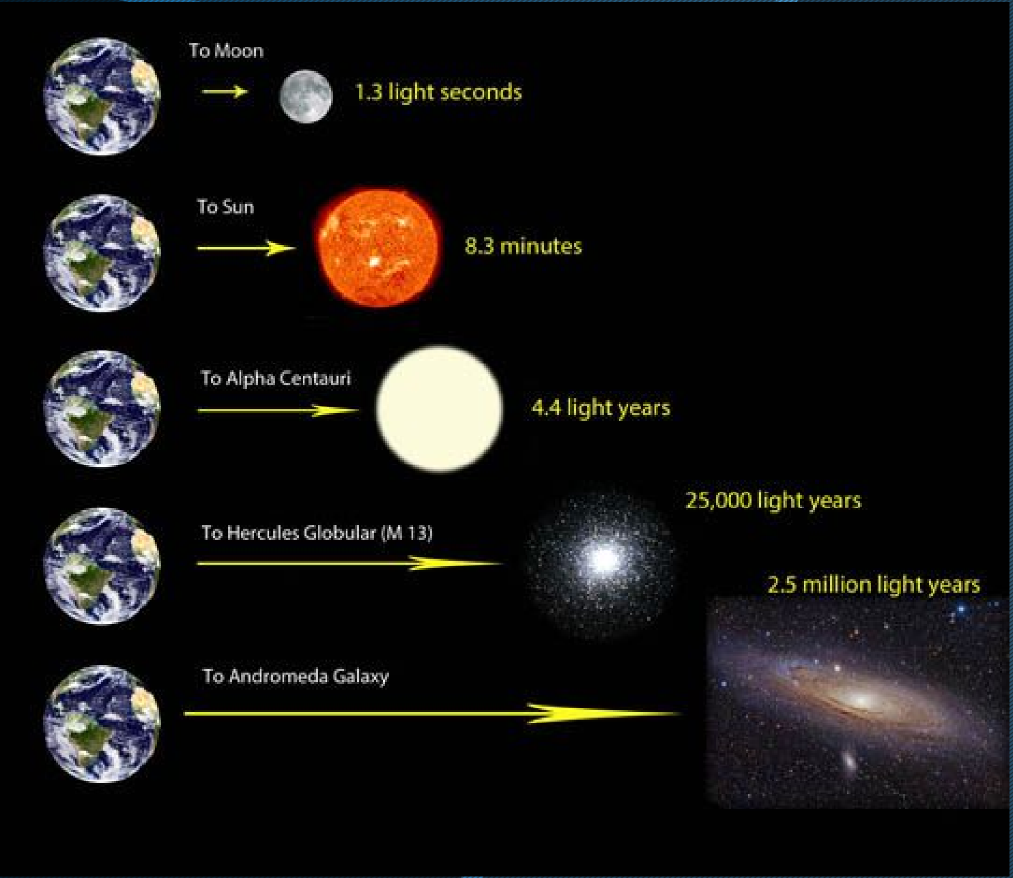





OGLE conventional image
Keck adaptive optics image




The Galactic Center at 2.2 microns
6”
Adaptive Optics OFF
Adaptive Optics ON
1”
1”



Since the distance between stars is so large, we have to use different units to represent how far away everything is

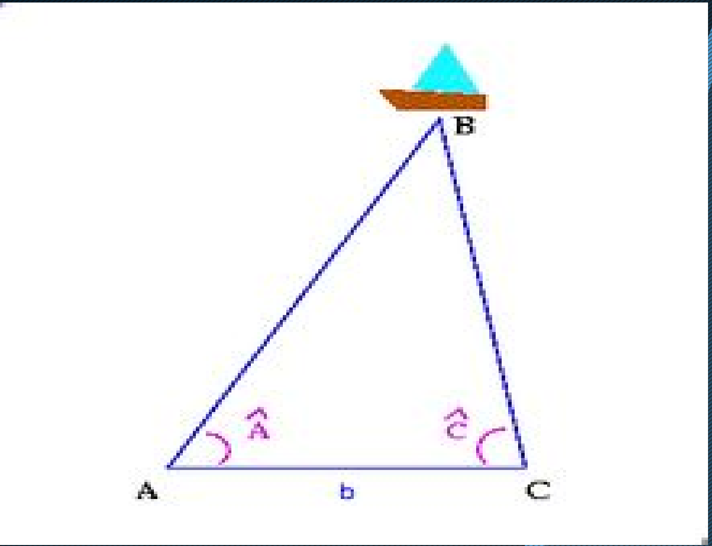
We use light years (the distance light can travel in a year) and Astronomical Units (AU: The distance from the Earth to the sun)

Distance to the stars:

- By using a distance you know, you can calculate an unknown distance.

One of the most common ways of doing this is called Triangulation

(aka **parallax technique**)



→ The longer the baseline- the more accurate the results