Bell ringer Day #6

Does light travel instantly? What does this mean for us?

Telescopes

Astronomers are observers—hardly get to experiment

- Space is a big space, things are far away.
- Observe ALL wavelengths of EM spectrum
  \[\text{R} \rightarrow \text{M} \rightarrow \text{IR} \rightarrow \text{VIS} \rightarrow \text{UV} \rightarrow \text{X} \rightarrow \text{G} \rightarrow \text{LIGO}\]
- Collecting light (EM) more important than magnification (CCD)
Reflecting Telescope

![Diagram of a reflecting telescope]

Mirror → Focal Point

Refraacting Telescope

Visible Light → Bending

Lens (eye) → Focal Point

Problems on Earth:

Light Pollution
- Lights from cities, etc... makes the sky bright.

Particulate Pollution
- $\text{SO}_2$ and such in air that diffuse light.

Seeing
- Turbulence in the air
  - $\text{H}_2\text{O}$
  - $\text{CO}_2$
  - $\text{SO}_2$
  - $\text{O}_3$
Webquest: Telescopes

Galileo’s Era:
1609–1610 years ago. He was the first to use mirrors on the moons and that was when they could be turned. He looked the boat: the Catholic Church did not like the idea that the celestial spheres were not perfect (especially the moon).

Early Reflectors:
Kapler went back to improve telescopes. Encountered a problem called spherical aberration, which meant that these telescopes needed to be larger than practical.

Great Reflectors:
Nineteen found the spherical aberration problem but glass naturally has imperfections. The first telescopes used with photography, however a huge limit to how big they can be.

Newton’s Era:
These telescopes had little aberration and were smaller. They were made with mirrors. However these were a problem with likely images. Also this does not get very bright and will finish easily.

Early Reflectors:
Ended spherical aberration forever! However they were limited by the size of the mirror (need to make good mirrors big).

Huge Reflectors:
New mirrors were used bigger and better. New location needed, had to deal with light pollution. Could use these with photography and get longer exposure times, meaning you could see fainter objects (those not visible to our eyes).

Radii:
These allowed astronomers to observe all day! Many new objects could be studied, and could study the composition of these objects.

Sides:
See features on the sun. Magnifying is more important than light gathering (not true of any other telescope).

Multi-Mirrors:
Much easier than one big mirror. Coupled with a CCD device can measure the intensity of the light.

Space:
All the problems with the atmosphere (weather and dusting effects) are no longer a problem. Can look at all wavelengths (those that are blocked by the atmosphere, like X-ray and Gamma ray).