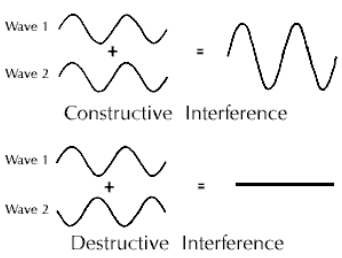
Interferometry

- When two waves (sound, light, seismic, ocean, etc.) come to the same place and time → **interference**
- The technique of **interferometry** uses interference phenomena for measurement purposes, either for small angles or for tiny distance increments.

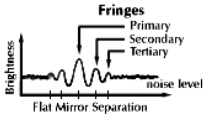


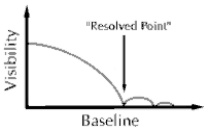
- An **interferometer** is a device to make such measurements.

http://sim.jpl.nasa.gov/interferometry/Demo/simford7.htm

Challenges of Inteferometry

- Fringes on length scales of wavelengths
  - → precise measurements (laser metrology)
  - → sensitive to vibration, movement, thermal expansion
- Starlight not monochromatic
  - → interference smeared out





http://www.space.com/scienceastronomy/astronomy/interferometry_101.html

Interferometry in Astronomy

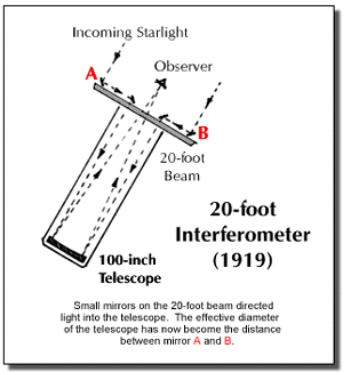
- Michelson was the first American to be awarded the Nobel Prize in Physics in 1907. Michelson was also the first to apply interferometry to astronomy.

(From left) Albert Michelson, Albert Einstein, Robert A. Millikan on the Caltech campus in Pasadena.

http://sim.jpl.nasa.gov/interferometry/

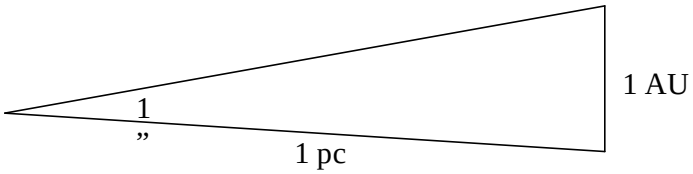
Michelson Stellar Interferometry

The 20-foot beam on top of the 100-inch Hooker Telescope on Mt. Wilson in Southern California.

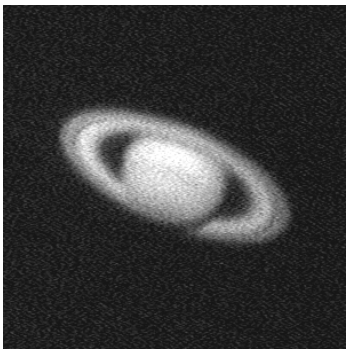


➔ angular diameter of Betelgeuse

AB=Effective diameter

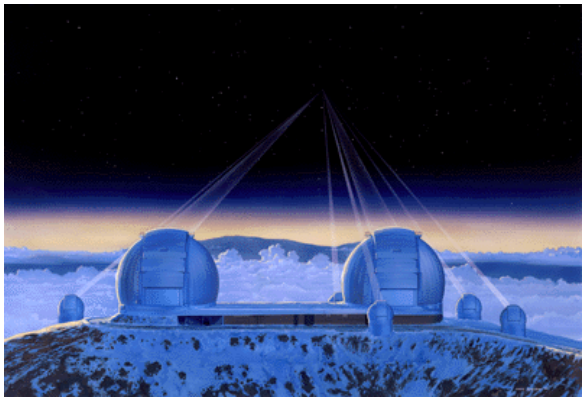


Q: $R_\odot \sim 7 \times 10^8$ m, so…..what is the approximate angular size of a nearby star?

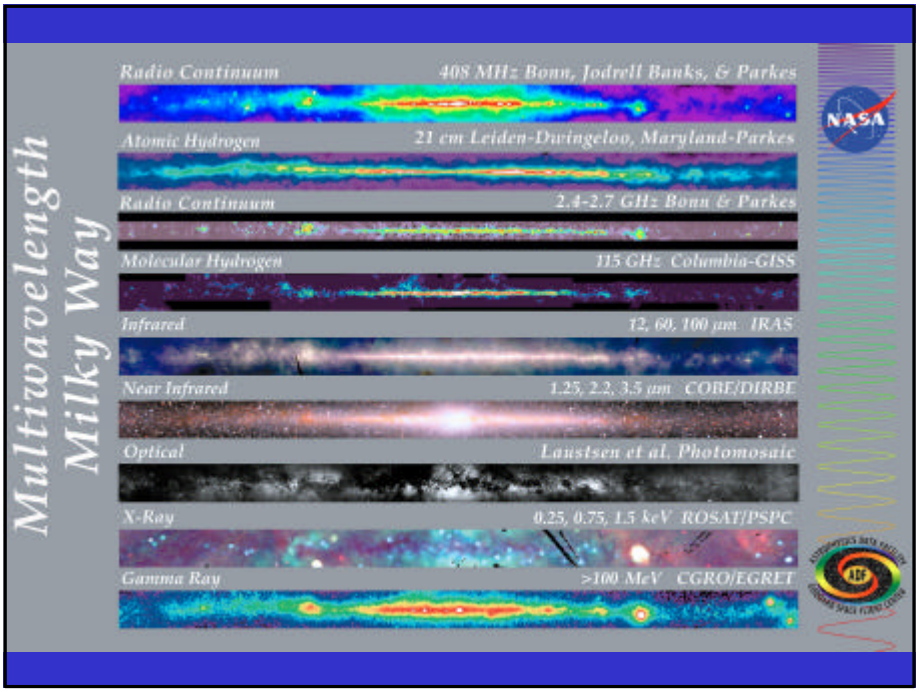


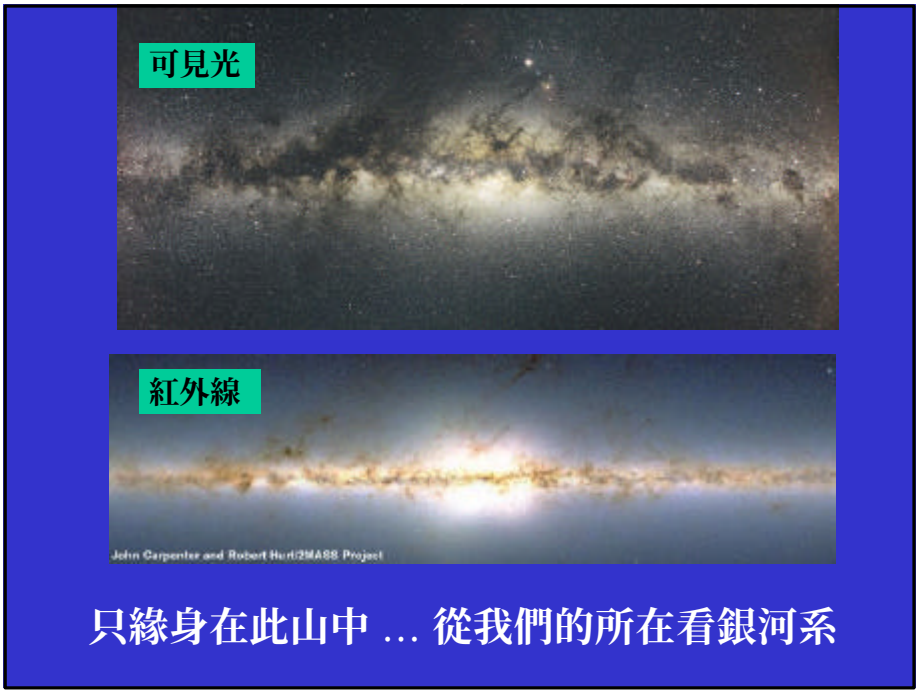
CHARA (Center for High Angular Resolution Astronomy) Array on Saturn 50 frames at 1/10 fps taken with S2 on Oct 2, 2000

http://www.chara.gsu.edu/CHARA/



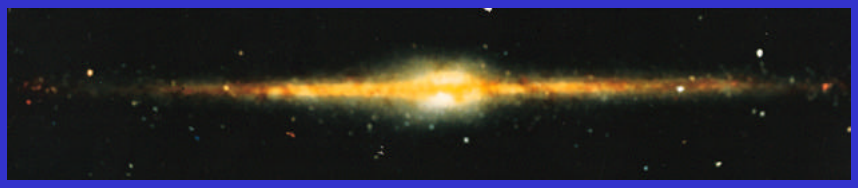
Keck Telescopes as part of an interferometer





只緣身在此山中 … 從我們的所在看銀河系

Far Infrared View of the Milky Way
(IRAS 12, 25, 60, 100 microns)



Near Infrared View of the Milky Way
(COBE 1.2, 2.2, 3.4 microns)

銀河系包含大約4千億顆 (400 billion) 恆星。 所有我們看到的星星都在銀河系內

由於星系塵埃的影響，我們看到的只是鄰近的星星