

Bessel, Henderson, & Struve—3 Oct

- You are a young astronomer in 1814. What problem do you want to study?
 - In 1814, Madison evacuated Washington, DC before the British attack.
 - Napoleonic Wars



Friedrich Bessel
1784-1846
hsci.cas.ou.edu/images/thumbnail/19thCentury/Bessel/

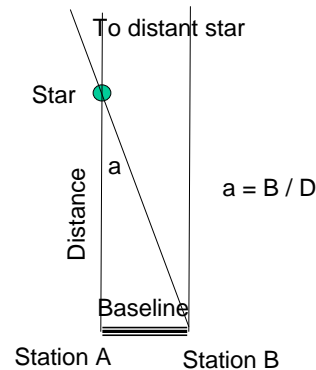


F G Wilhelm Struve
1793-1864
www.obs.ee/obs/pildid.html

Thomas Henderson (1798-1844).

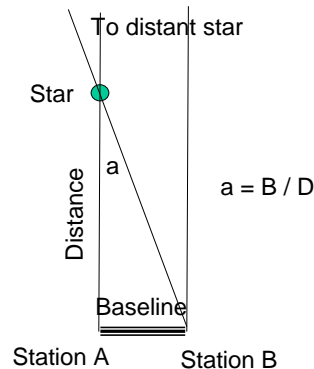
Bessel, Henderson, & Struve Measure Distances of Nearest Stars

- Parallax angle
angle = baseline / distance
 - For the great distances of the stars, the angles are small and difficult to measure
- You are a young astronomer in 1825. What baseline should you choose?



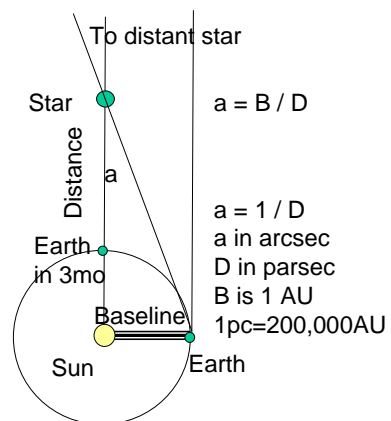
Bessel, Henderson, & Struve Measure Distances of Nearest Stars

- Parallaxic angle
angle = baseline / distance
 - For the great distances of the stars, the angles are small and difficult to measure
1. You are a young astronomer in 1825. What baseline should you choose?
- A. London to South Africa
 - B. Paris to Cayenne
 - C. Earth and Earth 6 months later

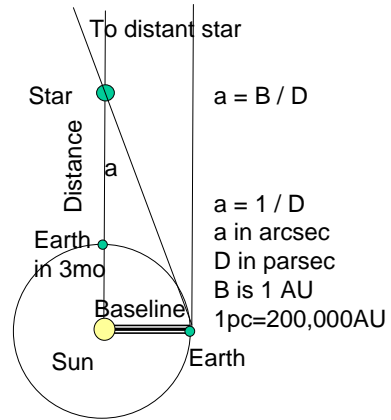


Definitions

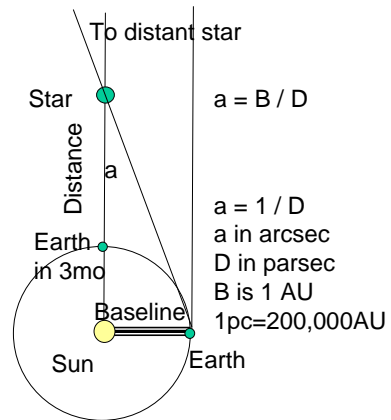
- Angles are measured in arcseconds (arcsec)
 - An arcminute is 1/60 degree
 - An arcsecond is 1/60 arcminute
- Distances to stars are measured in parsec
 - 1 pc = 200,000AU
 - Nearest stars are about 1 pc away.
- With a baseline of 1 AU
 $a = 1/D$
 if angle a is in arcsec and distance D is in parsec.



2. You are a young astronomer in 1825. Measuring the distance to one star requires years of work. What type of star should you choose to likely get a close one?



3. You are a young astronomer in 1825. Measuring the distance to one star requires years of work. What type of star should you choose to likely get a close one? Bright/faint? Fast/slow?
- Bright or fast
 - Bright or slow
 - Faint or fast
 - Faint or slow



First distances of stars 1837

- Thomas Henderson in South Africa
 - Wilhelm Struve in Dorpat, now in Estonia
 - Frederich Bessel in Königsberg, now in Russia
1. Which is the most distant star?
- A. 61 Cygni
 B. Vega
 C. α Centauri

	Star	Char	Parallactic angle [arcsec]	Dist [pc]
Bessel	61 Cyg	Proper motion 5arcsec/yr	0.29	3.4
Struve	Vega	Bright	0.12	8.3
Henderson	α Cen	Bright	0.75	1.3

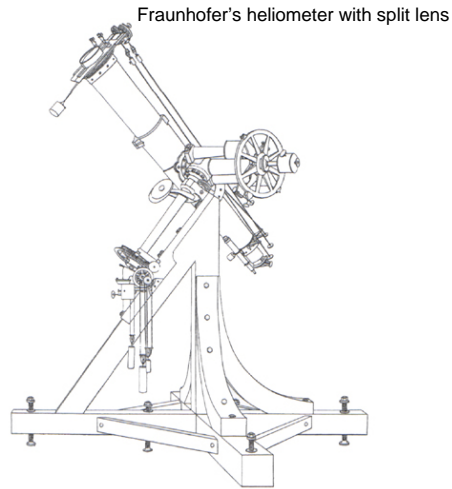
F G Wilhelm Struve

- Born in Altona (Denmark, now Germany)
- Educated at U Dorpat (Russia, now Estonia)
- Petition to Prince Lieven, Chancellor of University of Dorpat
 - “The opportunity to acquire this instrument, the possession of which would raise our observatory to one of the first in Europe, perhaps will never return.”
- The Great Refractor built by Fraunhofer arrived in 22 crates in 1824, and the city of Dorpat celebrated.
- Czar Alexander I sent diamond rings to Struve & Fraunhofer.



Friedrich Bessel

- 61 Cyg was difficult because there is no nearby reference star.
- Fraunhofer built a telescope with a split lens to show two separate images.
 - By moving the two lens pieces, Bessel could offset the two images and bring 61 Cyg close to reference star.



Lens pieces moved slightly



Lens pieces moved to align 61 Cyg & ref.

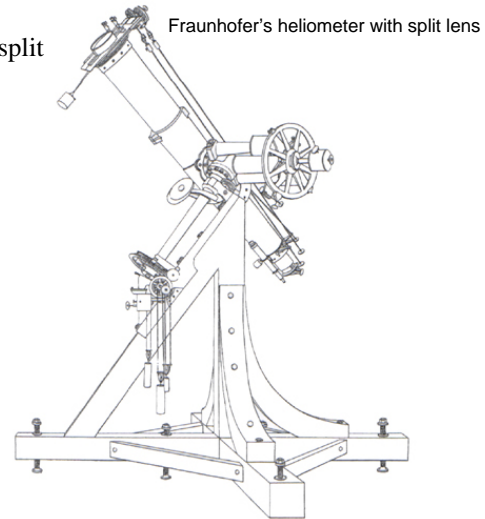
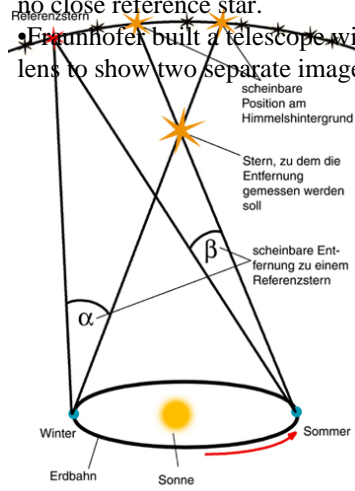
pluslucis.univie.ac.at/FBA/FBA99/Neho/3_1_1_.htm

Summarizing Question

- What was known about the universe in 1850 that was not known in 1814?

Friedrich Bessel

- 61 Cyg was difficult because there is no close reference star.
- Fraunhofer built a telescope with a split lens to show two separate images.



pluslucis.univie.ac.at/FBA/FBA99/Neho/3_1_1_.htm