

Eye safety

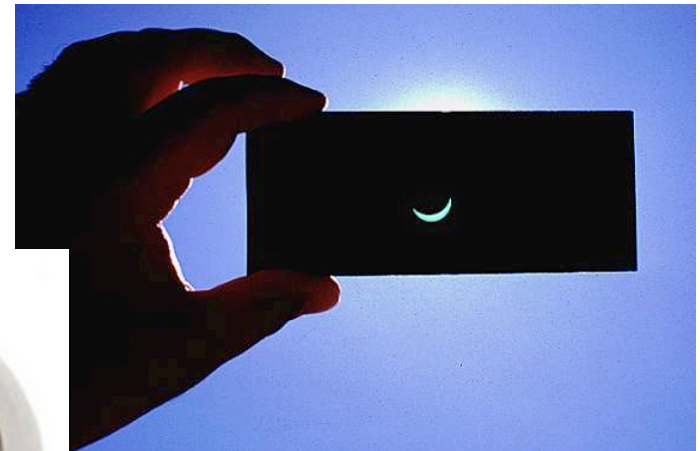
- The Sun is no more or less dangerous during an Eclipse
- It is never safe to look directly at the Sun except during a total eclipse
- A partial or annular eclipse, even when the Sun is mostly covered ...
 - Can still cause permanent eye damage!
- You might not feel any discomfort as the eyes are being cooked
 - There are no pain nerves at the back of your eye
- Looking at the Sun at any time for more than a second or two can cause permanent eye damage

Safe methods of directly viewing the Sun

- Must block 99.999% or more of the Visible light!
- Must block 100% of UV and Infrared light!
- "CE" Certified Eclipse Shades



- #14 Welder's Glass
 - Standard #12 Arc Welder glass is NOT dark enough!!!

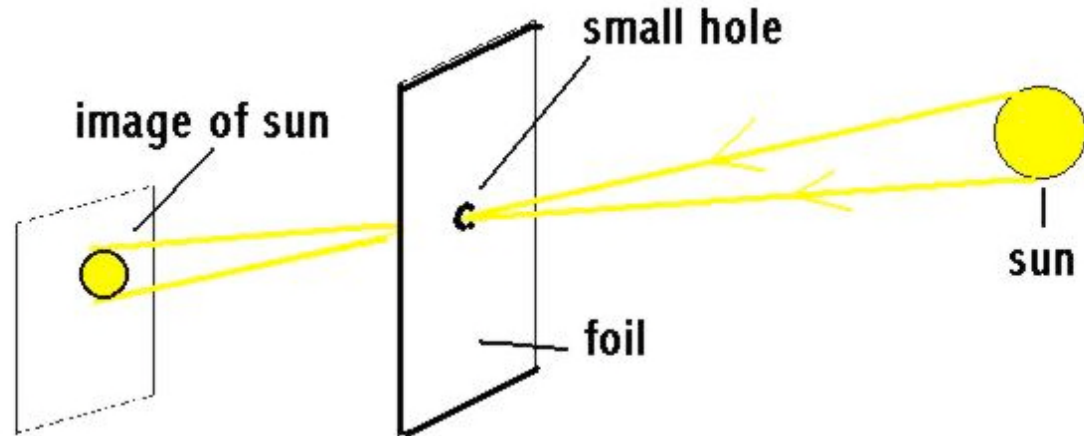


- Front Binoc. / Telescope filters
 - Orion or Thousand Oaks are two excellent brands



Safe indirect viewing of the Sun

- Pinhole projection



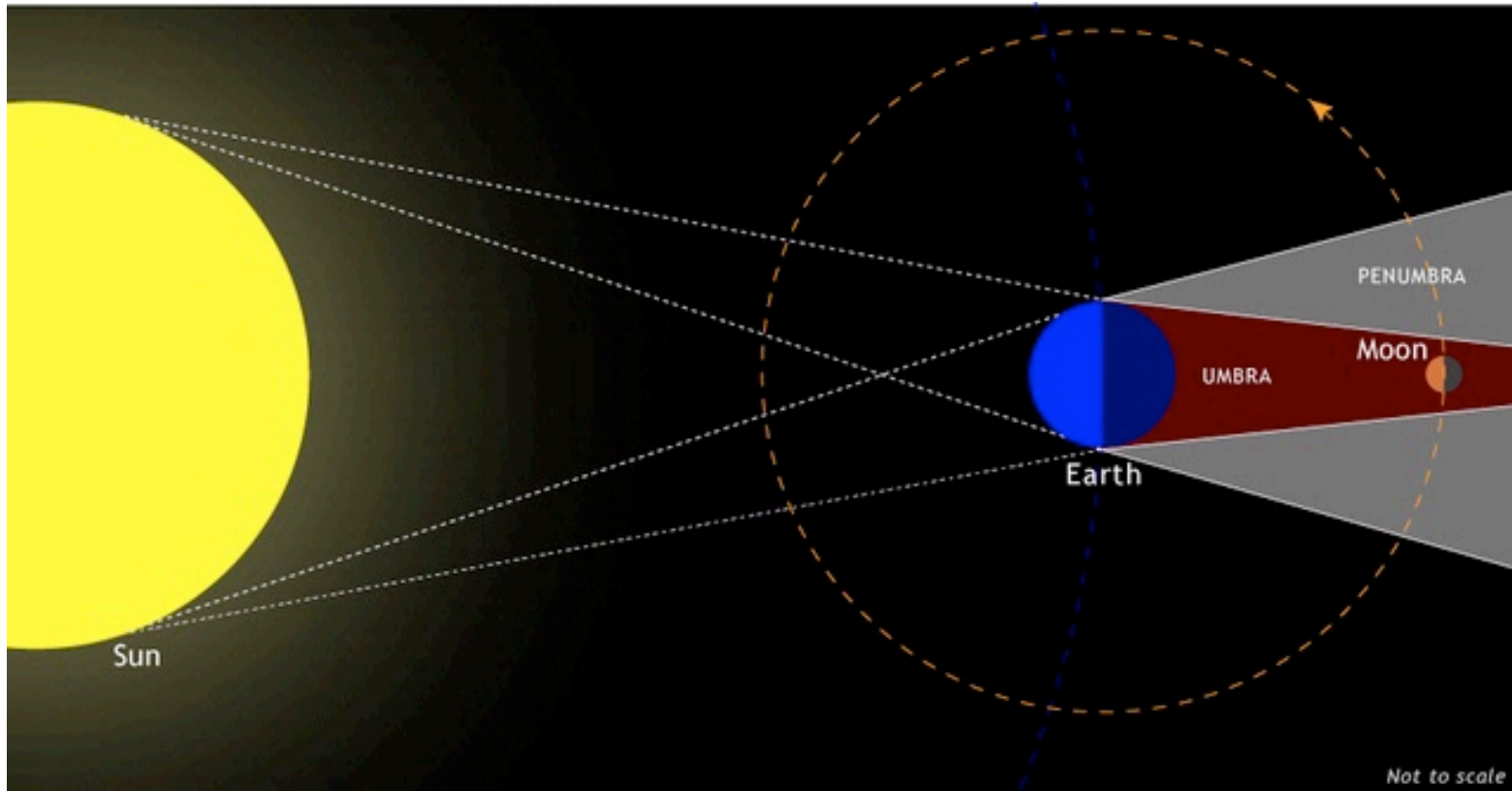
Fun Views

- Make your own message



What is a Lunar Eclipse?

- Earth casts a shadow on the Moon



- Image not to scale

Partial Lunar Eclipse - 2012 June 04

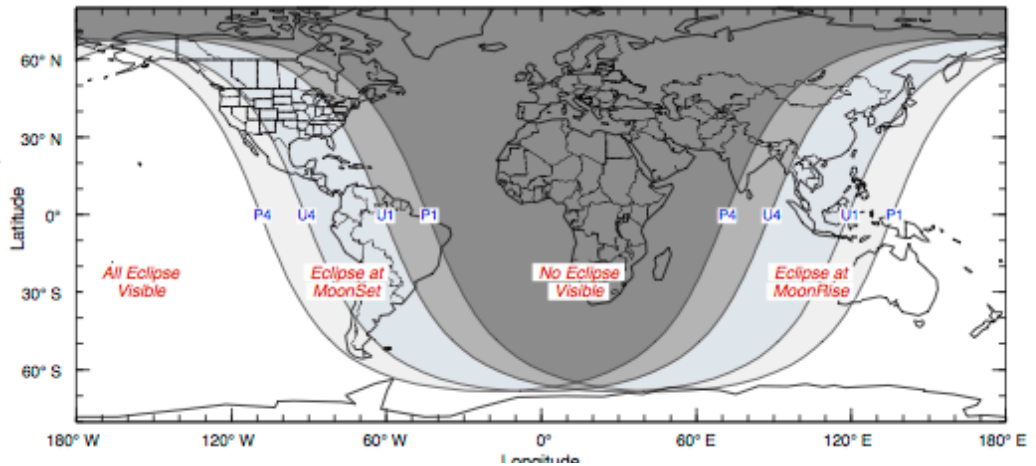
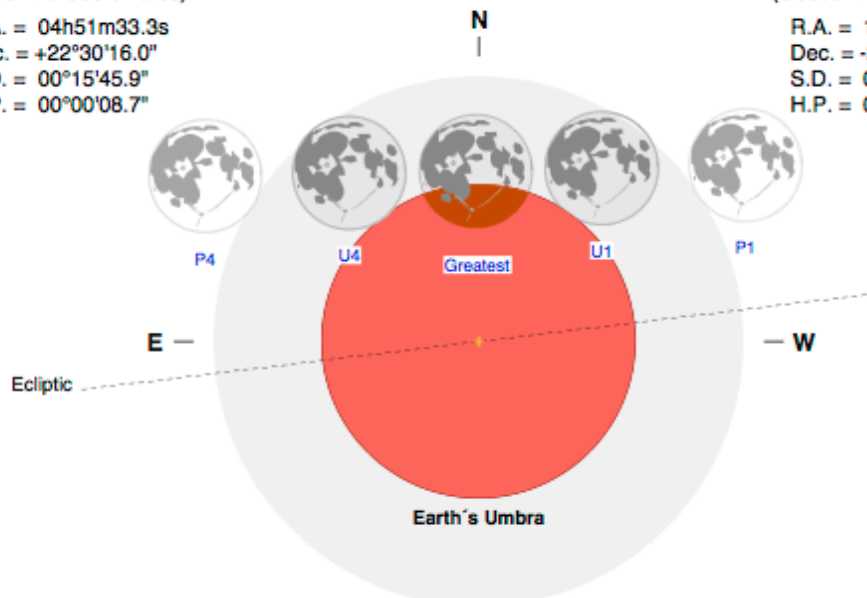
Saros Series = 140 Member = 25 of 80

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 04h51m33.3s
Dec. = +22°30'16.0"
S.D. = 00°15'45.9"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 16h51m37.6s
Dec. = -21°39'56.5"
S.D. = 00°16'37.9"
H.P. = 01°01'02.3"

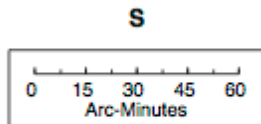


Eclipse Durations

Penumbral = 04h30m09s
Umbral = 02h06m37s

$\Delta T = 67$ s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

Earth's Penumbra



F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

Eclipse Contacts

P1 = 08:48:09 UT
U1 = 09:59:53 UT
U4 = 12:06:30 UT
P4 = 13:18:17 UT

Partial Lunar Eclipse - 2012 June 04

- When?

- Start: 03:00
- Max: 04:03
- End: 05:06



A very rare Transit of Venus - 2012 June 5

- Venus passes in front of the Sun!

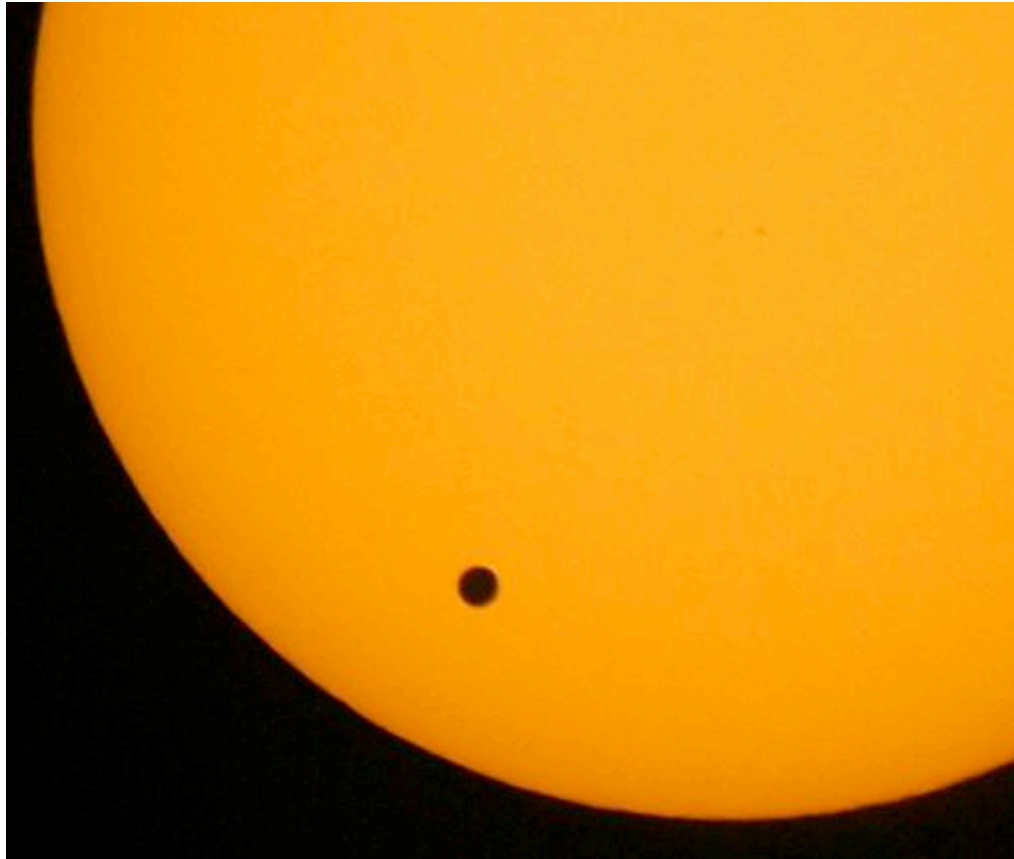


Image Credit:
Wikipedia

Why are they so rare?

- Venus and Earth must be in orbit crossing at the same time
- Venus orbit is inclined 3.4° from Earth orbit

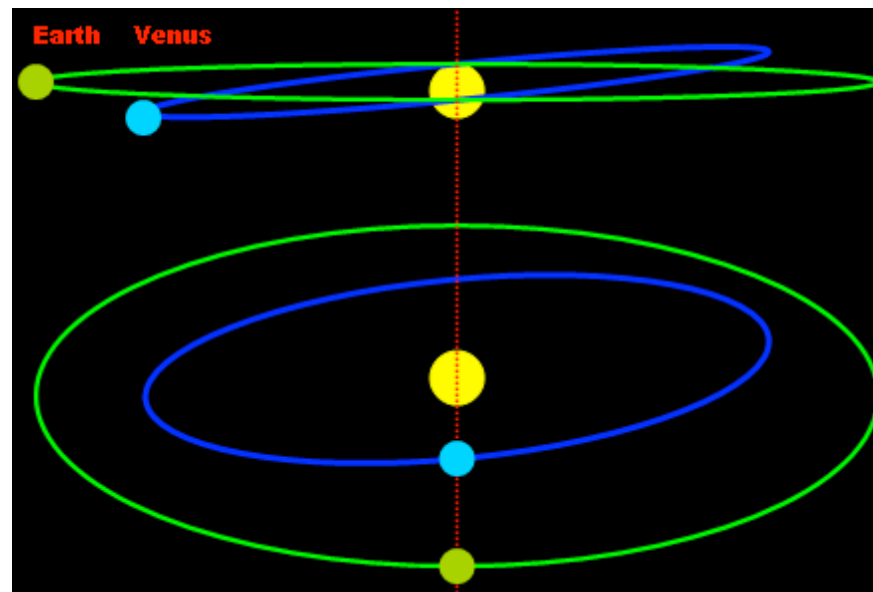
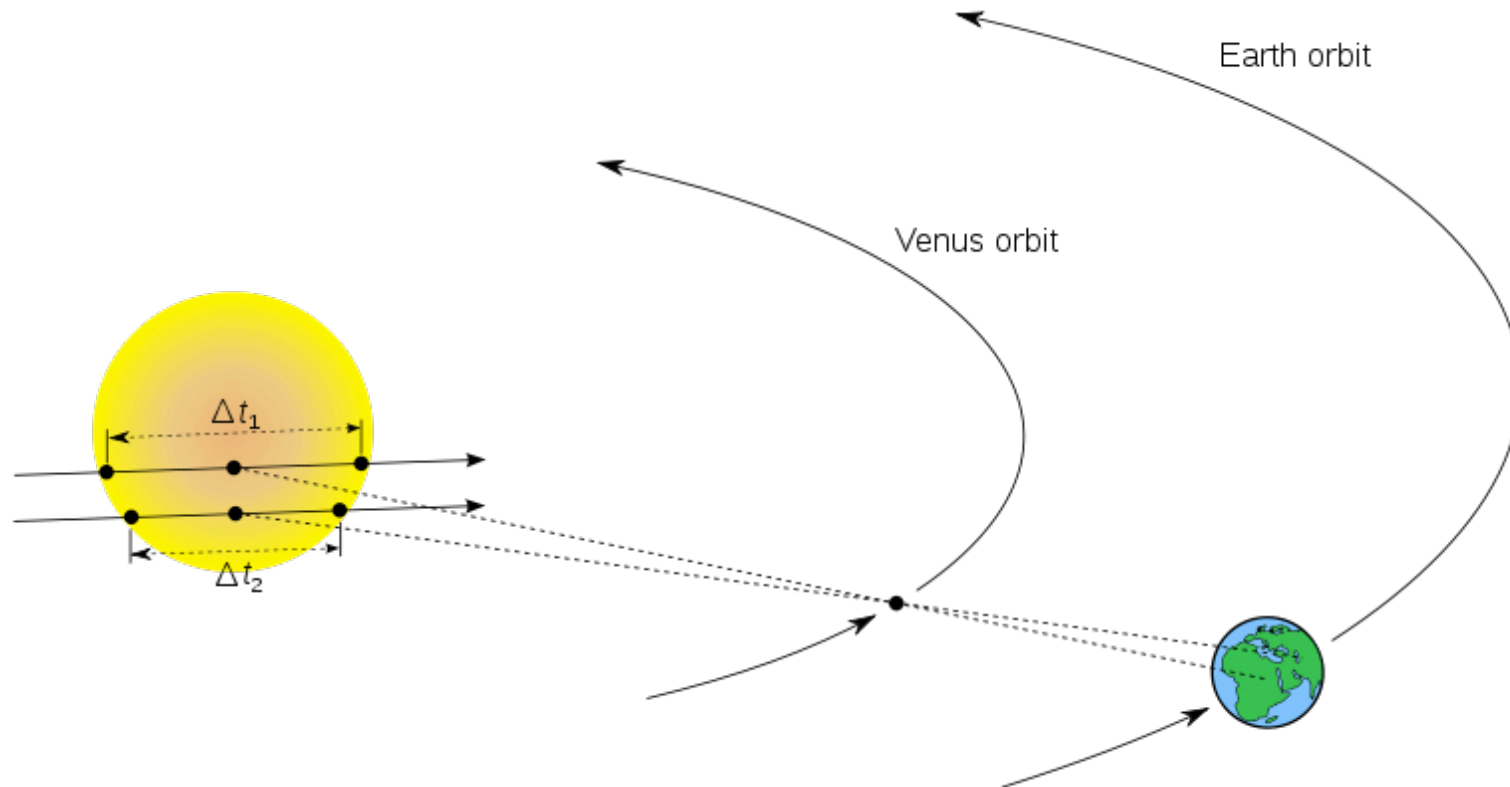


Image Credit:
Wikipedia

- Widely viewed only 7 times in recorded history
 - 1631, 1639, 1761, 1769, 1874, 1882, 2004
- Next Transit after 2012 June 5 will be in 2117 Dec 10!

What is the big deal?

- How we first measured the distance to the Sun
- Distance to the Sun, in turn, is used to help determine:
 - Distance to the Planets, Stars, Nebulae, Galaxies, Clusters of Galaxies, Even to objects formed shortly after the Big Bang 13 740 000 000 years ago!



Landon's first complete sentence in 1962

- How far is the Sun?



- Questions Children Ask, page 126: “About 93,000,000 miles”
- My 2nd sentence: Why?
 - What I really was asking was:
“How did they measure such a long distance to the Sun?”

7 Years later - Summer 1970

- California Academy of Sciences, Morrison Planetarium:



- A method developed by Isaac Newton & Edmond Halley
 - Time the Transit of Venus
- The speaker said we would have to wait all the way until 2004 ...
 - So I waited!

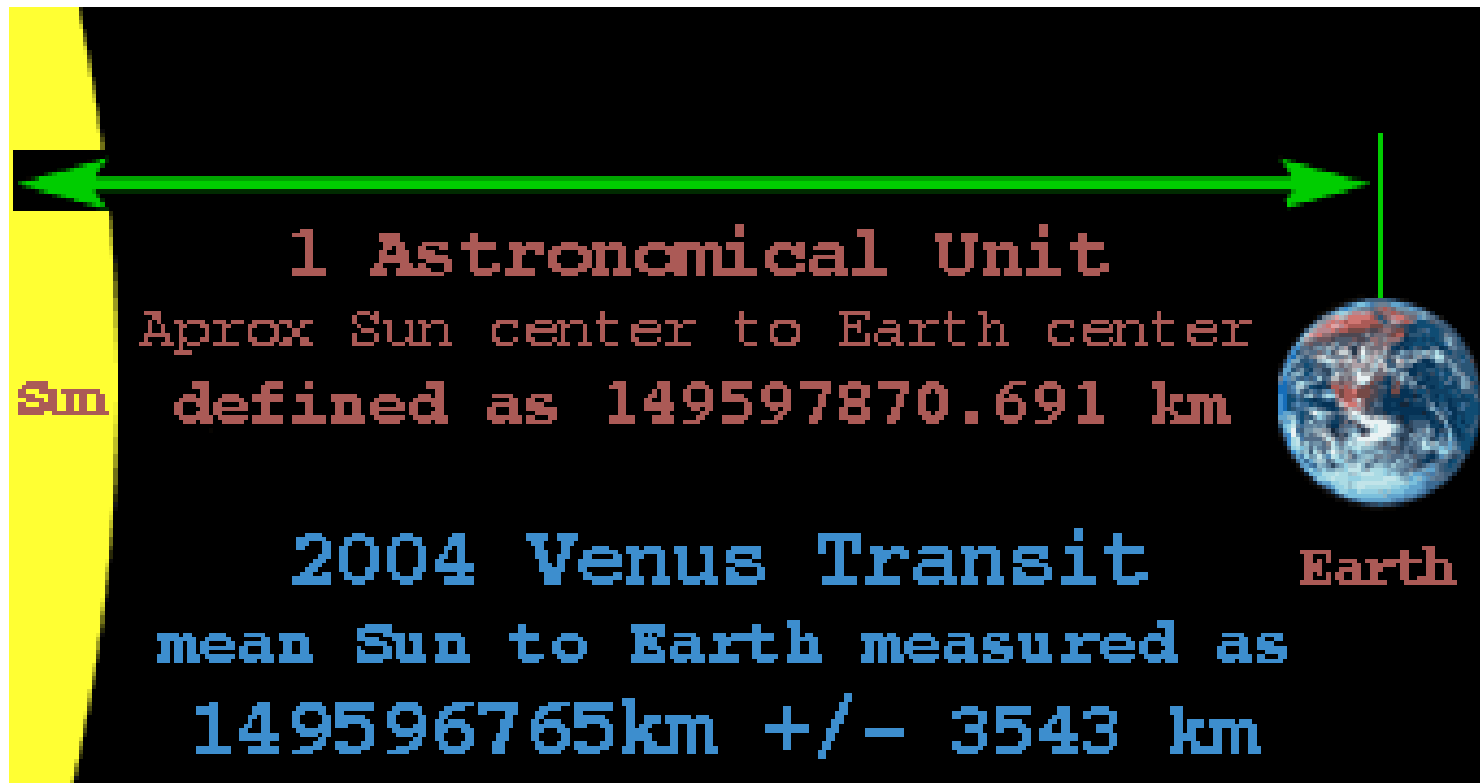
2004 June 8

- Arcetri Astrophysical Observatory in Italy
 - Overlooking the house in which Galileo was imprisoned during the final years of his life



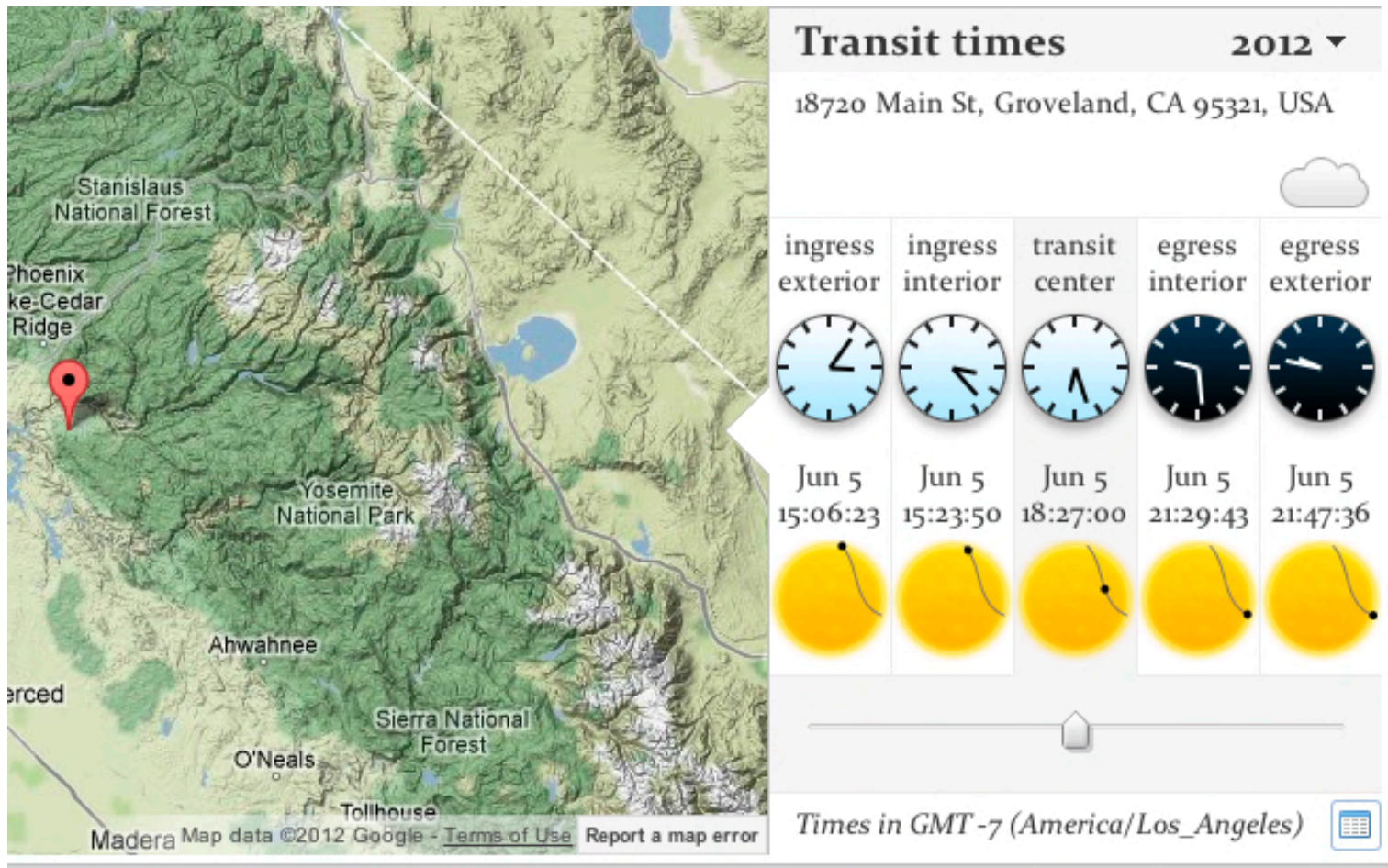
Combined with data from Madagascar

- Distance to the Sun (AU): 149,596,765 km \pm 3543 km
 - 0.0237% uncertainty: 1 part in 42224



2012 June 5 Transit of Venus

- Best time to view: Between 15:30 and 19:00

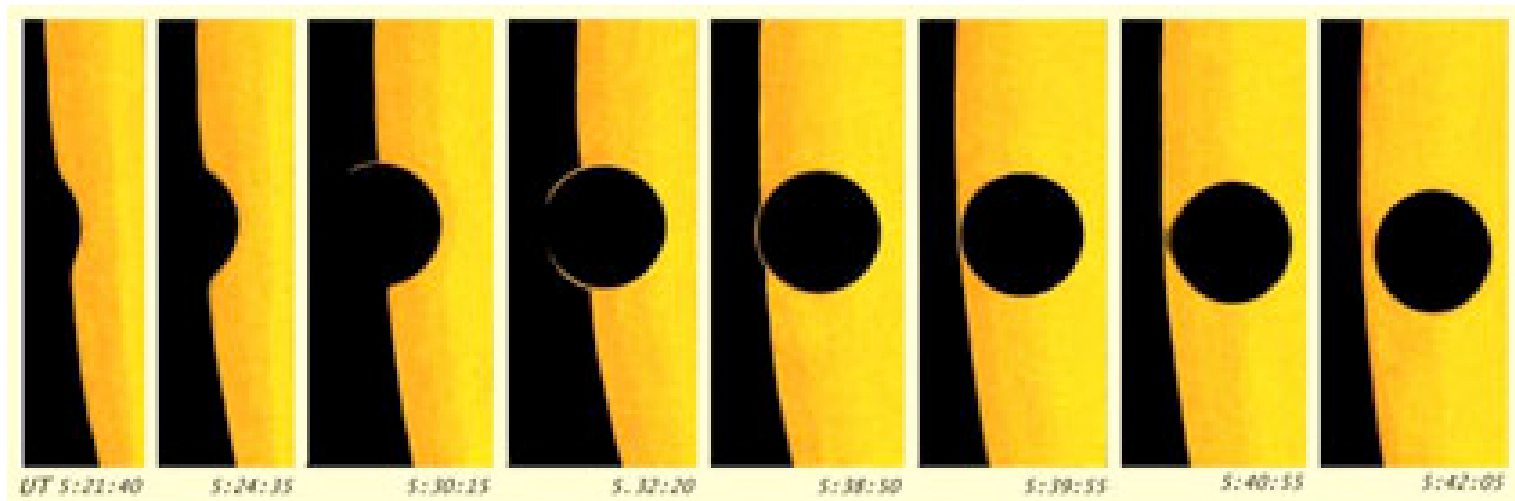


Look for a small black dot

- Use your Eclipse Safety glasses
 - Venus will block only 0.1% of the Sun's surface



Black Drop and spots



Bottom of Talk.
Thank you.

Touching the South Geographic Pole \pm 1cm
Antarctica Expedition 2011
Landon Noll, Aram Kaprielian, Gary Bengier



© 2011 Landon Curt Noll
www.landonnoll.com