



# Mercury Transit 2006

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# Overview

- The Basics — What's happening?
- History of Mercury Transits (inc. my 1973 obs)
- What is this transit good for? Fun, more...
- Observing (some of) the transit from Virginia
  - handouts with "how to", times, more.
- Safety!!!!
- Questions, comments, *etc.*

# The Basics

- Orbits not perfect
  - Mercury's orbit inclined at  $7^\circ$
  - Also highly eccentric
    - Sun subtends  $< 2$  degrees at aphelion
    - Sun subtends  $> 3$  degrees at perihelion!
- Transits infrequent
- On average, only 13 per century
- Occur in May and November
  - due to resonance between orbits





# History of Mercury Transits


- 1<sup>st</sup> known: Nov. 7, 1631 Pierre Gassendi
- 14 Transits in 20<sup>th</sup> Century
  - including 1973, Author's first!
    - See next slide for log book entry
- 21<sup>st</sup> Cent.: 2003, 2006, 2016, 2019, 2032...
  - Total of 12 after this upcoming transit.
- Venus: 6<sup>th</sup> June 2012, then not till 2117.



Sat. 10/11/1973.

Me-2-73

Transit

Mercury: Observed latter half of Transit of Mercury  
at Eddie Cassidy's observatory. (10" Schmidt-Cass.)  
Telescope Stopped down to 4", and heliostat-mounted mounts 3% of  
light with Zeiss filters + camera, also Projection. - Dia  
of Sun 3 ft. in dia - mercury  Duration of egress  
(granulation)  
- 1 min. 25 sec. ultra. Observed also (B, Tom King, & myself)  
with 60mm (30x; Projection) Telescope - we used it to the limit  
- made out  $\frac{1}{2}$  of dia of Mercury at egress! i.e. 3" - absolute  
limit of Resolution! Took some photos afterwards thru telescope.

(5)  
Eddie Cassidy's  
10" Celestron (Schmidt  
Cass. f2-f135) with  
Camera In Observatory  
on Stepladder 3 Rocks  
Mon. 10th Nov. 1973



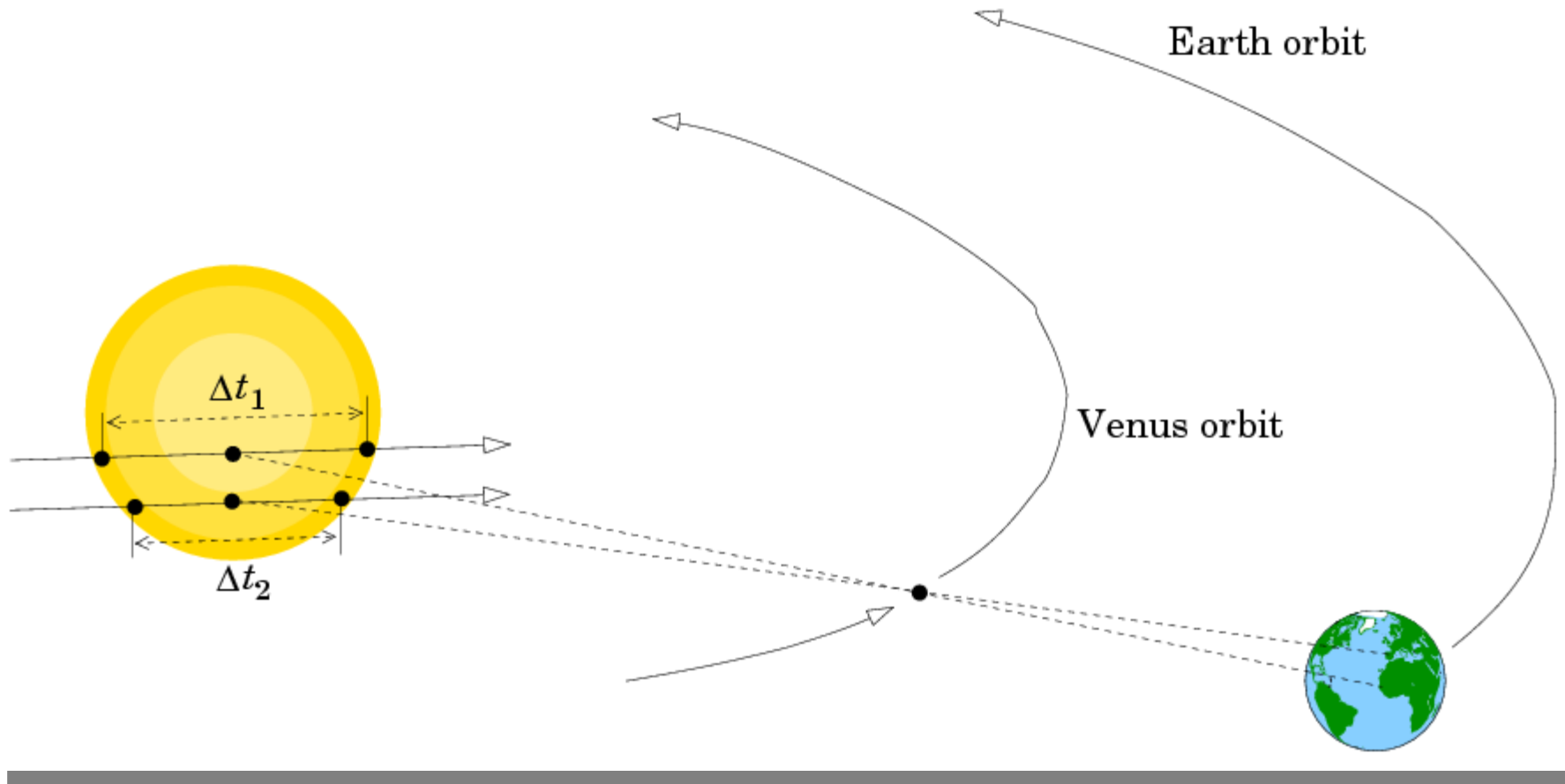


# What is the Transit Good For?

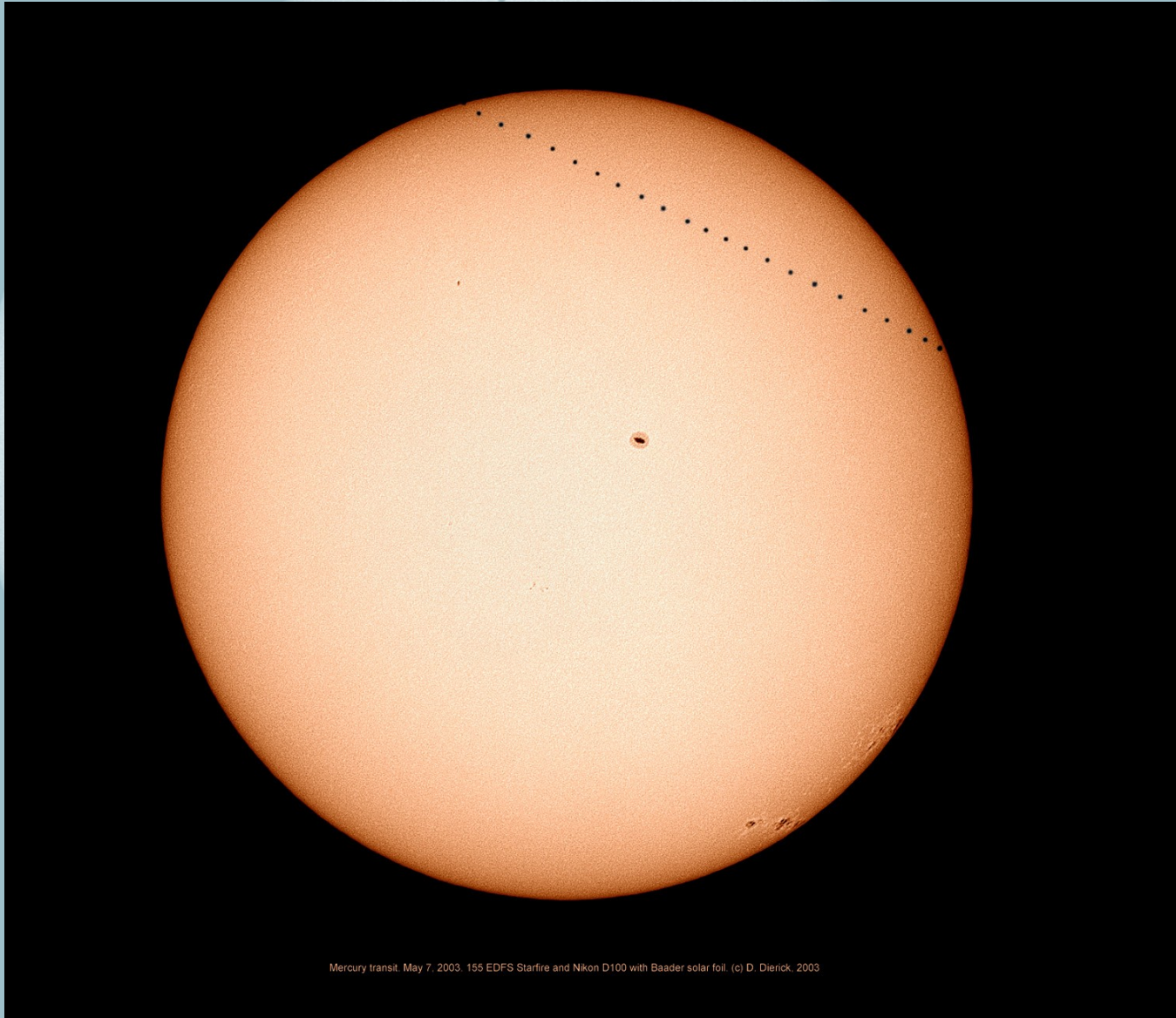
- At one time: determine scale of solar system
  - use parallax and triangulation (see next slide)
- Now: other techniques better (*e.g.*, radar)
- Rare event: not many lifetime opportunities
  - so take advantage of this one!
- Great way to envision size of the Sun!
- Timing is still useful (more later...)

## Parallax / Triangulation for a Venus transit

- Principle applies to Mercury Transits also.
- Different locations on Earth observe duration of transit
- Timing used to calculate ingress, egress points



# What does it look like?



Mercury transit, May 7, 2003. 155 EDFS Starfire and Nikon D100 with Baader solar foil. (c) D. Dierick, 2003

SOHO Movie



# November 8, 2006: Virginia

Details for Richmond:

External Ingress:	2:12pm
Sun Altitude at Ingress:	27°
Internal Ingress:	2:14pm
Mid Transit:	4:41pm
Sun Altitude at mid:	4°
Internal Egress:	After sunset



Source: <http://sunearth.gsfc.nasa.gov/eclipse/transit/transit.html>

# November 8, 2006: Virginia (2)

## Details for Lynchburg:

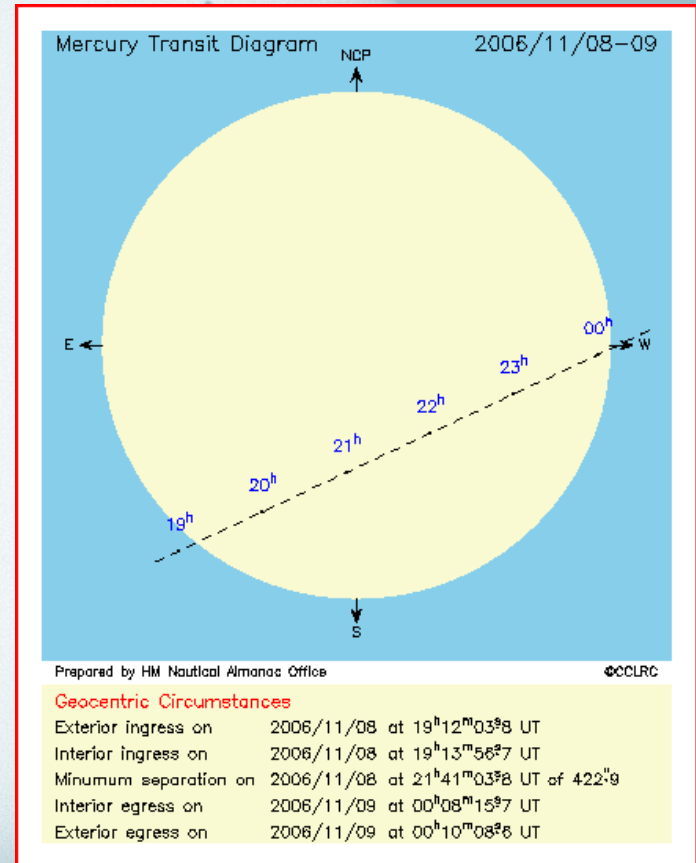
External Ingress:	2:12:19pm
Sun Altitude at Ingress:	27°.6
Internal Ingress:	2:14:12pm
Position Angle:	+141°
Minimum Separation:	4:40:48pm
Sun Altitude at mid:	4°.8
Internal Egress:	After sunset



Source: <http://home.hetnet.nl~smvanroode/mercury.html>

# Orientation, Angles...

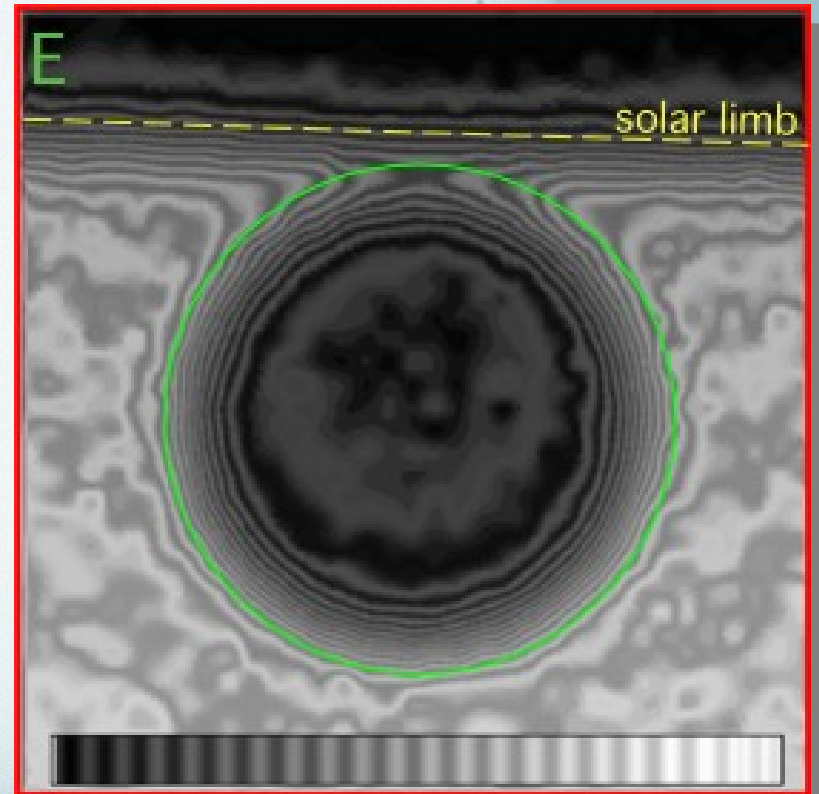
- See **first handout**
- NCP (North Celestial Pole) will be at an **Angle**
- With Astronomical refractor or reflector, image will be upside down!





# The "Black Drop" Effect

- Ingress and Egress
- Seems to "connect" with Sun's edge
- Limb Darkening
- Not Earthbound
- Seen from space too



Source: Schneider, Pasachoff, Golub: AAS New Orleans, 2001  
<http://nicmosis.as.arizona.edu:8000/POSTERS>



# Web Links: Safety, Equipment...

- List of some vendors of safe solar filters
  - [http://www.mreclipse.com/Totality/TotalityApC.html#Solar\\_Filters](http://www.mreclipse.com/Totality/TotalityApC.html#Solar_Filters)
- Eye Safety during Solar Eclipses (good for transits too)
  - <http://sunearth.gsfc.nasa.gov/eclipse/SEhelp/safety2.html>
- A Solar Observing Refresher Course (from S&T)
  - <http://skytonight.com/observing/objects/sun/3304286.html?page=1&c=y>
- Observing the Sun by Projection (also from S&T)
  - <http://skytonight.com/observing/objects/sun/3304766.html?page=1&c=y>
- Avoid "blind date" with the Sun!
  - <http://www.transitofvenus.org/safety.htm>



# What can YOU do?

"Amateurs can make a useful contribution by timing the four contacts at ingress and egress. Observing techniques and equipment are similar to those used for lunar occultations. Since poor seeing often increases the uncertainty in contact timings, an estimate of the possible error associated with each timing should be included. Transit timings and geographic coordinates of the observing site (measured from a topographic map or GPS) should be sent to Dr. John Westfall (johnwestfall@comcast.net), A.L.P.O. Mercury/Venus Transit Section, P.O. Box 2447, Antioch, CA 94531-2447".

Source: NASA Eclipse Home page

<http://sunearth.gsfc.nasa.gov/eclipse/0H/transit06.html>

# Conclusions

- Mercury transits: only 13 per century
- Safety (can't emphasize this enough!)
- Scale of solar system

Questions?

<http://www.cv.nrao.edu/~pmurphy/Talks/Mercury-Transit-2006>