Transits of Mercury

28 October 2019

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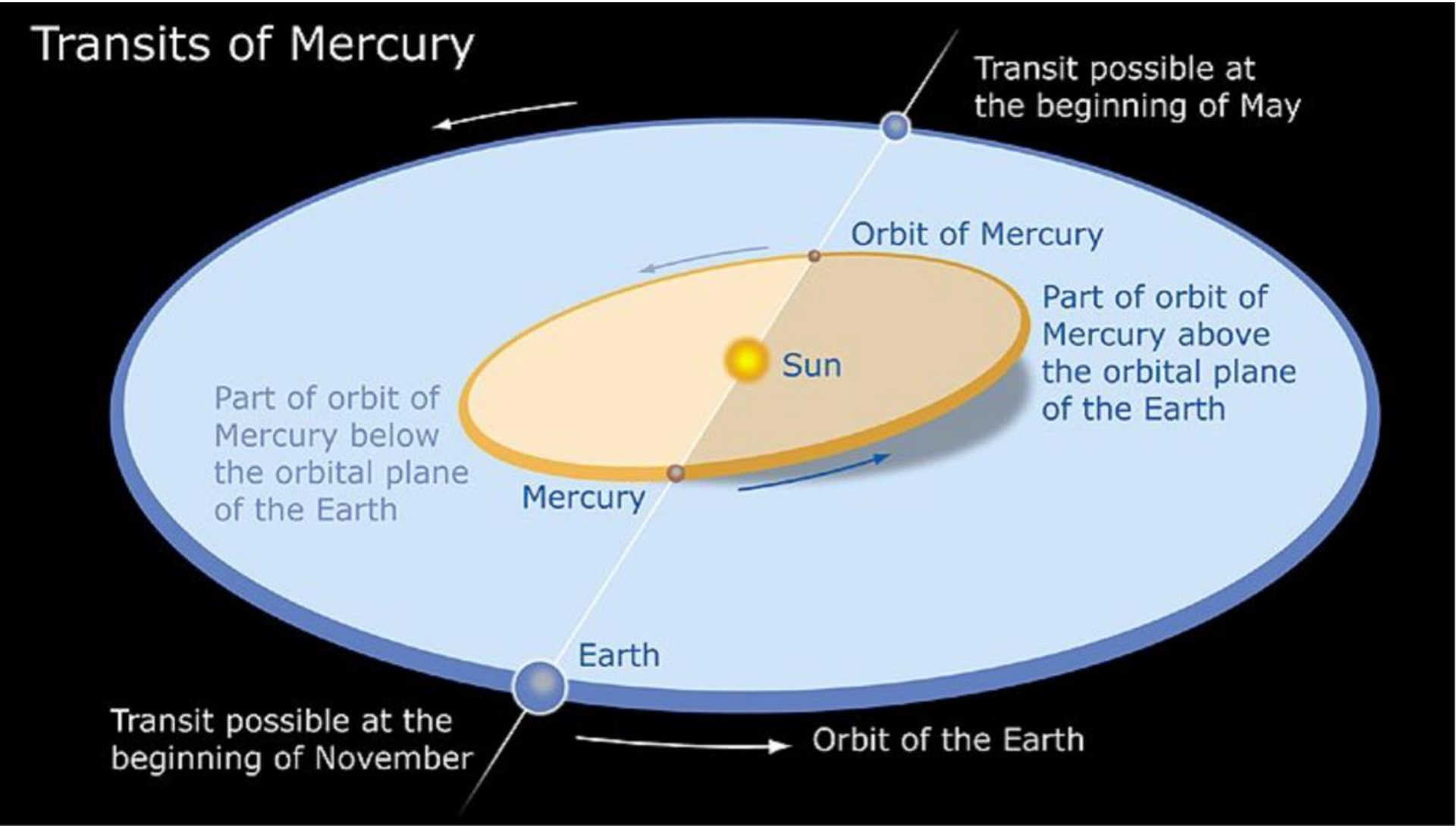
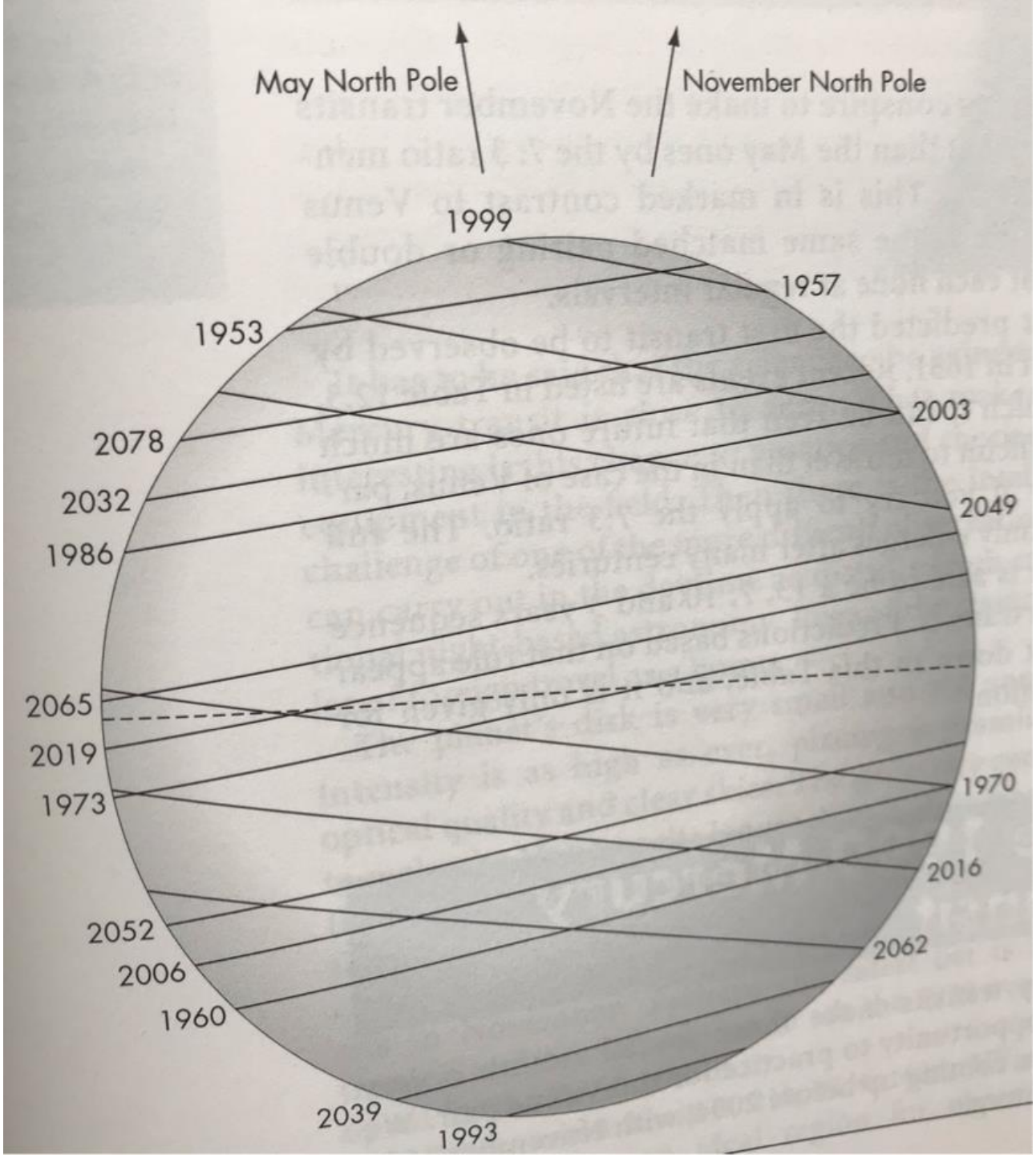
Mercury	Venus		Earth	Mars
4 880	12 104	Mean Diameter (km)	12 742	6 779
0.3075	0.7184	Perihelion (AU)	0.9833	1.382
0.4667	0.7282	Aphelion (AU)	1.017	1.666
0.2056	0.0068	Eccentricity	0.0167	0.0934
7.005	3.3946	Inclination (°)	0.0000	1.850


Transits of Mercury
Transit possible at the beginning of May
Orbit of Mercury
Part of orbit of Mercury above the orbital plane of the Earth
Sun
Part of orbit of Mercury below the orbital plane of the Earth
Mercury
Earth
Transit possible at the beginning of November
Orbit of the Earth


May North Pole
November North Pole
1999
1957
1953
2003
2078
2049
2032
1986
2065
2019
1970
1973
2016
2052
2062
2006
1960
2039
1993

A Few Facts about Transits

- Mean transit dates (1600-2032)
- May 6 (SD = ±2.35 days), decending node & close to aphelion (0.47AU) 12.0”⌀, day/night ≈ $15^h11^m/8^h49^m$, and
- November 8 (SD = ±3.53 days), ascending node & close to perihelion (0.31AU) 9.8”⌀, day/night ≈ $9^h13^m/14^h47^m$

- November transits outweigh May ones by 2:1

A Few Facts about Transits

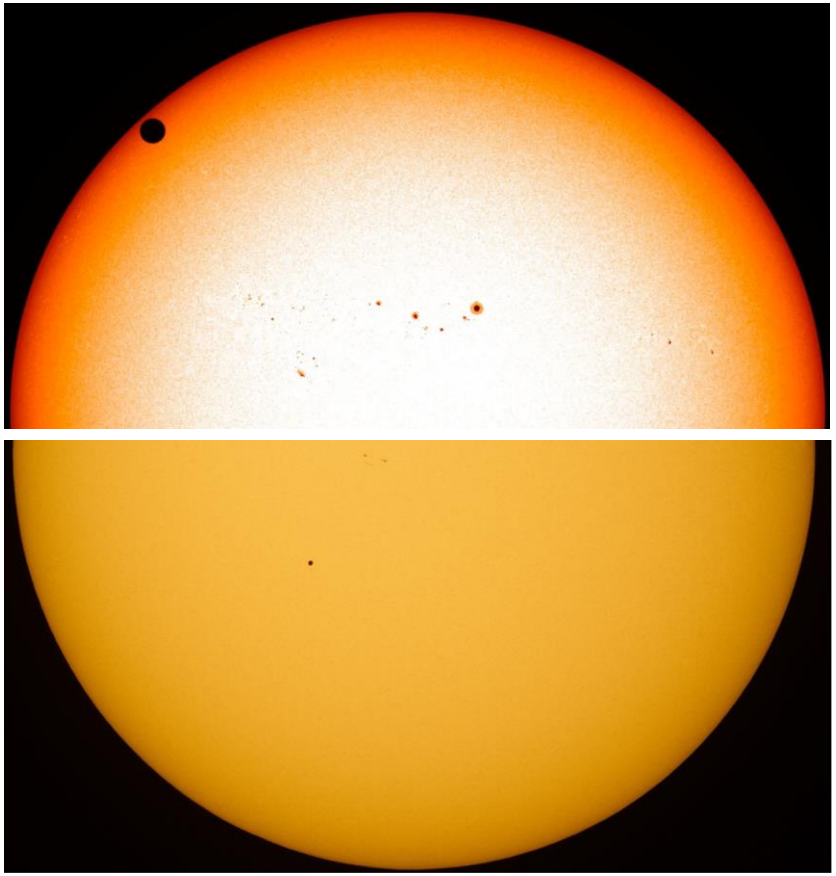
- Previous event 2016 May 09, 11:12-18:42UT
- This event 2019 November 11, 12:35-18:04
- Next event 2032 November 13, 06:41-11:07

- Maximum duration 8 hours, no preferred longitude

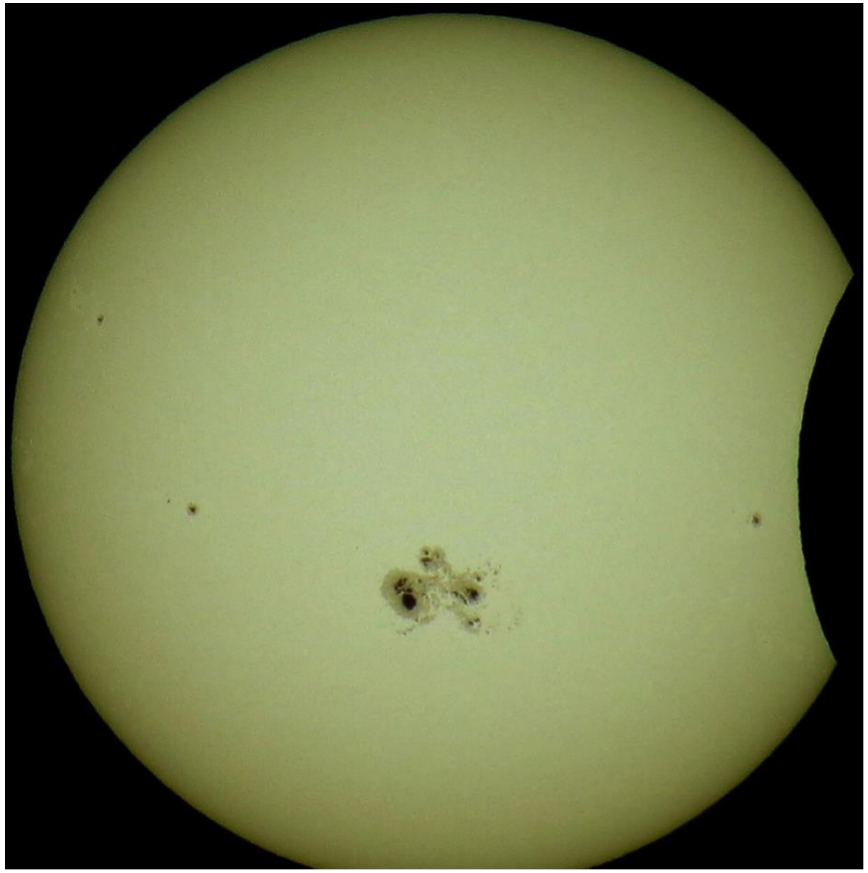
- Mercury moving from evening sky (eastern elongation) to morning sky (western elongation), so left to right across the face of the Sun

Inferior Planets vs. Sunspots

2012 June 5-6 Transit of Venus



2016 May 09 Transit of Mercury



Sunspots and partial solar eclipse
2014 October 23

Location Selection

- 2019 November 11 (Monday)
- Start: 12:35
- Sunset (UK): 16:10
- Finish: 18:04

- South (20° altitude) to West (242° azimuth)

- Human eye can resolve down to ≈1’, but Mercury is only ≈9-12”, therefore not visible without optical aid

Instrument Selection

- Catadoptric Compound
- Reflector
- Refractor

- Up 4” (100mm) aperture, but can go bigger
- x80 maximum to start with (FoV ≈ 40/M, 0.5°)

- Image orientation
  - Start: 110° (N-E-S-W)
  - Finish: 299°, but irrelevant as view terminated by sunset

How to Observe

- Objective Filter
- Herschel Wedge
- Projection
- Specialist Hα Telescope

Objective Filter

- Any telescope
- Any eyepiece

- Mylar (cheap, easily damaged, but replaceable)
- Glass (more expensive, sturdier)

- Post filter image manipulation
- Neutral Density
- Crossed polarising
- Solar Continuum (depending on objective filter type, double stack)

Herschel Wedge

- Refractors only
- Any eyepiece

- Beware of internal plastic components

- 1¼” up to 4” aperture, 2” up to 6” aperture, double the weight of a ‘star diagonal’
- Post wedge image manipulation
- Neutral Density
- Crossed polarising
- Solar Continuum (double stack)

Projection

- Refractors only
- Cheap Huygenian eyepiece
- No Barlow lens

- Beware of internal plastic components
- Extra torque of screen

- Multiple observers can follow events

Finding the Sun

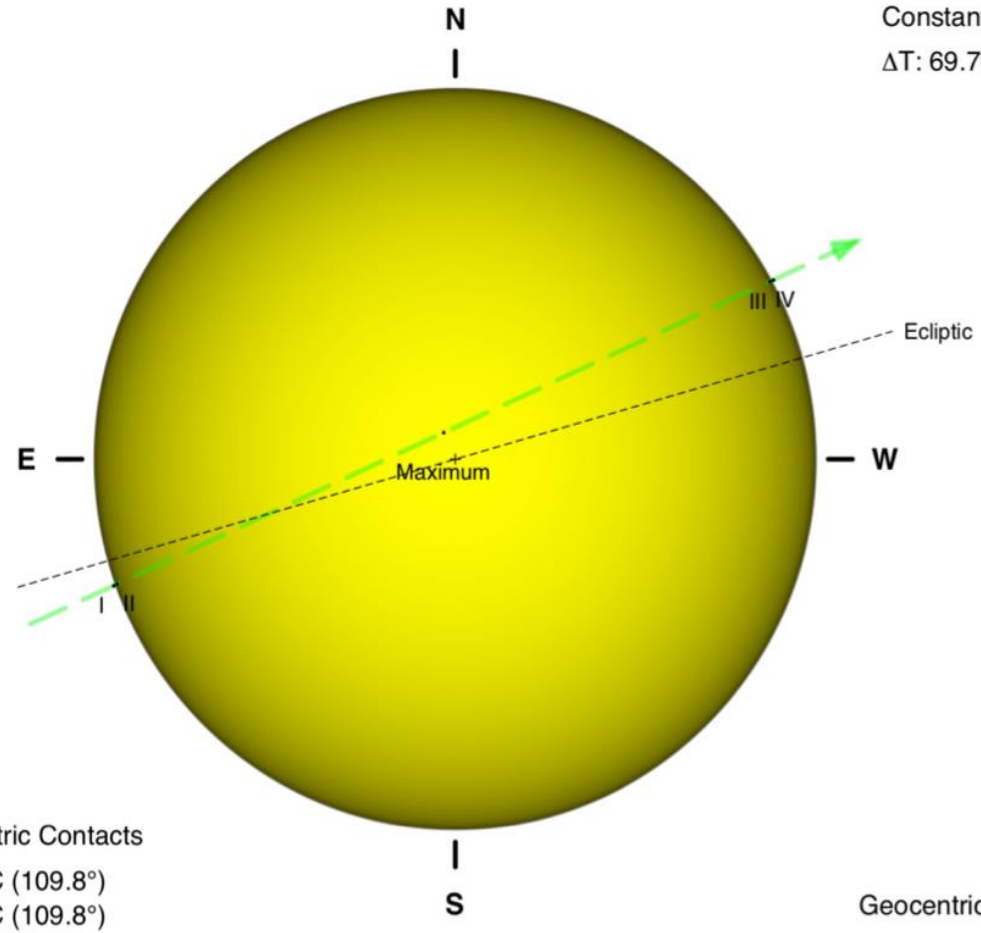
- Can’t look, or project, through finder
- Finder objective filter
- Commercial or home made solar finder
- ‘Minimum Shadow’ method

Transit of Mercury

- If there are any sunspots on the Sun and Mercury approaches them, look for colour changes in the spots

- If all I’ve just said sounds just too difficult, why not come along to Orwell Park

Greatest Transit: 15:19:47.4 UT J.D.: 2458799.138743



Constants

ΔT: 69.70s

Transit Geocentric Contacts

I: 12:35:26 UTC (109.8°)
II: 12:37:08 UTC (109.8°)
G: 15:19:47 UTC (24.3°)
III: 18:02:33 UTC (298.8°)
IV: 18:04:14 UTC (298.7°)

N
E W
S
P.A.

0 5 10 15
Arc-Minutes

Geocentric Data

Minimum separation: 75.9”
General Duration: 05h28m47s
Central Duration: 05h25m25s

Historical Review

Post Millenium Transits

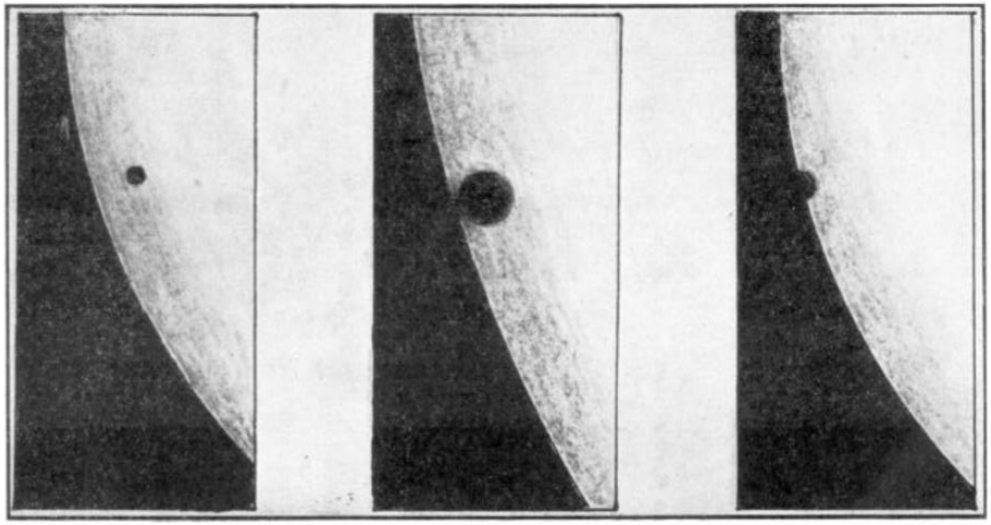
Date	By	Location	Reference
2016 May 09	OASI members	Orwell Park & other locations	OASI News No. 522
2003 May 07	OASI members	Orwell Park & other locations	OASI News No. 377

Late 20th Century Transits

Date	By	Location	Reference
1973 November 10	Clouded Out		OASI News No. 23
1970 May 09	Clouded Out		OASI News No. 23
1960 November 07	IDAS-OASI Interregum		
1953 November 14			IDAS Stargazer, 1953 October

Early 20th Century Transits

Date	By	Location	Reference
1927 November 10	A. F. Bennett	Leiston	MNRAS, vol. 88, p. 486
1924 May 08	A. F. Bennett	Leiston	JBAA, vol. 34, p. 272
	B. Brown	Rickinghall	JBAA, vol. 36, p. 77
	E. H. Collinson	Ipswich?	JBAA, vol. 34, p. 274
1914 November 07	A. G. Cook	Stowmarket	JBAA, vol. 25, p. 84
1907 November 14	G. Fenner	Ipswich	East Anglian Daily Times, 1907 November 16



Arthur Frederick Bennett's observation of the 1924 transit (reference above)

Late 19th Century Transits

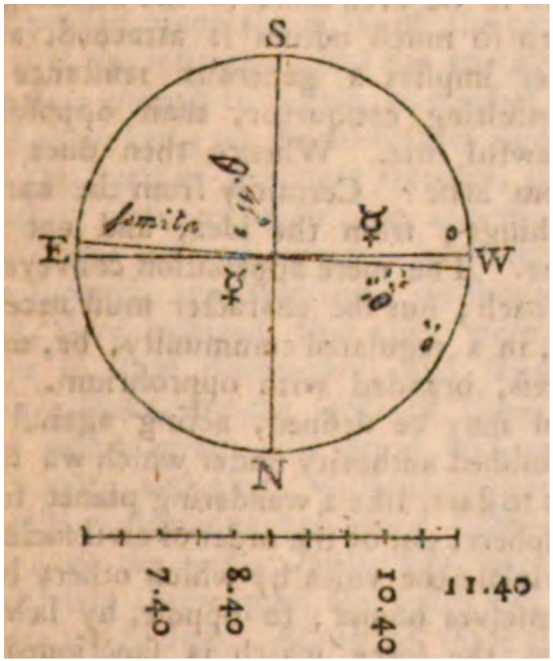
Date	By	Location	Reference
1894 November 10	Clouded Out		East Anglian Daily Times, 1894 November 16, p. 2
1891 May 08			
1878 May 06	A. W. Blacklock	Gateshead	English Mechanic, 1878 May 10, p. 217
	E. Ledger	Barham	The Observatory, vol. 2, p. 97
	W. London	Woodbridge	English Mechanic, 1907 November 1, p. 283
	J. I. Plummer	Orwell Park	MNRAS, vol. 38, p. 413
1868 November 05	W. Dawson	Bury St. Edmunds	Bury Free Press, 1868 November 14, p. 5
	J. I. Plummer	Durham	MNRAS, vol. 29, p. 18
1861 November 12	T. Chevallier	Durham	MNRAS, vol. 22, p. 39

Mid 19th Century Transits

Date	By	Location	Reference
1848 November 09	G. B. Airy	Greenwich	Greenwich Observations,vol. 10, p. D53
	T. Chevallier	Durham	MNRAS, vol. 9, p. 40
1845 May 08			
1832 May 05			

Regency Period Transits

Date	By	Location	Reference
1802 November 09	C. Lofft	Troston, Bury St. Edmunds	The Monthly Magazine, vol. 14, p. 479
1799 May 07	C. Lofft	Troston, Bury St. Edmunds	The Monthly Magazine, vol. 7, p. 380



Capel Lofft's observation of the 1802 transit (reference above)

Earlier Georgian Transits

Date	By	Location	Reference
1789 November 05			
1786 May 04	Clouded Out		Ipswich Journal, 1786 May 13, p. 2

And Finally

Date	By	Location	Reference
1818 January 06	J. Acton T. Crickmore C. Lofft	Ipswich	The Monthly Magazine, vol. 45, p. 102