

Interesting Astronomical Events for 2019



**International Space Station
passing in front of Moon**

Feb 1, 2018

References:

<https://skysafariastronomy.com/>

<http://astropixels.com/ephemeris/astrocal/astrocal2017cst.html>

<http://www.seasky.org/astronomy/astronomy-calendar-2017.html>

<http://www.calsky.com/cs.cgi>

RASC Handbook 2019

Ottewell <https://www.universalworkshop.com/guysblog/wp-content/uploads/2018/12/tim2019-2.pdf>

All Photos by Mark Jones

Unless noted

Southern Cross

May 6, 2018

Tulum, MX



Full Moon Events 2019

Largest

Jan 20 - 2nd biggest full moon of the year

Feb 19 – This is the 3rd biggest full moon of the next 10 years, and the biggest of the year. Next larger full moon is at 12-24-2026



Apogee Moon
Jan 15, 2014
406,532 km



Perigee Moon
Nov 13, 2016
350,853 km

Moon 2019

Smallest

Sept 13 – Smallest full moon of the next 10 years, and the smallest of the year. Next smaller full moon is 10-22-2029



Apogee Moon
Jan 15, 2014
406,532 km



Perigee Moon
Nov 13, 2016
350,853 km

Moon Conjunctions 2019

Feb	13	21:29	Aldebaran 1.7°S of Moon, Alt=55°
Feb	17	21:05	Beehive 1°S of Moon, Alt=60°
May	10	19:35	Beehive 0.0°S of Moon, Alt=50°
Aug	28	5:31	Beehive 0.2°S of Moon, Alt=10°
Oct	22	2:15	Beehive 2°S of Moon, Alt=18°
Nov	18	4:11	Beehive 3°S of Moon, Alt=70°



Moon and Venus July 15, 2018

Other Moon Events 2019

Golden Handle on the Moon

Sun rises on the Jura mountains, while Sinus Iridium is still in shadow

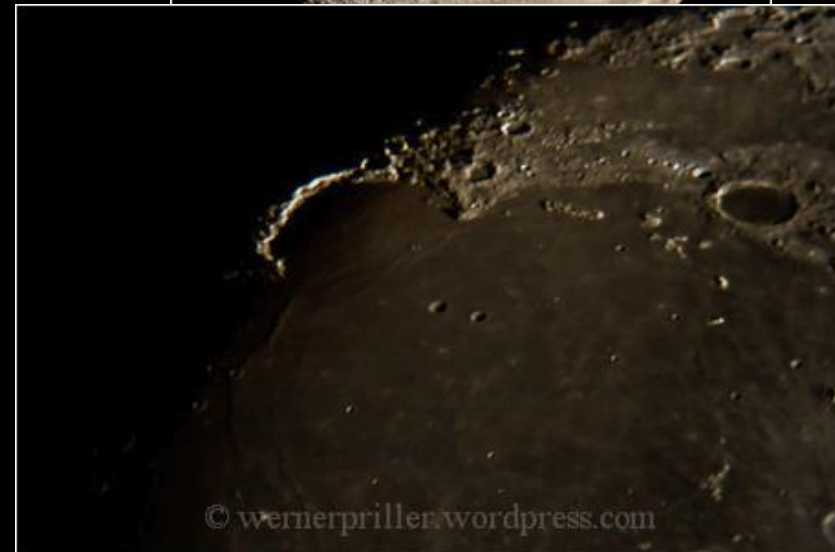
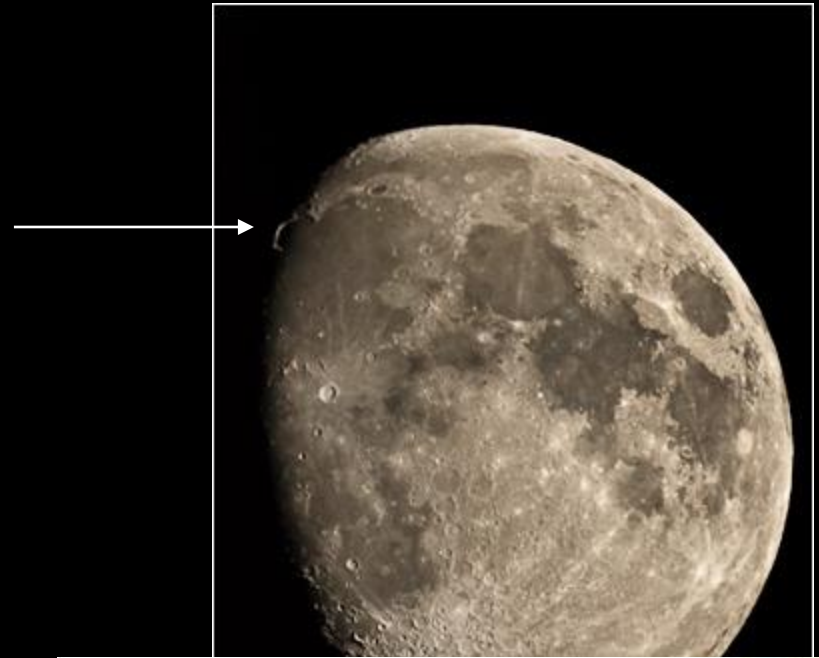
- Feb 14 – 21:24 Alt=72°
- Apr 15 – 2:30 Alt=22°
- Jun 13 – 00:12 Alt=33°
- Aug 10 – 19:12 Alt=30°
- Oct 8 – 17:36 Alt=34°
- Dec 6 – 21.48 Alt=52°

Start times. Event visible up to 7 hours

Data provided by CalSky

Photos by Werner Priller

Local STL times



Other Moon Events 2019

Lunar-X on the Moon

- Feb 11 – 20:18 Alt=43°
- Apr 11 – 23:24 Alt=30°
- Jun 9 – 23:24 Alt=27°
- Aug 7 – 22:48 Alt=19°
- Oct 5 – 23:12 Alt=10°

Start times. Event visible up to 2 hours

Data provided by CalSky

Local STL times



Other Moon Events 2019

Curtiss Cross on the Moon

Ridges in Fra Mauro visible on the evening terminator

- Apr 28 – 03:18 Alt=1°
- Jun 26 – 01:42 Alt=1°
- Oct 22 – 00:36 Alt=2°
- **Dec 20 – 02:54 Alt=24°**

Start times. Event visible up to 1/2 hour

Data provided by CalSky

Photo by Jerry Lodriguss

Local STL times



2019 Meteor Showers

- January 3 Quadrantids; ZHR=40 (NM-3days)
- April 22 Lyrids; ZHR=20 (FM+3days)
- May 5 Eta Aquarids; ZHR=60 (NM)
- July 28 Delta Aquarids; ZHR=20 (NM-4days)
- Aug 12 Perseids; ZHR=60 (FM-3days)
- Oct 21 Orionids; ZHR=20 (LQ+1day)
- Nov 17 Leonids; ZHR=20 (LQ-1day)
- Dec 14 Geminids; ZHR=120 (FM+2days)

Yellow=Favorable Moon Conditions

Eclipses 2019

Jan 6 – Partial Solar Eclipse

– Eastern Asia, not visible from US

Jan 20 – Total Lunar Eclipse

– visible from US

Jul 2 - Total Solar Eclipse

– S America, not visible from US

Jul 16 – Partial Lunar Eclipse

– not visible from US

Dec 26 – Annular Solar Eclipse

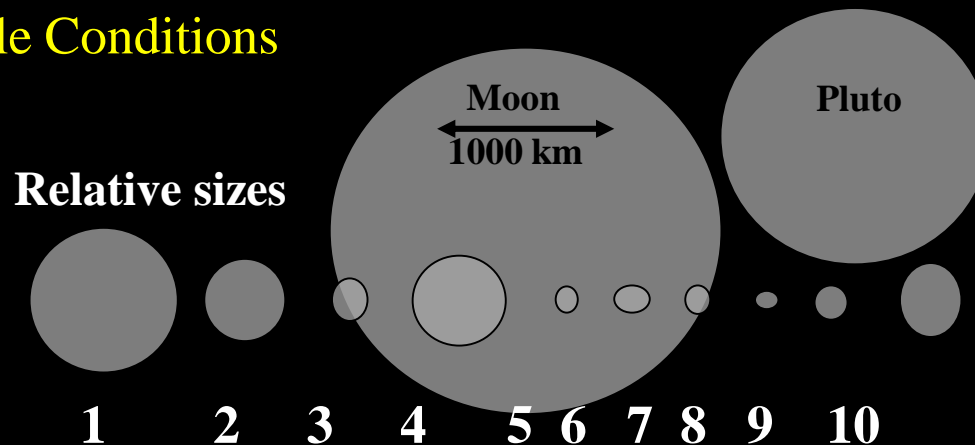
– Middle East thru Far East, not visible from US

Yellow=Favorable Conditions

Small Body Oppositions 2019

May	28	Dwarf Planet Ceres (1) at opposition, mag +7.0 (2019)
Apr	6	Asteroid Pallas (2) at opposition, mag 9.0 (2019)
Apr	2	Asteroid Juno (3) at opposition, mag 8.2 (2020)
Nov	12	Asteroid Vesta (4) at opposition, mag +6.5 (2019)
Apr	3	Asteroid Hebe (6) at opposition, mag 9.9 (2020)
Apr	5	Asteroid Iris (7) at opposition, mag 9.4 (2019)
May	11	Asteroid Flora (8) at opposition, mag 9.7 (2019)
Oct	26	Asteroid Metis (9) at opposition, mag 8.6 (2019)
Nov	26	Asteroid Hygiea (10) at opposition, mag 10.3 (2019)
Jul	12	Dwarf Planet Pluto (134340) at opposition, mag 14.2

Yellow=Favorable Conditions



Planet Oppositions 2019

- Venus GEW – Jan 6 (24.5 arc-sec)
- Venus SC – Aug 14 (9.6 arc-sec)
- Mars SC – Sep 2 (dia=3.8 arc-sec)
- **Jupiter – Jun 10 (dia=46 arc-sec)**
- **Saturn – Jul 9 (dia=18.4 arc-sec,
24° ring tilt)**
- Uranus – Oct 28 (dia=3.7 arc-sec)
- Neptune – Sep 10 (dia=2.36 arc-sec)

- **Yellow=Favorable Conditions**
- **SC= Superior Conjunction**
- **GEW= Greatest Elongation West**

Images from Stellarium



**Top to Bottom:
Relative sizes of**



January - March

M42 Sep 14, 2018

Whiteside MO

Venus 2019

Largest/Smallest Size

- **Venus Dichotomy – Jan 5 (mag= -4.6)**
- Venus GEW – Jan 6 (24.5 arc-sec)
- Venus 2.4deg from Jupiter – Jan 22
- Venus 3deg from Moon – Jan 31, Alt=20deg
- Venus 1 deg from Saturn – Feb 13
- Venus 1.2deg from Moon – Mar 2 (mag= -4.1)
- Venus 4deg from Mercury – Apr 16
- **Venus SC – Aug 14 (9.6 arc-sec)**
- Venus 1 deg from Regulus – Aug 21
- Venus 0.3deg from Mars – Aug 24
- **Venus 0.3deg from Mercury – Sep 13**
- Venus 1.5deg from Jupiter – Nov 24
- Venus 1.9deg from Moon – Nov 28
- **Venus 1deg from Moon – Dec 29**



Venus – Jan 5



Venus – Aug 14

Lunar Eclipse – Jan 20, 2019

Moon is 0.6 days before perigee

Part of Saros Cycle 134 (1150AD – 2830AD)

Beehive Cluster 5 deg east of Moon

Partial Eclipse start: 9:35pm , EL=51 deg

Total Eclipse start: 10:42pm, EL=63 deg

Total Eclipse ends: 11:45pm, EL=70deg

Partial Eclipse ends: 12:52am, EL=69deg

Lunar Eclipse



Lunar Eclipse Jan. 20, 2000



Eclipse almost same exact time and location as Jan 20, 2000

Eclipsed Moon/Beehive

Jan. 20, 2019

Date and Time			Date and Time		
Date and Time			Julian Day		
2019	/	1	/	20	
			22	:	46
				:	6

Moon

δ -Cancerids

Asellus Australis

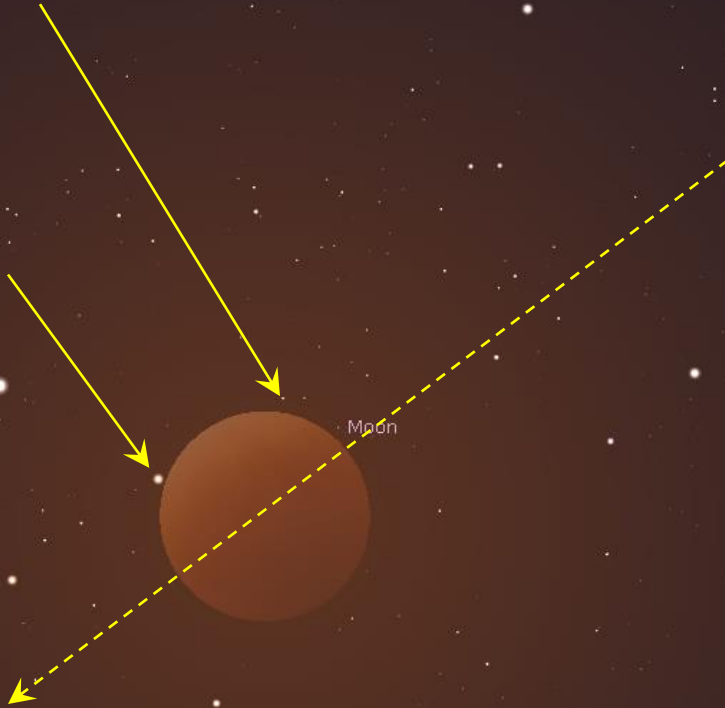
Beehive Cluster



Eclipsed Moon Mid-eclipse 11:19pm

Mag=10.2 star

Mag=7.8 star

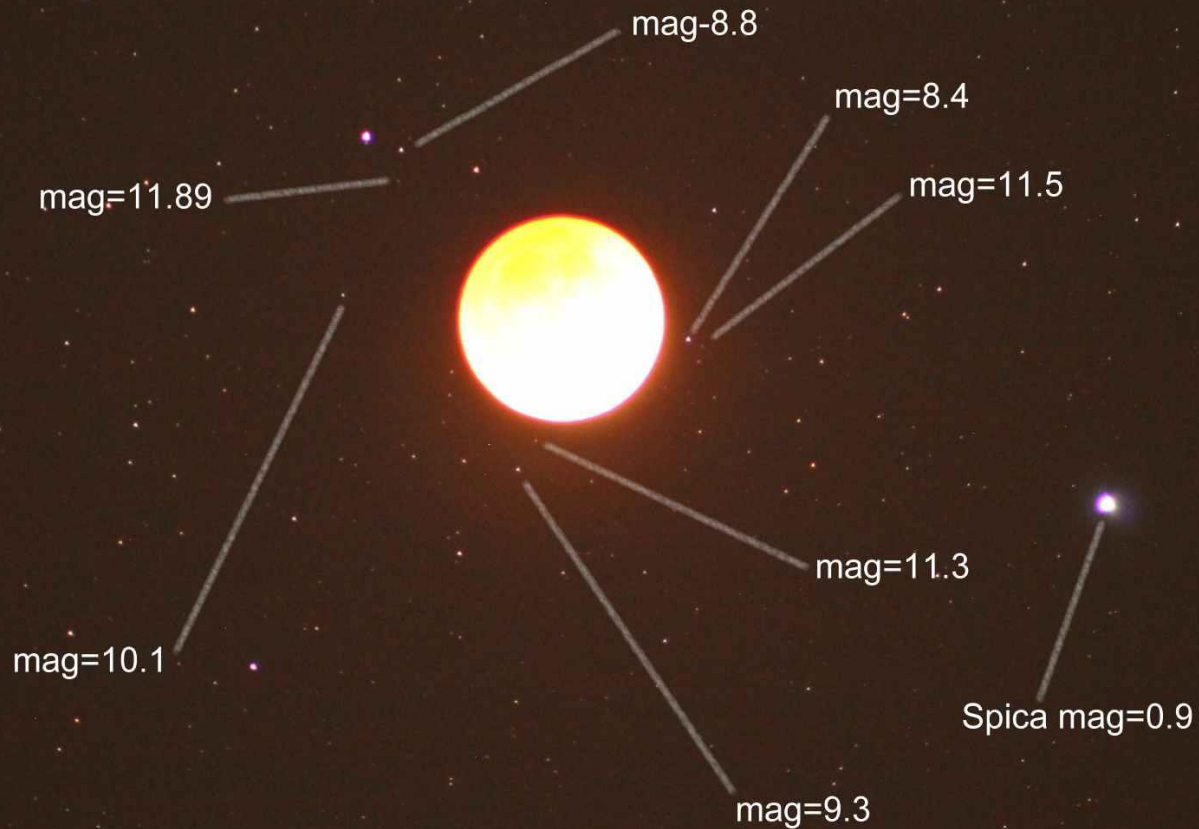


Date and Time		Date and Time		Julian Day				
2019	/	1	/	20	23			
					:	19	:	29

Eclipsed Moon

Mid-eclipse 2014

Total Lunar Eclipse
April 15 2014
Mid-eclipse 2:46am CDT



Venus, Jupiter, Antares – Jan 22, Alt=10deg 4:50am

Venus
Jupiter



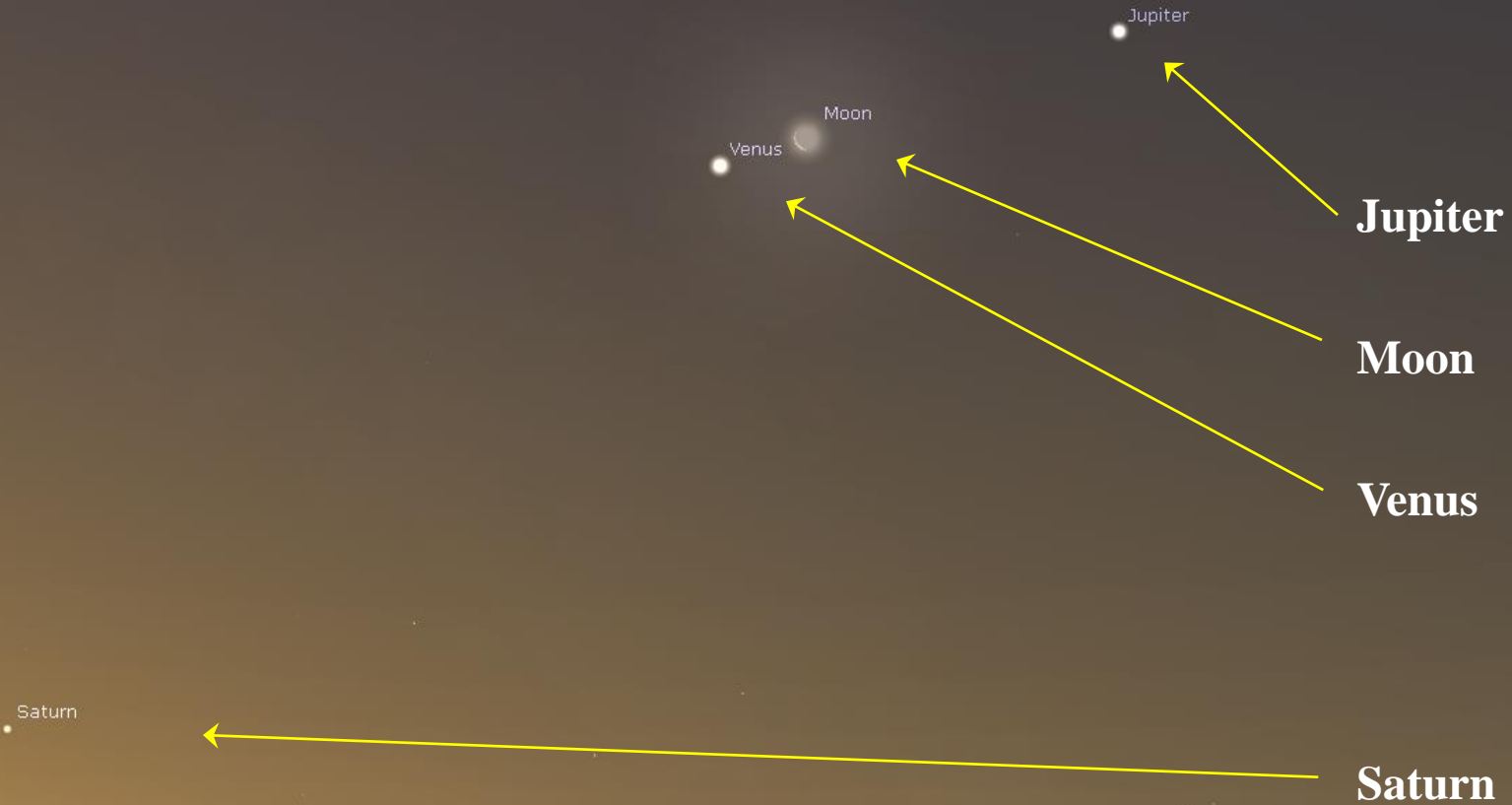
Antares

Images from Stellarium

Date and Time		Date and Time		Julian Day				
2019	/	1	/	22				
				4	:	52	:	30

Venus 3deg from Moon – Jan 31, Alt=20deg

6:45am



Date and Time							Date and Time			Julian Day		
2019	/	1	/	31	6	:	44	:	47			

Moon Hyades Feb 13

9:00pm

Feb

13

21:06

Aldebaran 1°S of Moon, Alt=55deg

2019

/

2

/

13

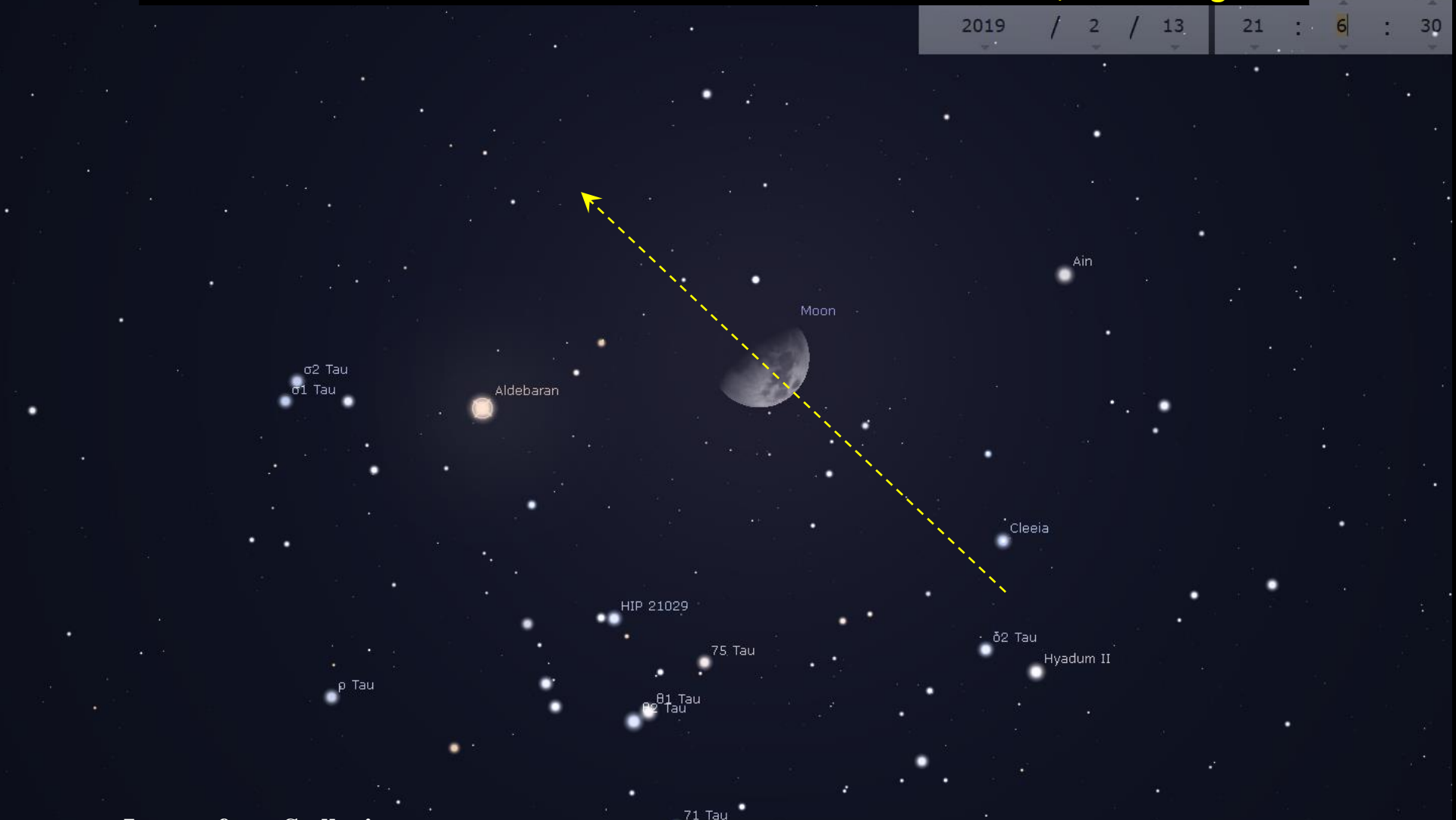
21

:

6

:

30



Images from Stellarium.

Uranus 1deg from Mars – Feb 13 (65deg from Sun) 10:20pm



Date and Time							Date and Time			Julian Day		
2019	/	2	/	13	22	:	22	:	24			

Saturn 1deg from Venus – Feb 18 (43deg from Sun)

6:00am

Jupiter

Venus
Saturn

Date and Time		Julian Day		
2019	/ 2 / 18	6	:	1 : 31

Venus, Moon, Saturn – Mar 2, Alt=10deg 5:15am



Date and Time		Date and Time		Julian Day	
2019	/	3	/	2	5 : 16 : 10

Mars 2019

- Mars 1deg from Uranus – Feb 13 (76deg from Sun)
- **Mars Spring begins – Mar 22 (mag= +1.4)**
- Mars 3deg from Pleiades – Mar 31 (50deg from Sun)
- Mars 2 deg from Moon – Jun 5 (29deg from Sun)
- Mars 0.3deg from Mercury - Jun 18 (24deg from Sun)
- Mars 0.2deg from Moon – Jul 4 (19deg from Sun)
- Mars 0.4deg from Beehive – Jul 13
- **Mars SC with Sun – Sep 2 (3.5 arc-sec)**
- Mars Summer begins – Sep 7

- Yellow=Favorable Conditions
- SC= Superior Conjunction

Largest/Smallest Size



Moon/Beehive Cluster

Feb 17, 9:00pm

Date and Time

Julian Day

2019

/

2

/

17

21

:

8

:

24

Feb

17

21:09

Beehive 0.0°S of Moon, Alt=60deg

Asellus Borealis

B Cnc

Moon

Asellus Australis

Mars 3deg from Pleiades – Mar 31 (50deg from Sun)

9:00pm

Aldebaran

Mars

Mirphak

Date and Time

Date and Time	Julian Day
2019 / 3 / 31	21 : 5 : 48

W

Images from Stellarium



April - June

M8 and M20 July 7, 2018

Whiteside MO

Venus, Mercury, Moon – Apr 2, Alt=7deg 6:00am



Jupiter 1.4deg from Moon – Apr 23 5:00am



Images from Stellarium

Date and Time

Date and Time				Julian Day					
2019	/	4	/	23	4	:	56	:	17

Moon/Beehive Cluster

May 10, 9:00pm

May

10

19:35

Beehive 0.0°S of Moon, Alt=50deg

2019 / 5 / 10 21 : 0 : 6



Mars 6deg from Moon – Jun 5 (29deg from Sun) 9:00pm



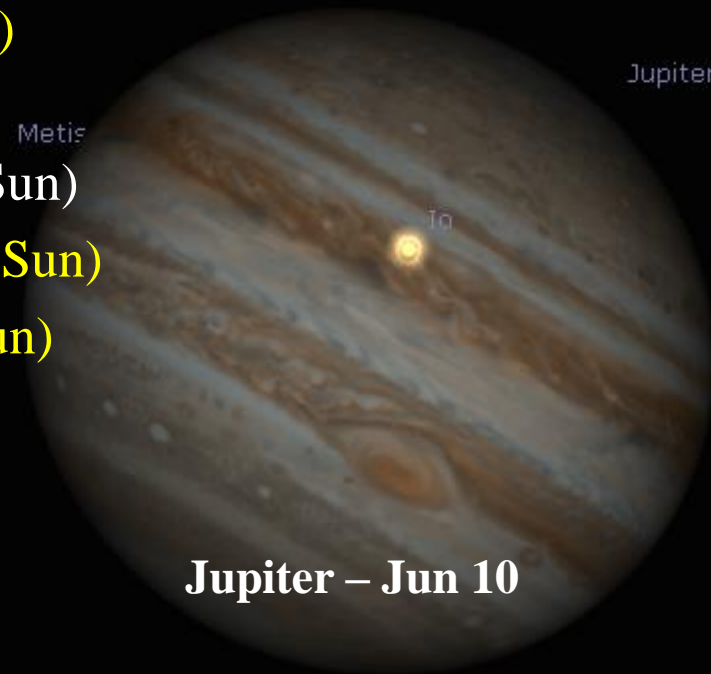
Jupiter 2019

- **Jupiter west quadrature – Feb 14 (mag= -1.9)**
- Jupiter 2deg from Moon – Feb 27
- Jupiter 2deg from Moon – Mar 26
- **Jupiter 2deg from Moon – Apr 23**
- Jupiter at opposition – Jun 10 (mag= -2.6)
- **Jupiter 2deg from Moon – Jun 16**
- **Jupiter 3deg from Moon – Sep 5 (69deg from Sun)**
- Jupiter east quadrature – Sep 8 (mag= -2.2)
- Jupiter 1.3deg from Moon – Oct 31 (45deg from Sun)
- **Jupiter 1.4deg from Venus – Nov 24 (26deg from Sun)**
- **Jupiter 1deg from Moon – Nov 28 (24deg from Sun)**
- Jupiter SC with Sun – Dec 27

Largest/Smallest Size
Europa Jupiter



Jupiter – Feb 14



Jupiter – Jun 10

Mars 0.3deg from Mercury – Jun 18 8:45pm

Mercury



Mars



Date and Time

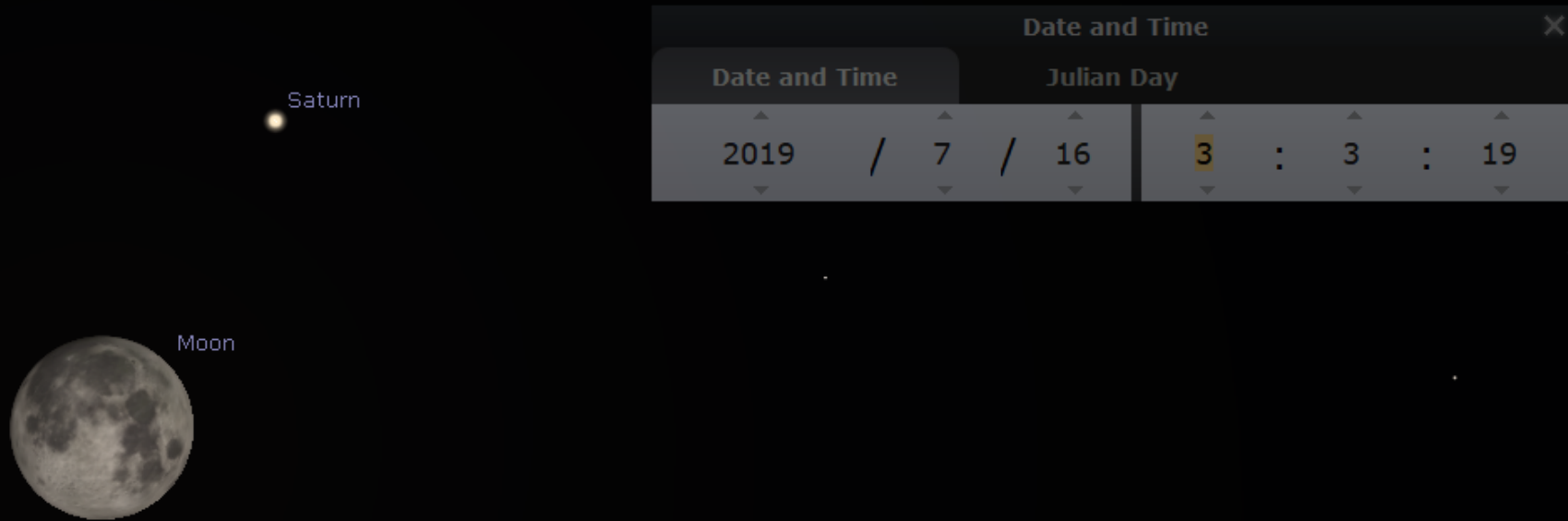
Date and Time			Julian Day		
2019	/	6	/	18	20
				:	42
				:	5

Saturn 2deg from Moon – Jun 18 (159deg from Sun) 10:00pm



Date and Time						Date and Time			Julian Day		
2019	/	6	/	18	22	:	1	:	22		

Saturn 2deg from Moon – Jul 16 (174deg from Sun) 3:00am





July - September

M31 Sep 14, 2018

Whiteside MO

Saturn 2019

Largest/Smallest Size

- **Saturn SC with Sun – Jan 2**
- Saturn 1deg from Venus – Feb 18 (43deg from Sun)
- **Saturn 0.4deg from Moon – Mar 1 (53deg from Sun)**
- Saturn west quadrature – Apr 10
- **Saturn 0.6deg from Moon – Jun 19 (159deg from Sun)**
- **Saturn opposition – Jul 9 (mag = +0.1)**
- **Saturn 0.4deg from Moon – Jul 16 (174deg from Sun)**
- **Saturn 0.3deg from Moon – Oct 5 (92deg from Sun)**
- Saturn east quadrature – Oct 7
- **Saturn 1deg from Moon – Nov 29 (41deg from Sun)**
- **Saturn 0.4deg from Venus – Dec 11 (30deg from Sun)**
- **Yellow=Favorable Conditions**



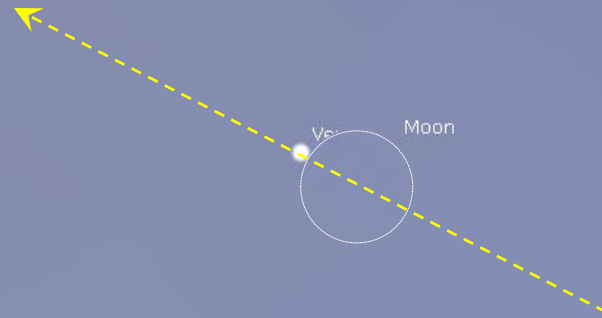
Pluto 2019

- Pluto SC with Sun – Jan 11
- **Pluto opposition – Jul 14 (mag = +14.2)**



Moon/Venus Occultation Jul 31

Daytime Event
Start: 4:15pm
End: 5:21pm
Alt= 50 to 30 deg



Images from Stellarium

Date and Time		Date and Time		Date and Time		Date and Time			
Date and Time		Julian Day		Date and Time		Date and Time			
2019	/	7	/	31	16	:	8	:	15

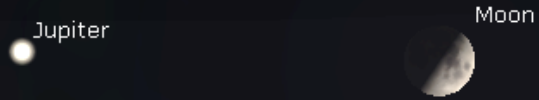
Moon/Beehive Occultation Aug 28



Start: 4:30am
Alt=3deg
Mid: 5:45pm
Alt= 17 deg

Date and Time		Date and Time		Date and Time	
Date and Time		Date and Time		Date and Time	
Date and Time		Date and Time		Date and Time	
2019	/	8	/	28	
		4	:	31	:
				12	

Jupiter 3deg from Moon – Sep 5 (Alt=20deg) 10:40pm



Date and Time

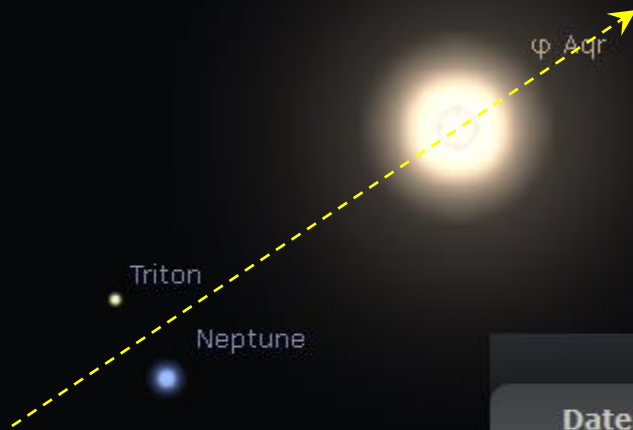
Date and Time	Julian Day
2019 / 9 / 5	22 : 40 : 33

Neptune 2019

- Neptune SC with Sun – Mar 7
- Neptune 0.3deg from Venus – Apr 10 (33deg from Sun)
- **Neptune 0.01deg from Upsilon Aquarii - Sep 9 (mag=+4.2)**
- **Neptune opposition – Sep 10 (mag = +7.8)**



Neptune – Sep 9, 8:30pm



Date and Time						Date and Time			Julian Day			
2019	/	9	/	5	20	:	33	:	56			

Venus 0.3deg from Mercury – Sep 13, Alt=7deg 7:00pm



Date and Time

Date and Time	Julian Day
2019 / 9 / 13	18 : 58 : 51



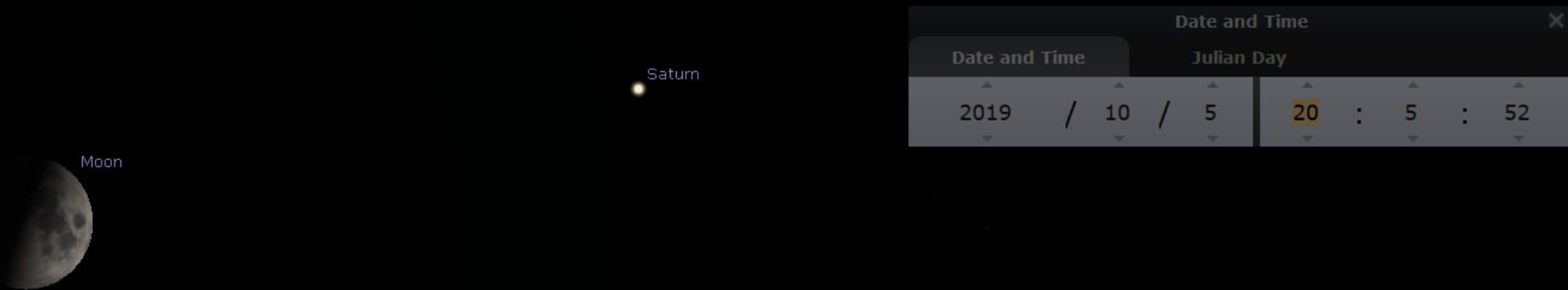
October - December

Double Cluster in Perseus

July 7, 2018

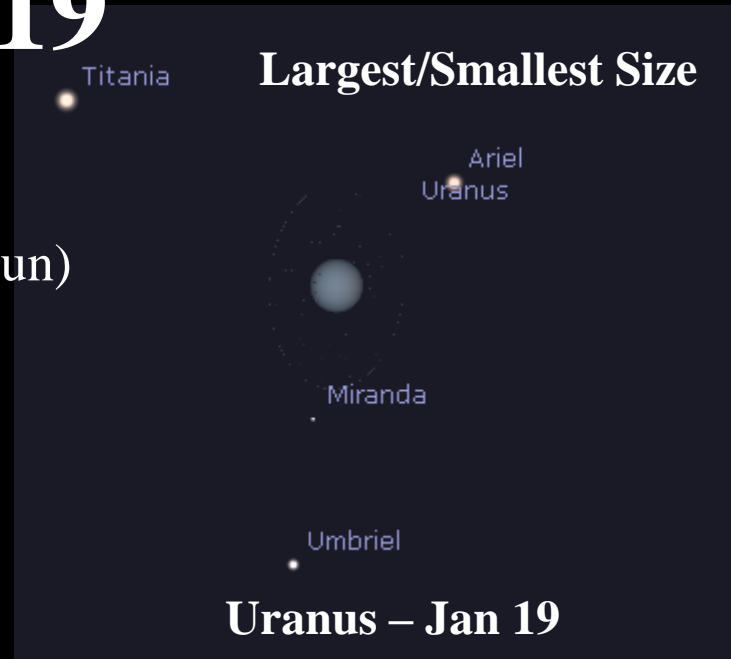
Whiteside MO

Saturn 2deg from Moon – Oct 5 (92deg from Sun) 8:00pm



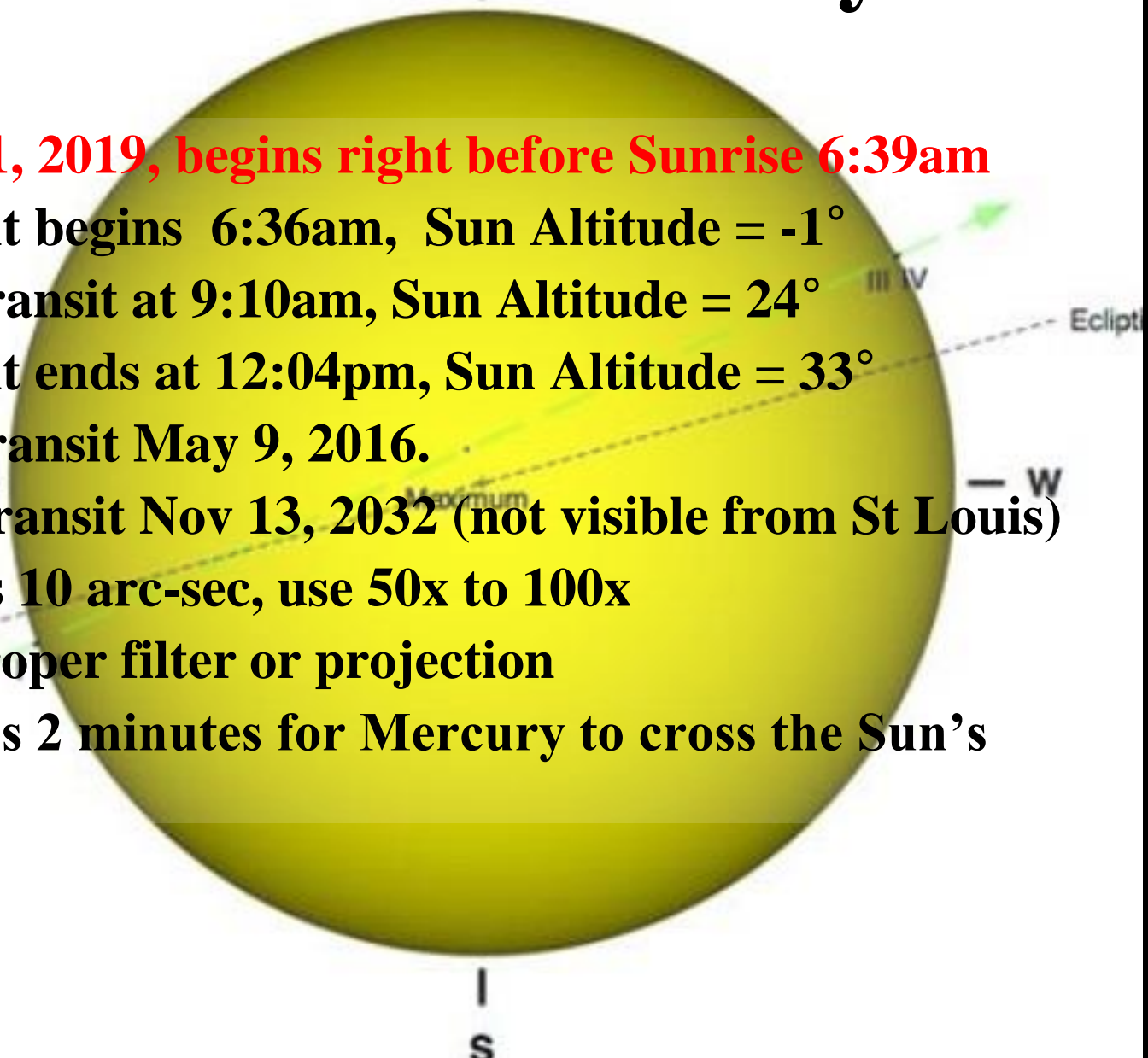
Uranus 2019

- **Uranus east quadrature – Jan 19**
- Uranus 1deg from Mars – Feb 13 (65deg from Sun)
- Uranus SC with Sun – Apr 22
- Uranus west quadrature – Jul 29
- **Uranus opposition – Oct 28 (mag = +5.7)**

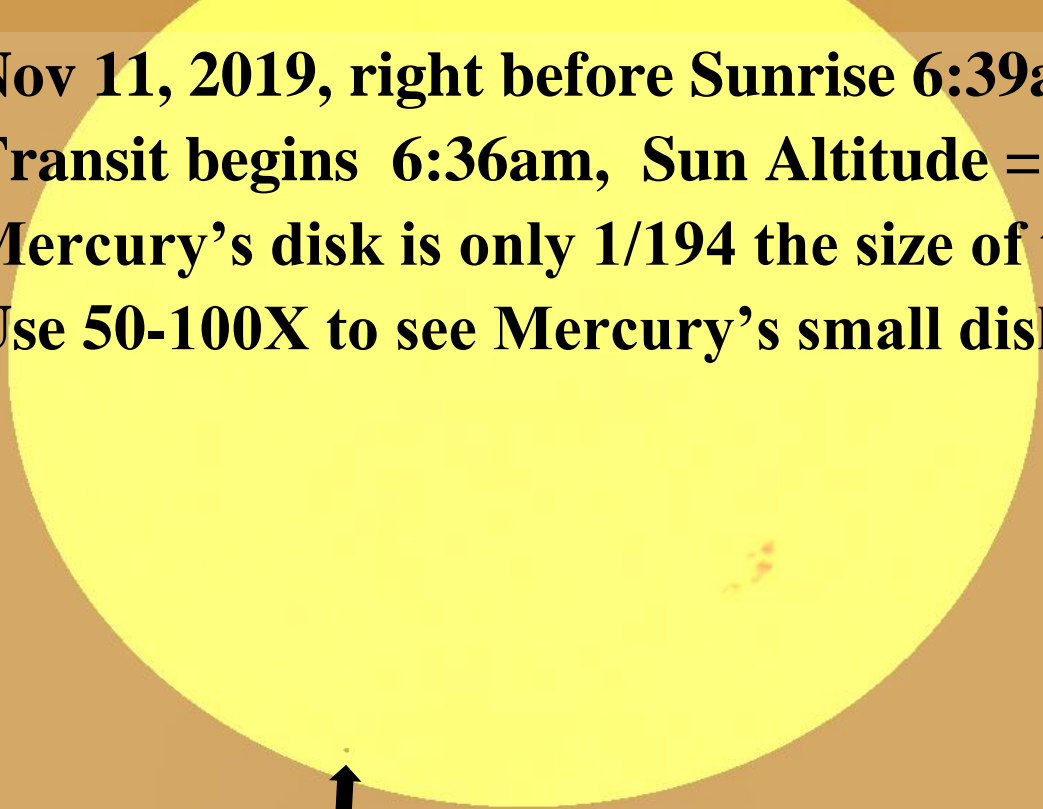


Transit of Mercury

- **Nov 11, 2019, begins right before Sunrise 6:39am**
- **Transit begins 6:36am, Sun Altitude = -1°**
- **Mid-transit at 9:10am, Sun Altitude = 24°**
- **Transit ends at 12:04pm, Sun Altitude = 33°**
- **Last transit May 9, 2016.**
- **Next transit Nov 13, 2032 (not visible from St Louis)**
- **Disk is 10 arc-sec, use 50x to 100x**
- **Use proper filter or projection**
- **It takes 2 minutes for Mercury to cross the Sun's limb**

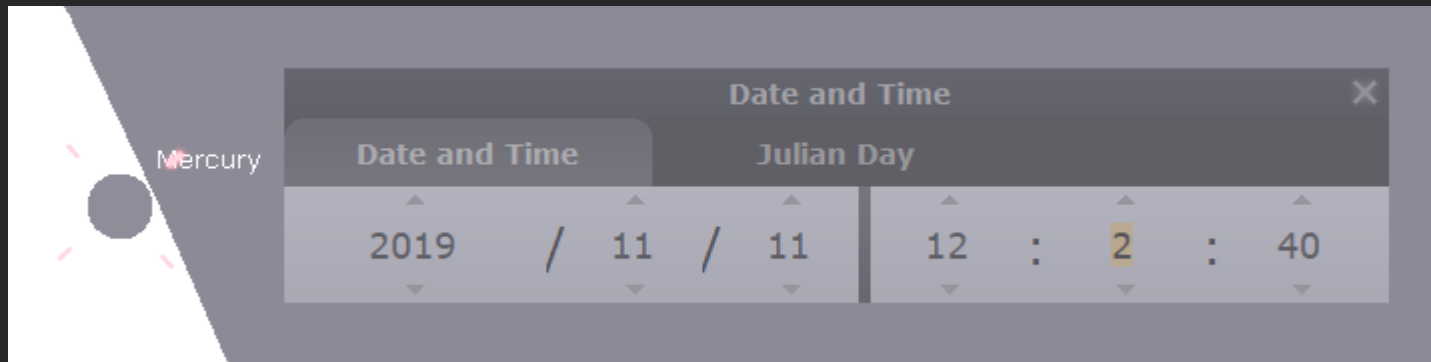


- **Nov 11, 2019, right before Sunrise 6:39am**
- **Transit begins 6:36am, Sun Altitude = -1°**
- **Mercury's disk is only 1/194 the size of the Sun's**
- **Use 50-100X to see Mercury's small disk**



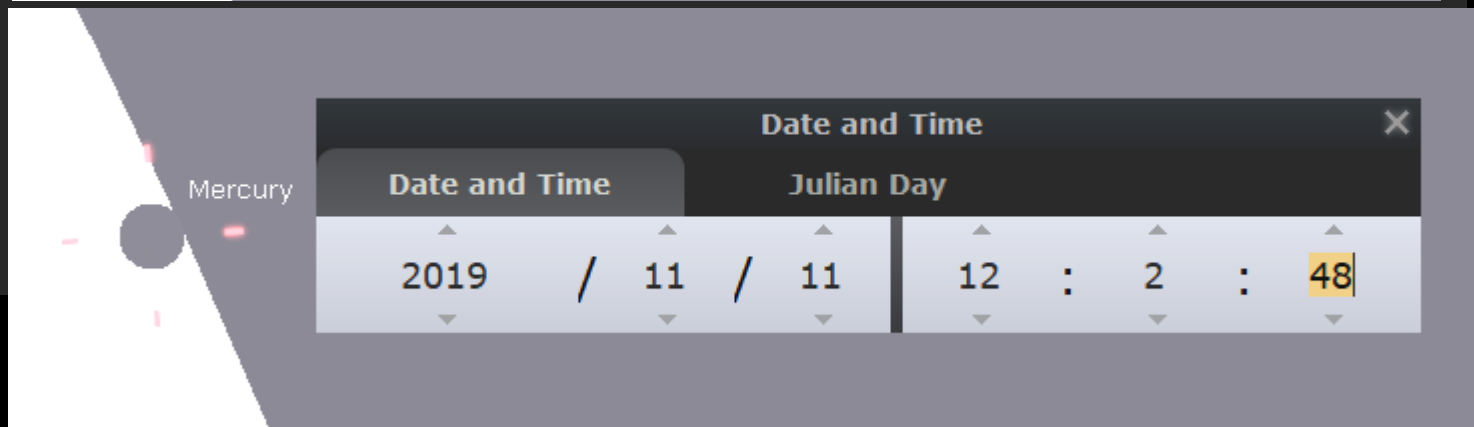
Date and Time		Julian Day	
2019	11 / 11	6	47 : 7

- **Transit ends at 12:04pm, Sun Altitude = 33°**
- **Use 50-100X to see Mercury's small disk**



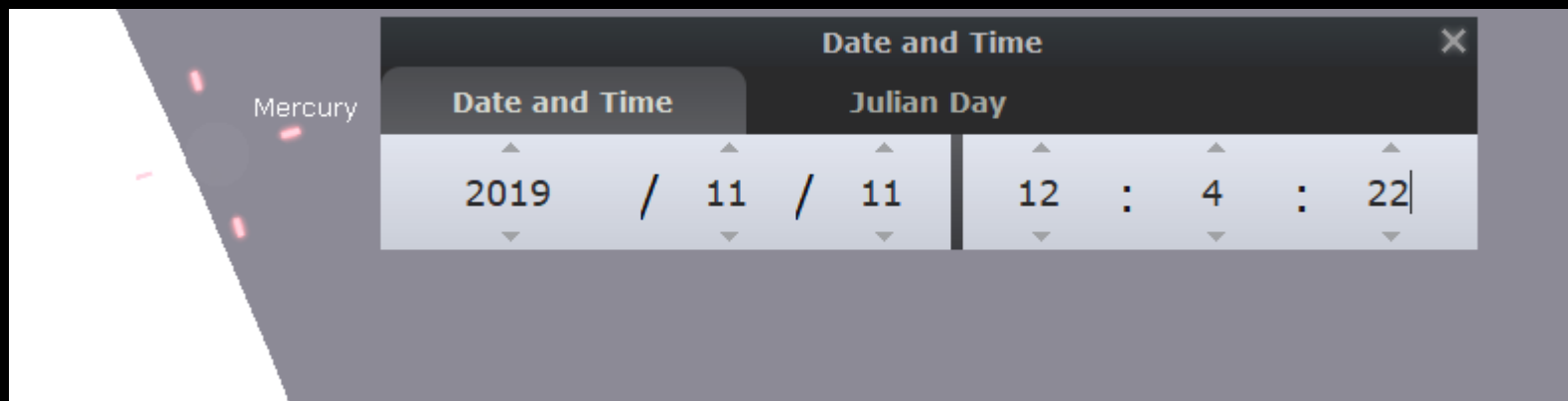
A screenshot of a software interface showing Mercury's position. On the left, a large black circle represents the Sun, and a smaller red dot represents Mercury. The interface includes a 'Date and Time' window with the following data:

Date and Time		Julian Day	
2019	/ 11 / 11	12	: 2 : 40



A screenshot of a software interface showing Mercury's position. On the left, a large black circle represents the Sun, and a smaller red dot represents Mercury. The interface includes a 'Date and Time' window with the following data:

Date and Time		Julian Day	
2019	/ 11 / 11	12	: 2 : 48



A screenshot of a software interface showing Mercury's position. On the left, a large black circle represents the Sun, and a smaller red dot represents Mercury. The interface includes a 'Date and Time' window with the following data:

Date and Time		Julian Day	
2019	/ 11 / 11	12	: 4 : 22

Warning

Warning! NEVER look at the Sun directly through an unfiltered telescope – you could be blinded.

Only use filters from reputable suppliers intended for solar observing.

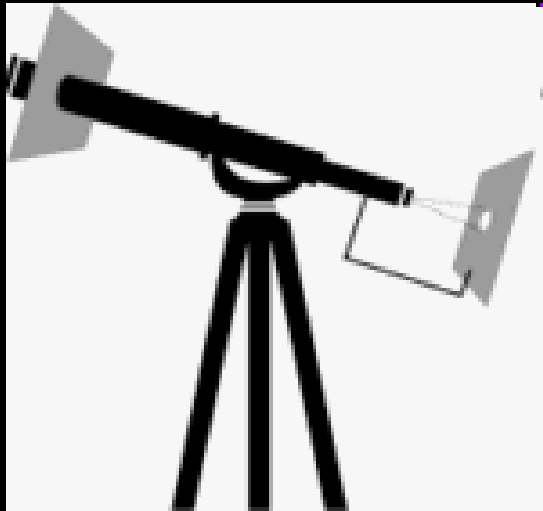
Do not assume that a filter which makes the Sun look dark is safe to look through; it may let through infra-red and/or UV.

See NASA Website:

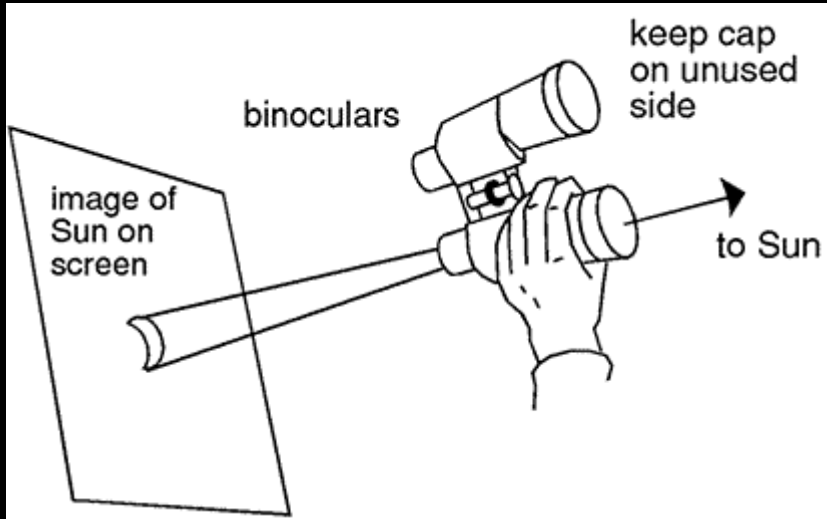
<http://eclipse.gsfc.nasa.gov/SEhelp/safety2.html>

<http://eclipse.gsfc.nasa.gov/transit/catalog/MercuryCatalog.html>

SAFE Solar Viewing Methods



Solar
Funnel



Transit of
Mercury

Nov 10,
1973



Moon/Beehive Cluster

Nov 18, 3:15am

Nov

18

3:16

Beehive 2°N of Moon, Alt=61deg

2019 / 11 / 18

4 : 14 : 49

Asellus Borealis

η Cnc

Moon



θ Cnc

Asellus Australis

Jupiter 1.4deg from Venus – Nov 24 (26deg from Sun) 5:30pm



Date and Time		Date and Time		Julian Day					
2019	/	11	/	24	17	:	33	:	21

Jupiter, Venus, Moon, Saturn – Nov 28 (24deg from Sun) 5:15pm



Date and Time

Date and Time	Julian Day
2019 / 11 / 28	17 : 17 : 4

Saturn 3deg from Moon – Nov 29 (41deg from Sun) 6:50pm

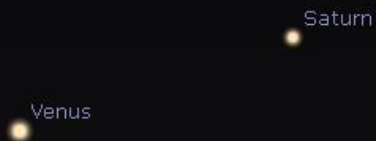
Moon

Saturn

Date and Time

Date and Time	Julian Day
2019 / 11 / 29	18 : 54 : 21

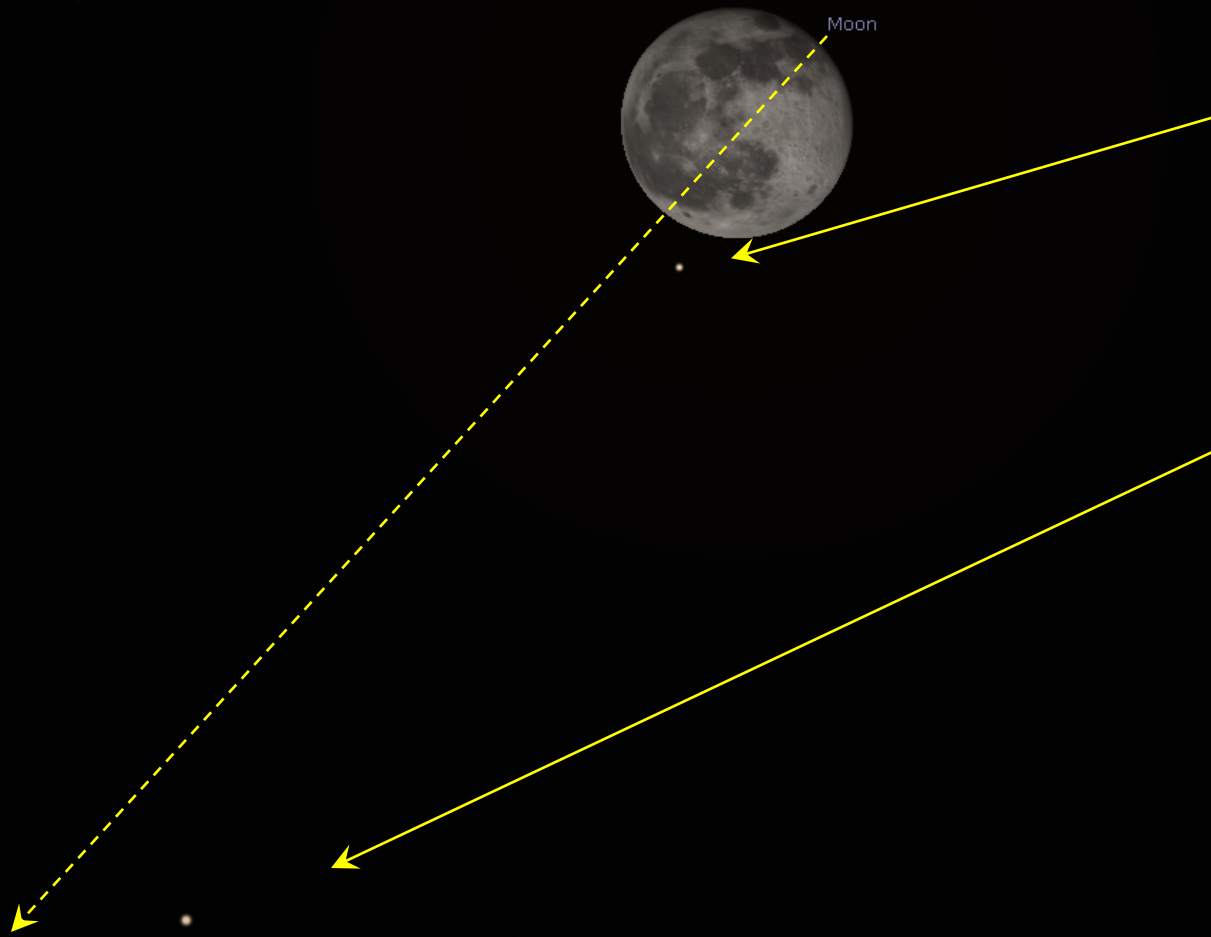
Saturn 1deg from Venus – Dec 11 (41deg from Sun) 6:00pm



Date and Time

Date and Time			Julian Day		
2019	/	12	/	11	
				18	:
				1	:
					6

Moon Occultation Dec 12-13



Eta Gem mag= +3.3
start 10:52pm
end: 11:58pm

Mu Gem mag= +2.8
Start: 3:55am
End: 4:35am

Date and Time		Date and Time		Julian Day				
2019	/	12	/	12	:	36	:	31