Re: Obs rep and notes on Saturn Venus conjunction

Source: http://sci.tech−archive.net/Archive/sci.astro.amateur/2007−07/msg00062.html

- *From*: Matthew Ota <otakenji@xxxxxxxxxxxxx>
- *Date*: Sun, 01 Jul 2007 20:00:30 −0700

On Jul 1, 1:46 pm, canopus56 <canopu...@xxxxxxxxx> wrote:

> Our local Utah club had a small star party at our observatory (http://www.slas.us/spoc2.htm).
>
> In a single low−magnification e.p. view (50mm 2" e.p. on a 5 1/2 inch 1120mm refractor), Venus and Saturn presented a great asthetic view. Just past sunset, the Earth's terminator passed overhead, mirroring the terminator on Venus. As the sky darkened, Saturn, Titan and Venus became visible in a brighter twilight sky. Using an light blue (80A) filter at higher magnification, some detail could be seen in Venus's terminator, but the arcsec resolution of 5 1/4 inch apeture combined with low−altitude sunset atmospheric seeing was insufficent to resolve any other cloud detail.
>
> The Saturn and Venus conjunction also showed a number of basic solar system planet relationships between inferior and superior planets that will repeat again this evening:
>
> 1) Inner planets have a phase; outer planets do not.
>
> The inner planet Venus showed a sharp crescent phase; Saturn presented no distinct illuminated fraction. But at conjunction, both planets are nearly in the same visual line from Earth. Mars, which was not observed on this evening, rises in the early morning hours and does show a phase. See story <<http://www.space.com/news/070627_mars_storm.html
>
> .
>
> Because both Venus and Saturn are nearly on the same sight line from Earth, the initial common sense impression is that they should both show a phase.
>
> To see a distinct illuminated phase, a planet must be inferior to the Earth or slighty outside its orbit. Each planet's Earth−planet−Sun geometry varies due to their relative distance from the Earth. The ratio of the diameter of the Earth's orbit (1 A.U.) to Saturn's orbit

(9.5 A.U.) is so small that the Earth never reaches an orbital position where Saturn has a significant illuminated fraction. The Earth−Venus−Sun phase angle is around 108 degrees, but the Earth−Saturn−Sun phase angle is only about 4 degrees.

If the Cassini spacecraft was pointed looking back towards Earth, its wide angle images would show both the crescent shapes of Venus and Earth. Although no Cassini image exists, a concept simulation can be made using the JPL/NASA Solar System Simulator <<http://space.jpl.nasa.gov/

and setting the "field of view" option to 0.2 degrees.

2) Distance and physical size relate to apparent size and brightness.

Saturn (1.0 mag), although much more massive than Venus, had an apparent brightness much lower than Venus (−2.8 mag). Saturn is 10 times larger than Venus but is about 30 more times distant than Venus. (Radius: Saturn 60.2km / 6.0km). (Distance a.u.: (9.5 a.u. − 1.0 a.u.) / (1.0 a.u. − 0.7 a.u.) = 8.5 / 0.3 = ~30). Saturn orbits at 1,429M km; Venus at 108 M km; and the Earth at 149.5M km.

Because of its relative nearness, the smaller diameter Venus had an apparent linear brightness of about 28 times brighter than Saturn or 3.8 times as bright on the magnitude scale. (1127.2 / 34.0 = 28 ; 1v − (−2.8v) = 3.8v).

Because of its relative nearness, the smaller radius Venus (6.0km) had a relatively larger apparent diameter (radius 6km, 32") as compared to the more distant, but much larger, Saturn (radius 60.2km, apparent diameter 17").

3) Some planets are tilted with respect to the ecliptic; others are not.

Saturn, like the Earth is tilted on its rotation axies relative to the ecliptic. Saturn is tilted about 27 1/2 degrees to ecliptic as compared to the Earth's 23 1/2 degrees. Because of its cloud cover, Venus has no visually discernable tilt, equator or rotation axis. From radar studies is is known to be about 177 degs, or nearly aligned with the plane of the ecliptic.

Usually observers do not perceive Saturn's tilt relative to the ecliptic because there is no visual reference of the ecliptic plane in the e.p. view. The rings provide a physical reference of the tilt of Saturn relative to the Earth.

At this conjunction, mentally drawing a line perpendicular to the cusps of Venus's terminator provides an ecliptic reference line in the

> e.p. view and enables the observer to visually appreciate the tilt of Saturn's equator relative to the ecliptic. If Venus and Saturn cannot be seen in the same e.p. view, a reticule e.p. can be used on Venus to set the near ecliptic line and then the e.p. can be panned over to Saturn.
>
> The Earth's tilt with respect to the ecliptic can be demonstrated by referencing the angular distance between due west and the point of the setting Sun in your local horizon system.
>
> 4) Because inferior inner planets move around the Sun relatively faster than the Earth and the outer planets, conjunctions between outer and inner planets are relatively more frequent.
>
> Inferior Venus conjunctions with the outer planet Saturn within 4 degrees will occur 11 times in the next 10 years. Inferior Venus conjunctions with the outer planet Saturn within 1 degree will occur 5 times in the next 10 years:
>
> 7/2/2007 00h 0.77 degrees
> 8/13/2008 19h 0.24 degrees
> 10/13/2009 15h 0.56 degrees
> 11/27/2012 05h 0.56 degrees
> 1/9/2016 03h 0.09 degrees
>
> In contrast, there are no conjunctions between outer planets Saturn and Jupiter in the next 10 years. Mars and Saturn will have four conjunctions less than 4 degrees in the next ten years.
>
> On 7/11/2008 06h, Mars and Saturn will be 0.69 degrees apart. In North America, they will be low (~20 deg alt) and about due west, just after the Sun sets.
>
> − Canopus56

Thank you for all of the technical information.
It inspired me to set up all of my equipment, including digital camera
and ToUCam Web Camera to attempt to image the conjunction tonight,
using an F6.3 focal reducer on my 10 " LX250SCT.

If the shots work I will post them on the Orange County Astronomers
web page.

Matthew Ota
16" LX200 SCT @Mount Wilson Observatory
10" LX250 SCT @ home
www.ocastronomers.org

.