

# Galileo Observing Club

Observing Log for Michael A. Hotka  
Member of the Longmont Astronomical Society

I really enjoyed this observing club. I found the observations not to be trivial and have a greater appreciation for what Galileo did with the primitive equipment he used in 1609. I had a lot of fun with this observing club and highly recommend it to everyone in the Astronomical league.

I used my 20x80 binoculars, thus achieving the 20 power telescope limitation.

Please have my name read Michael A. Hotka on my certificate and send it to my home at:

Mike Hotka  
1425 Snowberry Lane  
Broomfield, CO 80020

Thank you for an enjoyable observing club.

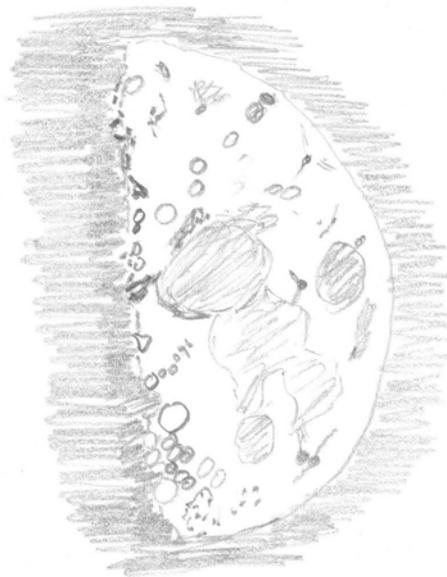
Mike

1. December 24, 1604 – Supernovae (optional): The objective is to show that the heavens do change. Observe a naked-eye supernova in the Milky Way galaxy. Make a sketch of the sky during the supernova and one after the supernova has faded below the level of visibility. Estimate its maximum brightness. It should be noted that the last time a supernova was visible in the Milky Way galaxy was in the early 1600's when Galileo observed one.

I have never observed a naked eye supernovae. That would be something to behold someday.

2. November 30 through December 19, 1609 – The Moon: The objective is to show that the moon is not a flawless sphere; it has mountains. Observe and sketch the moon. It may be done at any phase where enough detail can be seen to show that there are mountains and valleys on the moon. Near the first or last quarter phases is the best time for this observation. Include only the details that you can see.

Moon  
1st Quarter  
8/27/09  
9:03P

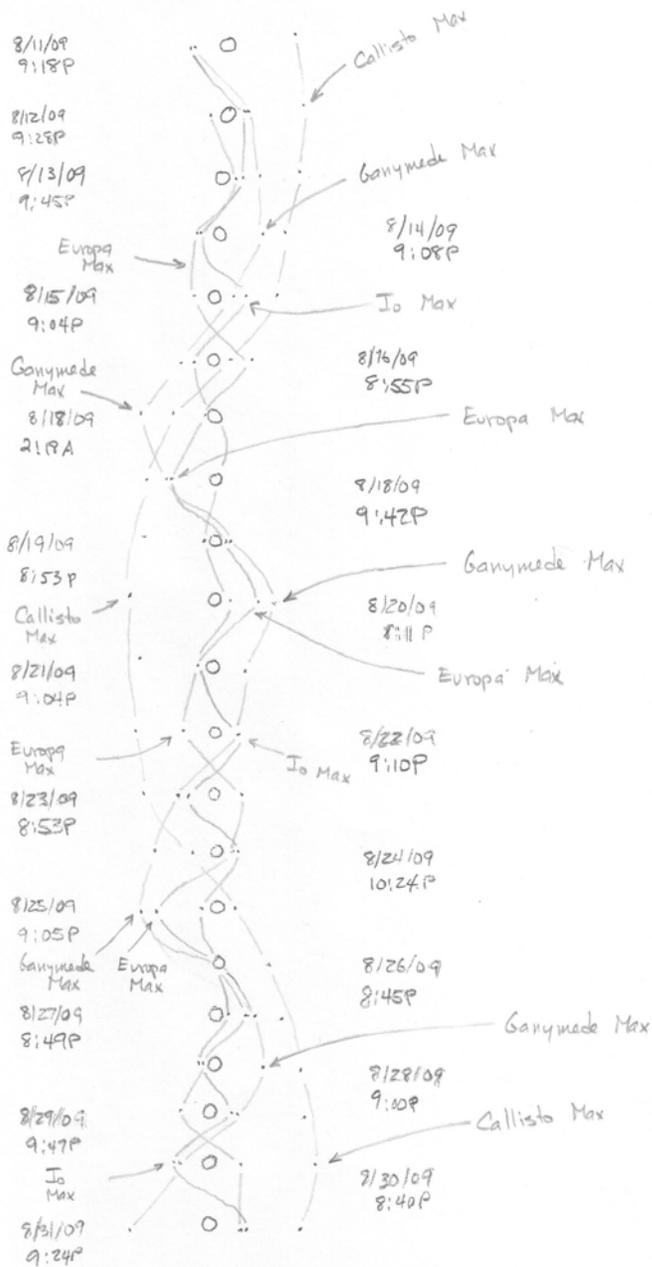


3. January 1, 1610 – Jupiter's moons: The objective is to show that all objects in the universe do not orbit the Earth. Observe and sketch Jupiter and its moons daily through at least one cycle of their orbits. This will be a minimum of 17 days, and you may have to do multiple orbits to get the entire orbits. From these sketches, note the dates and times of their greatest distance from Jupiter, and calculate the orbital periods of the four Galilean moons: Io, Europa, Ganymede, and Callisto.

The first picture is the raw data of my Jupiter moon observations. The second picture is where I annotated the first picture with orbits and determined the orbital periods of each moon.

8/11/09 9:18P	.. 0	
8/12/09 9:28P	. 0	
8/13/09 9:45P	0 .. .	
	.. 0 .. .	8/14/09 9:08P
8/15/09 9:04P	. 0 .. .	
	.. 0 .. .	8/16/09 8:55P
8/18/09 2:19A	. . . 0	
	.. . 0	8/18/09 9:42P
8/19/09 8:53P	- . 0 ..	
	. . . 0 .. .	8/20/09 8:11P
8/21/09 9:04P	. . . 0 .	
	.. . 0 .	8/22/09 9:10P
8/23/09 8:53P	.. . . 0 .	
	.. . . 0 ..	8/24/09 10:24P
8/25/09 9:05P	.. . 0 .	
	. . . 0 .	8/26/09 8:45P
8/27/09 8:49P	. 0 .. .	
	.. 0 . . .	8/28/09 9:00P
8/29/09 9:47P	. 0 .. .	
	.. 0 . . .	8/30/09 8:40P
8/31/09 9:24P	. . . 0 .. .	
	.. . . 0 .	9/1/09 9:23P

Item #3



My Calculated Orbits from Observations

Callisto Orbit approx 17 days  
 Ganymede Orbit approx 8 days  
 Europa Orbit approx 4 days  
 Io Orbit approx 48 hrs - 2 days  
 & made 3 orbits

Actual Orbits

Callisto 16.689 days  
 Ganymede 7.155 days  
 Europa 3.551 days  
 Io 1.761769 days

4. 1612 – Jupiter's moons in eclipse: The objective is to show that in addition to the moons being occulted by Jupiter, they also travel through Jupiter's shadow and are eclipsed. Observe and sketch, noting the timing, one of Jupiter's moons during an ingress or egress with Jupiter's shadow. Callisto or Ganymede is the most dramatic. Two observations should be done. One should be close to when Jupiter is at opposition. The second should be done when Jupiter is at quadrature (90 degrees from the sun). Note how close to the planet the moon is when the event occurred. (Editor's note: At least two observations and timings are required.)

8/18/09

1:49 AM

Europa  
2:18 AM

This was Europa leaving eclipse 4 days after opposition. The event is now on left hand side of Jupiter where previous

Ganymede was on right hand side 6 days before opposition.

Europa reappeared very close to Jupiter, making it hard to spot.

11/7/09

7:00 P

7:17 P

Europa

This is Europa leaving eclipse 4 days after Quadrature. This was easier to see for it exited Jupiter's shadow farther from the planet.

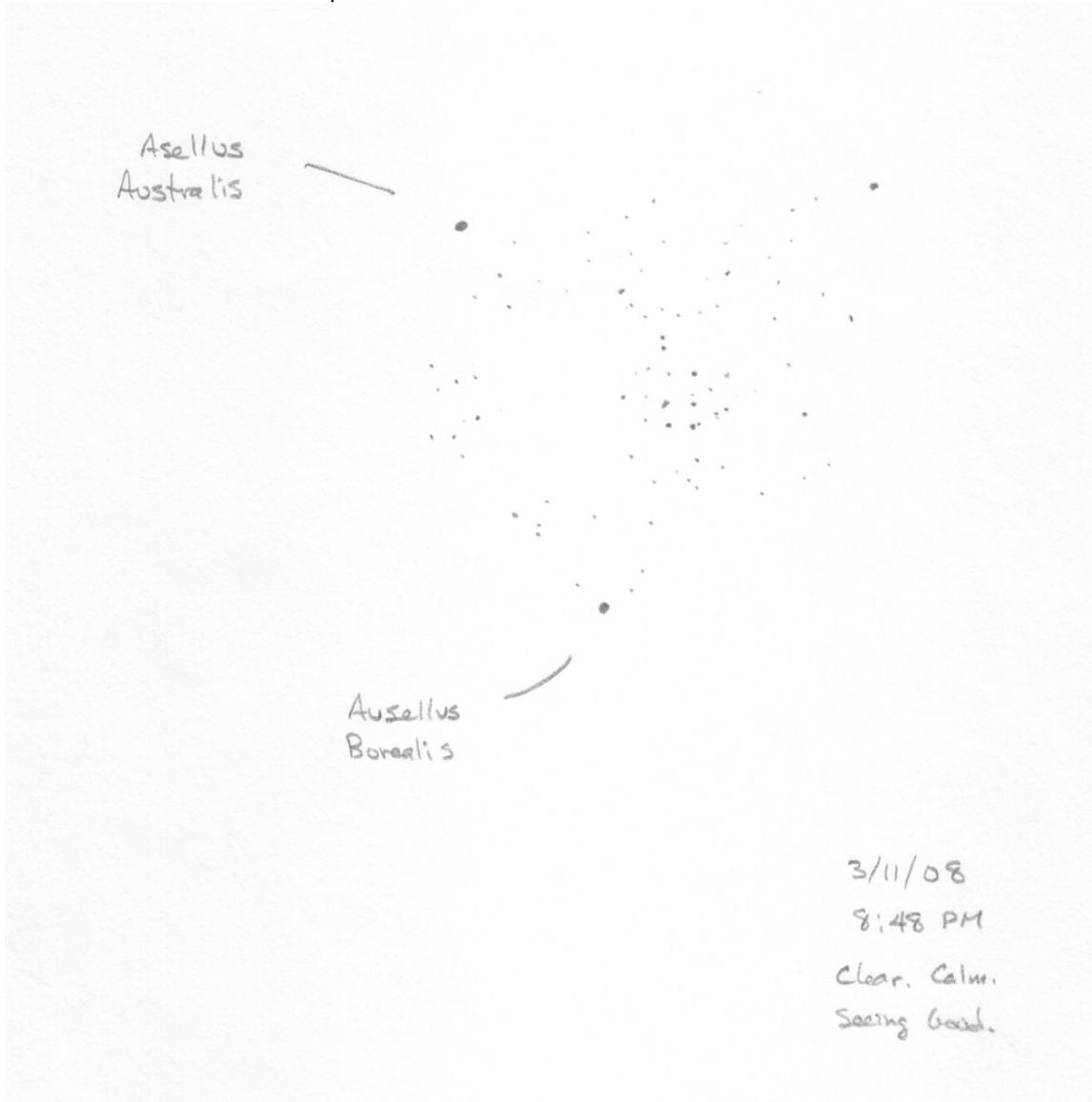
It was way cool to see Europa brighten gradually as it left the shadow.

5. 1610 – Orion's Head Nebula: The objective is to show that there are more stars visible through a small telescope than there are with the naked eye. Observe and sketch the region at the head of Orion (the star is called Meissa or Lambda Orionis). You will note that what looks like 1 star naked eye is actually 3 bright stars and many lesser ones. Sketch what you see. Galileo was able to see 20 in a region about 2 degrees across. North is up in this sketch.



3/10/09 8:18P  
Clear. Sky Good.  
My Backyard.

6. Praesepe Nebula: The objective is to show that there are more stars visible through a small telescope than there are using just the eyes. Observe and sketch the area of M44 in Cancer. In a field of about 3.5 degrees, stretching from Asellus Australis to Ausellus Borealis Galileo was able to see 38 stars. North is up in this sketch.

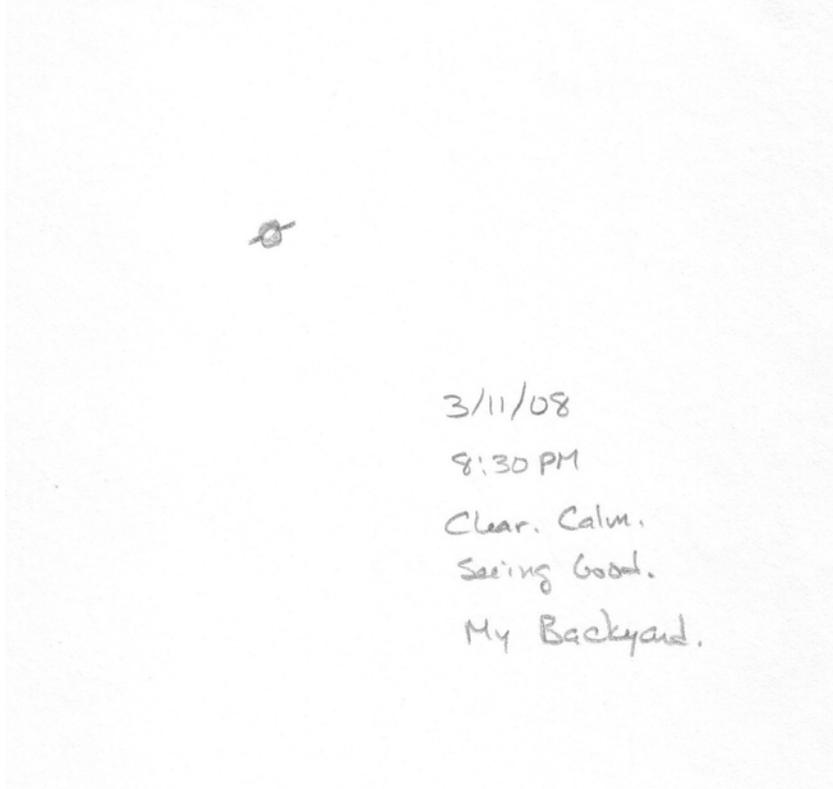


7. Pleiades Nebula: The objective is to show that there are more stars visible through a small telescope than there are using just the eyes. Observe and sketch the area of M45 in Taurus.



3/10/09 8:07 PM  
Sky Clear. Good Seeing.  
My Backyard.

8. July, 1610 – Saturn's Ears: The objective is to show that Saturn does not appear as a perfect sphere. Observe and sketch Saturn. The sketch should show that Saturn is not a perfect sphere. The rings do not appear as rings at this power, but appear as ears on the planet.



9. December 1610 – Venus phases: The objective is to show that Venus has phases like the moon, that it changes in size dramatically, and that one cycle of the phases is rather long. Observe and sketch Venus monthly through at least a half cycle of phases. Since Venus is not visible when it is in the full or new phases, you can do this from the time it first appears in the morning or evening sky until the last time it is visible. Calculate the length of the cycle and be sure to capture the relative size of Venus.

☾	3/10/09	8:00 PM	- was really large here, relatively speaking
☾	4/6/09	5:52 AM	
☾	4/22/09	5:30 AM	
○	6/10/09	4:48 AM	
○	6/23/09	5:10 AM	
○	7/7/09	5:06 AM	
○	8/4/09	5:12 AM	
○	8/25/09	5:38 AM	
○	9/14/09	4:30 am	not quite full. Very small.
○	10/24/09	6:20 am	
○	11/7/09	6:04 am	A tiny gibbous disc

11/7/09 = day of year 311

3/10/09 = day of year 69

242 days which is a bit longer than the published 224 days

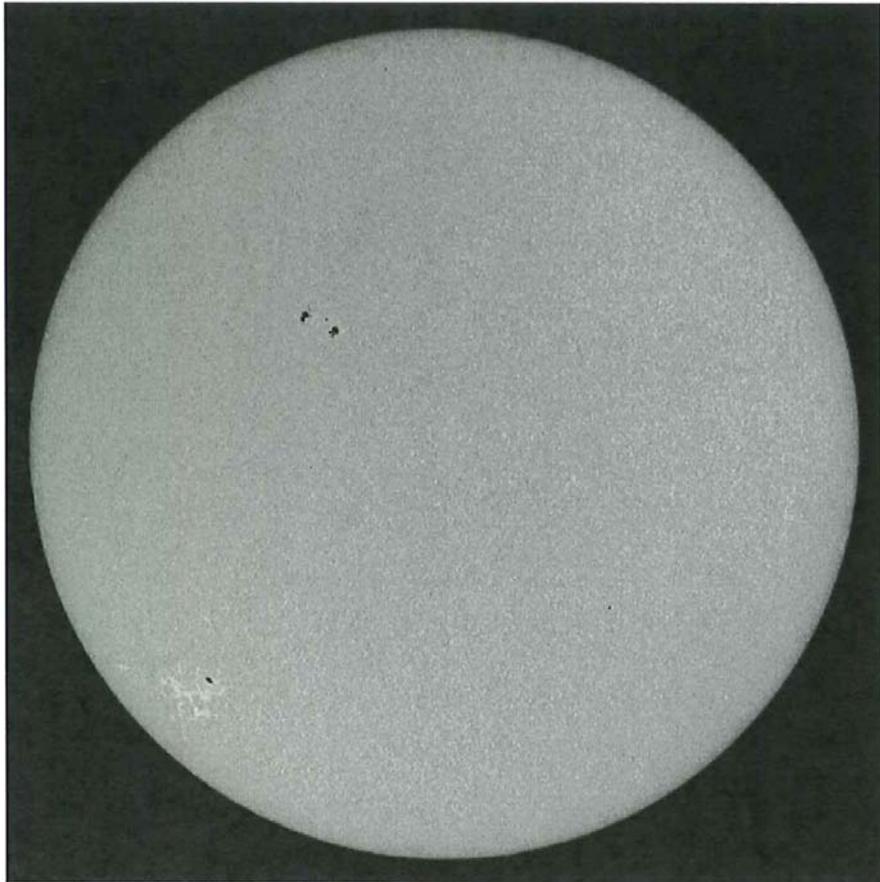
which means Venus is approaching inferior conjunction again but my relative observation of Venus with respect to the conjunction date is not the same as 11/7/09 as it was on 3/10/09

10. May 1611 – Sunspots: The objective is to show that the sun is not perfect (has sunspots) and is rotating. Observe one large spot that completes one complete rotation of the sun. This requires observing the sun, using a proper and safe solar filter. Full-face sketches should be made about once per week. Sunspots measured should be fairly close to the solar equator and measurements should be done from meridian crossing to meridian crossing. What is the rotational period for the sun near its equator?

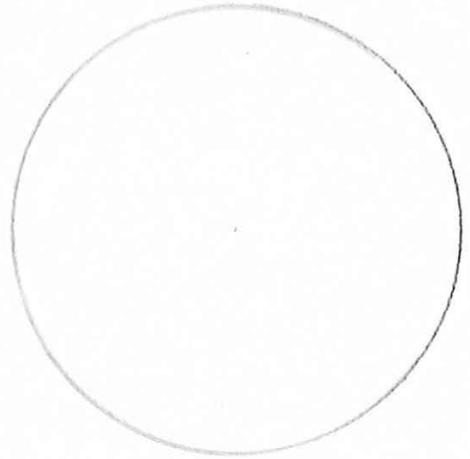
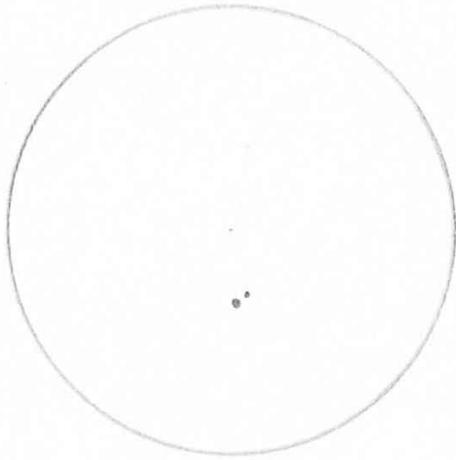
Finally, on 9/24/09 a sunspot group appeared on the Sun and it is clear. I will attempt to follow this group around the Sun. But this one fizzled out pretty quickly and I could not record the progress of this spot for very long across the Sun's surface.

Then on October 23, 2009, I spotted a little spot that blossomed into a nice, huge group. I watched it for several days until it disappeared behind the Sun on 10/30/2009. I had high hopes for this group reappearing, for it was growing in intensity as it approached the western limb of the Sun. It was supposed to reappear on 11/11/2009. I looked for it 2 times this day and then 3 times the next day, on 11/12/2009. The Sun is now again void of visible sunspots at 20x.

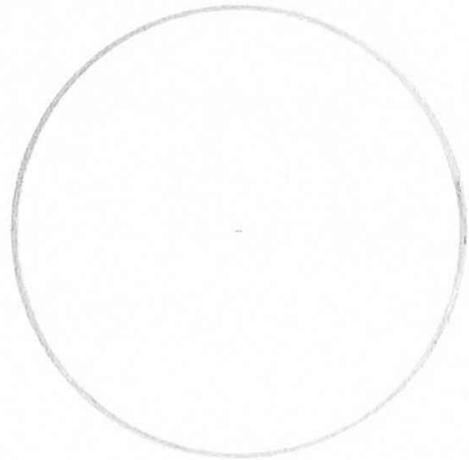
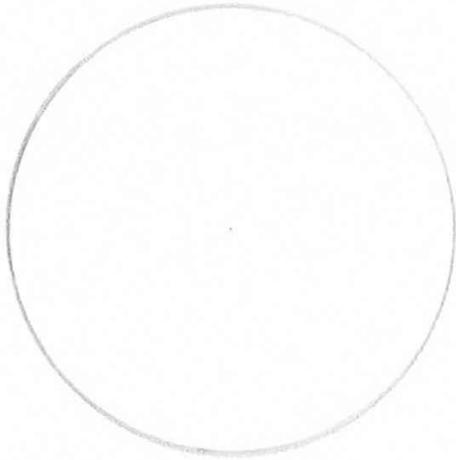
In order to get this award in the 400<sup>th</sup> anniversary year of Galileo's great accomplishments and the Sun continuing in its perpetual solar minimum, I hope that this second observation will be sufficient for this award.

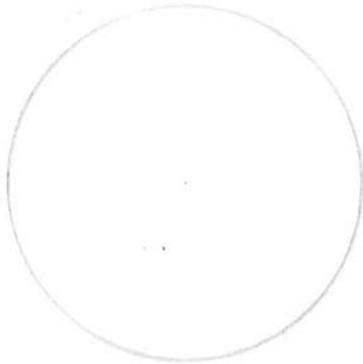


I couldn't spot this  
little one near limb  
in the projection

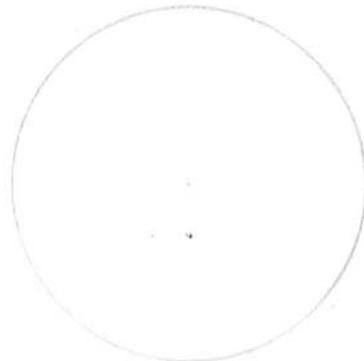


9/24/09  
11:21 AM

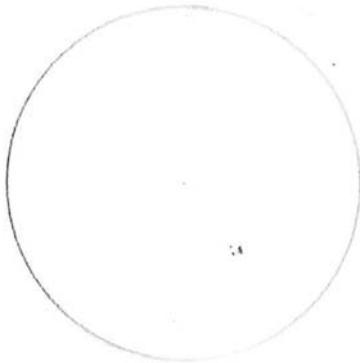




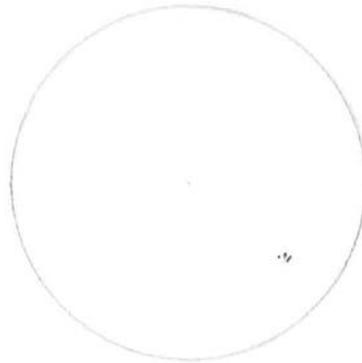
10/23/09  
11:19 AM



10/25/09  
12:06 PM

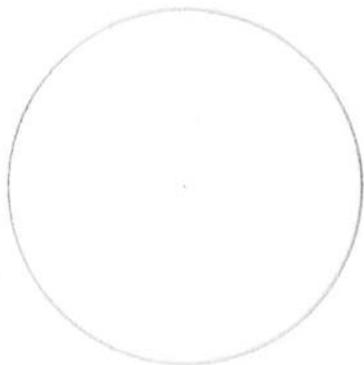


10/26/09  
12:36 PM



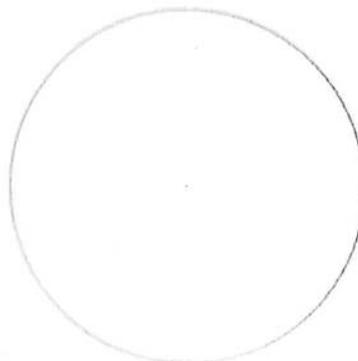
10/27/09  
12:52 P

No Sunspots Seen



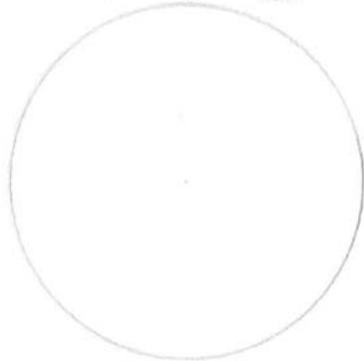
10/30/09  
11:56 AM

No Sunspots Seen



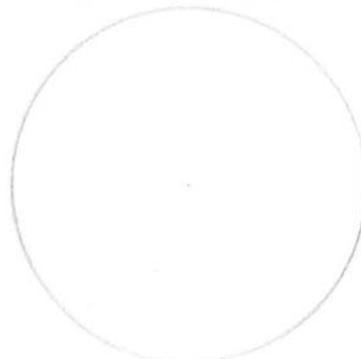
11/7/09  
9:56 AM

No Sunspots Seen



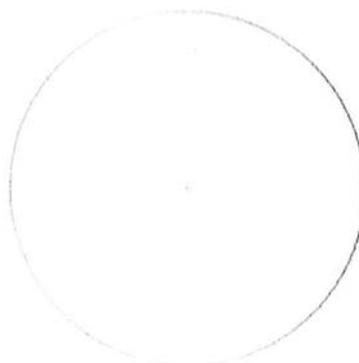
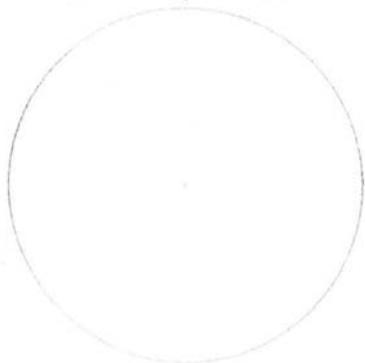
11/10/09  
11:56 A

No Sunspots Seen

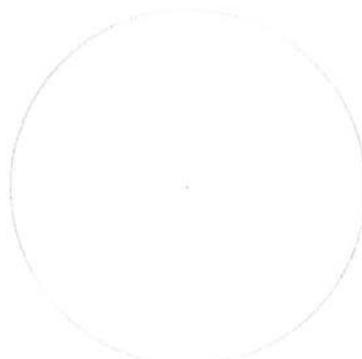
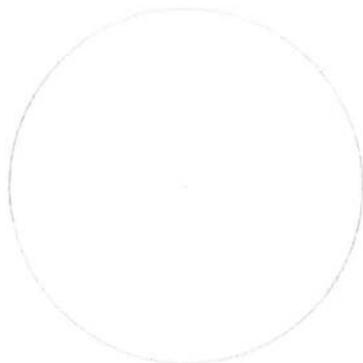


11/11/09  
1:16 P & 4:54 P

No Sunspots Seen



11/12/09 10:00 AM  
11:21 PM  
3:38 PM

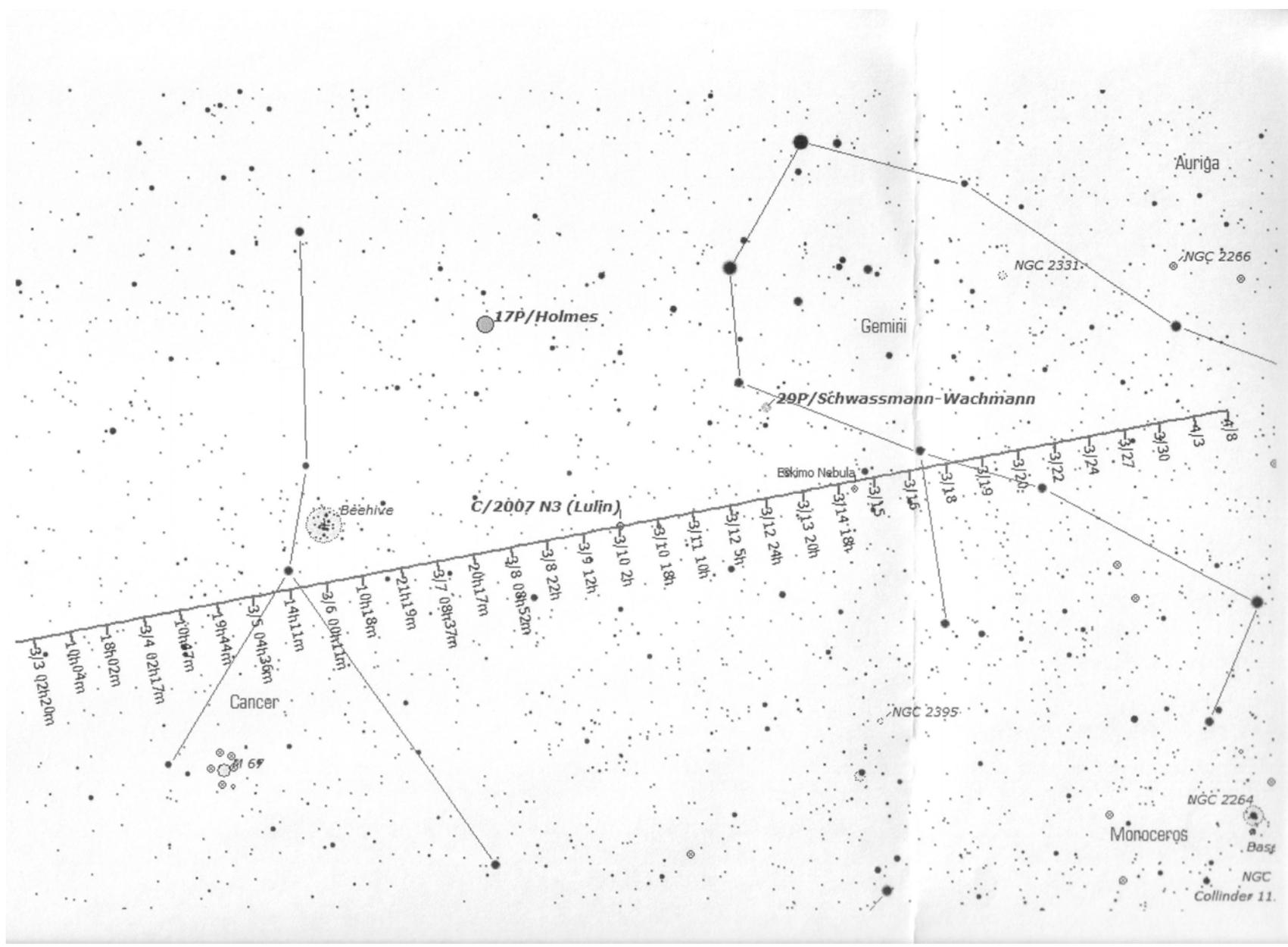


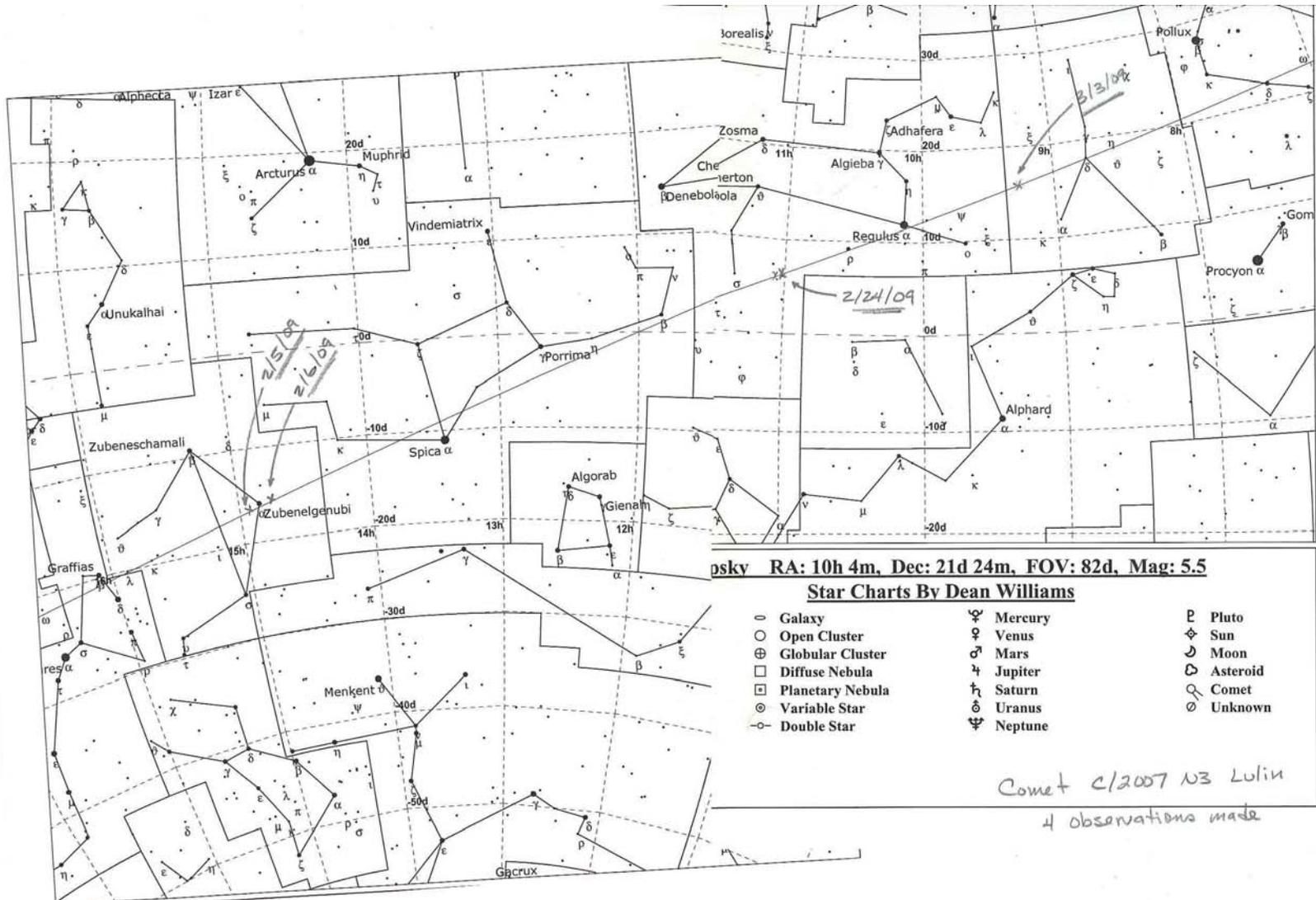
This sunspot group did not reappear from behind the sun. I looked many times for it. From 10/25/09, when this group was approx  $\frac{1}{4}$  way across face of Sun till 10/30/09 when it disappeared behind sun is 6 days giving Sun's rotation rate about 24 days. Sun's rotation

rate at equator is 25 days. Sun rotates slower at higher or lower latitudes of Sun's disc, so 24 days is pretty close to correct. With the Sun at perpetual Solar minimum, I had high hopes for this group reappearing. It should have reappeared on 11/11/09. I looked for it twice on this day and 3 times on 11/12/09. The Sun's disc was completely void of any sunspot. If Galileo had observed the sun at a solar minimum, he would have missed the 'imperfections' in the Sun.

11. October, 1618 – Comets: The objective is to show that the path of a comet is not a straight line through the sky. Make at least three observations of a comet and plot its progress among the stars. Although you will not do the calculations, this data is enough to show that the comet is not moving in a straight line through space.

The first picture is the finder chart I used for finding Comet Lulin C/2007 N3 on each night of observation. The second page is something I printed and put together from my star printing program so I could annotate it with the position of this comet as I observed it.





psky RA: 10h 4m, Dec: 21d 24m, FOV: 82d, Mag: 5.5

**Star Charts By Dean Williams**

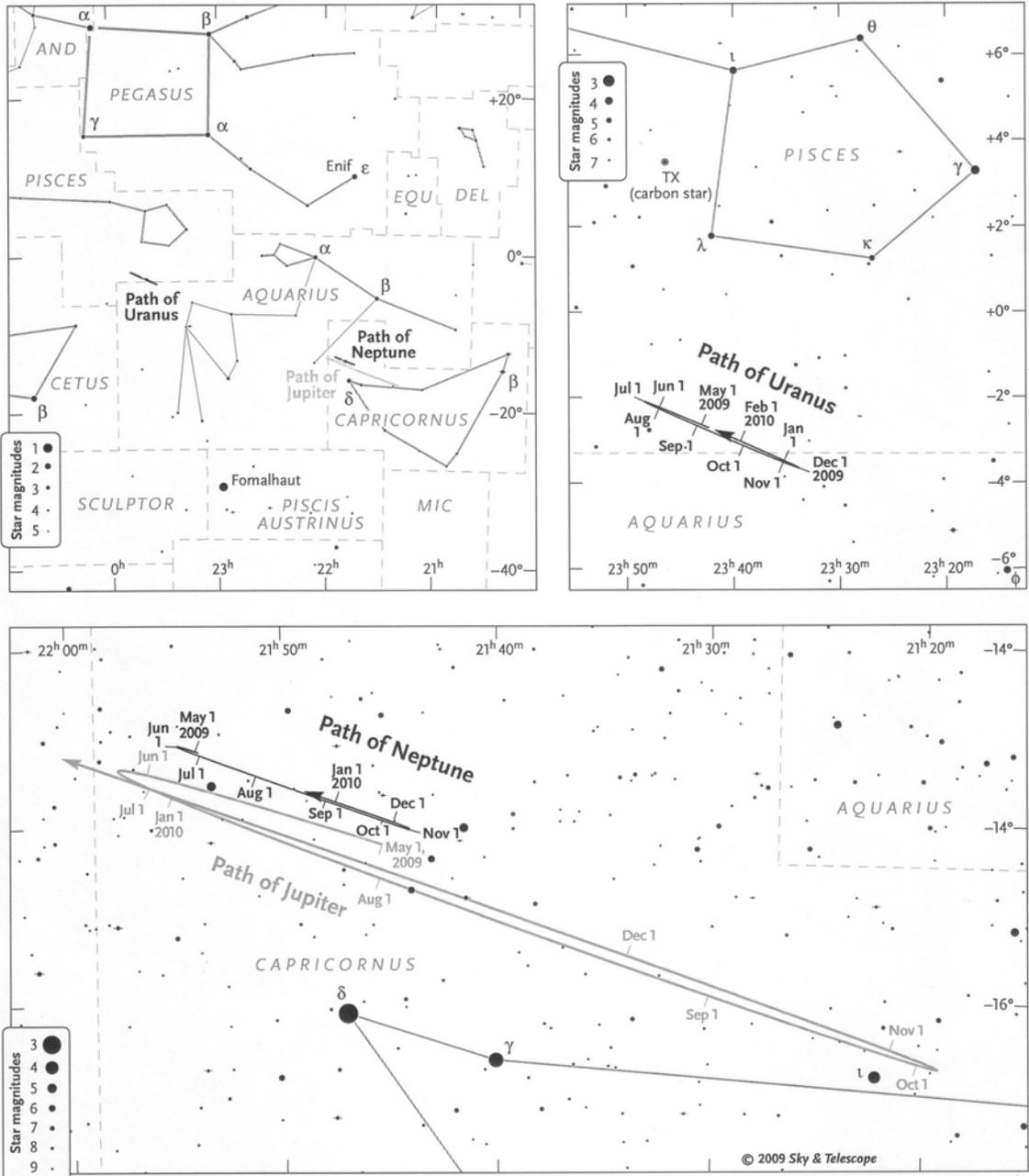
- |                    |           |            |
|--------------------|-----------|------------|
| ○ Galaxy           | ♿ Mercury | ♇ Pluto    |
| ○ Open Cluster     | ♀ Venus   | ☼ Sun      |
| ⊕ Globular Cluster | ♂ Mars    | ☾ Moon     |
| □ Diffuse Nebula   | ♃ Jupiter | ♁ Asteroid |
| ▣ Planetary Nebula | ♄ Saturn  | ☄ Comet    |
| ⊙ Variable Star    | ♅ Uranus  | ⊛ Unknown  |
| ○ Double Star      | ♆ Neptune |            |

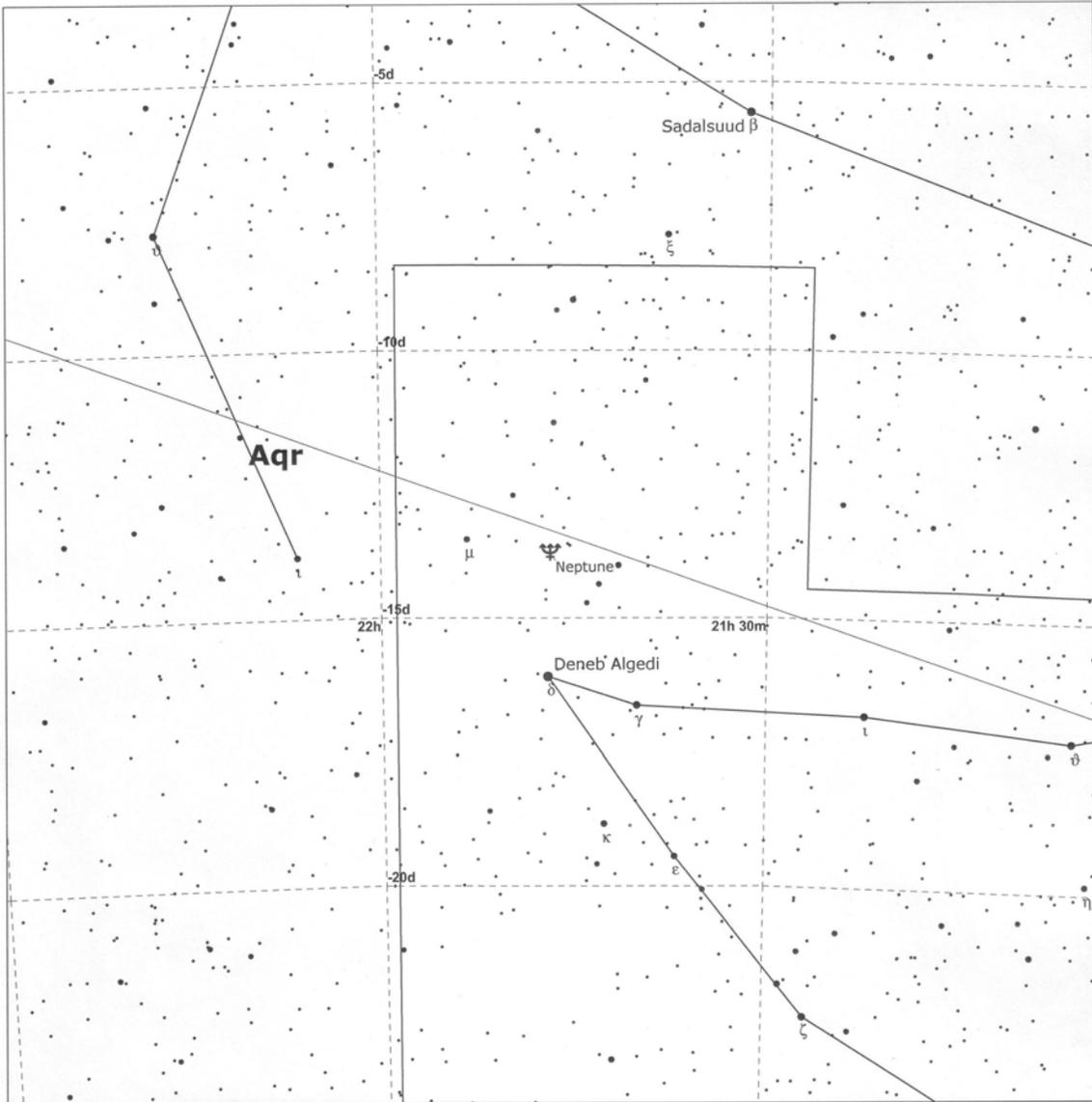
Comet C/2007 U3 Lulin  
4 observations made

12. February, 1619 – Neptune: Although Galileo observed Neptune, he did not recognize that it was anything other than another star. Observe Neptune and sketch what you see in your field of view.

The first two images are the finder charts that I used to find Neptune and the 3<sup>rd</sup> image is my observation.

## Uranus and Neptune for 2009





**Deepsky RA: 21h 46m, Dec: -13d 50m, FOV: 19d, Mag: 7**

**Star Charts By Dean Williams**

- ≤ 1.3
- 1.3 - 2.6
- 2.6 - 3.9
- 3.9 - 5.1
- 5.1 - 6.4
- 6.4 - 7.7
- > 7.7

- Galaxy
- Open Cluster
- ⊕ Globular Cluster
- Diffuse Nebula
- ◻ Planetary Nebula
- ⊙ Variable Star
- ⊖ Double Star

- ♿ Mercury
- ♀ Venus
- ♂ Mars
- ♃ Jupiter
- ♄ Saturn
- ♅ Uranus
- ♆ Neptune

- ♇ Pluto
- ☼ Sun
- ☾ Moon
- ♁ Asteroid
- ☄ Comet
- ⊘ Unknown

Neptune

9/17/09

9:22P

From my driveway  
in Broomfield, CO

Neptune in my  
20x80 Binoculars



Very faint, yet  
obvious. Put my  
telescope on this  
spot & revealed  
the planet.

•  
S Cap

Neptune



Verified its  
Bluish disk  
in my telescope

10/17/09

7:19P

Keota, Co

Clear, Calm,  
Seeing Good.

• S Cap

13. 1619 – Aurora (Optional): Galileo coined the term Aurora Borealis for the Northern Lights. He was mistaken in that he thought it was sunlight reflecting off of the Earth's Atmosphere. Observe and sketch either the Aurora Borealis or the Aurora Australis.

Although I did not do this optional activity for this award, I have personally observed the Aurora Borealis on about 6 occasions throughout my life.