Return to Home Page

The Astronomical League

The World's Largest Federation of Amateur Astronomers.

# Astronomical League Planetary Observers Club Certificate

Related Info:

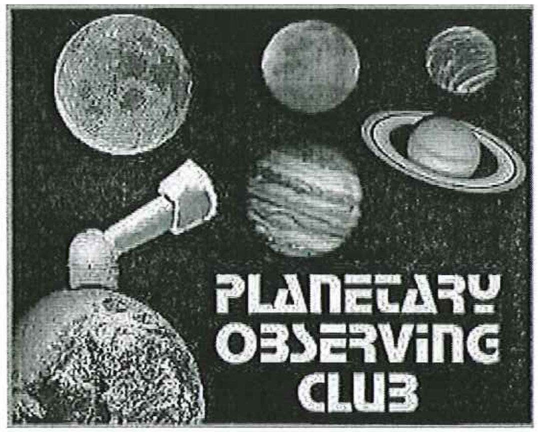
**Planetary Observers Club:**

- Introduction
- Sun and Moon
- Inner Solar System
- Outer Solar System
- Glossary and References
- Awardees

---

- Arp Peculiar Galaxy Club.
- Asteroid Observing Club;
- Binocular Messier Club;
- Caldwell Club;
- Deep Sky Binocular Club;
- Double Star Club;
- Earth Orbiting Satellite Club;
- Herschel 400 Club;
- Herschel II Club;
- Lunar Club;
- The Master Observer Club;
- The Master Observer Club;
- Messier Club;
- Meteor Club;
- Planetary Observers Club;
- Southern Skies Binocular Club;
- Sunspotters Club;
- Universe Sampler Club;
- Urban Observing Club.
- Back to the Observing Club Page;

**Planetary Observers Club Chair:**




*Paul R. Castle*
*Planetary Observing Club*
*Co-ordinator*
*2535-45th Street*
*Rock Island, IL 61201*
*(309) 786-6119*
*E-mail: prc29@aol.com*

**Introduction.**

Welcome to the Astronomical League's *Planetary Observers Club*. The P.O.C. is a list of twenty-seven selected projects designed to introduce you to the pleasures of planetary observing. Observing skills come only with experience. An eye trained by observing will see more, regardless of what type of optical aid is used. Good observing skills reinforce the desire to observe. Observing trains the eye to see. It is a cycle that has to be willed to happen. Given the time and effort it WILL happen. Once it happens, astronomy will become a joyful lifelong experience.

In these days of increasing light pollution, the wonders of our own solar system may well take on an increased importance among skywatchers. Dark skies and moonless nights are not a priority for any of the listed projects. If you are intrigued by the enclosed projects, I would refer you to the Association of Lunar and Planetary Observers. ALPO members regularly observe solar system objects and have contributed significantly to our understanding of this corner of the universe. For more information you may contact:

Harry D. Jamieson
P.O. Box 171302
Memphis, TN 38187-1302

Whether you decide to go on to serious data collection or simply observe for your own edification - *enjoy yourself*. The sky is there for all. It is a great equalizer. Beneath its huge expanse we are all reduced to nearly infinitesimal size, but in trying to understand it we grow.

**Rules and Regulations**

**About Us:**

- Information & Business
- Conventions
- Our Regions
- Our Member Societies
- The *Reflector*
- Astronomy Day
- Aids for Our Member Societies
- Contact Us

**Membership:**

- For a Society
- At-Large
- Through a Society
- *Reflector* Only

**Our Store**

**Astro-Info:**

- Observing Clubs
- Astro-Notes
- Astro-Books
- MarsWatch 1999

**Awards:**

- We Present

**Navigation:**

- Site Map
- External Links

**Search:**

Search

To qualify for the A.L.'s Planetary Observers Club Certificate and pin, you need only be a member of the Astronomical League, either through an affiliated club or as a Member-at-Large, and complete twenty-five of the suggested projects. Record your observations on copies of the included log. Some observations may require sketches, but don't panic; artistic prowess is not required. Make as many copies of the log sheet as you will need. Fill in information appropriate to that project.

At the end of the projects, you will find a glossary of terms.

If you need to become a member of the Astronomical League as a Member-at-Large, contact the Executive Secretary.

To receive your Planetary Observers Club Certificate and pin, simply send a copy of your logs along with your name, address, phone number and club affiliation to Paul Castle, Planetary Observers Club Chairman, 2535-45th Street, Rock Island, IL 61201. Upon verification of your observations, your certificate and pin will be forwarded to you or your club's Award Co-ordinator, whomever you choose.

Happy Observing!

Paul Castle

---

**PROJECT LOG**

NAME OF PROJECT________________________________________

Project Begun__________________Project Ended__________________

Seeing Conditions________________________________________

Binocular Size________________________________________

Telescope: Type________________________________________

Aperture________________________________________________

Focal Length_____________________________________________

Eyepiece Focal Length______________________________________

Observational Notes, Comments and Impressions:

---

Add pages with copies of any supplementary sketches.

---

Read the Projects for the Sun and Moon;

Read the Projects for the Inner Solar System;

Read the Projects for the Outer Solar System;

Read the Glossary and References;

Planetary Observers Club Awardees;

Return to the Planetary Observers Club Introduction;

Return to the Astronomical League Observing Club Page;

Return to Astronomical League Home Page.

*This page is maintained by David Knighton for the Astronomical League. Comments, corrections, and suggestions can be addressed to* webmaster@astroleague.org. *This page last updated September 12, 2001.*

Return to Home Page

The Astronomical League

The World's Largest Federation of Amateur Astronomers.

Related Info:

**Planetary Observers Club:**

- Introduction
- Sun and Moon
- Inner Solar System
- Outer Solar System
- Glossary and References
- Awardees

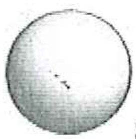
---

- Arp Peculiar Galaxy Club.
- Asteroid Observing Club;
- Binocular Messier Club;
- Caldwell Club;
- Deep Sky Binocular Club;
- Double Star Club;
- Earth Orbiting Satellite Club;
- Herschel 400 Club;
- Herschel II Club;
- Lunar Club;
- The Master Observer Club;
- The Master Observer Club;
- Messier Club;
- Meteor Club;
- Planetary Observers Club;
- Southern Skies Binocular Club;
- Sunspotters Club;
- Universe Sampler Club;
- Urban Observing Club.
- Back to the Observing Club Page;

# Planetary Observers Club - Projects for the Sun and Moon.

**Planetary Observers Club Chair:**

*Paul R. Castle*
*Planetary Observing Club*
*Co-ordinator*
*2435 45th Street*
*Rock Island, IL 61201*
*(309) 786-6119*
*E-mail: prc29@aol.com*

## SUN: Sunrise, Sunset Azimuth Positions

The Sun does not follow the same path across the sky every day. In the summer at northern latitudes, the Sun is high at midday, and in the winter, it is low in the southern sky. By observing the relative positions of the Sun at dawn or dusk, one can establish that the Sun does indeed shift along the horizon. Note where the Sun sets or rises once a week for at least four weeks in the spring or fall and for 6 to 8 weeks in the summer or winter. Be certain to observe from the same position each time. Note the time, day, month and year of each observation. At what season is the shift most noticeable?

## MOON: Maria

A naked eye or binocular view of the Moon shows two distinct types of lunar surface material, the *maria* and the *highland* areas. Both areas have their own visual characteristics. The highland material reflects light to a greater degree and appears very rough in character. The various mare areas are much darker and appear smoother. Before the telescope, these dark areas were speculated to be bodies of water, hence their name *mare* which is *sea* in Latin. Observe these "seas" or maria with your telescope. What evidence do you find that these are *not* bodies of water?

**About Us:**

- Information & Business
- Conventions
- Our Regions
- Our Member Societies
- The *Reflector*
- Astronomy Day
- Aids for Our Member Societies
- Contact Us

**Membership:**

- For a Society
- At-Large
- Through a Society
- *Reflector* Only

**Our Store**

**Astro-Info:**

- Observing Clubs
- Astro-Notes
- Astro-Books
- MarsWatch 1999

**Awards:**

- We Present

**Navigation:**

- Site Map
- External Links

## MOON: Highlands

Examine the bright, rough areas of the Moon. These are called the Lunar Highlands. If we are to assume that craters formed everywhere on the Moon at approximately the same rate, what can you conclude about the relative ages of the Lunar Highlands and the darker Maria? Why?

## MOON: Crater Ages

Twelve degrees south of the Lunar equator and about halfway from the eastern limb (Selenographic east, not east in Earth's sky) to the center of the Moon is one of the most prominent craters on the Moon. Theophilus is 100 km (62 miles) in diameter and has a terraced wall and a group of central mountains. Just to the south and west of Theophilus is another crater of equal size, Cyrillus. Remembering that the Lunar surface is constantly being eroded away by countless meteoroid impacts, which crater would you say is the oldest and why? Sunrise on Theophilus is five days after New Moon. A six or seven day old Moon should show the area well.

## MOON: Scarps

The Straight Wall, or "Rupes Recta" in Latin, is the best known scarp (fault area) on the Moon. When viewed less than a day after First Quarter, the fault's long thin dark shadow is hard to miss. Contrary to its appearance, it is a moderate slope and not steep. The Straight Wall is located at 22° South and 7° West. Just to the scarp's west is a small sharply defined crater called Birt. If Birt is known to be 17 km. (10.5 miles) in diameter, estimate the length of the Straight Wall.

## MOON: Occultations

Lunar occultations occur when the Moon, in its eastward path about the Earth, passes in front of stars or planets and eclipses them. The precise timing of the occultation concerns that instant when the occulted object seems to blink out behind the Lunar limb or reappears from behind the Lunar limb. These timings supply vital information regarding the Earth-Moon orbit and any changes in the velocity or distance of that orbit. Less frequent, but neater to observe, are occultations by the moon of the naked eye planets. These events, both of stars and planets, are always highlighted ahead of time in the astronomy magazines. Occultations of stars in the Hyades cluster are fairly common. Periodically also, the Pleiades cluster is crossed by our natural satellite. If this type of observation is appealing to you there are resources available that tell you how to do really worthwhile and productive

Search:

Search

work. You will need to have a telescope available, however. See the resources in the back of the book. Note the name of the object occulted, the day, month, year, the universal time of the object's disappearance and reappearance, and the place of your observations.

---

Read the Projects for the Inner Solar System;

Read the Projects for the Outer Solar System;

Read the Glossary and References;

Planetary Observers Club Awardees;

Return to the Planetary Observers Club Introduction;

Return to the Astronomical League Observing Club Page;

Return to Astronomical League Home Page.

*This page is maintained by David Knighton for the Astronomical League. Comments, corrections, and suggestions can be addressed to webmaster@astroleague.org. This page last updated January 31, 1999.*

Return to Home Page

The Astronomical League
The World's Largest Federation of Amateur Astronomers.

Related Info:

**Planetary Observers Club:**

- Introduction
- Sun and Moon
- Inner Solar System
- Outer Solar System
- Glossary and References
- Awardees

---

- Arp Peculiar Galaxy Club.
- Asteroid Observing Club;
- Binocular Messier Club;
- Caldwell Club;
- Deep Sky Binocular Club;
- Double Star Club;
- Earth Orbiting Satellite Club;
- Herschel 400 Club;
- Herschel II Club;
- Lunar Club;
- The Master Observer Club;
- The Master Observer Club;
- Messier Club;
- Meteor Club;
- Planetary Observers Club;
- Southern Skies Binocular Club;
- Sunspotters Club;
- Universe Sampler Club;
- Urban Observing Club.
- Back to the Observing Club Page;

# Planetary Observers Club - Projects for the Inner Solar System.

**Planetary Observers Club Chair:**

*Paul R. Castle*
*Planetary Observing Club*
*Co-ordinator*
*2435 45th Street*
*Rock Island, IL 61201*
*(309) 786-6119*
*E-mail: prc29@aol.com*


## The Projects for the Inner Solar System

### MERCURY

As an inner planet (closer to the Sun than the Earth), appearances of Mercury are fleeting, best seen just after sunset or just before sunrise. In compensation, this elusive planet can be seen, although sometimes with difficulty, several times a year. Mercury is never visible to the naked eye more than 28° above the horizon. Observations must therefore be accomplished during twilight, when Mercury is at or near its highest elevation for that particular apparition, or appearance. The result is we must observe through the thicker portion of Earth's atmosphere. For our purposes it will be sufficient just to locate this "Messenger of the Gods" on two different neighboring apparitions. Once in the morning sky and once in the evening sky. It may appear as a pinkish star-like object. Finding this elusive planet is its own reward. Watch for charts published in your favorite observing periodical. A pair of binoculars can be most helpful for the twilight observations, but you must wait until the Sun has sunk fully below the horizon. Record the time and date of the observations and the approximate azimuth (270°, 300°, etc.) and altitude (20°, 15°, etc.).

### VENUS: Low Power Crescent

Earth's "sister planet" will show its crescent phase in a high quality binocular that is held perfectly still. You might try mounting it on a tripod. Consult the astronomy periodicals if you are unsure when or where to look. This

**About Us:**

- Information & Business
- Conventions
- Our Regions
- Our Member Societies
- The *Reflector*
- Astronomy Day
- Aids for Our Member Societies
- Contact Us

**Membership:**

- For a Society
- At-Large
- Through a Society
- *Reflector* Only

**Our Store**

**Astro-Info:**

- Observing Clubs
- Astro-Notes
- Astro-Books
- MarsWatch 1999

**Awards:**

- We Present

**Navigation:**

- Site Map
- External Links

**Search:**

Search

observation will have to be accomplished when Venus is nearer the Earth and in its crescent phase. Galileo's observations of this the brightest of the planets provided crucial evidence for the triumph of the Copernican Sun-centered solar system. Since Venus exhibited phases it had to revolve around the Sun instead of the Earth. Can you repeat his observations? View before the sky gets too dark or Venus' brightness may obscure her phase.

## VENUS: Daytime Observation

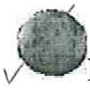
With a polar aligned telescope equipped with setting circles and a low power eyepiece, Venus can be readily observed during the day. Observing during the day can be a decided advantage. The planet's brightness will be subdued enough to not dazzle the eye. The planet is also high in the sky away from the denser portion of Earth's atmosphere. CHOOSE THIS PROJECT ONLY IF YOU HAVE A TELESCOPE PROPERLY POLAR ALIGNED AND CAPABLE OF LOCATING THE PLANET WITHOUT ENDANGERING EITHER THE INSTRUMENT OR YOURSELF - USE EXTREME CAUTION - EYE DAMAGE COULD RESULT.

In your favorite astronomy periodical note the right ascension and declination of the Sun and Venus. Center the Sun in your telescope by projecting the image onto a screen or the ground. Set your setting circles to that of the Sun and turn on your drive. Now offset the appropriate amounts to arrive at the coordinates for Venus. (Make sure your focus is correct, an out-of-focus planet may be impossible to see.) You should be able to see Venus in your finder scope. An orange filter in your main eyepiece will help increase image contrast. Describe your experience.

## VENUS: Phases

Like the Moon, Venus goes through phases. At Venus' brightest, about magnitude -4, it will be a thin crescent in your telescope. At its faintest the entire disk will be lit. This seeming contradiction is due to the fact that the thin crescent phase happens when our sister world is nearest us. The full phase happens when she is farthest away beyond the Sun. Try to watch Venus over about a two month period, making sketches. This will give you size and phase changes over about one forth of its orbit of 224.7 days. Keep them all at the same scale and always use the same eyepiece so you can get a feel for the changes in Venus' apparent diameter. Try to make them about a week apart. Viewing while the sky is still light will help cut down glare from the planet's brilliance and also help to eliminate atmospheric distortion because the planet will be higher in the sky. If the sky is still very light an orange filter will increase the contrast between Venus and the blue background and will also cut down Venus' glare.

Note the day/date/time and seeing conditions under each sketch on an 8-1/2X11 sheet of paper.



## MARS: Albedo Features

Observing the planet Mars can be either exciting and rewarding or boring and disappointing. It all depends on where the red planet is in its orbit compared with the Earth. Every 26 months Earth catches up to and passes Mars in Earth's smaller, faster orbit, and it is during these times that Mars can best be seen. This point of "catch up" is called an opposition. This is the time when Earth and Mars is on the same side of the Sun, resulting in the Sun being on the "opposite" side of the sky from us as is Mars. During this time Mars rises as the Sun sets and sets as the Sun rises, and is at its highest point in our sky at midnight. All oppositions are not created equal, however. Mar's orbit is more elliptical than our own, and these variations in distance makes Mars appear as small as 13.5 arc-seconds in diameter, or as large as 25 arc-seconds.

A few months before or after these oppositions Mars can still be observed, depending on the objective size of your telescope. Consult your favorite observing periodical for favorable Mars observing times. Many helpful hints will be given and times suggested for successful observing.

Drawing the "god of war" can be literally an illuminating experience. Sketching can help train your eye to see more detail than you would have otherwise noticed. Examine the planet for several minutes. Try an orange filter to see if that helps image contrast. Use the first accompanying circle to sketch in the major features after first locating the polar cap or possible slight phase defect. Just outlining the major features will do. Try to place them as accurately as possible. Note to the nearest minute when you have completed these steps. The first sketch should give accurate positions.

A soft pencil can be used to make a more finished looking version on the second circle. The second can be completed away from the telescope if desired, although as soon as possible while the memory is still good. It can be more "artistic", shaded to give a B&W photo appearance. If done carefully a very satisfying rendition can be had, and you will not have to be an artist to have accomplished it.

OBSERVATIONAL NOTES

1. The day/date/time.____________________________________________

2. The seeing conditions__________________________________________

3. The aperture of the telescope.____________________________________

4. The focal length of the telescope.__________________________________

5. The focal length of your telescopes

eyepiece.____________________________

6. Your own observational comments and
impressions.______________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

Mars Sketches (Include a copy of your Mars sketches with your report.)

To show the East-West direction of your sketches show with an arrow the direction of drift in your field-of-view without a drive running.

## MARS: Retrograde Motion

Early naked eye observers had a problem. The planet Mars, slowly drifting west to east from night to night, when seen against the background stars, would once a year act very strangely. As Mars approached opposition it would suddenly slow down, reverse itself, drift westward for a while (retrograde motion), before again reversing to assume its normal (prograde) eastward motion. We now know that this is an illusion caused by the motion of the Earth catching up to and passing the slower Red Planet, causing Mars to appear to be moving backward. You are to plot the apparent motion of Mars through this regrograde loop. Determine what constellation Mars will be in at the time of opposition. This can be done by consulting the astronomy periodicals. Make a copy of that area out of a star atlas. For example, Will Tirion's Star Atlas 2000.0. Then watch Mars beginning about a month before opposition until a month after opposition. Plot the planet's daily position on your copy by comparing its position to the fixed stars of the constellation. After these two months you should be able to trace out Mars' retrograde motion. Fortunately for us, the Copernican Revolution solved nicely the odd behavior of Mars, and also the behavior of Jupiter and Saturn, the other classical outer planets which exhibit a lessor amount of retrograde motion.

Include Copy of Your Map of Mars Retrograde Motion.

## ASTEROIDS: Course Plotting

Finding and following one of the small rocky planetoids that accompany the major planets around the Sun can be a most satisfying project. The small size of asteroids can make them a challenge to find, however. Although the largest, Ceres, is about 1000 kilometers (620 miles) in diameter, most range from about 100 kilometers (62 miles) to 200 k (125 miles) across, down to one kilometer (0.6 mile) or less. This means they all remain starlike even in the largest of amateur scopes. The four largest can be found in binoculars under dark skies specially at opposition when they are the brightest. All four are magnitude 8.5 or brighter. Since they are stellar in appearance their true nature can only be discerned by their movement compared to the background stars from one night to the next. Each year the daily or weekly positions for these fascinating little worlds are published in the astronomical periodicals. Using the information thus obtained, find and track an asteroid over a period of 3-5 nights. As little as three nights may be acceptable if weather is a problem. Copy an appropriate section of a star chart, preferably one that has a fairly large scale such as Wil Tirion's Star Atlas 2000.0 or the Uranometria 2000.0. From your observations mark the asteroids position as close as you can comparing it to the position of the background stars. Observe it again the following night locating and marking it again on the same star chart. Do this for three to five nights, then connect the dots showing the direction of the asteroid's movement with an arrow. Note the time and date of each asteroidal position in your notes. SEE ALSO THE NEXT PROJECT.

## ASTEROIDS: Measuring their Movement

Having plotted an asteroids pathway among the background stars for at least three evenings you can now figure out its approximate hourly movement. Using a finely graded ruler such as a millimeter rule, measure the distance from the dot representing your first observation to the dot representing your second observation. If these two observations were, for example, about 24 hours apart, divide that measurement by 24 (or whatever the time interval was in hours) to find out how far the asteroid traveled in one hour. Do the same thing for each subsequent observation. How far did the asteroid move in one hour? Using the same rule, measure the width of one degree on your star chart. If, for example, your asteroid moved 2mm in one hour and if a degree on your chart is 32mm wide, your asteroid was moving one degree in 16 hours. How long did it take your asteroid to move one degree? This determination is only a rough one, of course, but non-the-less it can be fun to do, and it will give you a sense of familiarity with YOUR asteroid.

---

Read the Projects for the Outer Solar System;

Read the Glossary and References;

Read the Projects for the Sun and Moon;

Planetary Observers Club Awardees;

Return to the Planetary Observers Club Introduction;

Return to the Astronomical League Observing Club Page;

Return to Astronomical League Home Page.

*This page is maintained by David Knighton for the Astronomical League. Comments, corrections, and suggestions can be addressed to webmaster@astroleague.org. This page last updated January 31, 1999.*

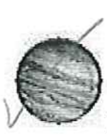
# Planetary Observers Club - Projects for the Outer Solar System

**Planetary Observers Club Chair:**

*Paul R. Castle*
*Planetary Observing Club*
*Co-ordinator*
*2435 45th Street*
*Rock Island, IL 61201*
*(309) 786-6119*
*E-mail: prc29@aol.com*


## JUPITER: The Great Red Spot

Jupiter is by far the easiest planet to observe. Its giant disk offers the most detail to the amateur observer. Even at its smallest it is 30 arc-seconds in diameter, and at opposition it can be almost 50 arc-seconds, twice the size of Mars even though Jupiter is ten times further away from us! You are to time the rotation of the Red Spot across the center of the disk of the planet Jupiter. In the "Calendar Notes" column in Sky and Telescope magazine the dates and times are given when this famous feature on Jupiter is due to cross the Central Meridian of the planet. The Central Meridian (CM) is a line drawn from the planet's north pole to its south pole dividing the great globe into two equal eastern and western sections. This project will require three timings. The first is the time at which the leading edge of the spot crosses the CM. The second is the time at which the spot appears centered exactly on the CM. The third is the time at which the trailing edge of the spot reached the CM. Use the S&T column to guide your observing sessions. If you can only make one timing, make it number two, the central transit time. Access to a WWV time signal is preferable but if this is impossible, the observation is still acceptable. State if WWV or another standard time source was used in making your report. Do not forget to convert to Universal Time. During the past few years the Great Red Spot has been very pale and should perhaps be known as the Great Pale Salmon Colored Spot!



## JUPITER: The Galilean Satellites

**About Us:**

- Information & Business
- Conventions
- Our Regions
- Our Member Societies
- The *Reflector*
- Astronomy Day
- Aids for Our Member Societies
- Contact Us

**Membership:**

- For a Society
- At-Large
- Through a Society
- *Reflector* Only

**Our Store**

**Astro-Info:**

- Observing Clubs
- Astro-Notes
- Astro-Books
- MarsWatch 1999

**Awards:**

- We Present

**Navigation:**

- Site Map
- External Links

**Search:**

Search


Ever since Galileo it has been noted that the planet Jupiter and its four brightest and largest satellites form a kind of miniature solar system with a speeded up time scale. This magnification of time scale makes the system specially interesting to those who study potential changes in orbital mechanics. We have observing data on Jupiter's moons going back about 300 years. This consists of the recorded times when a satellite disappeared on entering Jupiter's shadow or reappeared upon exiting from it. Studying this data makes it possible to determine if Jupiter' satellite's orbits, and by inference, planetary orbits, change over periods of time. These eclipses are spectacular phenomena to watch in a small telescope. Since timings require a WWV time signal receiver. For this exercise we will only ask you to sketch the satellite positions on the this page for six consecutive nights identifying each satellite in your sketches. Include a copy of them in your report. As much as possible, try not to skip more that one night between consecutive viewings. The "Jupiter's Moons" chart in the Almanac section of astronomy magazines each month will help you to identify the individual moons.

1.

______________________

______________________

______________________

2.

______________________

______________________

______________________

3.

______________________

______________________

______________________

4.

______________________

______________________

______________________

5.

________________________

________________________

________________________

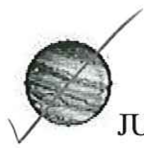
6.

________________________

________________________

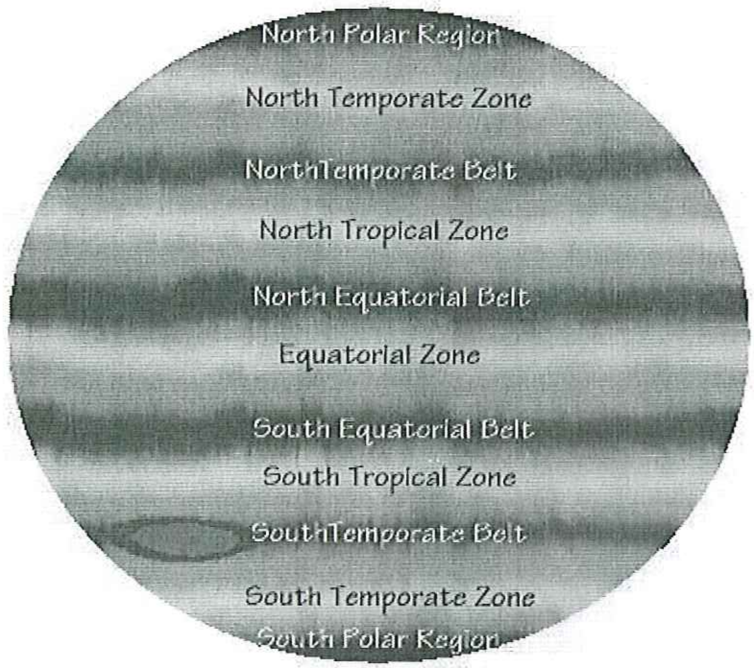
________________________

To show the East-West direction of your sketches show with an arrow the direction of drift in your field-of-view without a drive running.



## JUPITER: The Cloud Belts

The first thing that comes to a person's attention when looking at the disk of the great planet Jupiter are the striated clouds of it's turbulent atmosphere. Fascinating and compelling, even a modest telescope reveals a good amount of detail, but always leaves you yearning for more. Through the years a system of nomenclature has been applied to the alternating dark and light areas called belts and zones, respectively. Coupled with the giants fast rate of spin (Jupiter's bulk rotates once in a little under ten hours) even the casual observer can notice something new. Below is a detailed list of the main cloud bands. Not all are always present all of the time. Jupiter's dynamics are too complicated for that. How many can you see? Make your own sketch and label those parts that seem to match up with the accompanying diagram. Include a copy of your sketch in your report.




Do not worry about a lot of detail. In fact Jupiter rotates so rapidly that features may move if you take too long to work on details. NOTE: Your telescope may show Jupiter inverted.

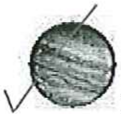
To show the East-West direction of your sketch show with an arrow the direction of drift in your field-of-view without a drive running.

JUPITER: Satellite Discovery

On January 7, 1610 Galileo Galilei observed the planet Jupiter with his fourth and latest telescope. He had "spared no time and expense" in its production. With it he saw three small bright stars near the bright planet and assumed that they were fixed background stars. The next night he observed the Jovian planet again and was amazed to discover that the "stars" had changed their positions relative to the planet's disk. Very perplexing! Within a week he had seen all four of what we now call the *Galileian* satellites of Jupiter.

Galileo was using a primitive simple telescope magnifying about twenty times. Can you duplicate his feat with the modern lenses of a pair of binoculars?

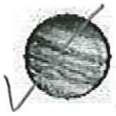
It is important that the binoculars be held perfectly steady for the eye to pick out the tiny moons next to Jupiter's glare. Any movement, even the blood pumping through your veins will make them difficult to see. Try bracing your binoculars against a solid structure like a telephone pole or the roof of a car. Better yet, mount them on a tripod. Observe the satellites for several days and then describle your experience.



## JUPITER: Satellite Shadow Transits

Shadow transits occur quite often and are a phenomenon that can easily be seen by the amateur. The shadows cast by the Galilean satellites are seen as tiny black dots slowly proceeding across the cloud tops of the giant planet.

Your task is to determine which of the four largest Jovian moons is casting the shadow. First you need to know if Jupiter is approaching its yearly opposition or if opposition has already passed. If Jupiter is moving toward its opposition then the shadow precedes the satellite. The moon's shadow will fall on the planet while the moon itself is still nearing the planet's limb. If opposition has passed, the moon will cross the planet's disc first, followed by its shadow. By consulting a Galilean Satellite Chart in an astronomy periodical you should be able to determine which satellite is casting the shadow. Which satellite was it?

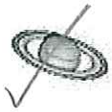


## JUPITER: Satellite Transits

Watching the Galilean Moons transit the disk of Jupiter is considerably more of a challenge than watching their corresponding shadows. The tiny little disks are similar in color to their parent planet so the satellite quickly gets lost from view in its frontal passage. The satellites can often be seen under the right conditions with larger apertures, for a few minutes, while still on the edge of Jupiter's limb. The limb tends to be slightly darker than the face of the planet itself. The contrast between the two helps the satellite to show up. The slow ingress or egress varies with each satellite. Io and Europa, being inner satellites, take only about two and a half minutes to ease onto or off of Jupiter's limb. Ganymede moves much more slowly, taking seven minutes, and Callisto crawls across the limb for nine minutes. If you are able to detect these ingresses or egresses, time them with a stop watch and compare the times with those just given. An alternative project would be to time the ingress or egress of one of the satellites into or out of Jupiter's shadow. What satellite did you time?

## JUPITER: Satellite Occultations/Eclipses

Occultations of the Galileon satellites as they pass behind the limb or eclipses as they move into the shadow of the giant planet are much easier to see than transits. Your task is to time the disappearance or reappearance of one of these satellites by using a radio tuned to the WWV National Time Standards signal out of Ft. Collins, Colorado. Then compare it to the time printed in the astronomy periodicals. Note the time the moment the satellite completely disappears or reappears behind Jupiter's limb or shadow. Timing a reappearance is much more difficult since the you do not know precisely when or where it will reappear. What satellite did you time?



## SATURN: The Rings

Saturn is the most impressive object in the solar system and surely one of the most beautiful. Saturn is the only ringed planet whose rings are visible in the amateur's telescope. On a clear steady night, nothing rivals the sharp divisions and contrast seen in Saturn's ring system. Because of Saturn's considerable distance, high powers must be used. Under average conditions use a power of about 40X per inch of telescope aperture. However, do not sacrifice a clear image for the sake of a larger one. Make a sketch of what you see. Using a pre-drawn outline for your drawing can save a lot of time and effort at the eyepiece. The "Planetary Data" section of the astronomy magazines is an excellent resource for this. Place an arrow on your drawing to indicate the direction of drift when your scope is not tracking. Include a copy of your sketch in your report.

### OBSERVATIONAL NOTES

1. The day/month/year/time____________________________________

2. The seeing conditions____________________________________

3. The aperture of the telescope.______________________________

4. The focal length of the telescope.____________________________

5. The focal length of your telescopes eyepiece.______________________

6. Your own observational comments and impressions.__________________

____________________________________________________

____________________________________________________

Sketch of Saturn

## SATURN: The Cassini Division

Within the three major rings that can be seen through the amateur telescope is the prominent gap known as the *Cassini Division.* It separates the "B" Ring, the brightest ring, from the "A" Ring and appears as a fine black line circling the planet. It is most easily seen on the two protrusions of the rings on either side of the planet known as *ansae*.

The axial telt of Saturn and the inclination of Saturn's orbit compared with the Earth's, combine to cause the

plane of Saturn's rings to change their tilt. About every 7.25 years the rings go from edge-on to fully open. Your ability to see the Cassini Division will vary depending on how "open" or "edge-on" the rings are. Seeing and aperture size will also affect your ability.

Describe your view of Cassini's Division. Can you see it? Can you barely see it or does it "jump out at you?" How complete a circle of the rings can you detect?

## SATURN: Disk Markings

At first glance the face of Saturn's disk seems rather boring, a bland creamy-yellow ball. Less than half the apparent diameter of Jupiter with proportionately duller markings, Saturn requires diligent study and a tranquil night of seeing. The greater your observing skill or equipment, the more subtle are the details you will see.

You should be able to tell that one hemisphere is decidedly darker than the other Can you tell which one? Be certain you know if your telescope shows an upright or an inverted image. Belts, zones and spots similar to Jupiter's can sometimes be glimpsed through the planet's top layer of obscuring haze. They are subtle. What do you see? Record your impressions.

## SATURN: The Satellites

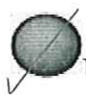
Of all the satellites of Saturn, only six of them can be seen in telescopes with moderate sized apertures. How many can you spot?

| | Magnitude | Orbital Period (Earth Days) | Recommended Aperture |
|---|---|---|---|
| Enceladus | 11.8 | 1.37 | 8-inch |
| Tethys | 10.3 | 1.9 | 6-inch |

| | | | |
|---|---|---|---|
| Dione | 10.4 | 2.7 | 6-inch |
| Rhea | 9.7 | 4.5 | 3-inch |
| Titan | 8.4 | 15.9 | 2-inch |
| Iapetus | 10.2-11.9 (varies) | 79.3 | 8-inch |

How many satellites you will be able to see will depend a great deal on atmospheric conditions . For example, I have seen all of them in a six-inch. In contrast with Jupiter, where all four moons orbital plane is nearly a straight line from Earth's viewpoint, Saturn's equatorial plane is considerably more tilted. This means that the orbits of the satellites can vary from a nearly straight line configuration to that of nearly a 30° ellipse depending on where Saturn and Earth are located in their orbits. This inclination changes at about a 15 year interval. Finder charts can be found in astronomy periodicals that will help you determine which of the Saturnian satellites you are seeing.

A note on Iapetus. The magnitude variation can be explained by the fact that it has two vastly different hemispheres. One reflects light almost two magnitudes brighter than the other. What satellites did you see?



URANUS: Locating

In 1781 the first non-classical planet was discovered by amateur astronomer William Herschel. The discovery changed Herschel's life forever and was a blow to astrologers who by their "craft" had no inkling that a seventh planet existed. Actually the planet had been seen and charted years before on no fewer than seventeen different occasions. Uranus is visible to the dark adapted naked eye under good skies. But the astronomers simply added it to their charts just like any other sixth magnitude star. It was Herschel who finally had enough resolving power and the observer's eye who could tell it had, in fact, a tiny disk, and was not a simple star-like point. He first suspected the tiny object to be a distant comet and took a series of measurements of its position. It was somewhat later that he realized its true nature.

It is much easier today for you and I. The 3.8 arc-second greenish disk shines at a magnitude of 5.7 and can be readily found using locator charts published in the astronomical periodicals. Give a verbal description your eyepiece impression.

NEPTUNE: Identifying

Although similar in size and appearance as Uranus, Neptune's distance averages over one billion miles further from the Earth. This great distance makes it's apparent diameter about 2-1/2 arc-seconds, a little over half the size of Uranus.

The 7.6th magnitude bluish dot will probably look stellar, for its tiny disk is near the resolving limit of most amateur telescopes. Consult your favorite astronomy periodical to find out where it is currently located. Write a verbal description of your impression.

---

Read the Glossary and References;

Display the Projects for the Sun and Moon;

Display the Projects for the Inner Solar System;

Planetary Observers Club Awardees;

Return to the Planetary Observers Club Introduction;

Return to the Astronomical League Observing Club Page;

Return to Astronomical League Home Page.

*This page is maintained by David Knighton for the Astronomical League. Comments, corrections, and suggestions can be addressed to webmaster@astroleague.org. This page last updated January 31, 1999.*

Return to Home Page

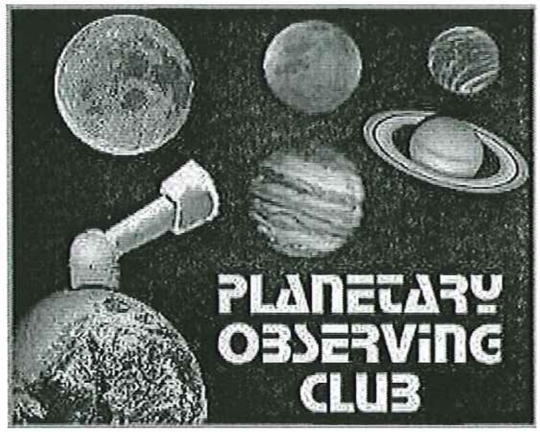
The Astronomical League
The World's Largest Federation of Amateur Astronomers

# Planetary Observers Club - Glossary and Reference



**Planetary Observers Club Chair:**

*Paul R. Castle*
*Planetary Observing Club*
*Co-ordinator*
*2435 45th Street*
*Rock Island, IL 61201*
*(309) 786-6119*
*E-mail: prc29@aol.com*




## GLOSSARY OF TERMS

**Albedo** The proportion of light falling on the surface of a body that is reflected.

**Ansae** Latin for 'handles'. The appearance of the protrusion of the rings of Saturn on either side of the planet's disc.

**Aperture** The diameter of the primary light collecting element of a telescope, be it a mirror or lens.

**Apparition** The period of time when it is possible to observe an object in the sky.

**Arc second** A unit of angular measurement. One 60th of an arc minute or 1/3600 of a degree.

**Eclipse** The occurrence of one celestial body's shadow temporarily falling on another body.

**Egress** To emerge from, as a star or satellite emerging from behind another planetary body.

**Ingress** To disappear behind. The opposite of 'egress'.

**Lunar Limb** The extreme edge of the visible Moon.

**About Us:**

- Information & Business
- Conventions
- Our Regions
- Our Member Societies
- The *Reflector*
- Astronomy Day
- Aids for Our Member Societies
- Contact Us

**Membership:**

- For a Society
- At-Large
- Through a Society
- *Reflector* Only

**Our Store**

**Astro-Info:**

- Observing Clubs
- Astro-Notes
- Astro-Books
- MarsWatch 1999

**Awards:**

- We Present

**Navigation:**

- Site Map
- External Links

**Search:**

Search

**Meridian** A line on the celestial sphere passing from the North Pole through the Zenith to the South Pole. Can also be the center line of a planetary body drawn through it's poles.

**Objective** The main light gathering optic in a telescope or binocular.

**Occultation** The passage of one celestial body moving directly in front of another.

**Opposition** The point at which a planet appears in our sky directly opposite the Sun.

**Phase Defect** The extent to which the illuminated area of a spherical body such as a planet or moon differs from a complete circular disk.

**Prograde** Motion of a celestial body moving in its usual direction on the celestial sphere.

**Red Spot** A large hurricane like oval feature in the clouds of Jupiter larger than the Earth. It has been visible since first reported in 1664. Its color density varies over time, sometimes being difficult to see.

**Retrograde** Motion of a celestial body moving in the opposite direction of its usual motion.

**Terminator** The boundary between the lighted and unlighted portions of a celestial body's surface.

**Transit** The crossing of a celestial object across the observer's meridian caused by the daily apparent motion of the celestial sphere. Also the passage of a planet across the face of the Sun or of a planet's satellite across the primary's disk.

## BRIGHTNESS SCALE

| MAGNITUDE* | COMMENTS |
|---|---|
| Very bright stars | |
| -4 | Venus at its brightest |
| -3 | Jupiter at its brightest |
| -2 | Sirius in Canis Major, the brightest star in the sky |
| -1 | Betelgeuse in Orion |
| 0 | Vega in Lyra |
| +1 | Spica in Virgo, Deneb in Cygnus, Pollux in Gemini |
| +2 | Polaris, the north star |
| +3 | Megrez, the faintest star in the Big Dipper |
| +4 | |

| | |
|---|---|
| +5 | Probable naked eye limit in the suburbs |
| +6 | Probable naked eye limit in the country |
| +7 | |
| +8 | Neptune |
| +9 | Approximate limit of typical binoculars |
| +10 | Approximate limit of a 60 mm telescope |
| +11 | Approximate limit of a 3-inch telescope |
| +12 | Approximate limit of a 4-inch telescope |
| +13 | Approximate limit of a 6-inch telescope |
| +14 | Approximate limit of an 8-inch telescope |
| Very dim stars | **(Above Comments assume as dark a sky as possible.)** |

* The difference in brightness between any successive two numbers is a ratio of two and one half times. Magnitudes are approximate.

## FILTERS FOR VISUAL OBSERVATION

A good resource at the telescope is a set of colored filters. Filters can be acquired from various sources. Consult your astronomy magazines. Kodak's Wratten series can be purchased in over a hundred colors and densities and can be mounted in slide mounts and simply held between the eyepiece and the eye. For longer observations, as when sketching, screw-in filters are available for both 1-1/4 and 2-inch eyepieces. You don't need to choose between dozens of colors though, only a few will do.

Filters can reduce glare, improve image definition and enhance tonal contrast. Here are some suggestions:

A **BLUE** filter, such as a Wratten #44A, 47B, or 80A, can be used for the detection of high altitude clouds on Mars, white ovals and spots in the belts of Jupiter, and the zones of the clouds of Saturn. It can also be used to cut down glare on a bright Moon.

A **GREEN** filter, such as a Wratten #58, allows you to see more clearly the edges of the Martian polar caps and enhances the belts and Great Red Spot in the clouds of Jupiter.

A **YELLOW** filter, such as a Wratten #8, 12, or 15, can improve markings in the clouds of Venus and enhance Martian dust storms.

An **ORANGE** filter, such as a Wratten #21, is one of the more useful ones you can have. It is used for bringing out detail on Mars, and enhancing some of the zonal detail on Jupiter. An orange filter darkens the blue sky so daytime observations of Jupiter, Venus and the Moon are much improved.

A **RED** filter, such as a Wratten #23A, 25, or 25A, can also be used to enhance contrast on Mars, Jupiter and Saturn. A red filter, however, is fairly dark, so it works best on larger aperture telescopes which give brighter images. Flipping back and forth between red and blue filters can sometimes bring out subtle colorations on the Moon.

A **POLARIZING** filter can cut down glare when observing a nearly full Moon, making it easier to see ray structure. It will also cut down day-time glare.

## ASTRONOMICAL SEEING

| | |
|---|---|
| LEVEL ONE | Severely disturbed skies: Even low power* views are uselessly shaky. Go read a good book |
| LEVEL TWO | Poor seeing: Low power images are pretty steady, but medium powers are not. |
| LEVEL THREE | Good seeing: You can use about half the useful magnification of your scope. High powers* produce fidgety planets. |
| LEVEL FOUR | Excellent seeing: Medium-powers are crisp and stable. High-powers are good, but a little soft. |
| LEVEL FIVE | Superb seeing: Any power produces a good crisp image. |

*The **PRACTICAL LOWEST** power magnification for any telescope is approximately 7 times for each inch of aperture. Example: 28X for a 4-inch (100mm) diameter telescope.

*The **PRACTICAL HIGHEST** power magnification for any telescope is approximately 50 times for each inch of aperture. Example: 200X for a 4-inch (100mm) diameter telescope.

---

Display the Projects for the Sun and Moon;

Display the Projects for the Inner Solar System;

Read the Projects for the Outer Solar System;

Planetary Observers Club Awardees;

Return to the Planetary Observers Club Introduction;

Return to the Astronomical League Observing Club Page;

Return to Astronomical League Home Page.

*This page is maintained by David Knighton for the Astronomical League. Comments, corrections, and suggestions can be addressed to webmaster@astroleague.org. This page last updated January 31, 1999.*

July 19, 2004

Dear Aaron,

I recently completed all the requirements for receiving the Planetary Observers Certificate and award pin. Enclosed you will find all the observing sheets I filled out for the program requirements.

I found this program to be very enjoyable for it provided exercises that we, as amateurs take for granted, like as Venus swings around the Sun in its orbit, its diameter increases in size (I picked the right time of year to watch this in the evening sky). Or how the Sun moves long the horizon at sunrise as the weeks marched on. I never really measured the travel and was surprised as to how far north the sun actually moved when measured from my home.

This program was full of illuminations for me. I knew this stuff, but never really sat down and observed it. Thank you for a wonderful program.

I am a member of the Longmont Astronomical Society, a member society of the Astronomical League. Please print my name on the certificate as Michael Hotka. Please mail everything to my home address listed below.

Sincerely,

Michael Hotka
1425 Snowberry Lane
Broomfield, CO 80020

# PROJECT LOG

NAME OF PROJECT Sun: Sunrise, Sunset Azimuth Positions

Project Begun 3/24/04 Project Ended 7/11/04

Seeing Conditions Clear

Binocular Size

Telescope: Type

Aperture

Focal Length

Eyepiece Focal Length

Observational Notes, Comments and Impressions:

| Date | Sunrise | Azimuth | Time Observed |
|---|---|---|---|
| 24-Mar | 5:57 | 75° | 6:15 AM |
| 29-Mar | 5:49 | 74° | 6:10 AM |
| 5-Apr | 6:37 | 70° | 6:50 AM |
| 11-Apr | 6:28 | 69° | 6:45 AM |
| 19-Apr | 6:16 | 62° | 6:24 AM |
| 27-Apr | 6:05 | 60° | 6:13 AM |
| 4-May | 5:56 | 57° | 6:05 AM |
| 10-May | 5:50 | 56° | 5:58 AM |
| 19-May | 5:41 | 52° | 5:53 AM |
| 23-May | 5:39 | 46° | 5:48 AM |
| 31-May | 5:34 | 50° | 5:45 AM |
| 7-Jun | 5:32 | 47° | 5:45 AM |
| 14-Jun | 5:31 | 46° | 5:43 AM |
| 21-Jun | 5:32 | 46° | 5:37 AM |
| 29-Jun | 5:35 | 50° | 5:48 AM |
| 4-Jul | 5:38 | 56° | 5:51 AM |
| 11-Jul | 5:42 | 59° | 5:54 AM |

# PROJECT LOG

NAME OF PROJECT Moon : Maria

Project Begun 3/29/04 Project Ended 3/29/04

Seeing Conditions Great

Binocular Size

Telescope: Type Newtonian

Aperture 8"

Focal Length f/8

Eyepiece Focal Length 10 mm

Observational Notes, Comments and Impressions:

The features on these Maria are static. Craters and markings such as rays never change. A body of water would present a different view all the time.

## PROJECT LOG

NAME OF PROJECT Moon: Highlands

Project Begun 3/29/04 Project Ended 3/29/04

Seeing Conditions great

Binocular Size

Telescope: Type Newtonian

Aperture 8"

Focal Length f/8

Eyepiece Focal Length 10 mm

Observational Notes, Comments and Impressions:

I would say the Lunar Highlands are older, for they show evidence of heavy bombardment of debris, making lots of craters. Whereas, the Lunar Maria once was as heavily cratered, but was covered up by lava flows since the heavy bombardment period & now only show some craters, those that hit the moon after the lava flows cooled & hardened.

## PROJECT LOG

NAME OF PROJECT Moon: Crater Ages

Project Begun 3/29/04 Project Ended 3/29/04

Seeing Conditions Great

Binocular Size

Telescope: Type Newtonian

Aperture 8"

Focal Length f/8

Eyepiece Focal Length 10 mm

Observational Notes, Comments and Impressions:

I would say that Cyrillus is older than Theophilus by the fact that:

- Theophilus is a complete "ring" of a crater that eats into the circular nature of Cyrillus, so it was made later
- Theophilus's features are crisp & sharp edged looking while Cyrillus is more eroded and the edges are softer.

# PROJECT LOG

NAME OF PROJECT Moon: Scarps

Project Begun 3/29/04 Project Ended 3/29/04

Seeing Conditions Great

Binocular Size

Telescope: Type Newtonian

Aperture 8"

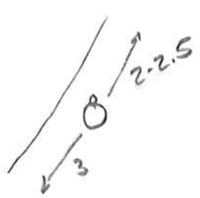
Focal Length f/8

Eyepiece Focal Length 10 mm

Observational Notes, Comments and Impressions:

Birt 17 km (10.5 mi) in diameter

Saw Birt & Straight Wall at 7:30P. Straight wall nice, dark straight line (at 9:16P, when I looked again, wall (dark line) less pronounced). Birt had a nice, dark outline around crater center. Gives a nice contrast to crater itself.




Measuring Straight Wall w.r.t. Birt, there are 3 Birt diameters to the left of Birt, as projected onto Wall, and at least 2, but not 3 Birt diameters to the right. I estimate Wall 6-6.5 Birt diameters, or 102-110.5 km or 63-68.25. Looking on Virtual Moon Atlas, it states Rupes Recta is 114 km (67 mi) long.