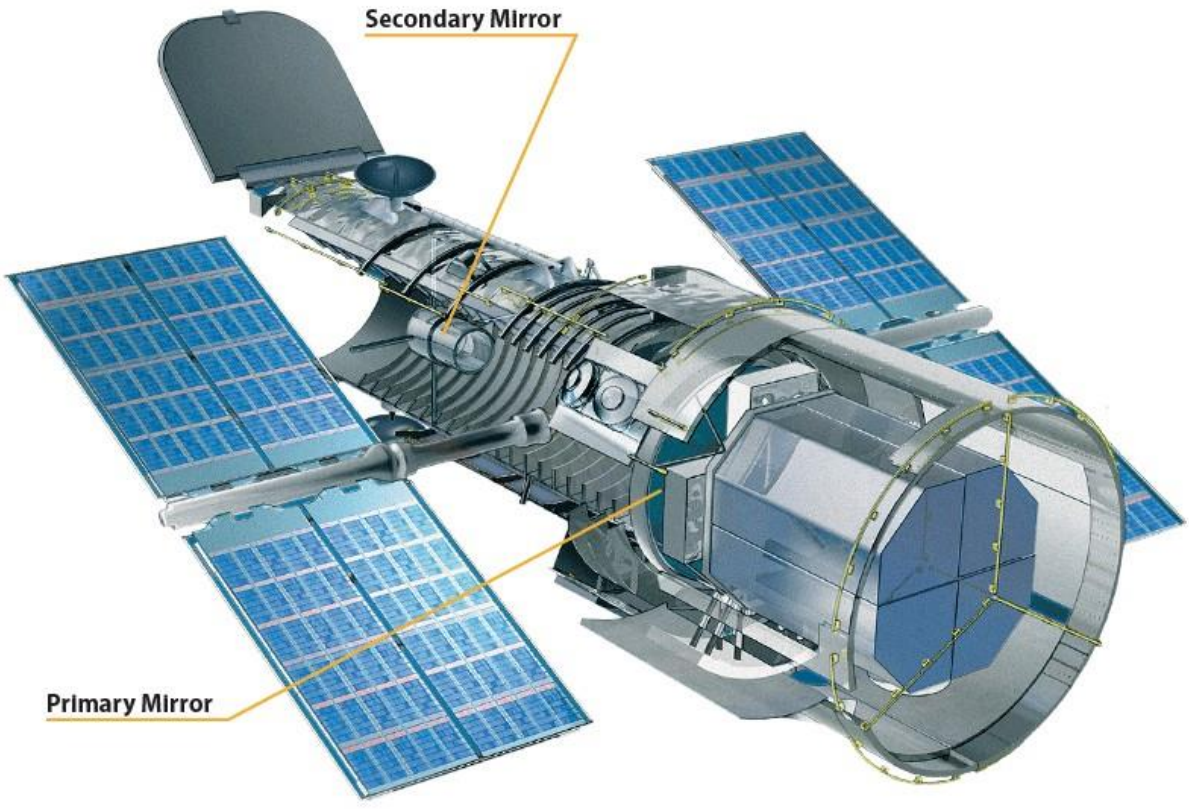
Hubble Space Telescope

Night Sky Challenge

2025

Participant Packet



Welcome to the Nurture Nature Center

At the NNC, science, art, and community involvement converge to make incredible things happen!

Founded in 2007 as a center for flood education and community outreach, the NNC has grown since then. Today, we provide a wide range of community programs including many with a focus on science and art. Please refer to our website for more and current information and news about what we offer:
www.nurturenaturecenter.org

One of the many unique opportunities available at NNC is the Science on a Sphere (SOS), a large, suspended globe that displays a variety of earth and space visualizations. We use the SOS to educate about our solar system and the field of astronomy, along with regular 'star parties' in the Easton community where we provide telescopes and staff to guide visitors in viewing the night sky. NNC is excited to expand its education and outreach programming through the 2025 Hubble Space Telescope Observation Challenge: a year-long effort to connect people to space, exploration, and wonder.

NASA launched the Hubble Space Telescope in 1990, thirty-five years ago. Although it wasn't the first space telescope, it continues to be one of the most consequential thanks to all the amazing discoveries it has provided about our universe. Many notable facts of its mission and contributions will be shared during the upcoming celebration at NNC.

Join us on the first Saturday of each month at NNC from 4 to 5 pm. We invite fellow sky-gazers (*of all ability levels and ages*) as we delve into the scientific discoveries of some of the universe's most beautiful views. Participants will be equipped with knowledge, tools, and strategies required to participate in the Hubble Space Telescope Night Sky Challenge.

Each time we meet, a new list of monthly targets will be provided. These objects are selected through a partnership between NASA and the Astronomical League. The NNC will provide information and instruction to make your participation in the challenge both enjoyable and rewarding. Those participating will be eligible for recognition and awards.

It is our hope that this opportunity will provide you with a greater appreciation for our Earth as we stargaze each month. The following pages contain many helpful resources to help us on our journey together. Instructions and additional resources will be provided during each monthly program. No matter your age or ability level, we will navigate the night sky together. We will learn together. We will discover new things together. And together we will grow as a community, using Hubble to help guide us along the way!

Let's Begin

In a day when many people spend their lives looking downward at their devices, the Hubble Night Sky Challenge is a refreshing opportunity. It is a reminder that an entire universe is waiting to be discovered, all around us. Not only is it available to all, but it is free of charge and requires no updates.

For some, this may be the first time you have taken an interest in ***astronomy***, *the study of everything in the universe beyond our Earth*. For others, this may be just another accomplishment to add to a long list of astronomical accomplishments. No matter where you are on this spectrum, there is a place for you this year at NNC.

Information and resources will be provided to educate and challenge anyone who wishes to join us throughout the year. This participant packet will provide both a starting point and a jump-off point to get you outdoors, at night, looking up, and seeing things you never saw before.

Before turning the page, let's introduce some of the main players in this journey. ***NASA*** is short for the National Aeronautics and Space Administration and is a US government agency established in 1958. It is responsible for research related to the atmosphere and beyond; NASA took our brave astronauts to the moon and back over 50 years ago. Much of its work has benefited all of us here on Earth.

One of the many missions initiated by NASA was the Hubble Space Telescope. This telescope, located in low Earth orbit, became famous for its challenges, then for its accomplishments. The ***Hubble***, launched in 1990, continues to provide us with views of the ***cosmos*** (*the structure of the universe*) that have captured the imagination of both artists and scientists alike with the beauty of its imagery.

During the 20th century, interest in exploring space (*physically and visually*) grew. Many groups formed to encourage amateur astronomers to become familiar with the objects to be discovered in the night sky. The ***Astronomical League*** was formed over 75 years ago and has grown into one of the best organized and well-known groups today. In cooperation with NASA, the League sponsors many Night-Sky viewing challenges. They provide free resources simply to inspire others.

Let's Continue

This packet contains information from NASA, the Astronomical League, and other resources online. Depending on your experience, some information may be new or a simple review. Either way, it is here to provide a common language as we come together.

Helpful Links to Explore:

NASA: www.nasa.gov
NASA Hubble Mission: www.science.nasa.gov/mission/hubble/
Hubble Activities: www.hubblesite.org/resource-gallery/activities
Astronomical League: www.astroleague.org
Astronomical League Challenges: www.astroleague.org/alphabeticobserving/
Sky and Telescope: www.skyandtelescope.org
Interactive Sky Chart: www.skyandtelescope.org/interactive-sky-chart/
Free Star Charts: www.freestarcharts.com
What's Up (*Monthly Skywatching Tips from NASA*):
www.youtube.com/watch?v=3uq6ym5FkEc
Seeing and Transparency Guide:
www.astroleague.org/seeing-and-transparency-guide/
Binocular Observing Program:
www.astroleague.org/binocular-messier-observing-program/
Youth Astronomer Program:
www.astroleague.org/youth-astronomer-observing-program/

Useful Resources in this Packet:

- You are Here
- Take Your First Steps Exploring the Heavens (8-page packet)
- Constellations and Asterisms
- The Need for Telescopes
- Observing Galaxies
- Hubble Space Telescope 35th Anniversary Observing Challenge
- Navigating the Mid-January Night Sky
- General Sky Chart for January
- January Hubble Images (*descriptions and sky maps*)
- Observation Form (*optional for recognition*)

Additional information and instruction will be provided during the monthly program on the 1st Saturday of each month at NNC from 4 to 5pm.

Our place in the Milky Way Galaxy

You Are Here

Our barred spiral galaxy

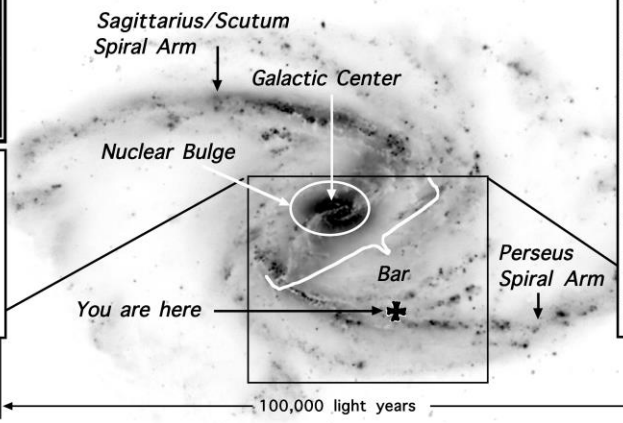
Many astronomers believe that the appearance of the Milky Way Galaxy resembles that of the 60 million light year distant barred spiral galaxy NGC 1365.

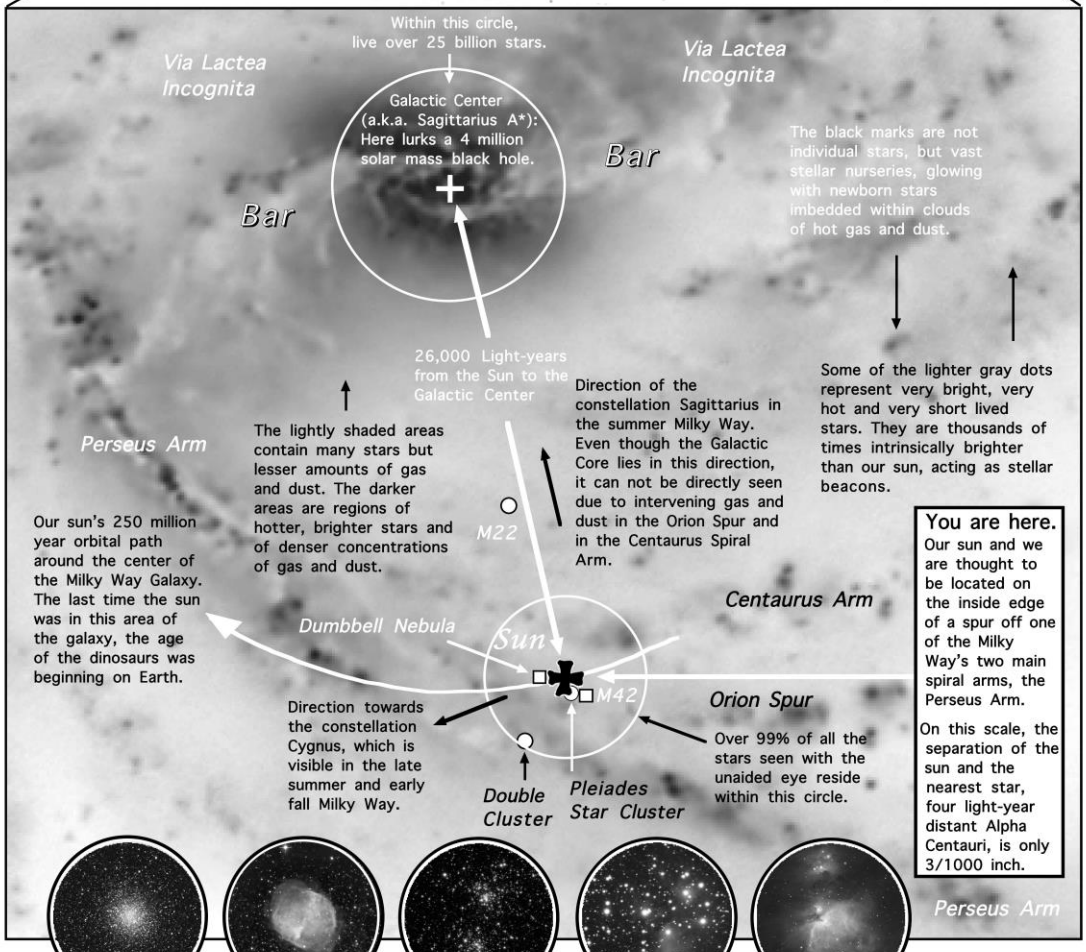
Original source image of NGC 1365 courtesy of NOAO/AURA/NSF.

Where is the Milky Way?

Everything that is around you from pencils to automobiles, from people to buildings, from distant mountains to the moon in the sky all are part of the Milky Way Galaxy. Besides our more familiar earthly objects, the galaxy contains at least 200 billion stars along with vast amounts of gas and dust spread unevenly across a disk 100,000 light-years wide and, in the spiral arms, 1000 light-years thick.

From our Earthbound viewpoint, we see the Milky Way's plane as a softly glowing band stretching across our night sky.





You are here.

Our sun and we are thought to be located on the inside edge of a spur off one of the Milky Way's two main spiral arms, the Perseus Arm.

On this scale, the separation of the sun and the nearest star, four light-year distant Alpha Centauri, is only 3/1000 inch.

M22 Cluster
A popular summer telescope object imbedded in the star fields of Sagittarius. It glows, 10,000 light-years towards the center of the galaxy.

Brian Kimball

The Dumbbell Nebula
At a distance of 1300 light-years, this 2 light-year wide cloud of gas and dust is the ejecta from a dying star.

Michael Good, Roanoke Valley Astronomical Society

The Double Cluster
Glowing dimly in the fall Milky Way, its true nature is revealed with binoculars. It lies 7000 light-years away, making it the farthest object in the Milky Way that is visible to unaided eyes.

Gary Hatfield

The Pleiades
An easy to see star cluster in the fall sky, also known as the "Seven Sisters." It lies 370 light-years from Earth.

Gary Hatfield, Starry Estate Observatory

M42
A stargazer's favorite object in the winter sky, the 1600 light-year distant nebula, M42, is easily seen in the constellation Orion.

Brian Kimball, Longmont Astronomical Society

Courtesy of:

Astronomical League
www.astroleague.org

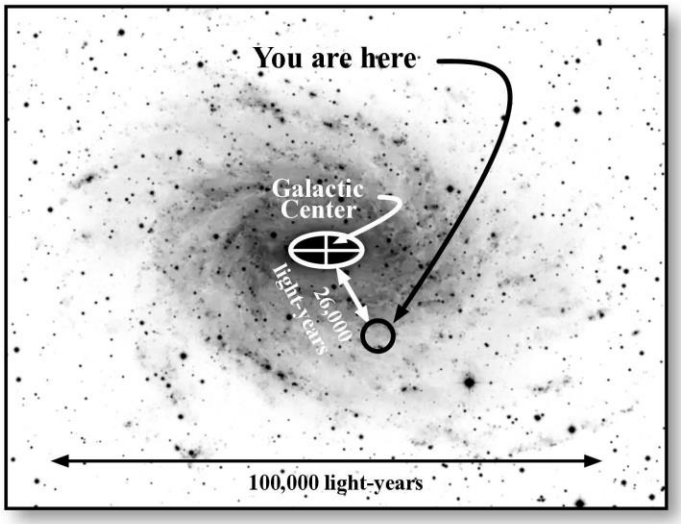
Design by John Jardine Goss

ASTRONOMICAL LEAGUE

The nation's largest federation of astronomical societies

Take your first steps exploring the heavens!

When beginning a journey, it is good to understand where you are ...



Negative image of galaxy NGC 6744, a galaxy very similar to the Milky Way. Original image: NASA

Where is the Milky Way?

The galaxy contains you along with more than 200 billion stars and vast amounts of gas and dust. It is spread unevenly across a disk 100,000 light-years wide, and, in the spiral arms, 2000 light-years thick.

No single word adequately conveys its immensity.

From our earthbound viewpoint, the Milky Way is seen as a soft, glowing band with bright areas and dark regions that stretches across the sky. While portions of it can be distinguished from suburban areas, dark skies are needed to fully appreciate this marvelous sight.

Since 1946, the ASTRONOMICAL LEAGUE has been helping stargazers explore the Milky Way and far beyond.

Let this well respected organization help you on your journey, and also help connect you to a community of stargazers through a local astronomy club or as a member of the AL. The League offers members its quarterly magazine, the *Reflector;* many Recognition & Youth awards; numerous and very popular Observing Programs and Observing Materials; plus much more!

www.astroleague.org

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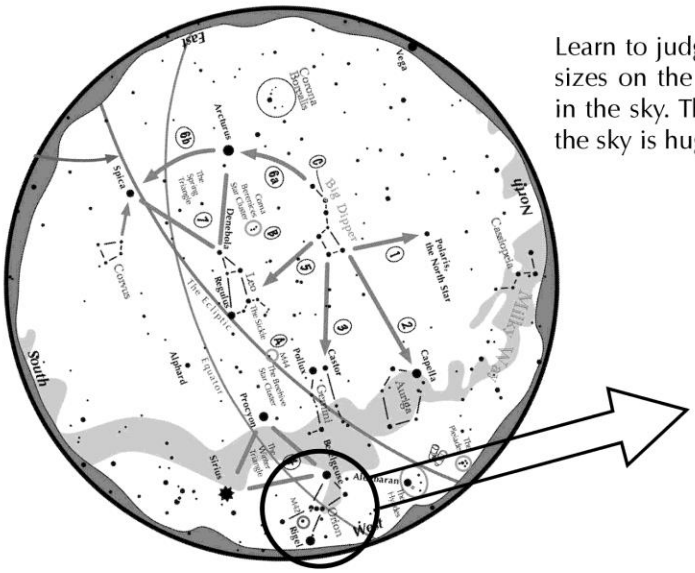
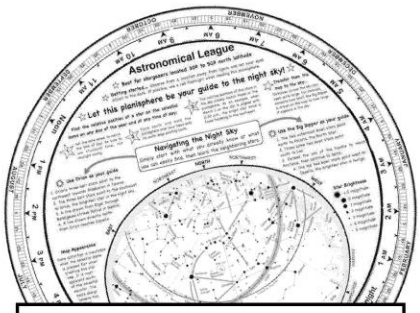
Take your first steps exploring the heavens



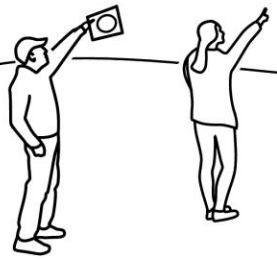
Learn to judge distances and sizes on the map with those in the sky. The map is small, the sky is huge!

Monthly sky maps and activities can be found at:
www.astroleague.org/navigating-the-night-sky-guides



A **planisphere** is a rotatable dial that shows star positions in the sky at any time of the year.

Do you see fewer stars in the sky than are plotted on your map? This is likely due the negative effects of light pollution.



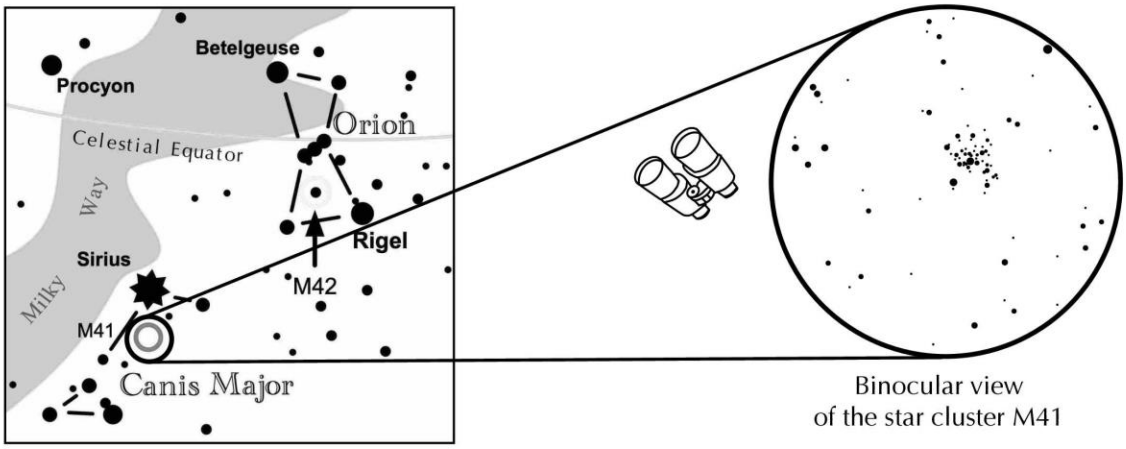
Nothing beats time spent under the stars

- Use a red flashlight and a basic star map – such as the ones produced by the Astronomical League – or a planisphere. Situate yourself away from direct outdoor lights. A bright moon will make it more difficult to see stars.
- Find North, South, West, and East in the sky and on the map. Rotate the map so that it matches the direction that you are facing. Match the overhead position on the map (called the zenith) with that same position in the sky.
- Learn the constellations and bright stars by starting with a star pattern that you already know and can find – perhaps the Big Dipper or Orion.
- Then, estimate the distances and directions to other nearby constellations and bright stars. You will quickly learn how the relative sizes and spacings of constellations and stars on your map compare with those in the sky.

Before you consider purchasing a telescope ...

Binoculars *The little instrument that can!*

- Easy to use, easy to store, and ultra-portable.
- Image – right side up and not mirrored.
- Can see large sections of the sky at once.
- Can use them for daytime activities, too.
- A tripod or other mount helps steady the image.
- Be sure to sharply focus them.
- Relax on a comfortable lawn chair.



Binocular view of the star cluster M41

Binoculars reveal wide double stars, brighter star clusters, wispy nebulae, and even a few incredibly distant galaxies!

Once you learn a few constellations and bright stars ...

- Look for celestial objects plotted on your basic star chart. These will be the brighter ones – bright enough to be spotted through binoculars.
- Simply estimate the object's distance and direction from two reference stars, then aim the binoculars to that point in the sky. This technique is called "Triangulation."
- 8x42, and 7x35 binoculars are fine for casual stargazing. 10x50 binoculars are even better!

Binoculars are perfect for scanning the Milky Way – its bright regions, its dark bays, and its misty glows.

Binocular size designation:

- The first number given is the magnification.
- The second number is the diameter (in millimeters) of the front lens. The larger the lens is, the fainter the objects revealed – but the heavier the binoculars are.
- Example: 10x50 (pronounced "10 by 50"); 10 magnification, front lens diameter of 50 millimeters (2 inches).

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Are you ready for a telescope?

Telescopes can split double stars, show twinkling star clusters, unveil wispy nebulae, reveal incredibly distant galaxies, and give tantalizing hints at the nature of our universe.

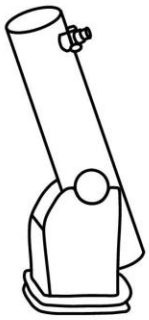
Before you purchase a telescope, ask yourself these questions...

- How well do you know the night sky? Finding objects is not easy without practice. A quality "go-to" computerized telescope is costly and its operation must be mastered.
- How hard is the scope to assemble? If it is too complicated, you won't use it.
- Where will you do most of your observing? A city resident will likely need to cart it to a dark site.
- If you really like astronomy, you'll outgrow too small a scope in six months.
- Will you eventually pursue astrophotography? You'll need a sturdy, motor driven mount that tracks accurately.

Observing tips:

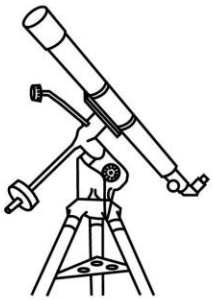
- Magnification – low power is used for most objects.
- Finder scope – a small one is nearly useless.
- The larger the telescope's diameter, the better views it gives, but the less portable it is.
- If the scope has poor optics or a wobbly mount, it will be frustrating to use.
- Never point the telescope at the sun without the proper filter installed ON FRONT of the scope.
- Don't expect what you see in the eyepiece to closely resemble what you see in photographs.

Reflector



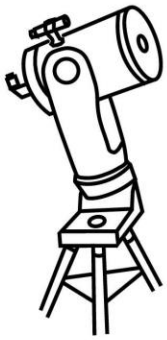
- Easy to use.
- Least expensive scope design.
- Great for star clusters, nebulae, and galaxies.
- Can be bulky.
- Generally, not suitable for astro-imaging.

Refractor



- Easy to use.
- Tend to be costly.
- Smaller aperture than Reflectors; showing fewer targets.
- Many can be configured for astro-imaging.
- Great for the moon and planets.

Catadioptric



- Portable, but heavy.
- Tend to be costly.
- Good for astro-imaging.
- General purpose scope.

Finding celestial wonders requires practice, patience, and perseverance. It is well worth the time and effort!

Learn more about telescopes, and the fascinating field of amateur astronomy by visiting your local amateur astronomy club!

www.astroleague.org

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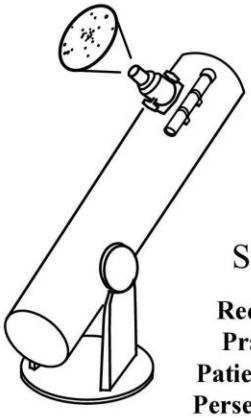
How do you find the celestial wonders that you want to see?

Finding celestial targets the modern way

Computerized "GoTo" style telescopes ... the quick and easy method:

- The telescope's computer operation must first be mastered.
- Except for the newest generation of telescopes, you still need to have some knowledge of the brightest stars.
- These instruments tend to be costly.
- Once the battery power is depleted, the telescope must be used manually.
- Data base typically contains over 1000 celestial objects. But that doesn't mean that all objects will give meaningful views.



As when using Binoculars, try Triangulation

Brighter objects are directly visible in binoculars and the finderscope

On a star chart, locate the position of the object with respect to nearby recognizable objects, such as bright stars. Judge the relative distances and angles from the guide objects to the target and mentally project them onto the sky. Then, carefully aim the telescope to that spot.

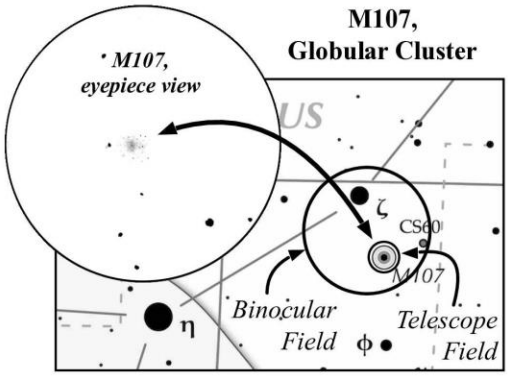
Star Hopping is an Art

Requires: Practice, Patience, and Perseverance!

It is well worth the time and effort. Your reward? A personal view of the Universe.

- Must have a **detailed** star map.
- Begin at a reference star that you can find.
- Match the stars on the map with those in the eyepiece.
- Hop among the stars in each subsequent field of view until the correct field is reached.

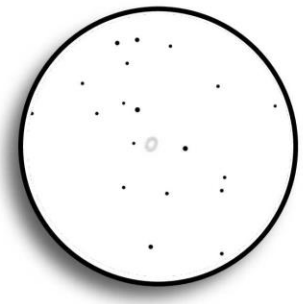
M107, Globular Cluster



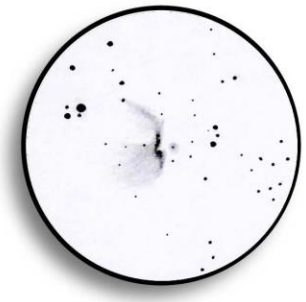
What will a telescope reveal? The wonders you see will be with your own eyes. You will see the universe as it truly is, not computer–enhanced, electronically obtained images.

Andromeda Galaxy

Ring Nebula



Orion Nebula



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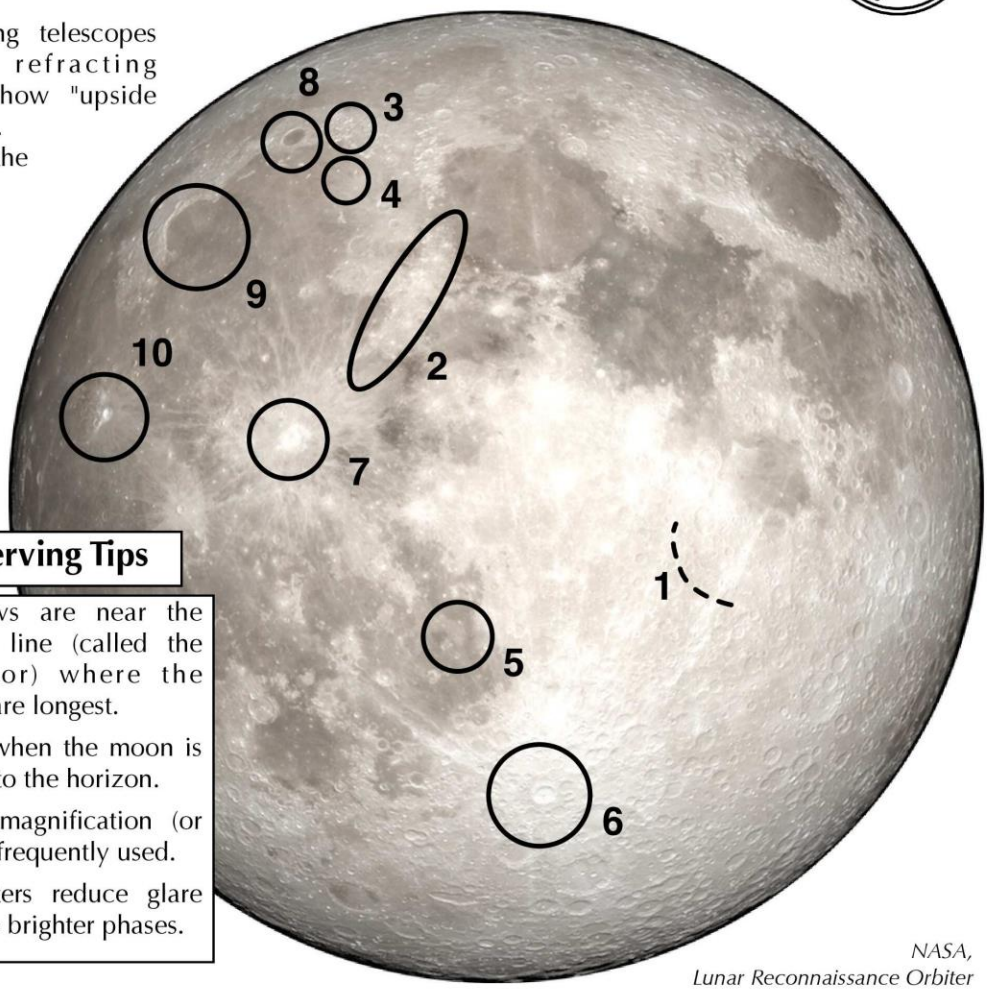
Discover the Moon – A Great Place to Start!

Being bright and large, the moon is a great target showing much detail. Telescopes of all sizes reveal craters, mountains, faults, and rays.

Most reflecting telescopes (and some refracting telescopes) show "upside down" images. Simply rotate the chart 180°.



NASA, Lunar Reconnaissance Orbiter

Observing Tips

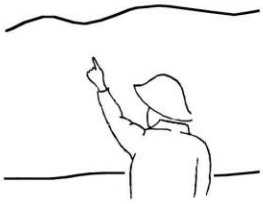
- Best views are near the night/day line (called the terminator) where the shadows are longest.
- Observe when the moon is not close to the horizon.
- Medium magnification (or higher) is frequently used.
- Moon filters reduce glare during the brighter phases.

Many lunar features are suitable for examination through a small telescope. Here are a few:

Number	Name	Type	Best seen
1	Altai Scarp	Cliffs	5 days
2	Apennine Mountains	Mtn range	1st Quarter
3	Alpine Valley	Fault	1st Quarter
4	Mons Piton	Massif	8 days
5	Straight Wall	Fault	8 days
6	Tycho	Complex crater	9 days
7	Copernicus	Complex crater	10 days
8	Plato	Flooded crater	9 days
9	Sinus Iridum	Flooded plain	11 days
10	Aristrachus region	Crater and rille	12 days

Observing the Bright Planets

Is that a planet or a star?

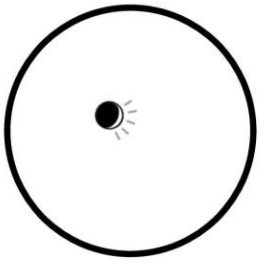


- A planet shines with a steady light. Stars tend to "twinkle."
- A planet is always located near the ecliptic, which is the sun's annual path across the heavens.
- A planet slowly shifts its position nightly with respect to the background stars.

Planets appear small – even at high magnification!

Mercury

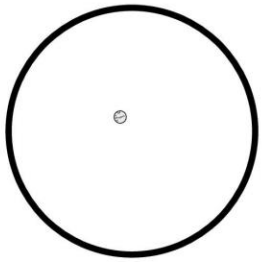
When it doesn't appear too near the sun, it lies either low above the western horizon just after sunset, or low above the eastern horizon just before sunrise. Oftentimes, a challenge to spot.



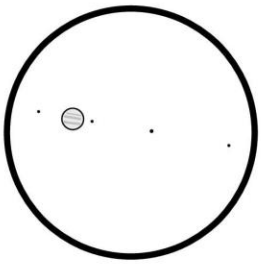
Venus

- Either above the western horizon in the evening, or above the eastern horizon in the early morning depending on where it lies in its orbit with respect to Earth.
- When it is near Earth, it presents a brilliant crescent phase.
- Dazzling bright object.

Mars



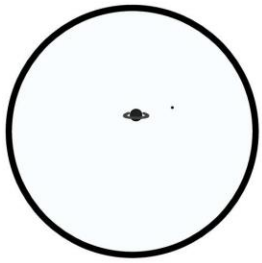
- When close to Earth, Mars is a bright red-orange object in the east after sunset, high in the south near midnight, and in the west before sunrise.
- A small telescope barely reveals its white southern polar ice cap, and strange, indistinct gray surface markings.



Jupiter

- When it is not near the sun in the sky, Jupiter is seen as a very bright pale white object.
- Notice that it is not round, but slightly oval.
- Cloud bands can be discerned at moderate magnification.
- Jupiter's four large moons are easily visible.

Saturn



- When it does not appear close to the sun, Saturn is seen as a bright creamy starlike object.
- Its famous ring system, though appearing quite small, can be seen in a small telescope using moderate magnification.
- Saturn's big moon, Titan, is frequently spotted off one side of the planet.

Uranus and Neptune

Uranus is only visible to the unaided eye under excellent conditions, while Nepture requires at least binoculars, again under excellent conditions, to spot. In a telescope, they present very small disks and show little detail.

Astronomical League
www.astroleague.org

The ABCs of Stargazing

How would you describe to a friend the size of a sky object, its distance from a particular star, its brightness, or its location on the celestial dome?

The ABCs of stargazing allow you to do just that!

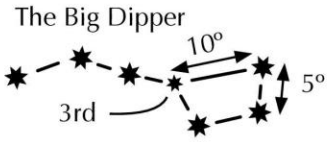
"A" is for angular size and distance

Remember these handy references when discussing size or distance in the sky:

- The moon spans 1/2°. It would take 360 "full moons" to reach from horizon to horizon!
- The apparent width of the tip of your index finger on your extended arm is less than 2°.
- The width of the bowl of the Big Dipper is 5° and its length is 10°.
- Your clenched fist on your fully extended arm is 10° from side to side.

Width of the Full Moon 1/2°

Moon's apparent size relative to your clenched fist

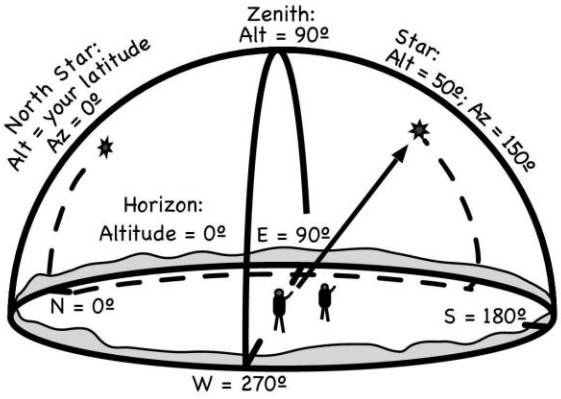


Six of the seven stars of the Big Dipper are of the 2nd magnitude.

"B" is for brightness

Skywatchers use the "magnitude" scale to describe an object's brightness. Don't be confused by the reverse nature of the scale: The brighter the object, the smaller is its magnitude. Objects with negative magnitudes are very bright, indeed!

Mag.	Object
-26	Sun (never look at the sun!)
-12	Full moon
-4	Venus
-2.5	Jupiter at its brightest
-1.5	Sirius, the brightest star in the night
0	Arcturus, Vega, Capella, Saturn
+2	Six stars of the Big Dipper, North Star
+6	The faintest star seen by unaided eyes



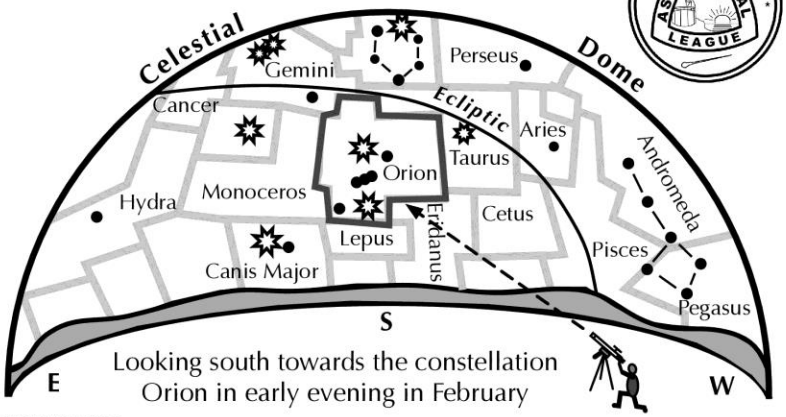
"C" is for coordinates

Stargazers often use the simple, but descriptive altitude-azimuth (alt-az) system to locate objects in the sky.

Altitude coordinate:	Azimuth coordinate:
Horizon is 0°	North is 0°
Zenith is 90°	East is 90°
	South is 180°
	West is 270°

Constellations & Asterisms

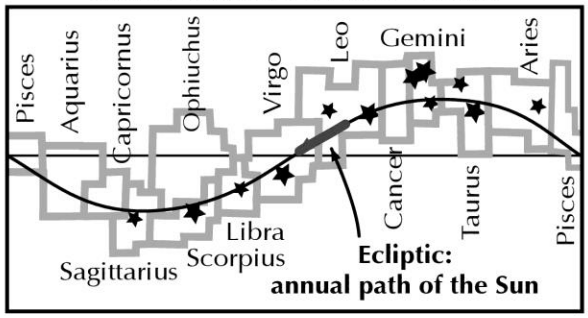
A constellation is an officially recognized section of the celestial sphere that has established boundaries, containing stars, planets, and other astrophysical objects. It is much like a state of the United States which contains many cities of different sizes, rivers, and mountains.



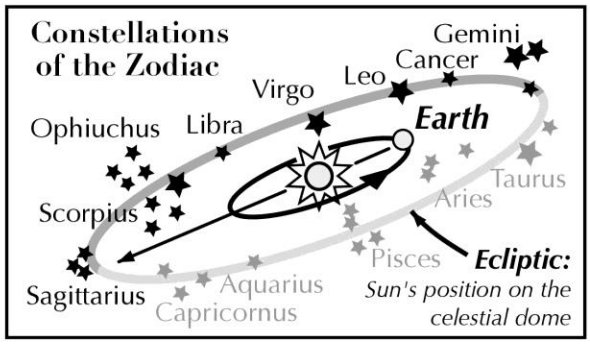
Looking south towards the constellation Orion in early evening in February

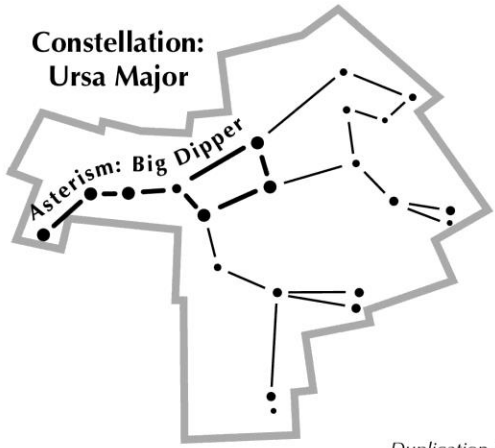
- 88 constellations are officially recognized.
- The Sun appears to travel throughout the year among 13 constellations along the ecliptic.
- Stick figures of most constellations do not closely resemble what they are said to represent.
- Some, but not all constellations contain bright stars. They all contain many dim stars visible to the unaided eye.
- The Moon and planets are found in or near the constellations of the Zodiac.

Constellations of the Zodiac

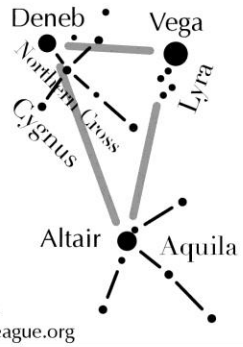


An asterism is an unofficial group of stars contained within one or more constellations. Asterisms range in size from being seen only through a telescope to streching across appreciable portions of the sky. The Big Dipper, for instance, is an asterism. It lies within Ursa Major, a constellation.





Asterisms can cover more than a single constellation. The **Summer Triangle** contains stars from Lyra (Vega), Aquila (Altair), and Cygnus (Deneb). Portions of Cygnus form another asterism called the **Northern Cross**.



The Astronomical League
www.astroleague.org/outreach

Our Moon

Apparent Diameter:
30 arc minutes = 1800 arc seconds
True Diameter: 2160 miles
Average distance from Earth:
240,000 miles

Langrenus: 82 miles in diameter,
and about the same apparent size as Jupiter!

Section of the waxing crescent moon when it is four days past new.

The Need for Telescopes

Our solar system is very large and the planets are very far away. So far that, even though some of them are much larger than Earth, their angular sizes are qite small. Consequently, they always appear star-like to the unaided eye. A telescope is required to magnify their pinpoint appearances, making them visible as small disks for study. Magnifications of greater than 100 power are often needed.

Compare the relative apparent sizes of the moon and the bright planets with this circle which represents a typical low-power field of view. In many low-power eyepieces, the moon is about the same size as the field of view.

Mercury *(greatest elongation)*

Venus (greatest brilliancy)

Mars *(closest)*

Mars *(farthest)*

Callisto

Ganymede

Jupiter *and its four large moons Callisto, Ganymede, Io, and Europa*

Io

Europa

Saturn *and its rings and its large moon Titan*

We all know how large the moon appears in our sky. While Venus, the planet that approaches closest to Earth, has a true diameter of over three times that of our moon, it is always at least 108 times farther away. As a result, its small angular size in the sky is comparable to the apparent sizes of the larger lunar craters. The other planets appear even smaller.

	Apparent Diameter (arc sec)	Actual Diameter (miles)	Distance at closest approach (miles)
Mercury (closest)	10	3025	57 million
Venus (closest)	60	7500	26 million
Earth	---	7900	---
Moon	1800	2160	220,000
Mars (closest)	25	4200	35 million
Jupiter	47	88,000	390 million
Saturn (planet)	19	75,000	794 million
Saturn (rings)	40	155,000	794 million

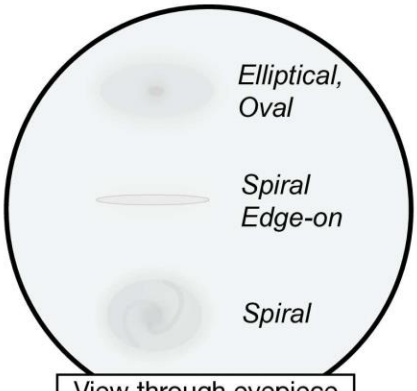
Observing Galaxies

Because galaxies are so very far away, they are typically faint. Therefore, your goals are to increase light collection and to maximize visual contrast whenever possible.

- Clear, dark skies are best.
- The larger the aperture of the telescope, the better. A four inch telescope barely reveals less than a dozen dim, indistinct glows, while an 8 inch scope picks out several dozen under the best conditions. Larger scopes begin to show internal structures such as dark dust lanes and spiral arms.

Consider these factors when observing:

- Note the general shape and apparent size of the galaxy. Is it more round than oval? Is it thin?
- If it is oval, in what direction does its major (long) axis point?
- What does the core look like? Is it star-like, or a round glow? Is it indistinct?
- Are spiral arms visible?
- For edge-on galaxies, are dust lanes visible?
- How quickly do the boundaries fade into blackness?
- Are smaller and dimmer galaxies also visible in the field?



View through eyepiece

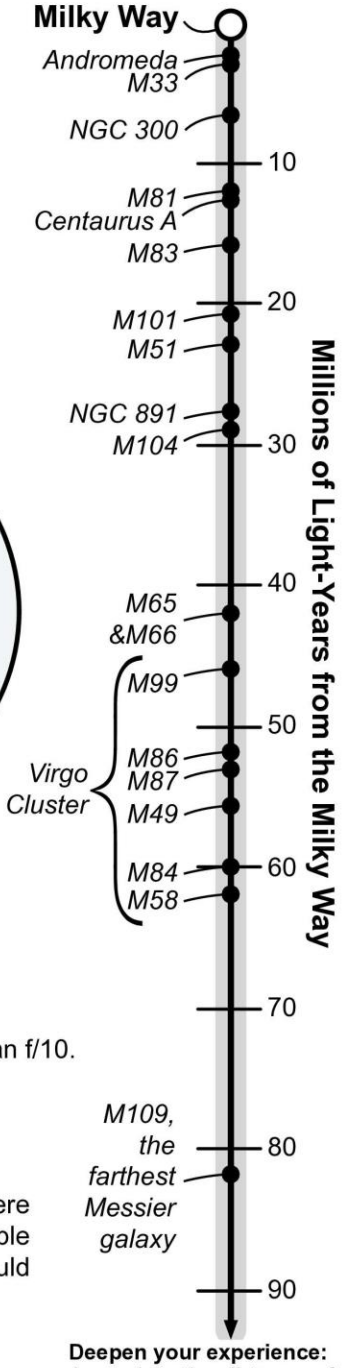
Enhance your view:

- Use averted vision.
- For better perception of small details, increase the magnification.
- To increase contrast, use a smaller focal ratio scope–f/5 is better than f/10.
- Tap the telescope tube to help bring out detail.
- Increase apparent field contrast by covering your head with a hood.

The importance of surface brightness:

The published magnitude of a galaxy refers to its brightness as if it were a point source. A galaxy, however, spreads its light over an appreciable area, making it appear dimmer than its published magnitude would suggest. As a result, it may be surprisingly difficult to discern.

Record your observations! Use a logbook, tablet, laptop, or voice recorder. Your notes are too precious to lose! You will refer to them years later.



Deepen your experience: Appreciate the distance of your target galaxy, and how long its light took to reach your eyes!

0223

Hubble Space Telescope
35th Anniversary Observing Challenge

To celebrate the successes of 35 years of the Hubble Telescope, the Astronomical League and NASA present a Special NASA Observing Award Challenge.

Two Challenge Levels: Silver and Gold Awards.

You do not need to be a member of the Astronomical League to participate and to receive the certificates and pin.

Silver Award (monthly certificates). **A new silver certificate is awarded each month** in which the set of activites has been completed. Submission deadline is the last day of the month after the month for that particular Silver Challenge. For instance, April's Silver Challenge has a deadline of May 31. Late submissions will not be accepted.

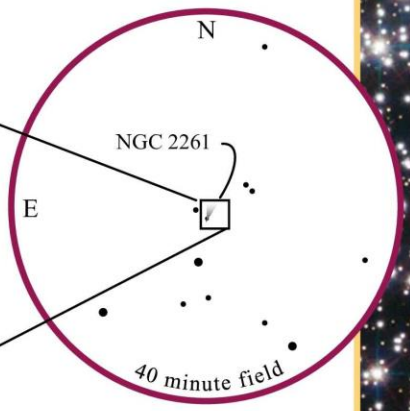
- Conduct one or more outreach activities highlighting Hubble's accomplishments. They must be done during the months for which you submit for the silver award. The same type of outreach activity may be done for multiple months.
- Your observations must be done during the specific month for each silver certificate. Each month's observation targets will be listed on the website given below.
- You must observe at least one of the objects on the month's list to earn the certificate.
- You must either sketch or image the object.
- Identify the part of your sketch or image that corresponds to the Hubble image.

Gold Award (certificate and pin). Submission deadline: January 31, 2026.

- Over 2025, hold four or more outreach activities highlighting Hubble's successes.
- Observe **four or more** objects from each month's list.
- Sketch or image all your observed objects.
- Identify the part of your sketch or image that corresponds to the Hubble image.

Note: The Gold Award requires additional observations each month beyond the requirements for the Silver Award.

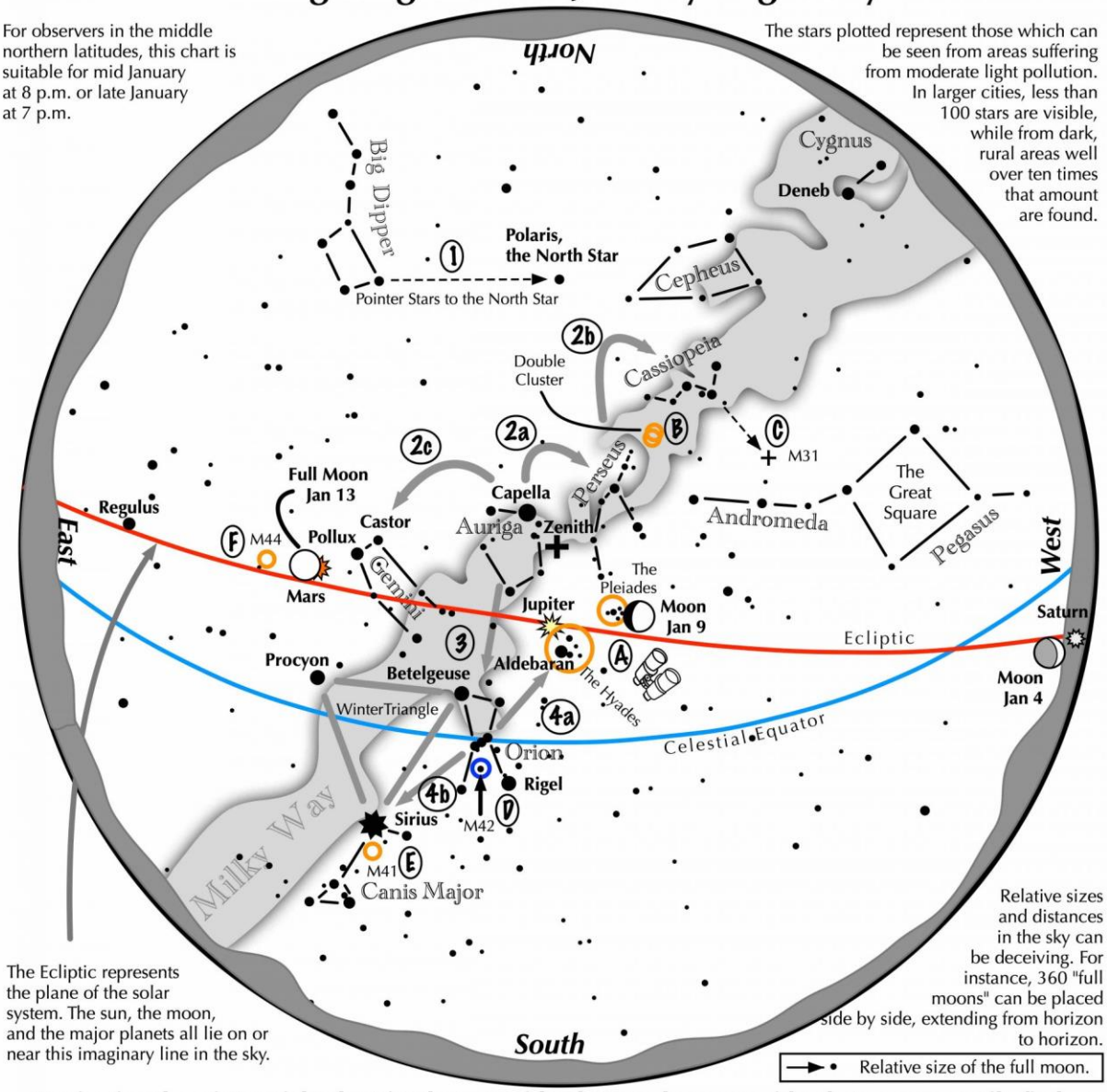
NGC 2261, *Hubble's Variable Nebula*
Hubble Space Telescope



For complete details: https://www.astroleague.org/nasa-observing-challenges-special-awards/

image: M12, HST

Navigating the mid January Night Sky



Navigating the winter night sky: Simply start with what you know or with what you can easily find.

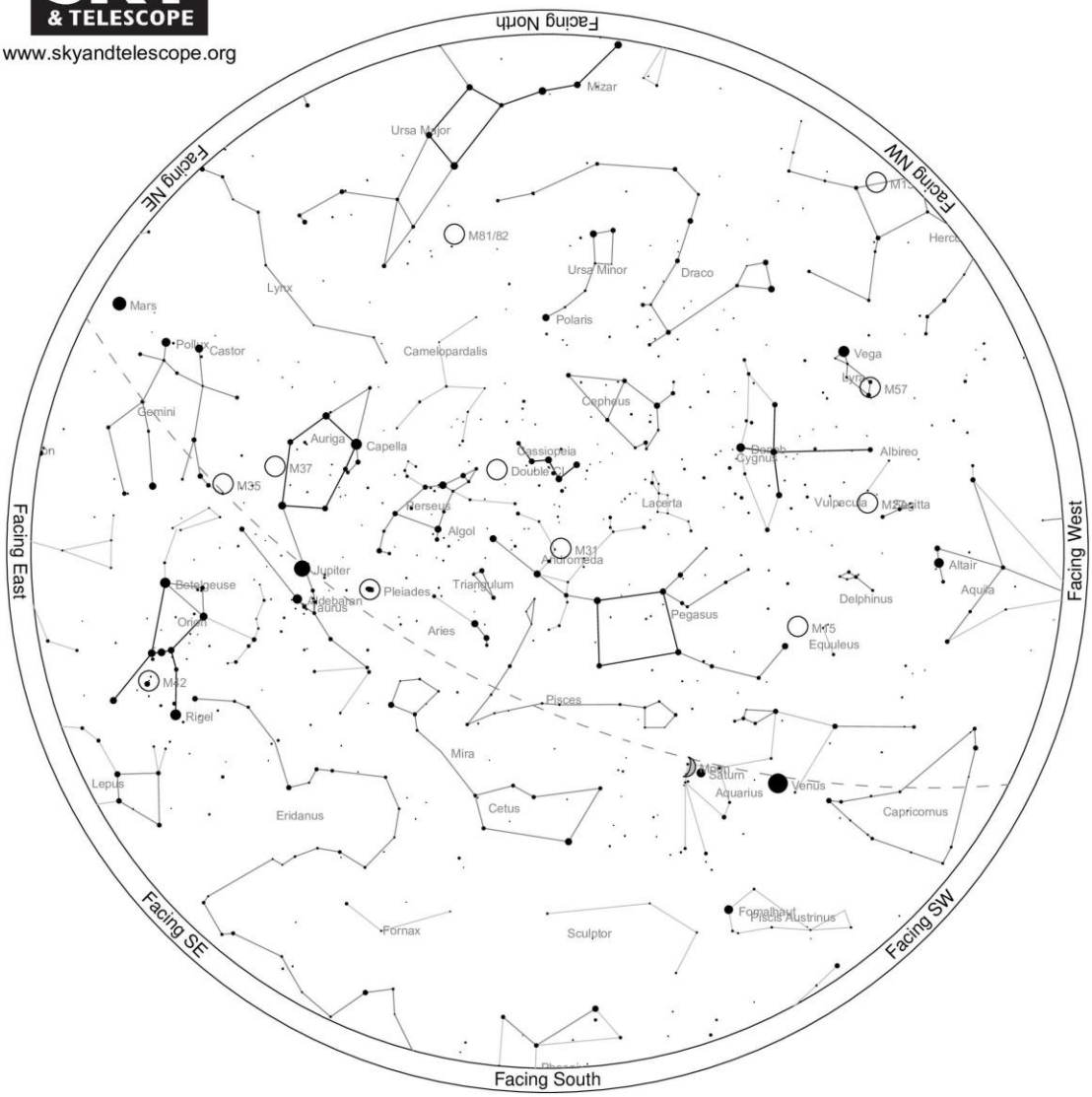
1. Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star.
2. Face south. Overhead twinkles the bright star Capella in Auriga. Jump northwestward along the Milky Way first to Perseus, then to the "W" of Cassiopeia. Next Jump southeastward from Capella to the twin stars Castor and Pollux of Gemini.
3. Directly south of Capella stands the constellation of Orion with its three Belt Stars, its bright red star Betelgeuse, and its bright blue-white star, Rigel.
4. Use Orion's three Belt stars to point to the red star Aldebaran, then to the Hyades, and the Pleiades star clusters. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius.

Binocular Highlights

A: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **B:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** M42 in Orion is a star forming nebula. **E:** Look south of Sirius for the star cluster M41. **F:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.

Sky Chart

www.skyandtelescope.org



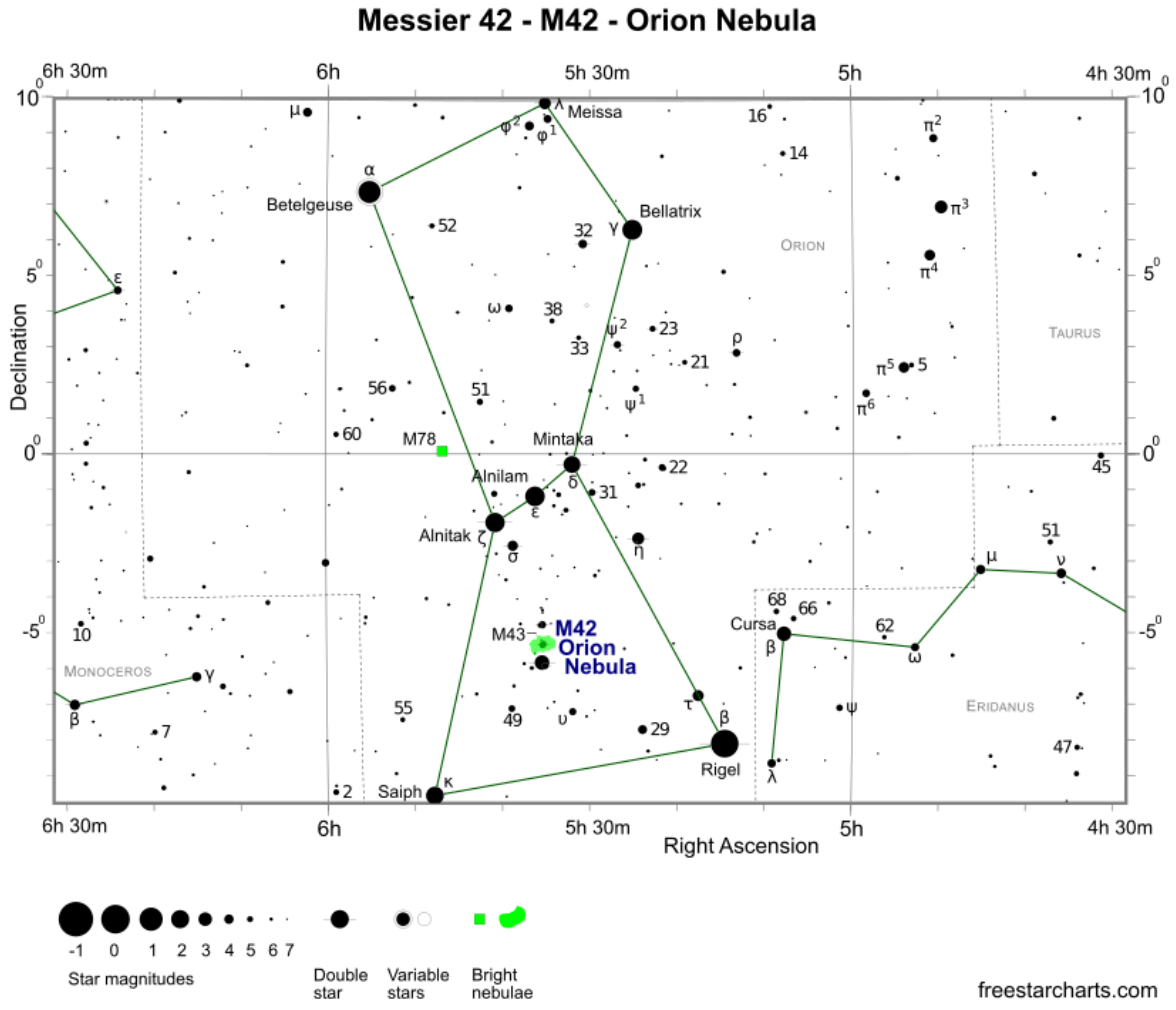
Location: Phillipsburg, NJ 08865
Latitude: 40° 41' N, longitude: 75° 10' W
Time: 2025 January 4, 18:00 (UTC -05:00)

Powered by: Heavens-Above.com

Messier 42 – Difficulty 1

*You can spot Messier 42, better known as the **Orion Nebula**, with the unaided eye from a dark sky site.*

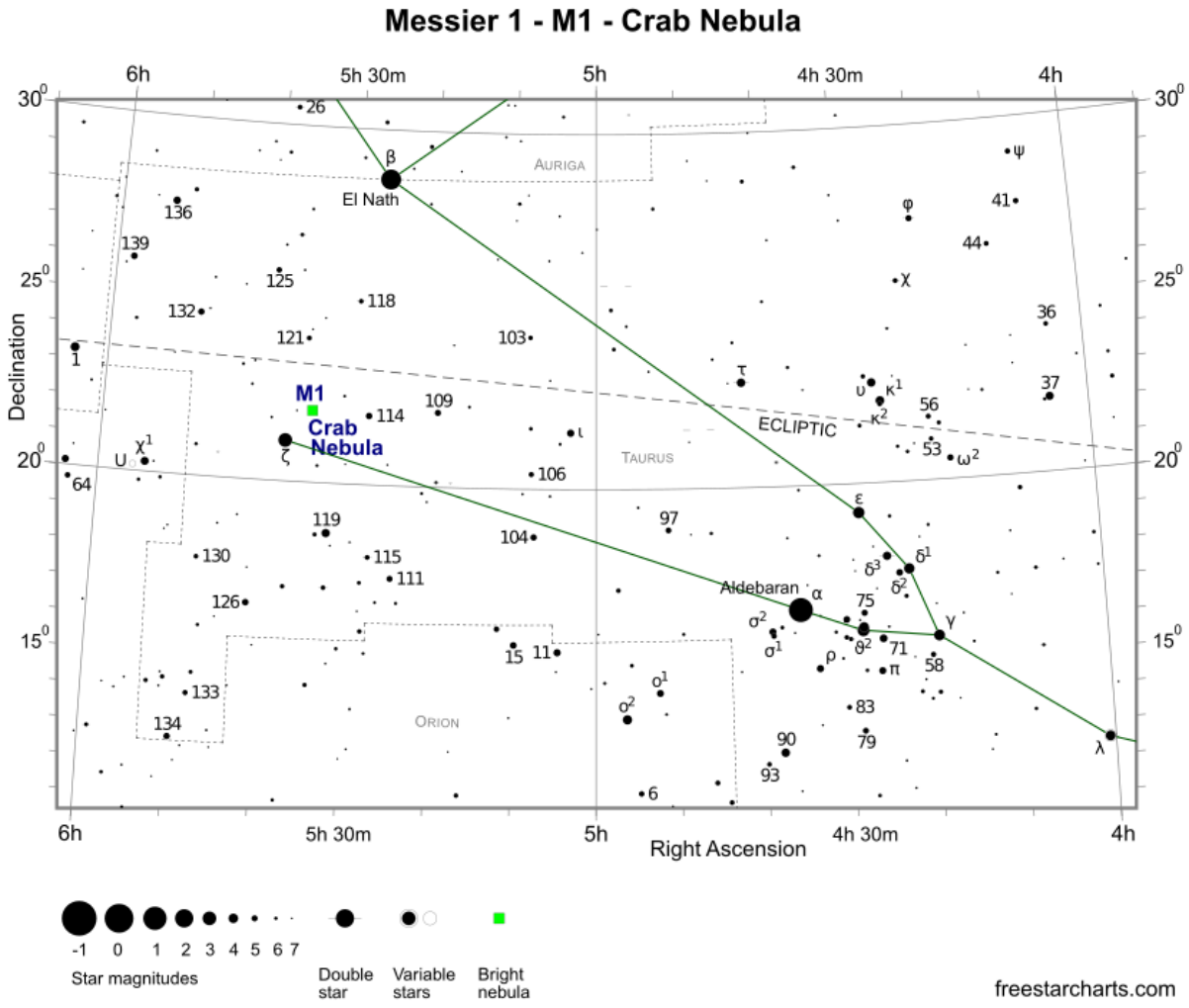
Distance: 1,500 light-years
Apparent Magnitude: 4.0
Constellation: Orion
Object type: Nebula



Messier 1 – Difficulty 2

*Better known as the **Crab Nebula**,*
Charles Messier originally mistook Messier 1 for Halley's Comet,
which inspired him to create his famous catalog of objects.

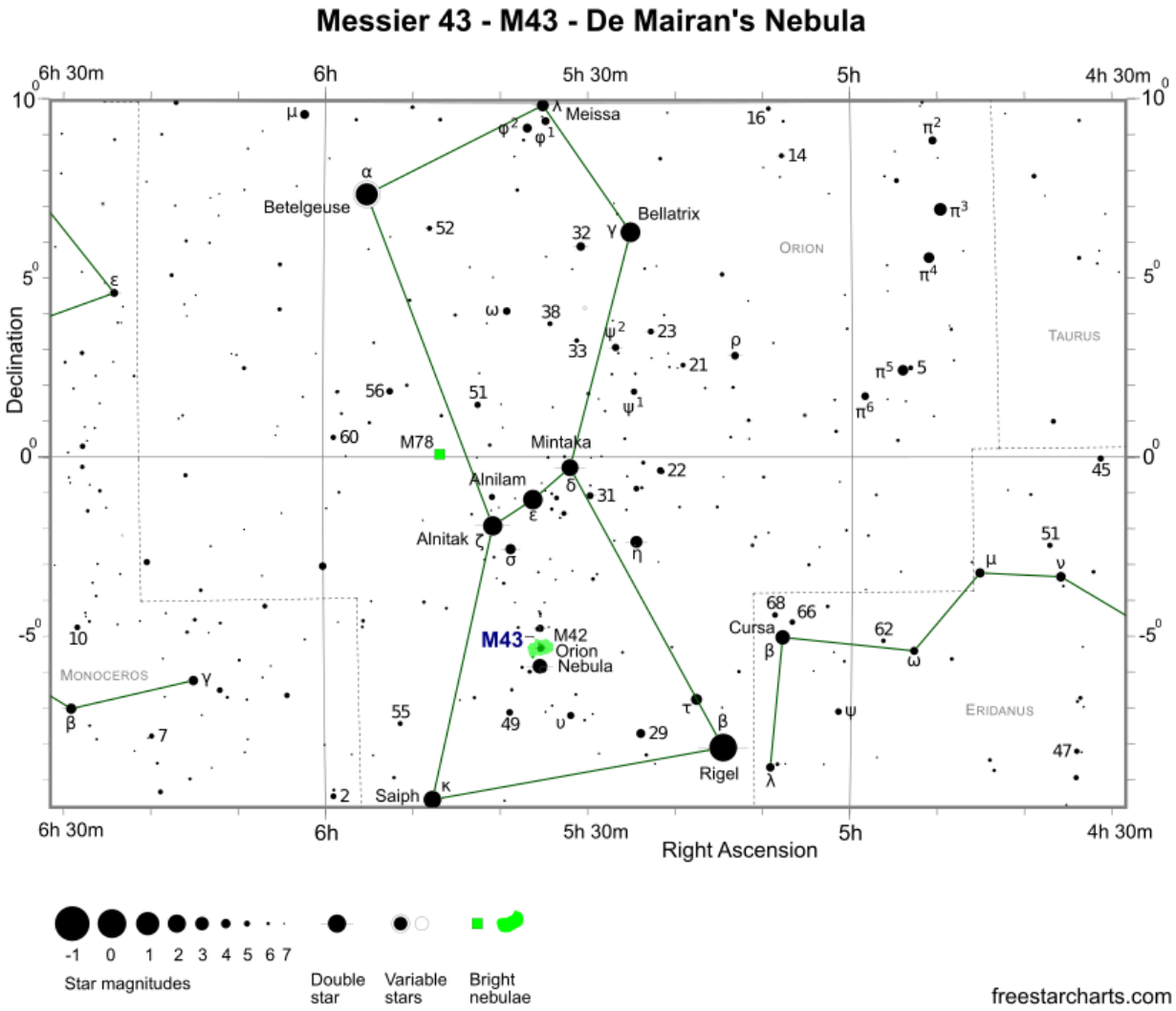
Distance: 6,500 light-years
Apparent Magnitude: 8.4
Constellation: Taurus
Object type: Planetary Nebula



M43: DeMairan's Nebula – Difficulty 2

Messier 43 is a neighbor to Messier 42, the Orion Nebula.

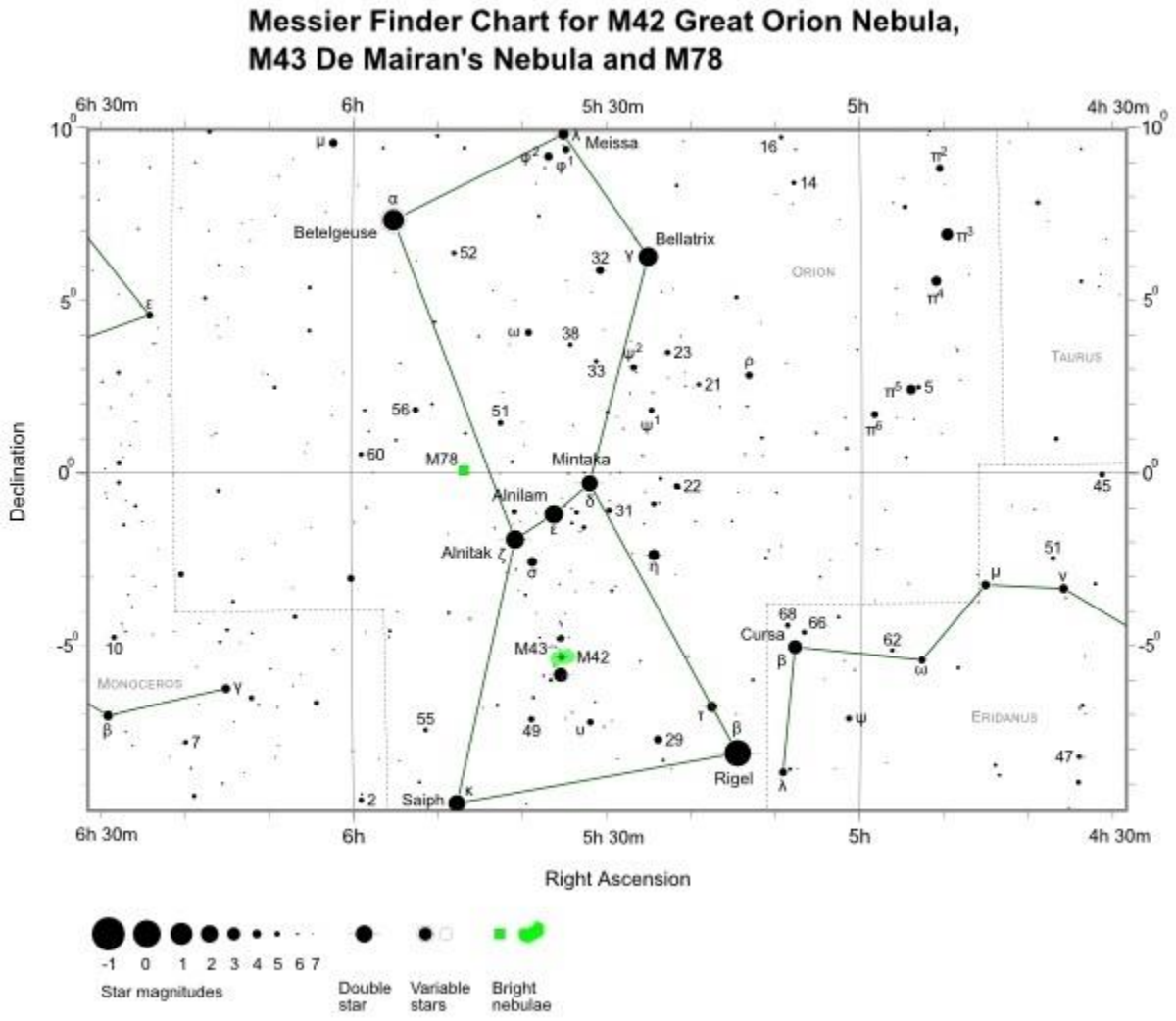
Distance: 1,600 light-years
Apparent Magnitude: 9.0
Constellation: Orion
Object type: Nebula



Messier 78 – Difficulty 2

Hubble's infrared image of Messier 78
helped astronomers understand how young stars develop.

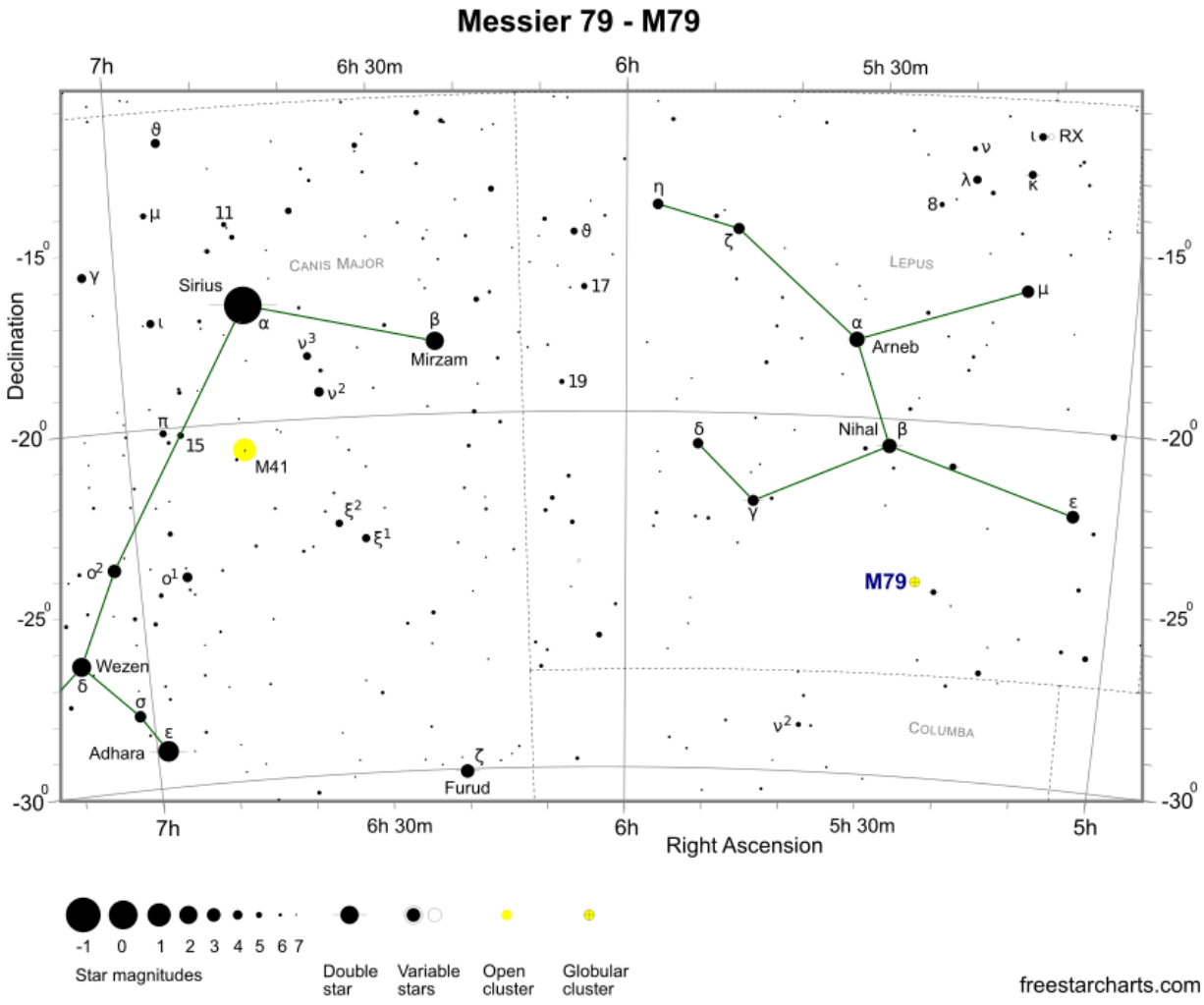
Distance: 1,600 light-years
Apparent Magnitude: 8.0
Constellation: Orion
Object type: Reflection Nebula



Messier 79 – Difficulty 2

Our Milky Way galaxy may have stripped this globular cluster from another galaxy.

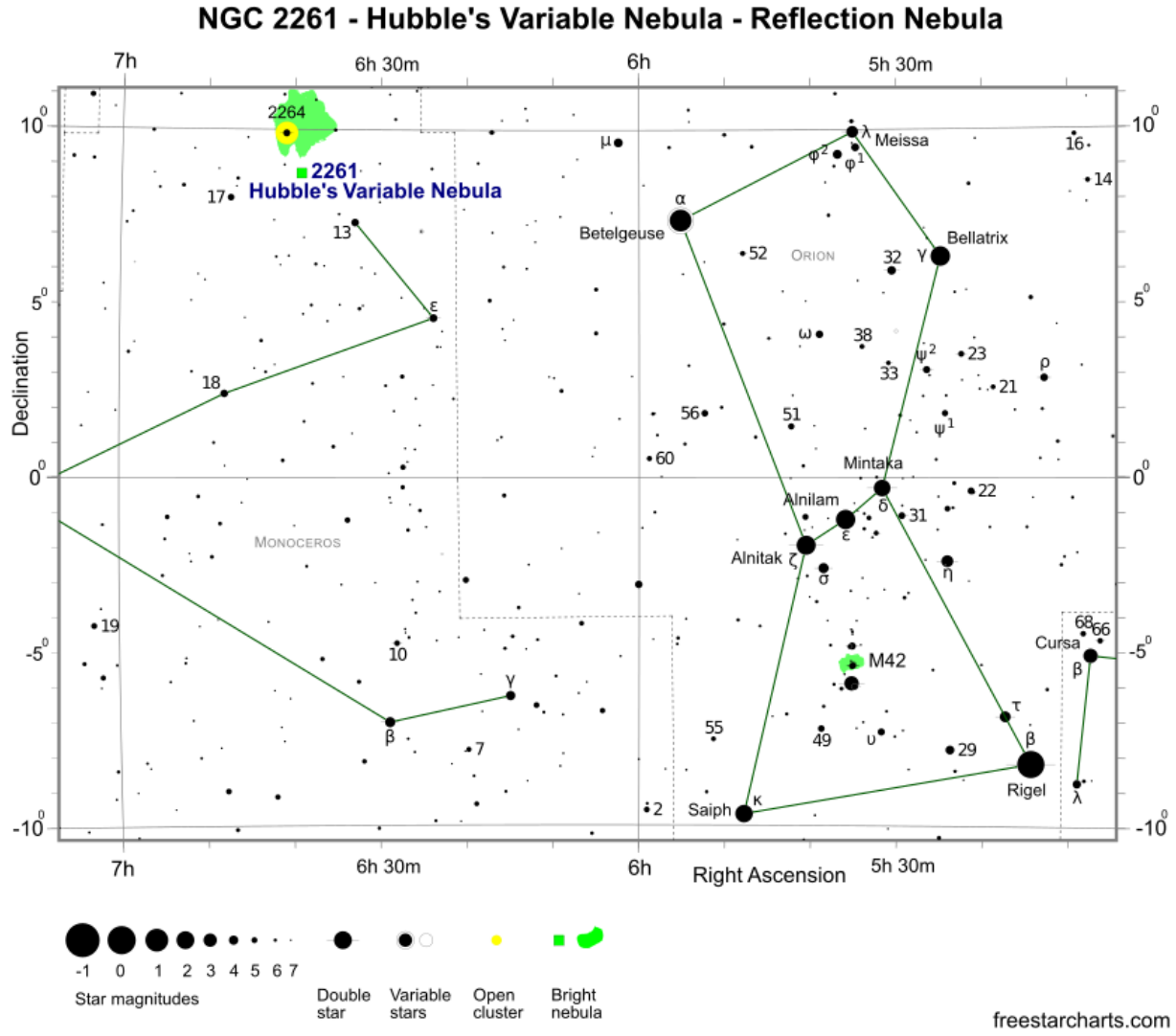
Distance: 41,000 light-years
Apparent Magnitude: 8.0
Constellation: Lepus
Object type: Globular Cluster



Caldwell 46 – Difficulty 3

This fan-shaped cloud of gas and dust shines by the light of a bright star at the bottom end of the nebula.

Distance: 2,500 light-years
Apparent Magnitude: 10.0
Constellation: Monocerotis
Object type: Reflection Nebula



What makes a good ***Description*** when you are filling in an ***Observation Log*** for an Astronomical League Observing Program? These are some suggestions and guidelines to help you. The reason for the object description requirement is to help the observer to become a more detail-oriented observer; to "observe" the object and not just "see" it, and in the end, to become a better observer. You cannot learn to "observe" from a book. It can only be mastered with eyeball to the eyepiece. The intent of requiring object descriptions is to have you pick out details to the best of your ability. These details are what make the object unique.

The description should describe what makes that object different from all the rest. This is possible with any size optical instrument. You can't say that M70 looks like M13 even though both are globular clusters. You wouldn't describe the Great Orion Nebula (M42) the same as the Crab Nebula (M1), even if they both are nebulae and appear as fuzzy clouds in the eyepiece. M31 looks nothing like M65 even though both are spiral galaxies seen at a fairly similar angle.

Things like:

Is the object *round*, *oval*, or *irregularly* shaped?

If the object is oval shaped, *how stretched out*, or oval, is it; i.e. 2 times longer than wide, 4 times longer than wide, even more? Is it basically just a little streak?

Does the galaxy or nebula have *sharp edges*, or does it *fade gradually* away to nothing? If it fades away to nothing, does *averted vision* (*not looking directly at it*) seem to increase its size?

Does the *galaxy* have a *brighter core area*, or is it an *even brightness* across the entire surface? Is the brighter core a *large area*, or does it come to a *stellar point*?

For *globular clusters*, is the central area *large and full*, or *very pointed* and stellar-like?

For *open clusters*, are all the stars the *same magnitude?* Can you guess the *number of stars*?

Does the open cluster *stand out well* against the starry background, or does it *blend in* making it difficult to determine the edges?

For *nebulae*, are there any *denser* or *lighter* areas? Are there any stars involved in the nebula?

What else is in the field of view that is *interesting*? Other deep sky objects? A nice double star? Any colorful stars? Is the field of view densely packed with stars? Did a satellite just pass? etc.

And of course, any other thoughts you have while viewing the object that might *make it personal* to this observation. After all, this is YOUR observing log.

Yes, it may at times seem like a lot of work, but after a dozen or so observations, it will become second nature to ask yourself these things. The result is that you end up training your eyes to see detail in the objects you observe. And after doing this, each object becomes unique.

Thanks to Observing Program Coordinator, Scott Kranz, for developing this instructional aid.

Here are two scales that are acceptable for all **Observing Programs.**

They are simple to use and require no special equipment.

Seeing:

How stable is the sky?

E (excellent) – The brighter stars are not twinkling at all.

VG (very good) – The stars are twinkling slightly, but the brighter planets are not twinkling.

G (good) – The brighter planets are twinkling slightly.

F (fair) – The brighter planets are obviously twinkling.

P (poor) – The atmosphere is turbulent. all objects are twinkling to the points where observation is not practical.

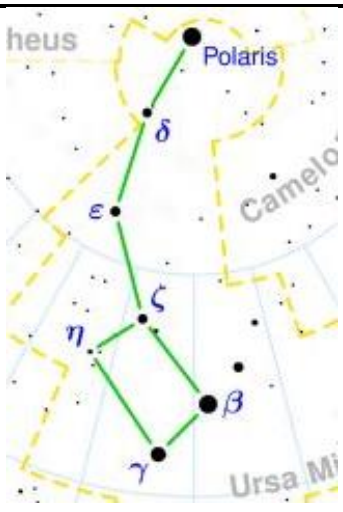
Transparency:

How clear is the sky?

Transparency is a measure of what you can see in the nighttime sky in spite of dust, smoke, haze, humidity, or light pollution. An easy way to measure this is to use the magnitude of the faintest star you can see. Ideally, this would be looking straight up at zenith.

But, in the northern hemisphere, to make life simpler, you can use the *Little Dipper (Ursa Minor*) if you can see it. Here is the scale (*based on the visible stars*):

1. No stars visible		**Magnitude 1 Sky**
2. Only Polaris is visible	α	**Magnitude 2 Sky**
3. … plus Kochab or Pherkad	β, γ	**Magnitude 3 Sky**
4. … plus any stars in the tail	δ (Yildun), ε	**Magnitude 4 Sky**
5. … plus another bowl star	ζ	**Magnitude 5 Sky**
6. All 7 stars are visible	η	**Magnitude 6 Sky**
7. More than 7 stars visible		**Magnitude 7 Sky**



Observation Journal

Observing Program: _____*NNC 2025 Hubble Space Telescope Night Sky Challenge*____

Observer's Name: _____

Location: _____

Object Name: _____

Catalog ID: _____

Host Galaxy: _____

Type of Object: _____

Magnitude: _____ **Constellation:**_____

Date: _____ **Time:** _____

Seeing: _____ **Transparency:**_____

Instrument Used: _____ **Magnification:**_____

Sketch / Drawing / Illustration:

Imaging: _____

Notes / Description / Interesting Facts: