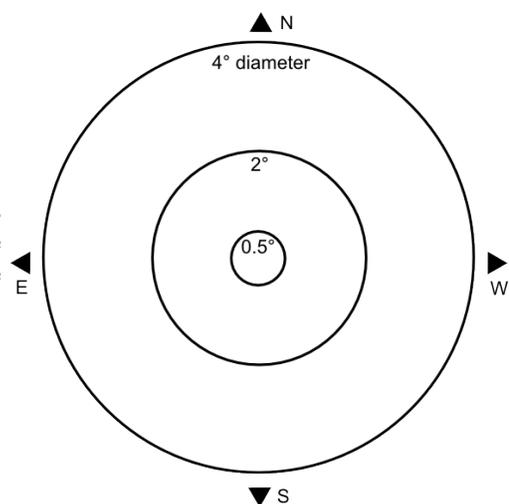


# Introduction

This booklet is meant to be an entry level guide for finding some of the brighter nebulae, galaxies, and star clusters in the northern sky. Each entry focuses on a single object, and contains the following sections

- **Finding-** What equipment is necessary for finding the object, and what conditions are necessary for finding it. Will you need a telescope? Must it be especially dark? Or can you see it with your eyes from downtown? Star maps and pictures of the object are given when it seems to me to be useful. All star maps are the work of *Sky and Telescope*.
- **Star Hopping-** For objects that are too faint to be seen with your eyes, nearby visible stars are given.
- **Viewing-** The brightness and size of the object, along with any tips for best viewing the object.
- **Description-** What kind of object is it? How far away is it? How big? How old? ...

For difficult to find objects, the Star Hopping directions include schematics of what you might see in a finder scope in the vicinity of the object. The schematics always include 3 rings for scale, with sizes illustrated at right.



The ranking of difficulty (Easy, Challenging, and VERY challenging) at the start of each set of instructions is only meant to give a very general idea of how hard an object is to find and see. Actual difficulty finding objects will, of course, depend on the weather conditions. Assuming conditions are good, the rankings mean the following:

- **Easy-** These can be seen without the telescope, or are next to bright guide stars. They are bright enough to be visible in the telescope under any clear conditions.
- **Challenging-** These are not easily visible without the telescope, and any star hopping uses faint guide stars. They may also be faint enough that they require good conditions for viewing.
- **VERY challenging-** These may have guide stars that are difficult to see in a finder scope, and may require multiple hops to find. They are also so faint that even using the telescope, they may not be visible from downtown under even the best conditions.

I hope the booklet might be helpful to adjuncts, or others who are inexperienced with finding objects in a telescope. It may also be useful to Astronomy students (second semester and later).

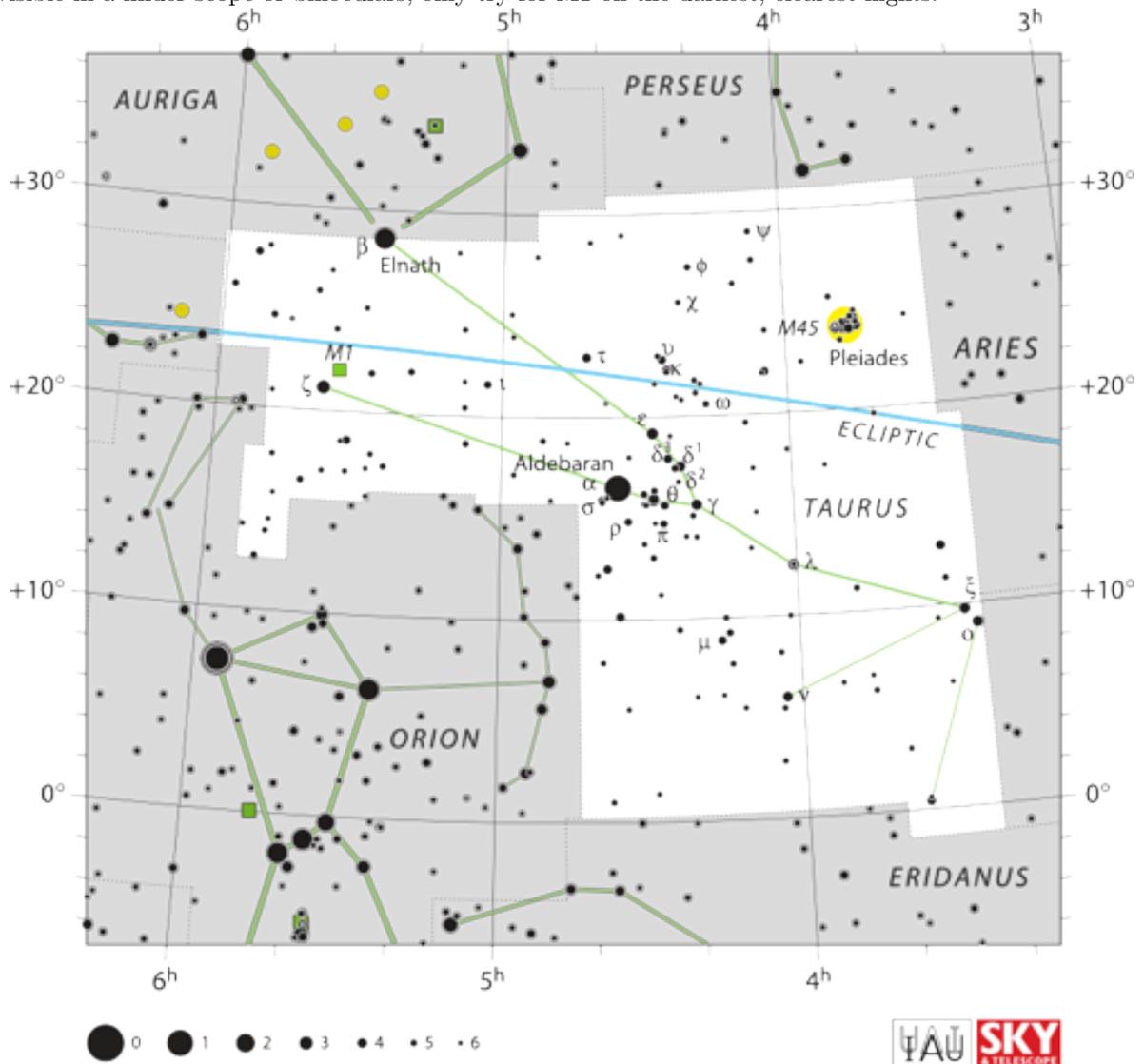
Some important notes:

- The booklet is written with downtown Charleston observing in mind. For example, "reasonably dark and clear" means "reasonably dark and clear for downtown Charleston".
- Objects requiring "darkest, clearest nights" to be seen will generally not be visible in downtown Charleston.
- In the same vein, "modestly sized telescope" refers more specifically to our 8" lab telescopes (f/10 Schmidt Cassegrain). "High magnification eyepiece" refers to our 26 mm eyepiece in the lab optics set, and "low magnification eyepiece" refers to our 40 mm eyepiece.

# M1: Crab Nebula (VERY challenging)

## Finding

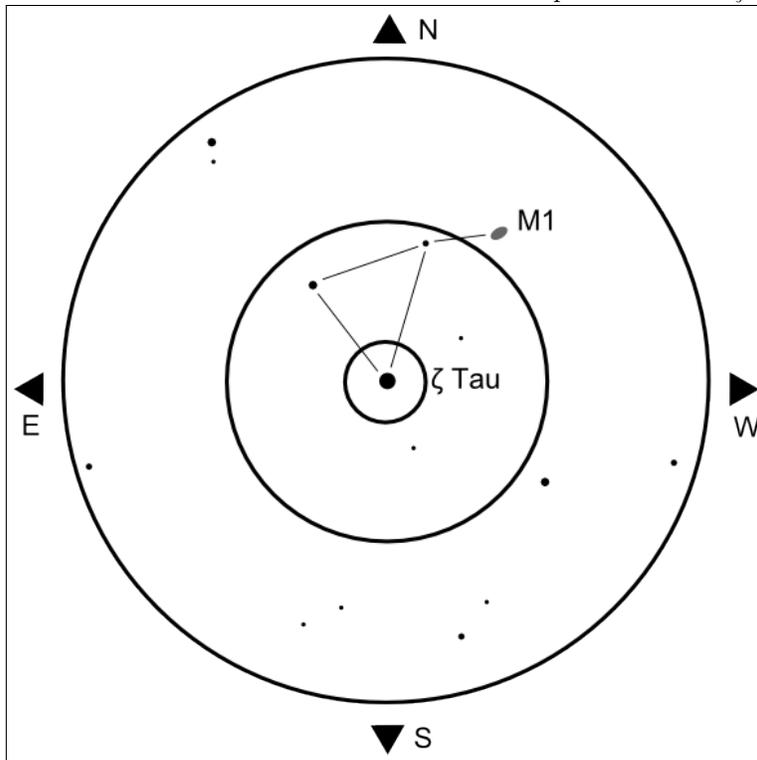
Invisible in a finder scope or binoculars, only try for M1 on the darkest, clearest nights.



## Star Hopping

- ζ Tau is the brightest star between Auriga and Orion. At magnitude +3.0, it is visible on any reasonably clear night.
- If you center ζ Tau in the finder, you will see the two next brightest stars are within 1 degree and make a nearly equilateral triangle.
- M1 is located roughly 0.5 degrees west of the more western dim star in the triangle.
- All stars within 0.5 degrees of M1 have magnitude greater than +9 (are VERY dim).

Below is a schematic of the view in a finder scope centered on  $\zeta$  Tauri.



## Viewing

- Brightness: +8.4 magnitude
- Size:  $7' \times 5'$
- Use low or high magnification eyepieces with a decently sized telescope. Or, consider using a CCD.
- Dates: M1 rises before 9 at the end of the fall semester, and during all of the spring.

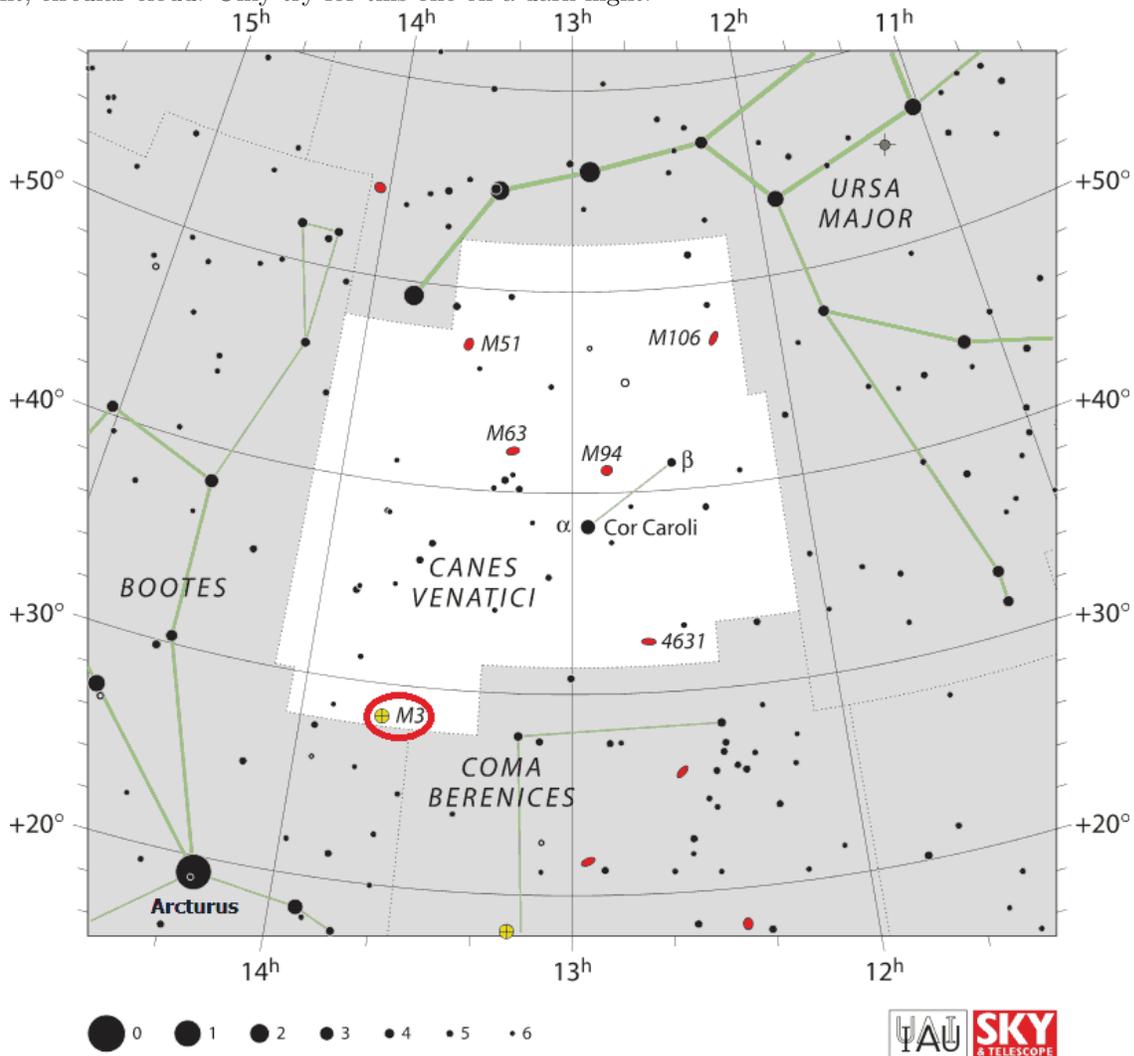
## Description

- Type: Supernova remnant (emission nebula)
- Distance: 6,500 light years
- Age: SN 1054 was first observed July 4, 1054 AD
- M1 is roughly 10,000 times as bright as the Sun, and contains a pulsar (33.5 ms).

# M3: Globular cluster in Canes Venatici - not checked

## Finding

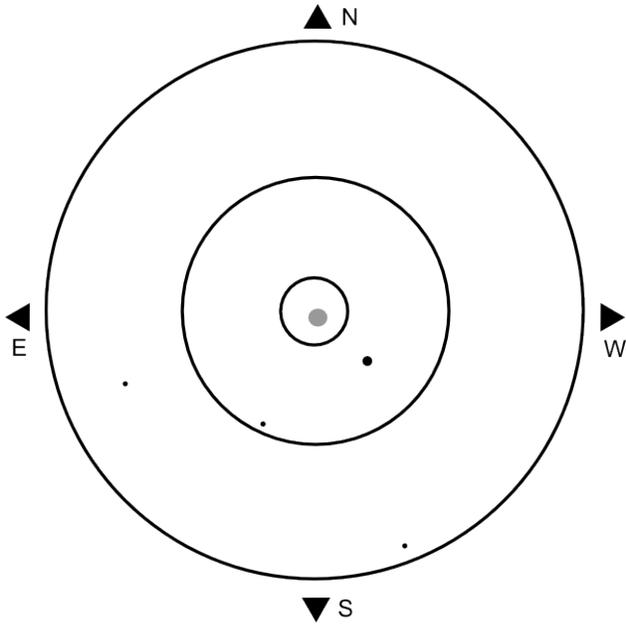
Well below the threshold of visibility, M3 can be found using binoculars, or in a small telescope, as a small, faint, circular cloud. Only try for this one on a dark night.



## Star Hopping

- M3 is halfway between Arcturus and  $\alpha$  Canes Venatici (Cor Caroli,  $m=+2.9$ )
- In your finder, center Arcturus.
- 6 degrees northward, the brightest star in the finder will be  $\delta$  Boo. Center it.
- 3 degrees north and 4 degrees west is 9 Boo ( $m=+5$ ).
- 1 degree north and 3.5 degrees west is M3.

Below is the view in a finder centered on M3. The only other stars are 6th magnitude and greater.



## Viewing

- Brightness: +6.2
- Size: 18'
- Use low or high magnification eyepieces in a modestly sized telescope.
- Dates: Late Spring (April and May, when it is highest above the horizon after sunset).

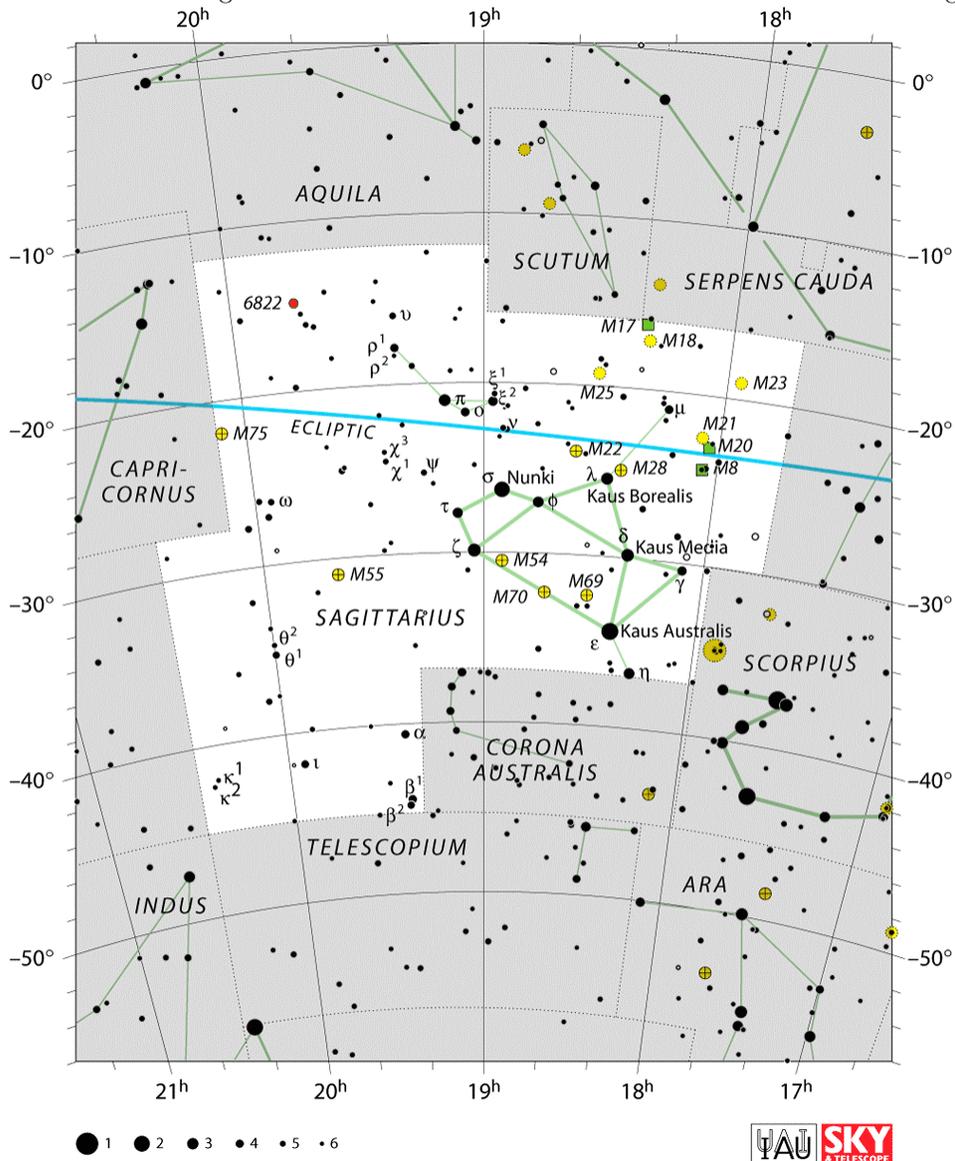
## Description

- Type: globular cluster
- Distance: 34,000 light years
- M3 contains maybe 500,000 stars, and is estimated to be 11.4 *billion* years old.

# M7: Ptolemy's cluster (Easy)

## Finding

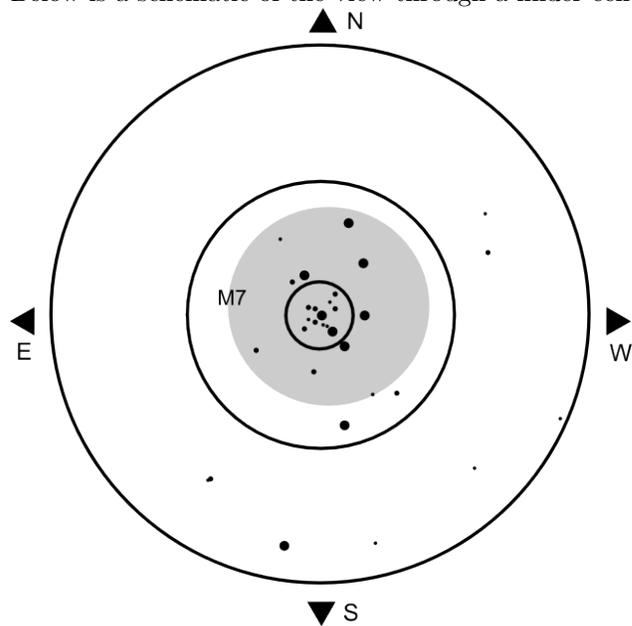
M7 is visible on dark nights with no aid. A finder or binoculars will resolve several bright stars.



## Star Hopping

- Find the star Kaus Australis in Sagittarius.
- M7 is 5 degrees (30m) west of Kaus Australis.
- Alternatively, M7 is halfway between Kaus Australis and the tip of Scorpius's tail.

Below is a schematic of the view through a finder centered on M7. Note the V shape of brighter stars.



## Viewing

- Brightness: +5.7
- Size: 80'
- Use the finder or binoculars.
- Dates: M7 is easiest to find in the Summer and early Fall.

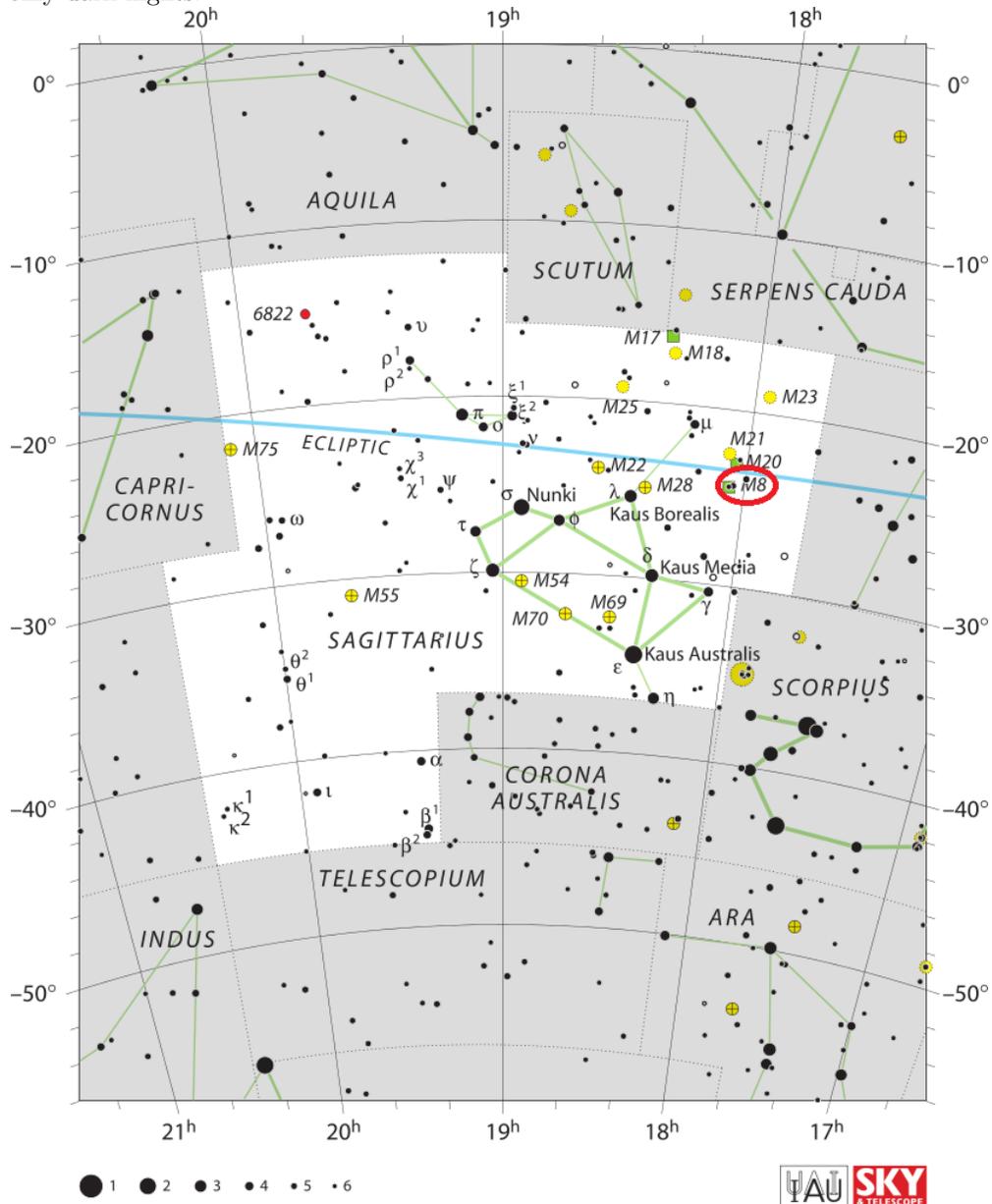
## Description

- Type: open star cluster
- Distance: 1,000 light years
- M7 is a relatively nearby cluster.

# M8: Lagoon Nebula + M20: Triffid Nebula (Challenging)

## Finding

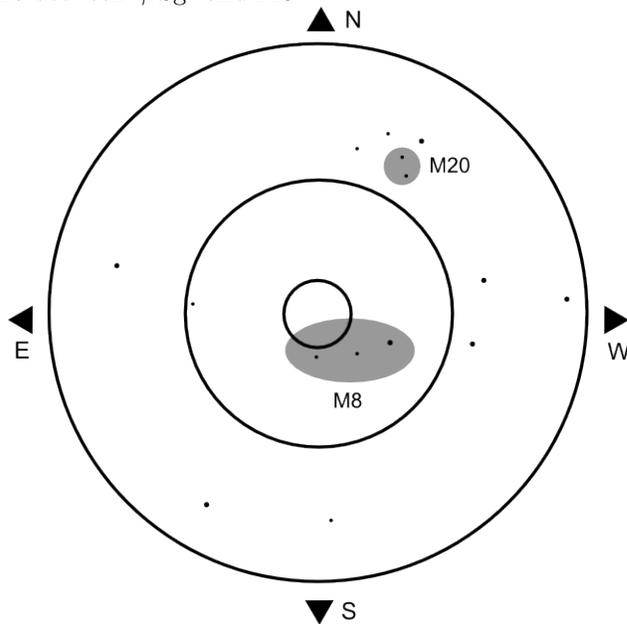
M8 is not easy to spot in the finder or binoculars. The nebula is visible as a small, faint, oval shaped cloud on only dark nights.



## Star Hopping

- Find the star  $\gamma$  Sgr.
- M8 is located 6 degrees northwards

Below is a schematic of the view in a finderscope containing M8 and M20 and several 4th, 5th, and 6th magnitude stars. There are three 4th and 5th magnitude stars within 3 degrees of  $\gamma$  Sgr, but no other bright stars between  $\gamma$  Sgr and M8.



## Viewing

- Brightness: +6.0
- Size: 90' X 40'
- Use the low magnification eyepiece in a modestly sized telescope.
- Dates: M8 is easiest to see in the early Fall.

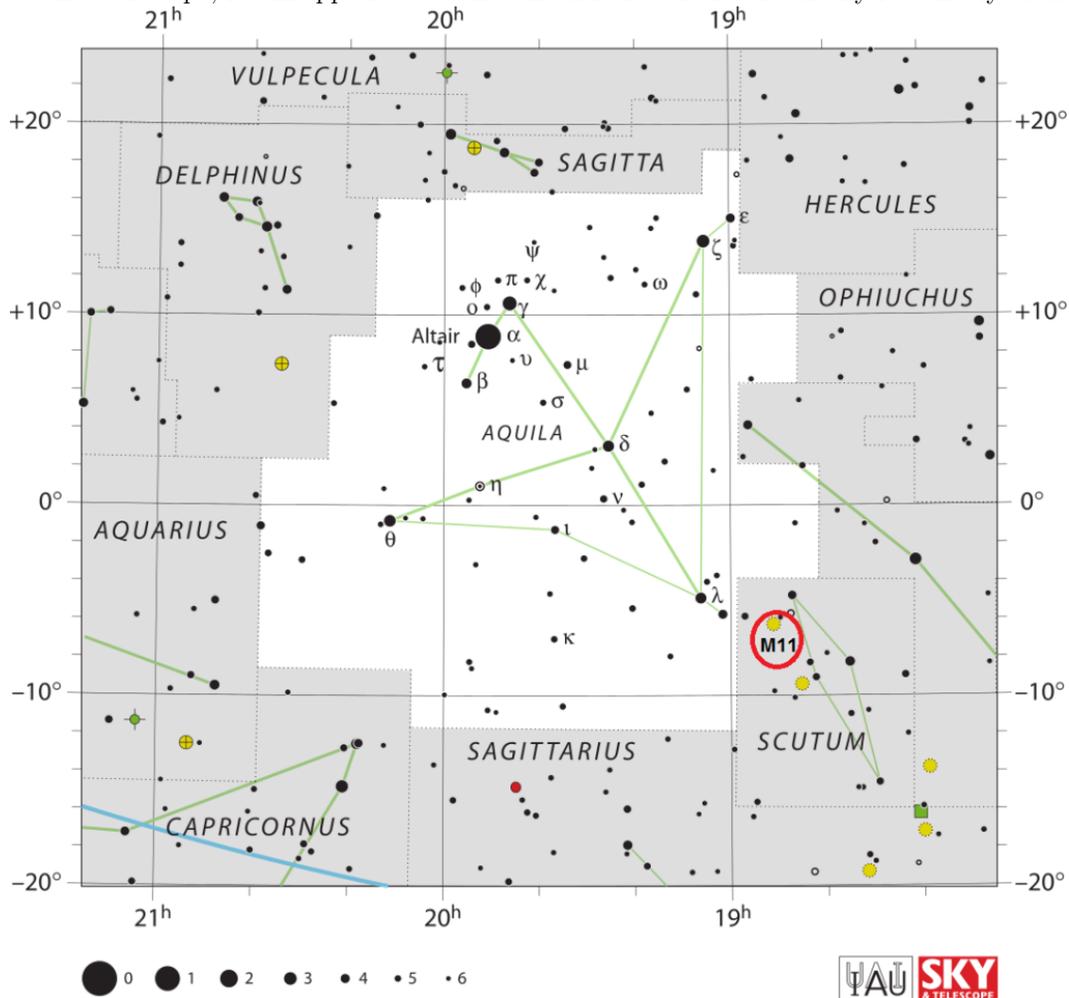
## Description

- Type: Emission nebula
- Distance: 4,000 light years
- The bright stars within the nebula are newly formed from nebula material.

# M11: Wild Duck cluster (Challenging)

## Finding

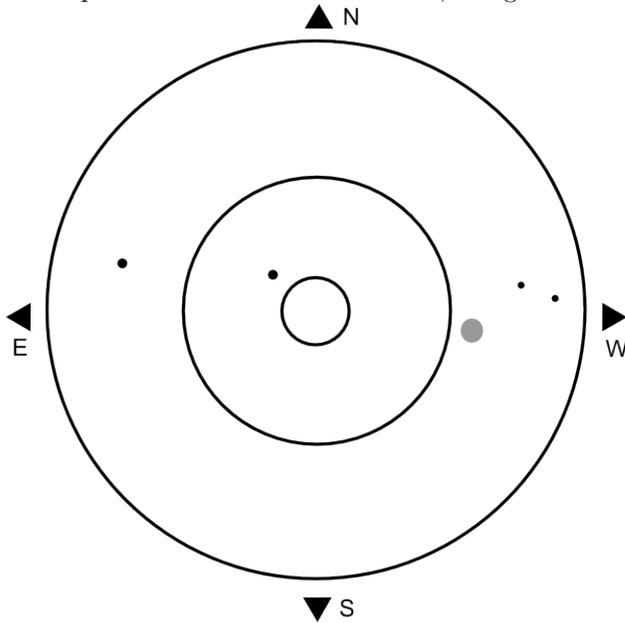
M11 will only appear in a finder scope on especially clear nights, where it will look like a faint, small circular cloud. In a telescope, it will appear as a dense circular cluster of stars on any reasonably clear night.



## Star Hopping

- Find Altair in Aquila.
- Looking through your finder, you should be able to follow southwest from Altair, to λ Aql ( $m=+3.4$ ).
- A 4th magnitude stars and a 5th magnitude star trace a line westward from λ Aql to M11.

In the finder view below, M11 is shown to the right of center. The 4th and 5th magnitude stars leading from  $\lambda$  Aql to M11 are shown on the left, along with two stars to the west with magnitude  $m=+6$ .



## Viewing

- Brightness: +6.3
- Size: 14'
- Use low or high magnification eyepieces in a modestly sized telescope.
- Dates: M11 is easiest to find in the late Summer and early Fall.

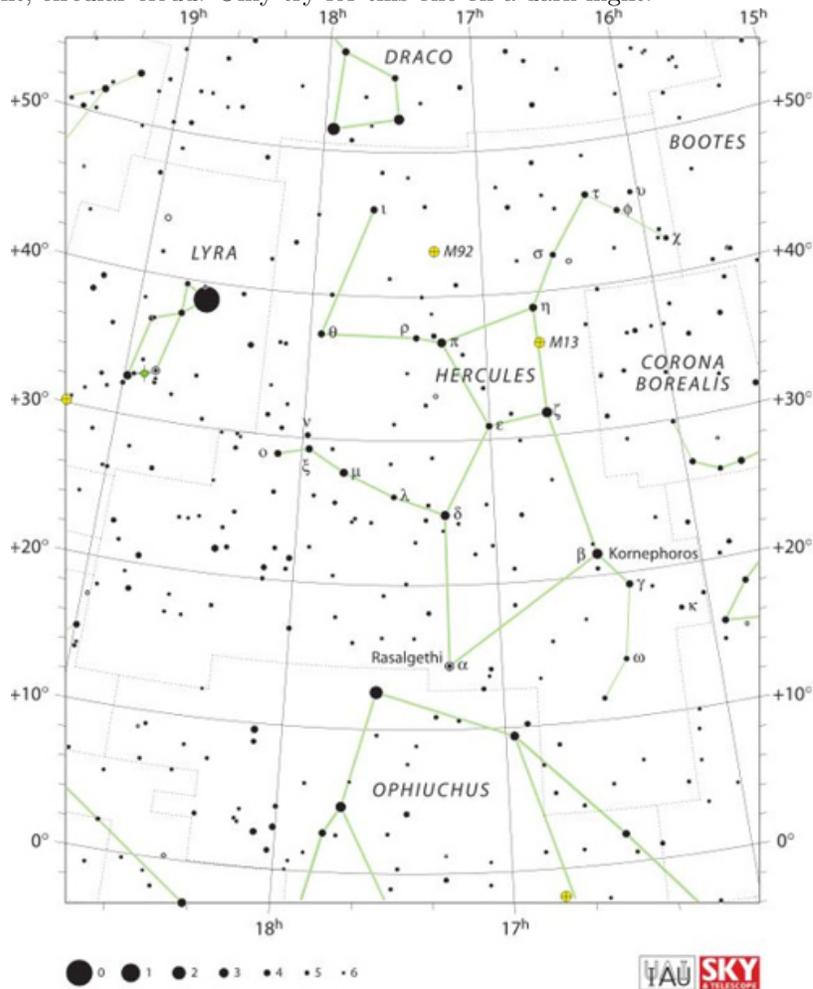
## Description

- Type: Open cluster
- Distance: 6,200 light years
- M11 contains roughly 3,000 stars, and is estimated to be 200 million years old.

# M13: Globular cluster in Hercules (Challenging)

## Finding

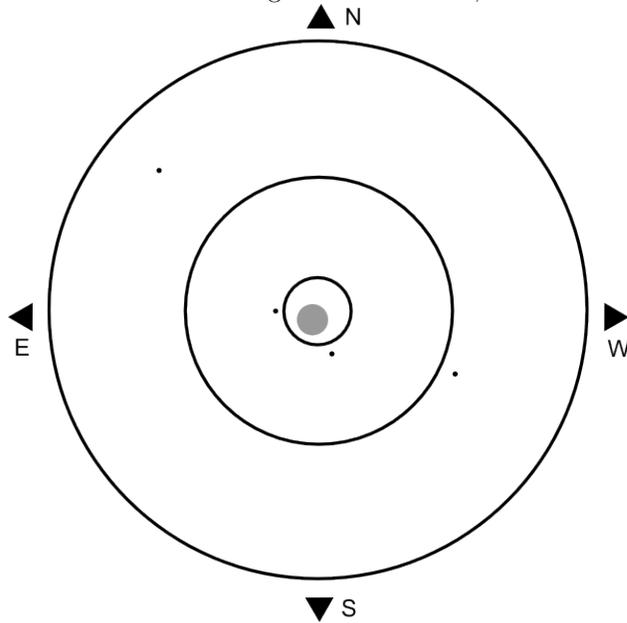
Well below the threshold of visibility, M13 can be found using binoculars, or in a small telescope, as a small, faint, circular cloud. Only try for this one on a dark night.



## Star Hopping

- Find Vega (in Lyra). Move westward 2 hours of RA to find  $\eta$  Hercules.
- Looking through your finder, move downward in declination about 2.5 degrees.

Below is a depiction of M13 as viewed through a finderscope. NOTE: there are two seventh magnitude stars in within a half a degree of each other, and M13 is roughly halfway between them.



## Viewing

- Brightness: +5.8
- Size: 20'
- Use low or high magnification eyepieces in a modestly sized telescope.
- Dates: M13 is easiest to find in the early Fall - when it is furthest from N. Charleston lights.

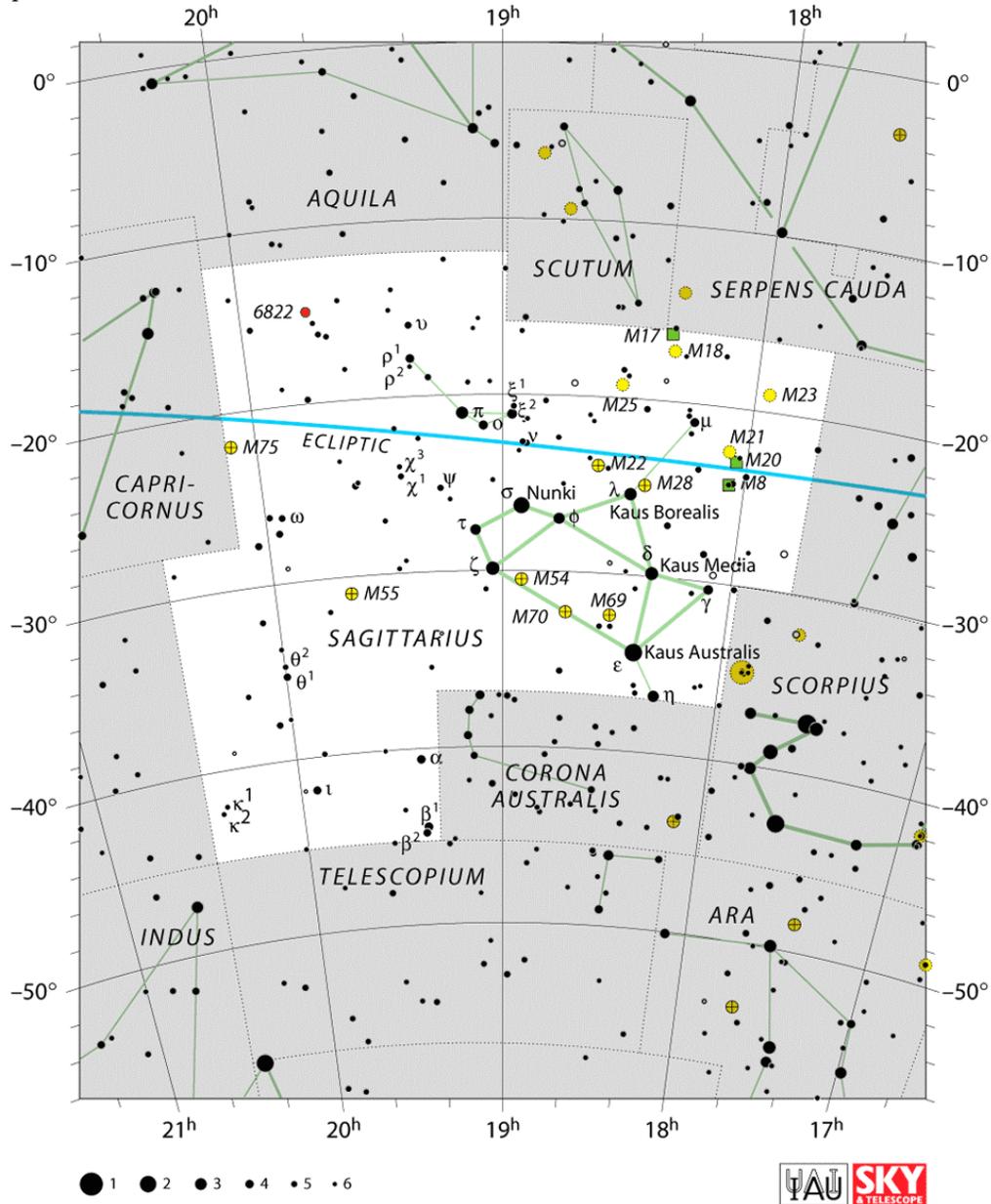
## Description

- Type: globular cluster
- Distance: 22,000 light years
- M13 contains roughly 300,000 stars, and is estimated to be 11.7 *billion* years old.

# M17: Swan Nebula (VERY Challenging)

## Finding

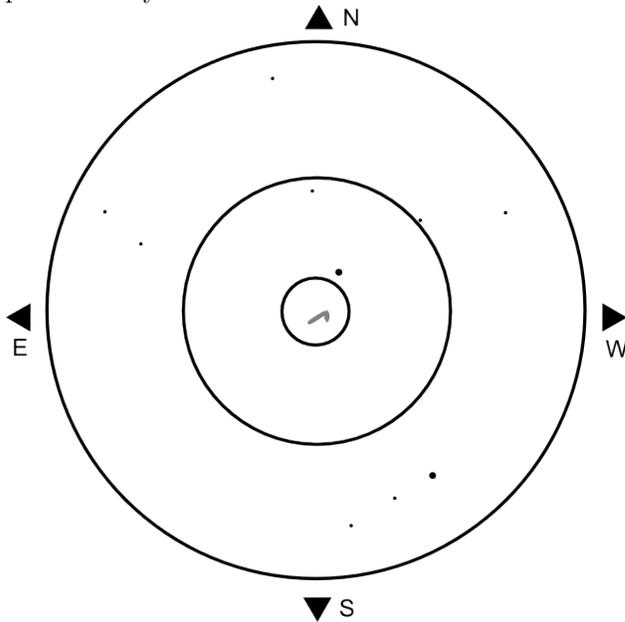
M17 is just visible in a finder as a faint cloud. A moderately sized telescope on a dark night can reveal its V shape.



## Star Hopping

- Find the constellation Sagittarius.
- Find the star  $\epsilon$  Sagittarius (Kaus Media) at -30 degrees declination.
- M17 is 14 degrees to the north (-16 degrees declination).

Below is a schematic of the view in a finderscope when centered on M17. There are two 5th magnitude stars, and several 6th magnitude stars. If you continue north past the nebula, the number of faint stars drops noticeably.



## Viewing

- Brightness: +6.0
- Size: 11'
- Use low or high magnification eyepieces in a modestly sized telescope.
- Dates: M17 is easiest to find in the early Fall.

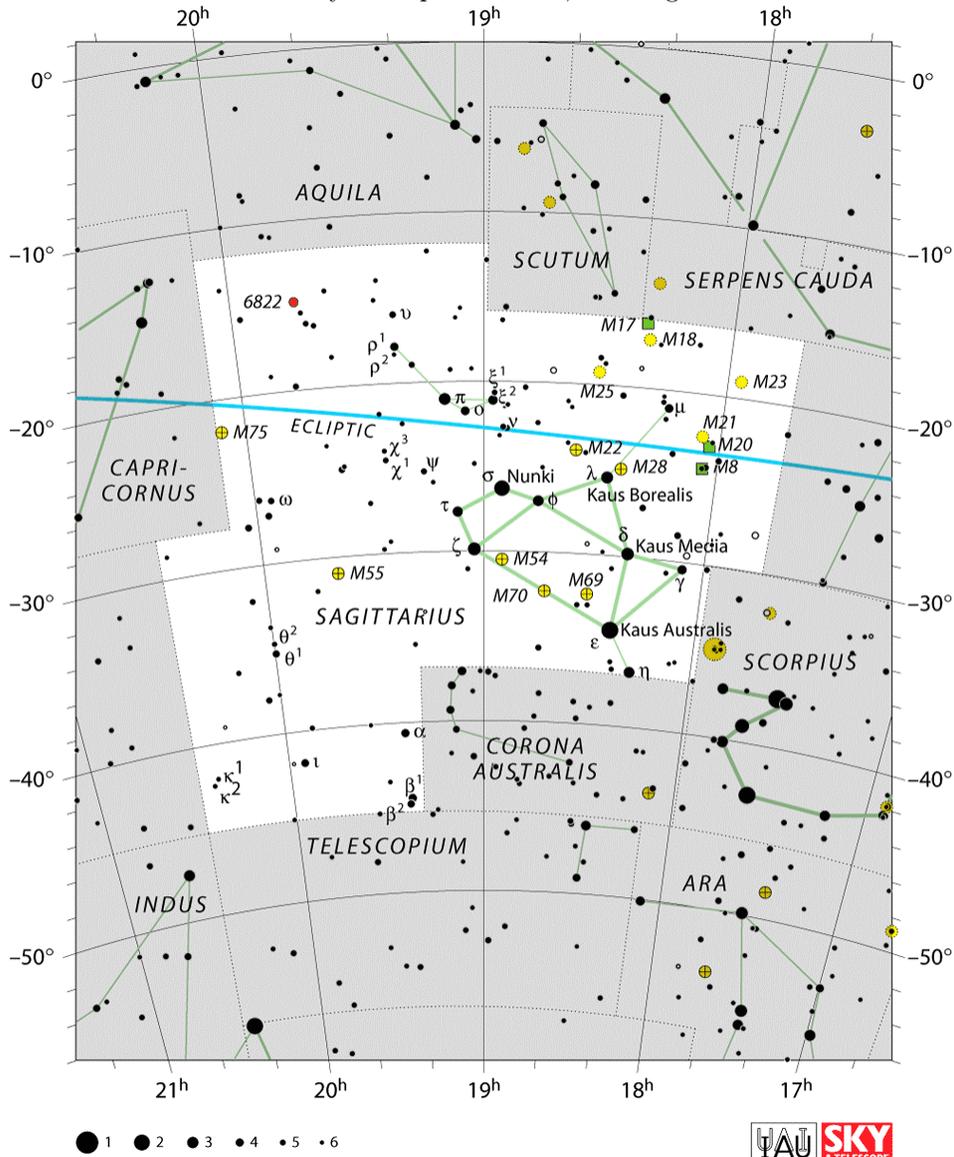
## Description

- Type: star cluster + emission nebula
- Distance: 6,000 light years
- M17 is a star forming region in our galaxy.

# M22: Sagittarius globular cluster (Challenging)

## Finding

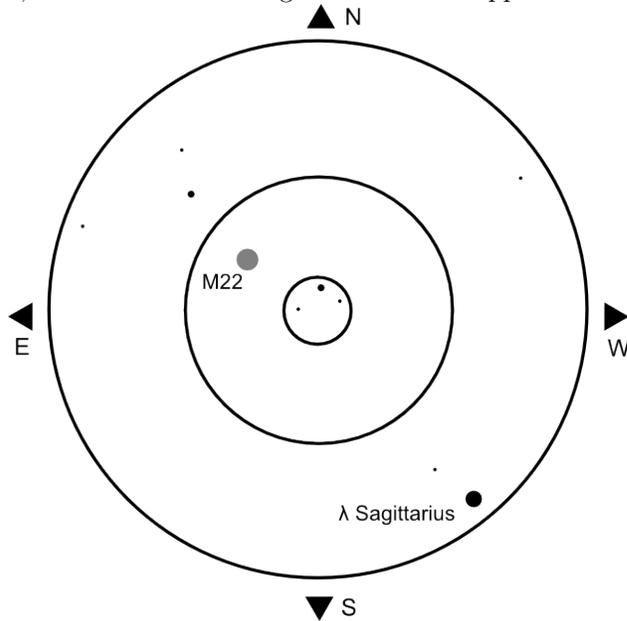
M22 is just visible in a finder as a small faint circular cloud. A moderately sized telescope on a dark night can resolve some of its stars. Only attempt on a dark, clear night.



## Star Hopping

- Find the constellation Sagittarius.
- Find the star  $\lambda$  Sagittarius (Kaus Borealis).
- M22 is 2.5 degrees to the northeast of  $\lambda$  Sgr.
- Note: There is a 5th magnitude star between  $\lambda$  Sgr and M22, roughly 0.5 degrees from M22.

Below is a schematic of the view in a finderscope containing M22 and  $\lambda$  Sgr. Note  $\lambda$  Sgr to the southwest. Also, there are two 5th magnitude stars on opposite sides of M22.



## Viewing

- Brightness: +5.1
- Size: 30'
- Use low or high magnification eyepieces in a modestly sized telescope.
- Dates: M22 is easiest to find in the early Fall.

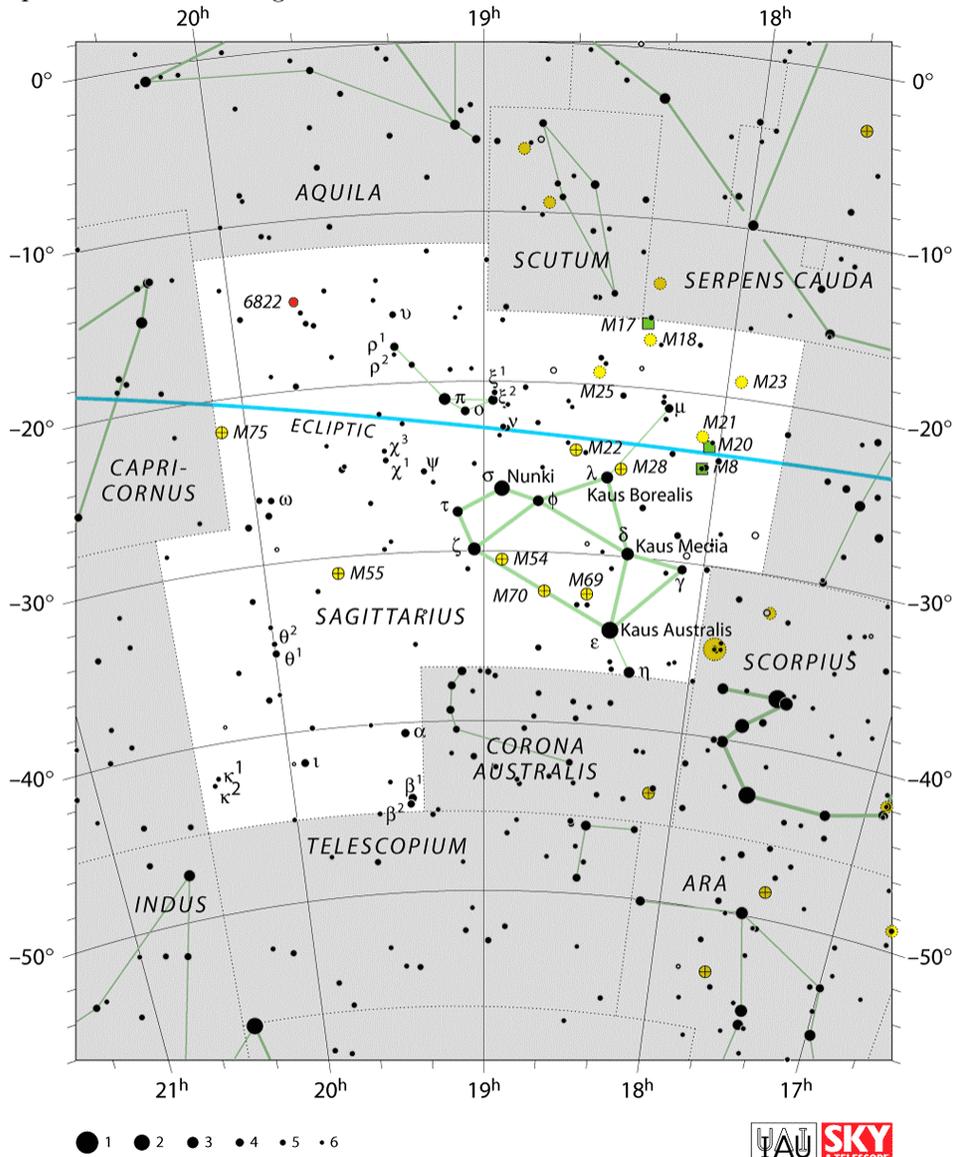
## Description

- Type: globular cluster
- Distance: 10,000 light years
- Age: 12 billion years
- M22 is one of the nearest, brightest globulars.

# M25: Open cluster in Sagittarius (Challenging)

## Finding

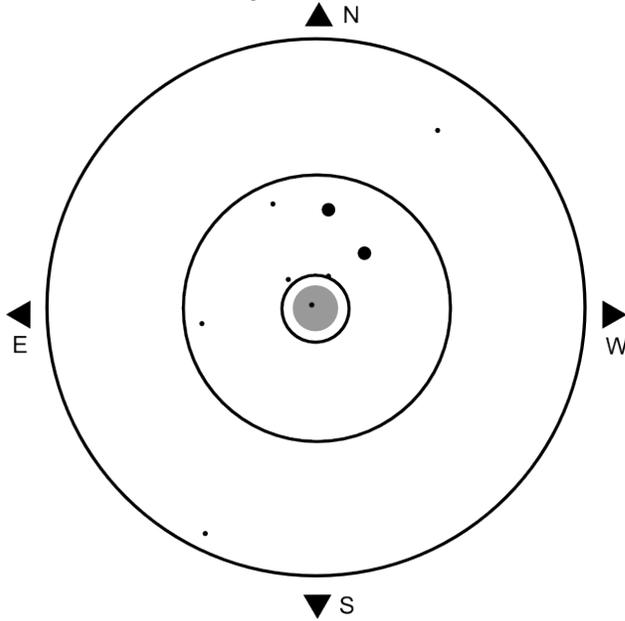
M25 is easily visible in the finder on any reasonably clear night, where it appears as a small, fuzzy patch. A telescope will resolve the brightest stars.



## Star Hopping

- Find the constellation Sagittarius.
- Find the star λ Sagittarius (Kaus Borealis).
- M25 is 6.5 degrees to the north (and slightly east) of λ Sgr.

Below is a schematic of the view in a finderscope containing M25 and  $\lambda$  Sgr. Note, M25 is one degree to the south of two 5th magnitude stars.



## Viewing

- Brightness: +4.6
- Size: 30'
- Use the low or high magnification eyepieces in a modestly sized telescope.
- Dates: M25 is easiest to find in the early Fall.

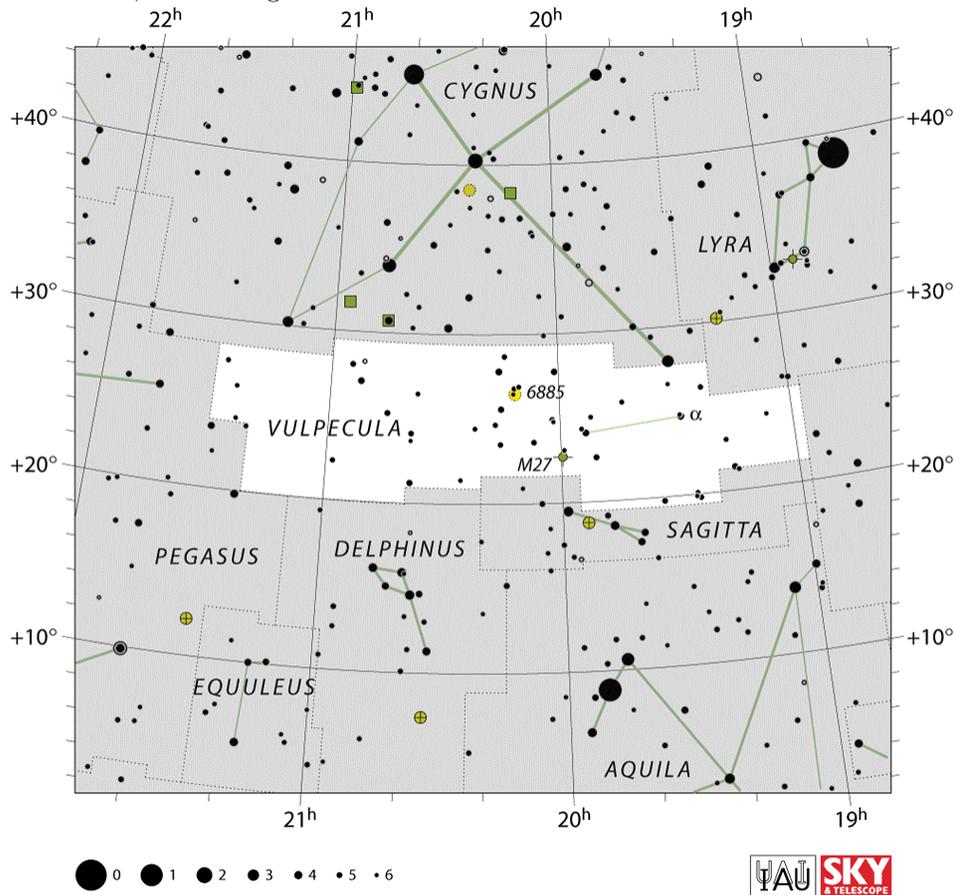
## Description

- Type: open star cluster
- Distance: 2,000 light years
- Age: 100 million years

# M27: Dumbbell Nebula (VERY Challenging)

## Finding

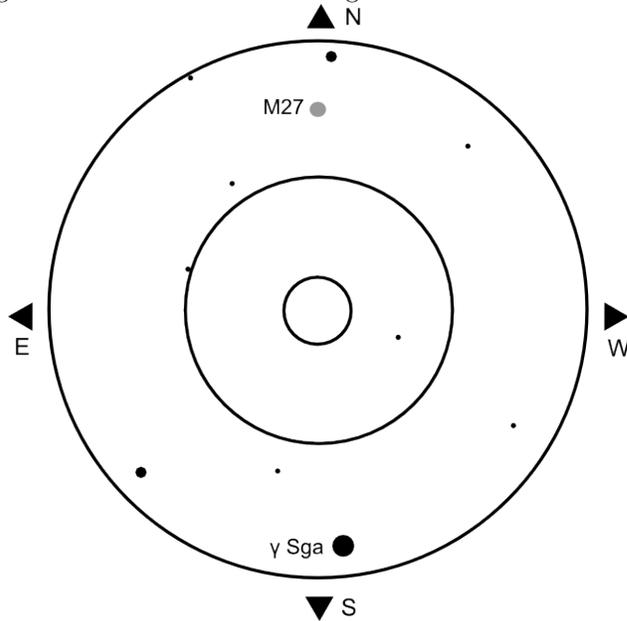
M27 is not easy to spot in the finder or binoculars. The nebula is visible as a small, faint, circular cloud on only the darkest, clearest nights.



## Star Hopping

- Find the star Altair in the constellation Aquila.
- The constellation Sagitta is 10 degrees north of Altair, and may require your finderscope to see.
- $\gamma$  Sagitta is the eastern most bright star (close to RA 20h).
- M27 is 3 degrees north of  $\gamma$  Sagitta.

Below is a schematic of the view in a finderscope containing M27 and  $\gamma$  Sagitta (Sga). Note, M27 is 0.5 degrees to the south of a 5th magnitude star.



## Viewing

- Brightness: +7.5
- Size: 8' X 5.6'
- Use the high magnification eyepiece in a modestly sized telescope.
- Dates: M27 is easiest to find throughout the Fall.

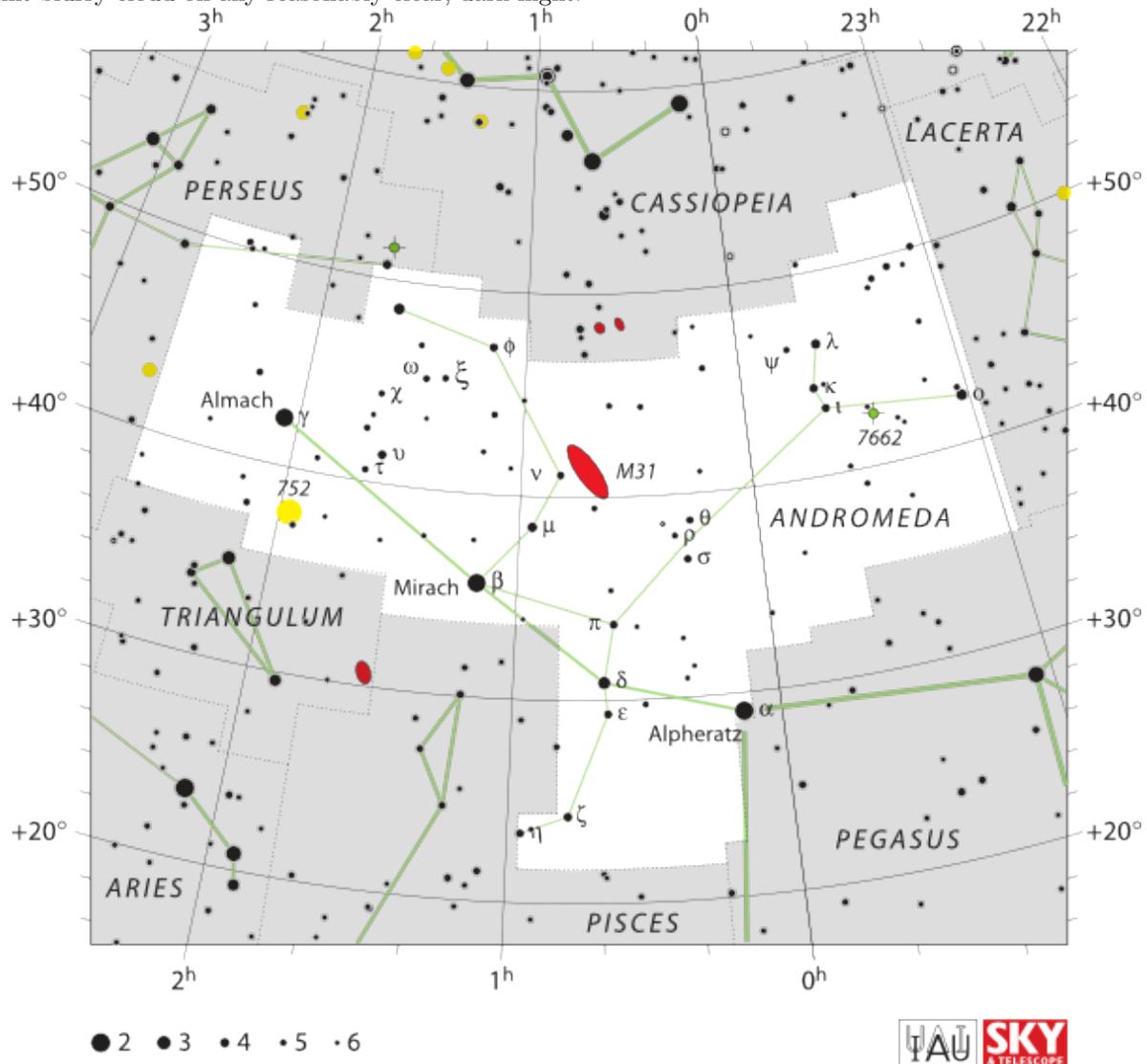
## Description

- Type: planetary nebula
- Distance: 1,400 light years
- The nebula is only roughly 5,000 years old.

# M31: Great Andromeda Galaxy (Challenging)

## Finding

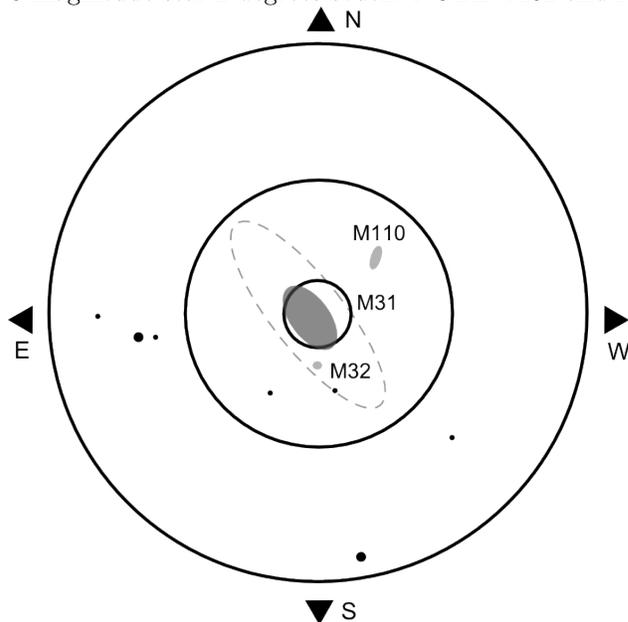
Andromeda sits at the threshold of visibility without aid. Using a finder scope or binoculars, it is visible as a faint blurry cloud on any reasonably clear, dark night.



## Star Hopping

- Find Pegasus and Cassiopeia. Locate  $\beta$  Andromeda between them, using your finder.
- Looking through your finder, move North West.
- You will encounter  $\mu$  Andromeda after 4 degrees, and M31 after about 4 more.

In the finder schematic below, the dashed oval represents the boundary of M31, while the filled oval within represents the brighter, visible portion. There is a +4.5 magnitude star 1.5 degrees to the east, and +5.3 magnitude star 2 degrees south. NOTE: M32 and M110 are both within 1 degree of M31.



## Viewing

- Brightness: +3.4
- Size: 1 degree X 3 degrees - you will only be able to see the very center, as the rest is too faint.
- Use the finder, binoculars, or low magnification. On a dark night, you will be able to see that it is not circular, but little more than that in a small telescope.
- Dates: M31 is up all of the fall, and early Spring.

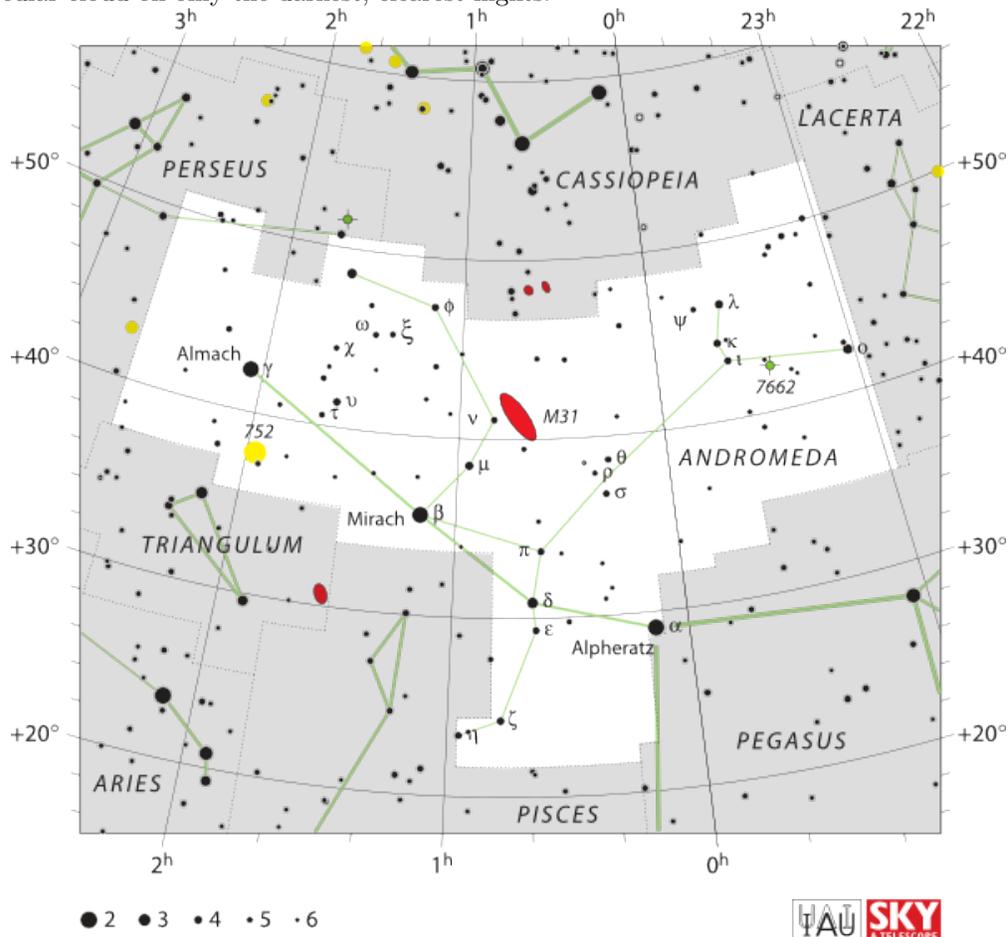
## Description

- Type: spiral galaxy
- Distance: 2.5 million light years - the most distant object visible without aid.
- Similar in size and shape to the Milky Way (100,000 ly across), with roughly 1 trillion stars.

# M33: Triangulum galaxy (VERY Challenging)

## Finding

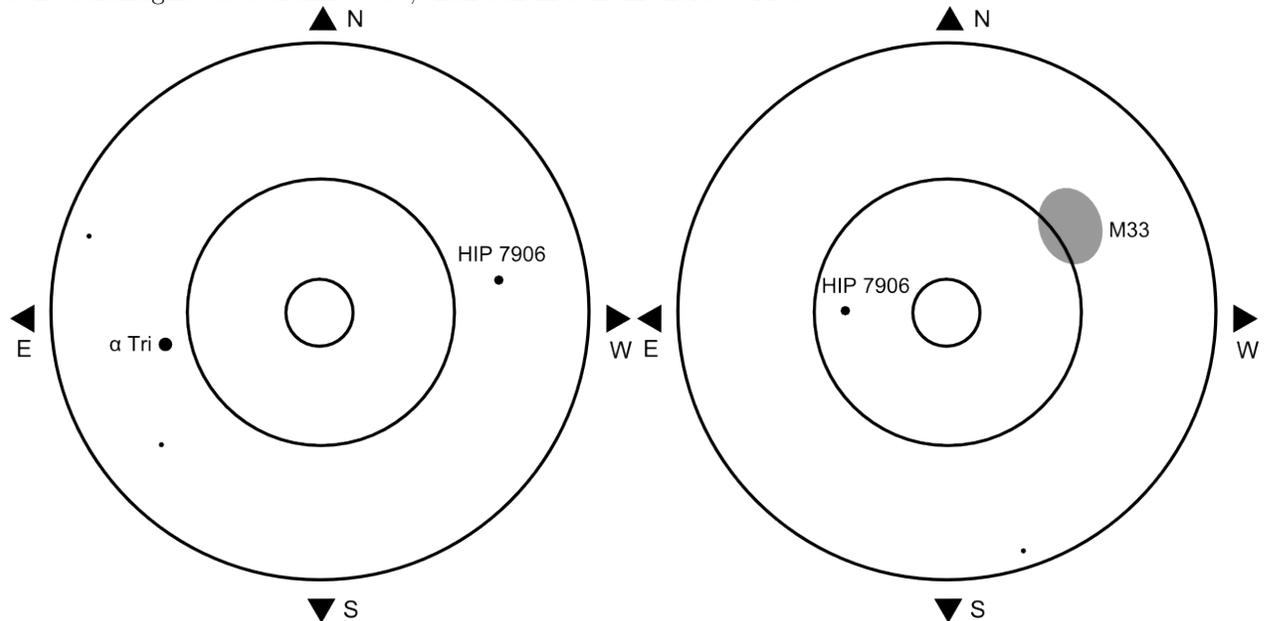
M33 is not easy to spot in the finder or binoculars. The galaxy is visible through a telescope as a faint, circular cloud on only the darkest, clearest nights.



## Star Hopping

- Find the star  $\beta$  Andromeda.
- The star  $\alpha$  Triangulum (the southernmost bright star) is 10 degrees southeast of  $\beta$  Andromeda.
- Searching west from  $\alpha$  Tri, you will encounter a 5th magnitude star after 3 degrees (12m RA).
- Continue another 2 degrees (8m RA) to reach M33.

Below are two schematics showing how to star hop from  $\alpha$  Triangulum to M33. Use  $\alpha$  Triangulum to find the 5th magnitude star HIP 7906, then continue from there to M33.



## Viewing

- Brightness: +5.7
- Size: 70' X 42'
- Use the low magnification eyepiece in a modestly sized telescope.
- Dates: M33 is easiest to find in late Fall.

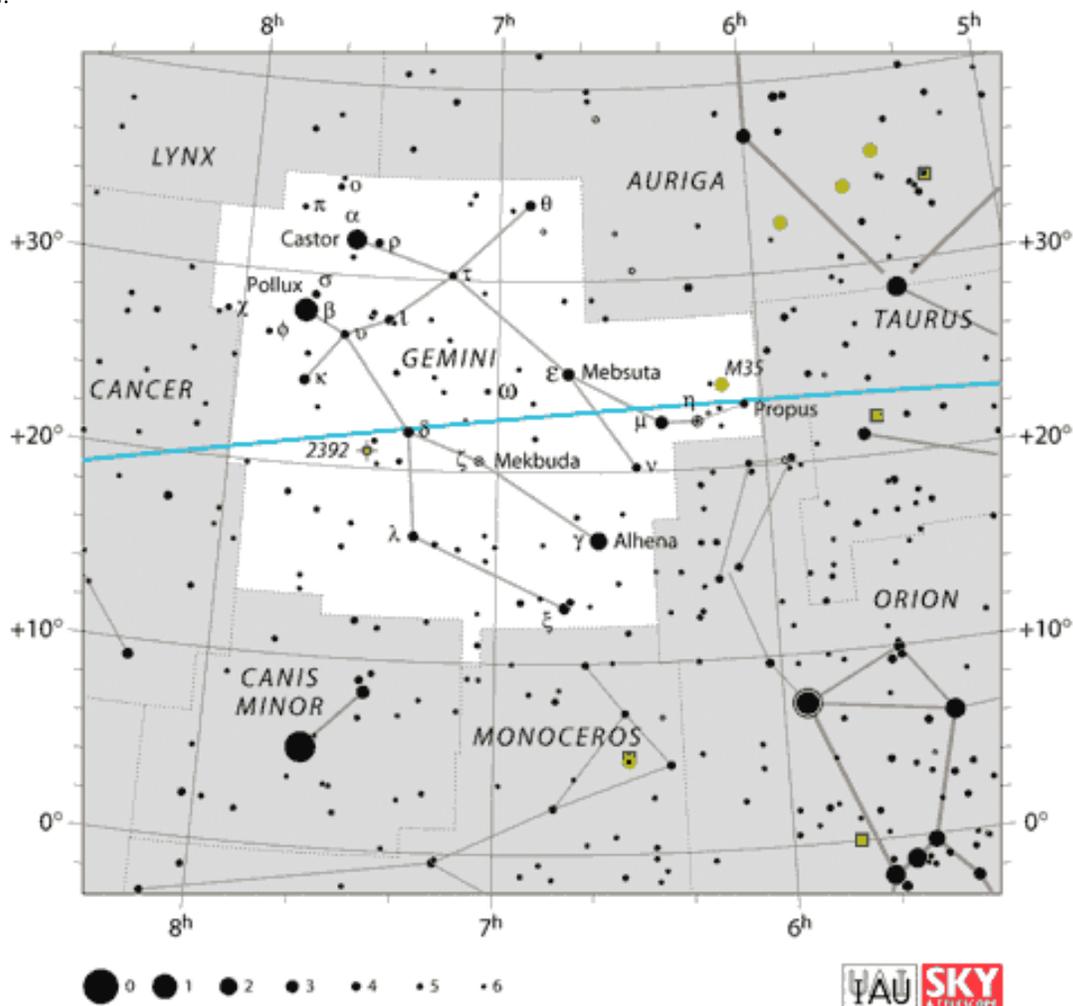
## Description

- Type: spiral galaxy
- Distance: 3 million light years
- The galaxy is the third largest in our local group (after Milky Way and Andromeda), and will probably collide with our galaxy in the distant future.

# M35 - Open cluster in Gemini (Challenging)

## Finding

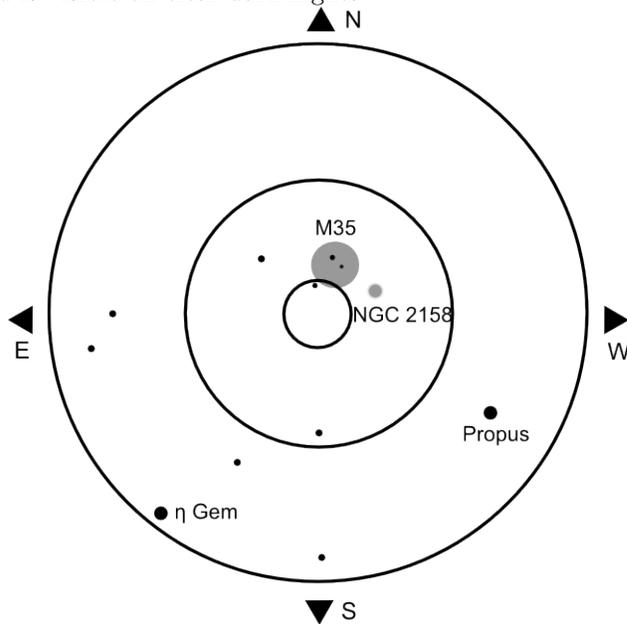
In binoculars or a finder scope, it will show as a dense cloud of faint stars on only the clearest nights. With the low magnification view through a telescope, it will resolve into many faint stars on any reasonably clear night.



## Star Hopping

- $\epsilon$ ,  $\mu$  Gemini, and  $\eta$  Gemini and Propus can be easily seen in a finder scope.
- There are 4 6th magnitude stars near  $\eta$  Gem and Propus, two between, one to the north, and one to the south.
- M35 is very close to the 6th magnitude star to the north of  $\eta$  Gem and Propus.

In the finder view below, notice the four 6th magnitude stars between  $\eta$  Gem and Propus, and the proximity of M35 to the northernmost of the four. Also, NGC 2158 is 0.5 degrees to the southwest of M35, and is visible on clear dark nights.



## Viewing

- Brightness: +5.3
- Size: 28"
- Use the finder and low magnification eyepiece for viewing.
- Dates: Late Fall and Spring.

## Description

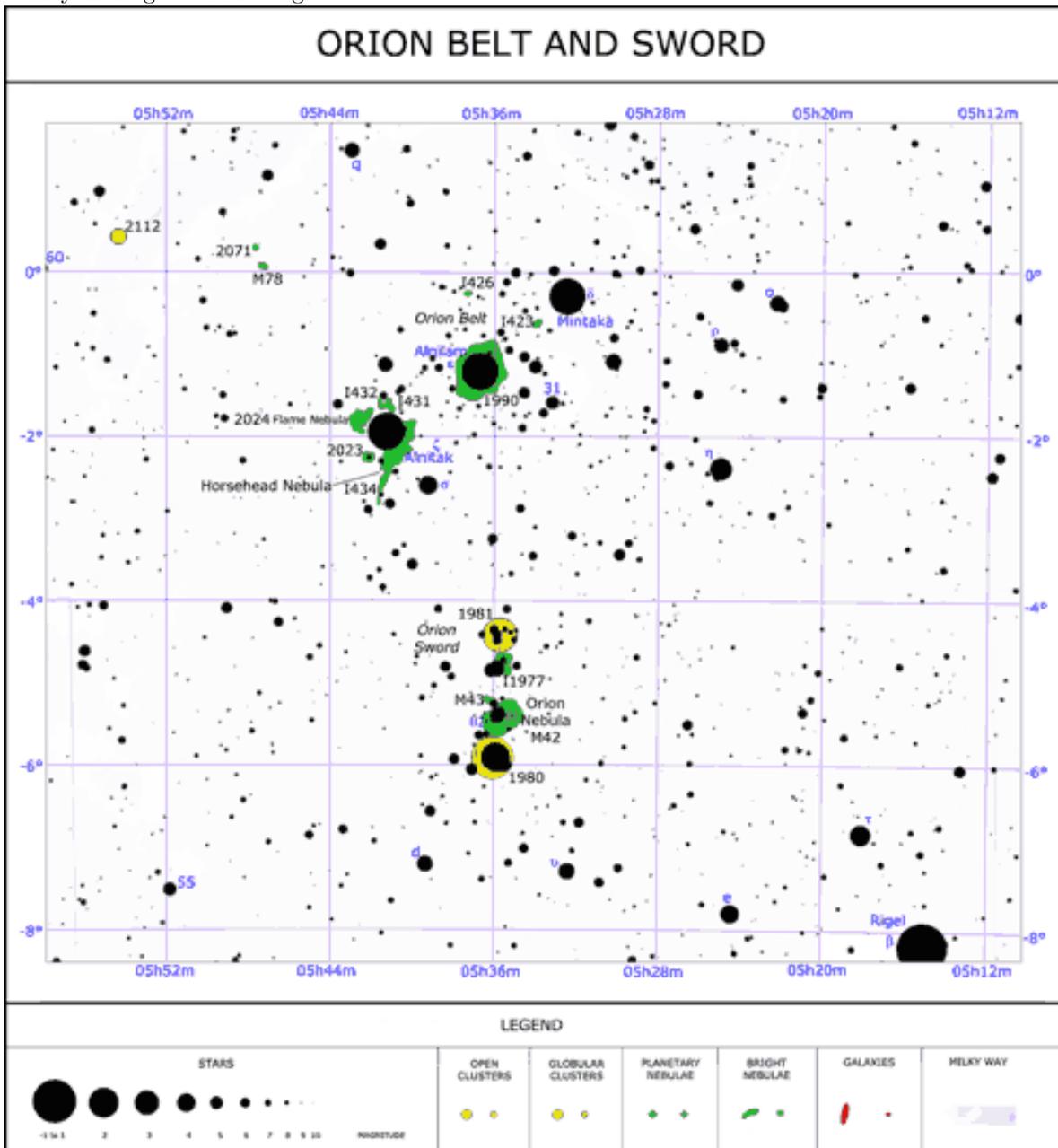
- Type: open clusters
- Distance: 2,800 light years
- There is a more compact and visible cluster (NGC 2158) immediately to the south west.

# M42: Orion nebulae (Easy)+ M43, NGC 1977, NGC 2024, and IC 434 (VERY Challenging)

## Finding

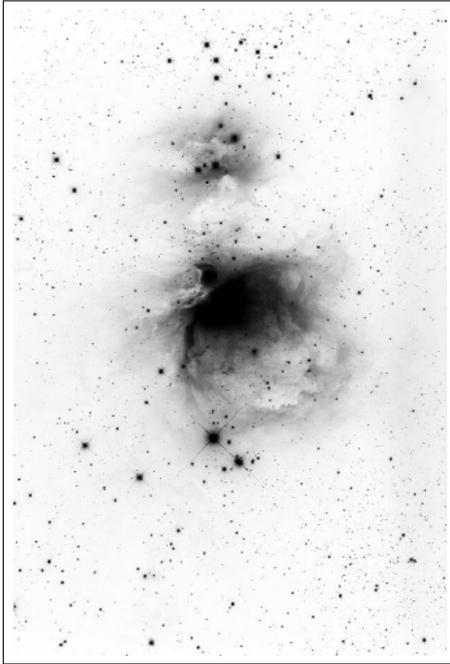
M42 is a bright target, easily visible without telescope or binoculars on any reasonably clear observing night. It is the middle star in the "sword" of Orion. A finderscope will resolve it into several stars and can reveal some nebulosity. The telescope will show the nebulosity on any reasonably clear night.

Other targets are included. NGC 1977 (running man) is visible on only the darkest nights. M43, NGC 2024 (flame nebula), and IC 434 (horsehead) are less likely to be visible from downtown Charleston. All of these may make good CCD targets.

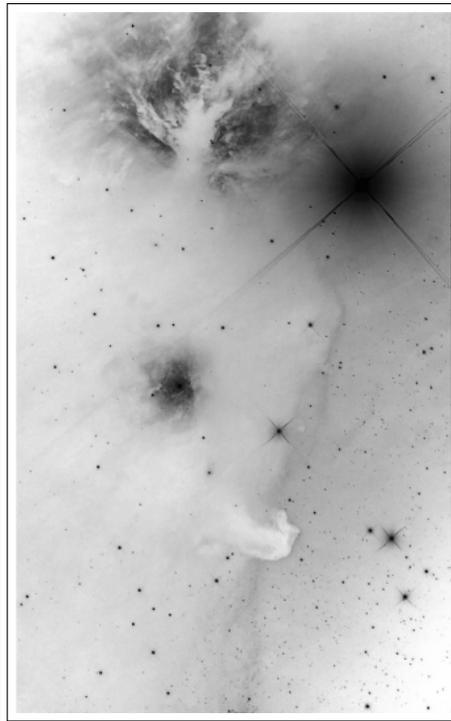


Credit: Roberto Mura

The image on the left is roughly 3 degrees from top to bottom, and shows M42 (the brightest nebula in the center), M43 (the dark nebula above and left of M42), and NGC 1977 (the bright nebula above M42). The image on the right is roughly 1.5 degrees from top to bottom, and shows NGC 2024 (top left), the bright star Alnitak (easternmost star of Orion's belt at top right), and IC 434 (the bright channel running top to bottom through the center).



Credit: F. Espenak



Credit: Walter Koprolin

## Viewing

- Brightness: M42 = +4, NGC 2024 = +2, NGC 1977 = +7, M43 = +9, IC 434 = +7.
- Size: All nebula are on the order of a degree across in their entirety.
- Best views are with low or high powered eyepieces.
- Dates: Orion is up all Spring semester.

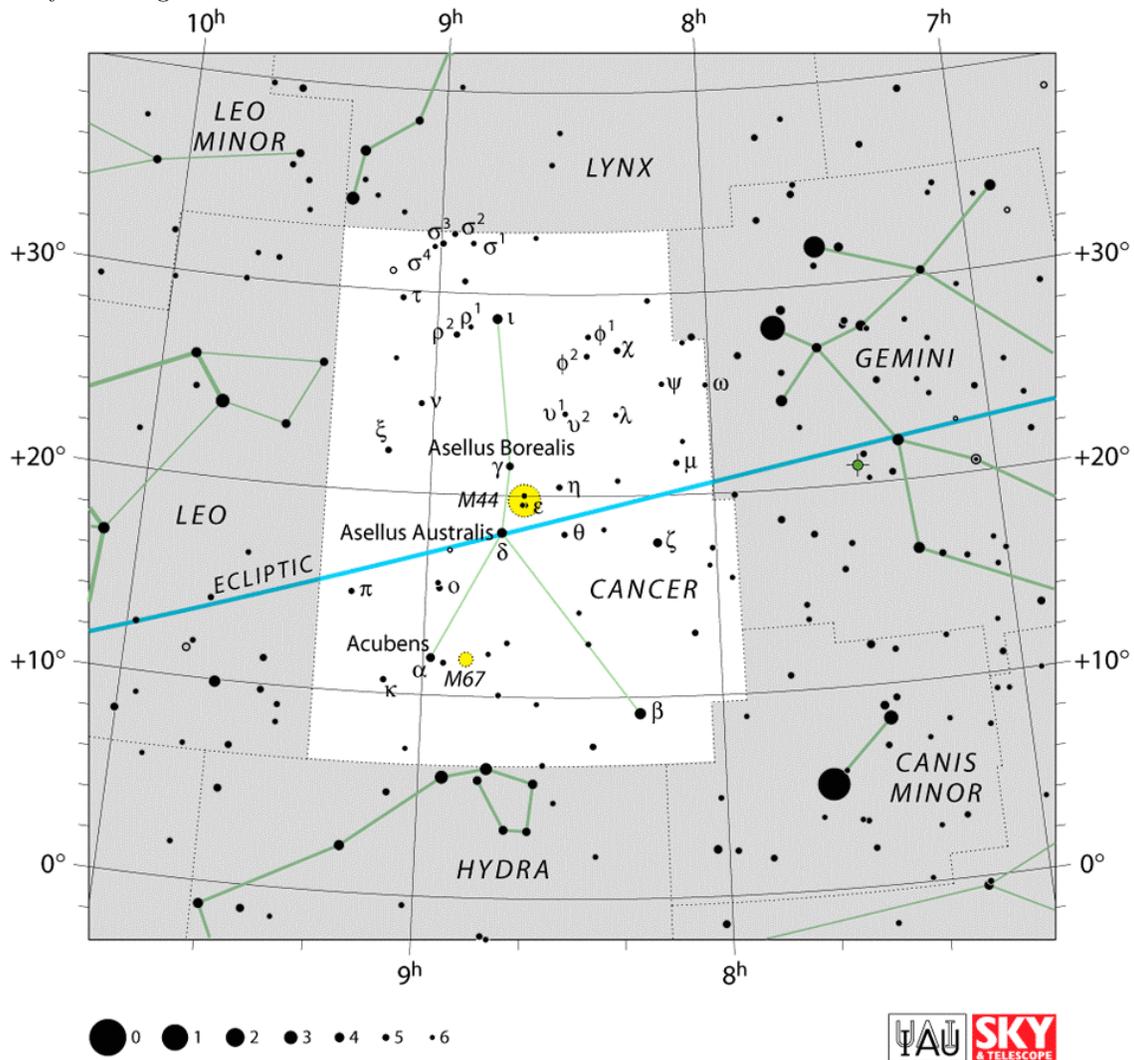
## Description

- Type: nebula (emission)
- Distance: 900 - 1500 light years
- Age: the nebulae are star forming regions

# M44: Praesepe or Beehive (Challenging)

## Finding

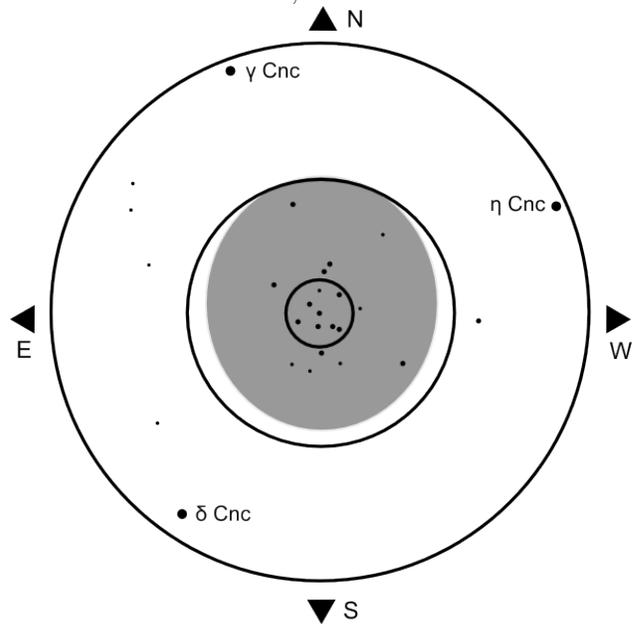
The cluster is visible without aid as a faint target on the darkest nights. In binoculars, a finder scope, or a low magnification view through a telescope, it will resolve into a cluster of bright blue stars on any reasonably clear night.



## Star Hopping

- Cancer is a very faint constellation. Find it halfway between Leo and Gemini, using the finder scope if necessary.
- $\gamma$  and  $\delta$  Cancer are visible in the finder scope, with M44 nearly halfway between them.
- TRICK: if your telescope has declination markings, you can set the declination to +20 degrees, and search from Leo to Gemini to quickly find M44.

In the finder view below, M44 is found in the middle of the triangle formed by  $\delta$ ,  $\gamma$ , and  $\eta$  Cnc.



## Viewing

- Brightness: +3.7
- Size: 95'
- Use the finder and low magnification eyepiece for viewing. The low magnification will not show the entire cluster.
- Dates: Late Spring.

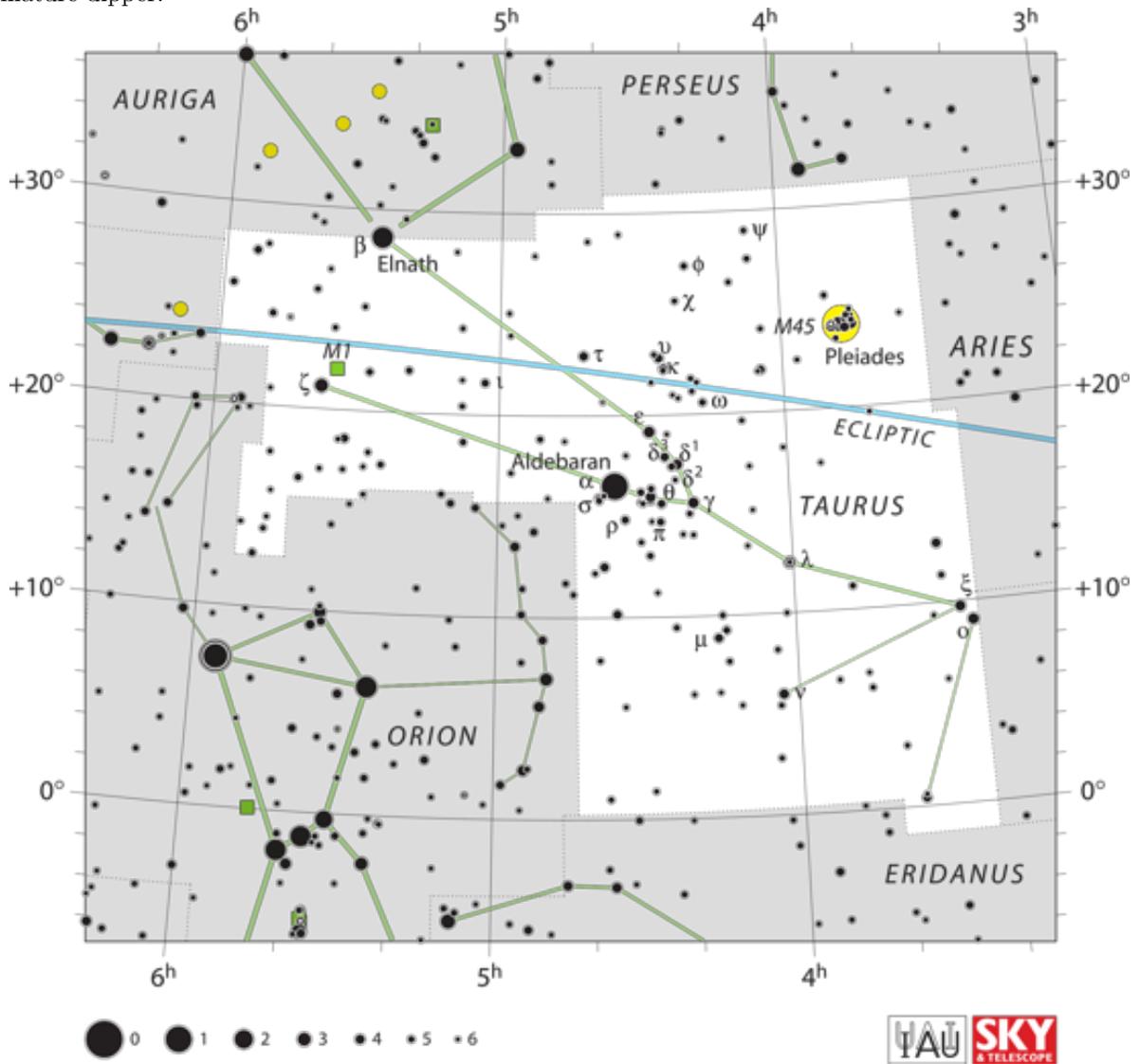
## Description

- Type: open clusters
- Distance: 560 light years
- M44 contains fewer than 1000 stars, and has an estimated age of 600 million years.

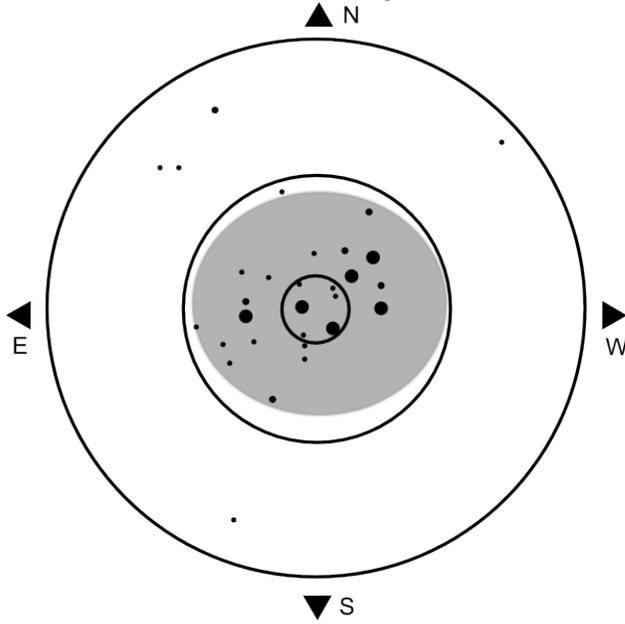
# M45: Pleiades (Easy)

## Finding

This is a bright target, easily visible without telescope or binoculars on any reasonably clear observing night. 6 or 7 stars can be seen without aid as faint, twinkling, and organized in a shape that looks a little like a miniature dipper.



In the finder view below, the bright stars in M45 make a distinct shape.



## Viewing

- Brightness: 6 stars with apparent magnitude less than 5 (visible with your eyes).
- Size: Roughly 2 degrees across
- Best view is with the finderscope or binoculars, which show the entire cluster. The telescope will only reveal a few additional stars. On a clear night, a couple dozen stars can be seen. Interstellar dust is only revealed by long exposure pictures.
- Dates: M45 is up within an hour after sundown starting in late October. It is up for the Spring semester.

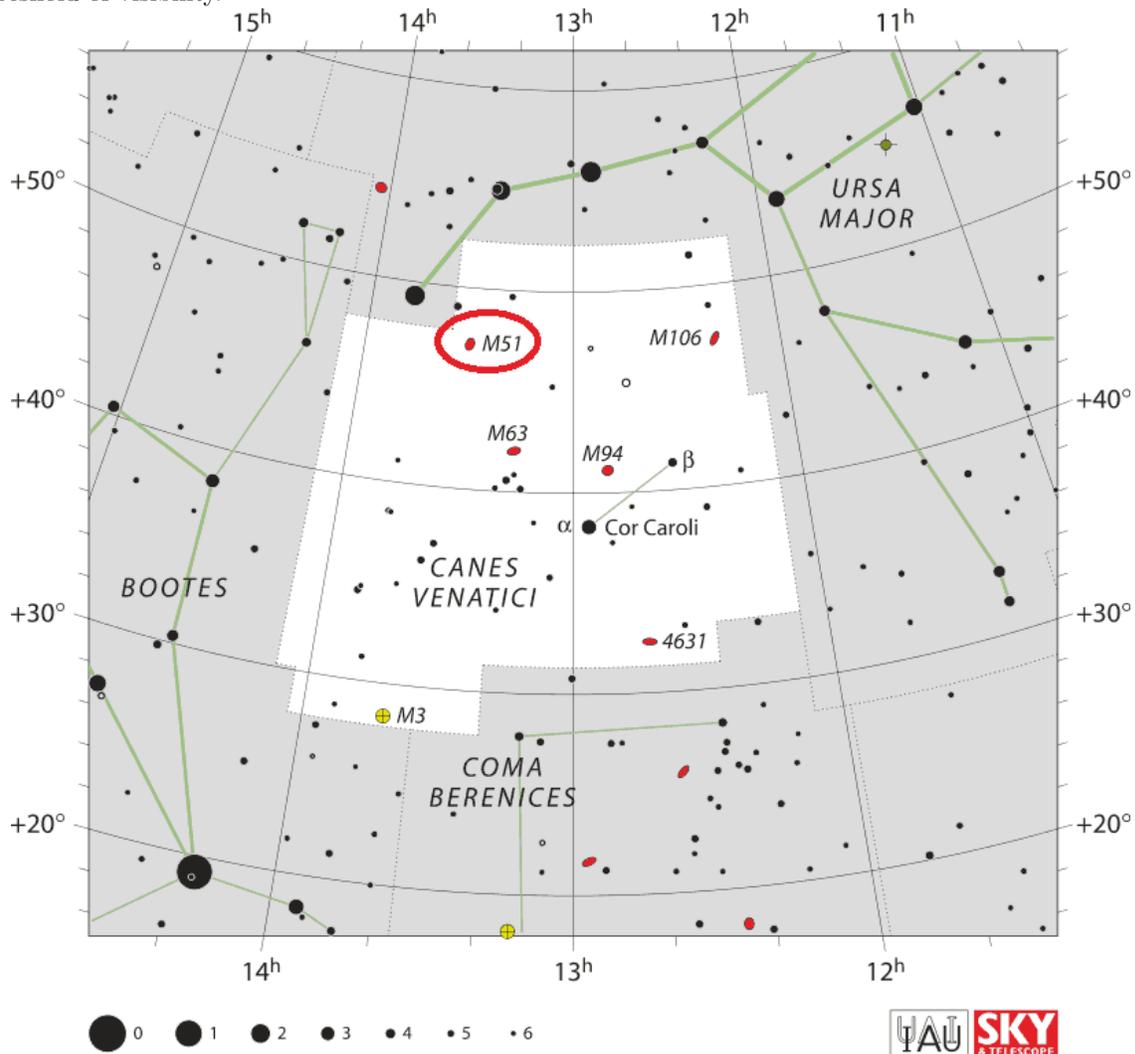
## Description

- Type: Open cluster
- Distance: 450 light years
- Age: less than 100 million years old
- Over 1000 stars are known to exist in the cluster. Only brighter (generally bluer) stars are visible in modest telescopes.

# M51: Whirlpool Galaxy - VERY challenging

## Finding

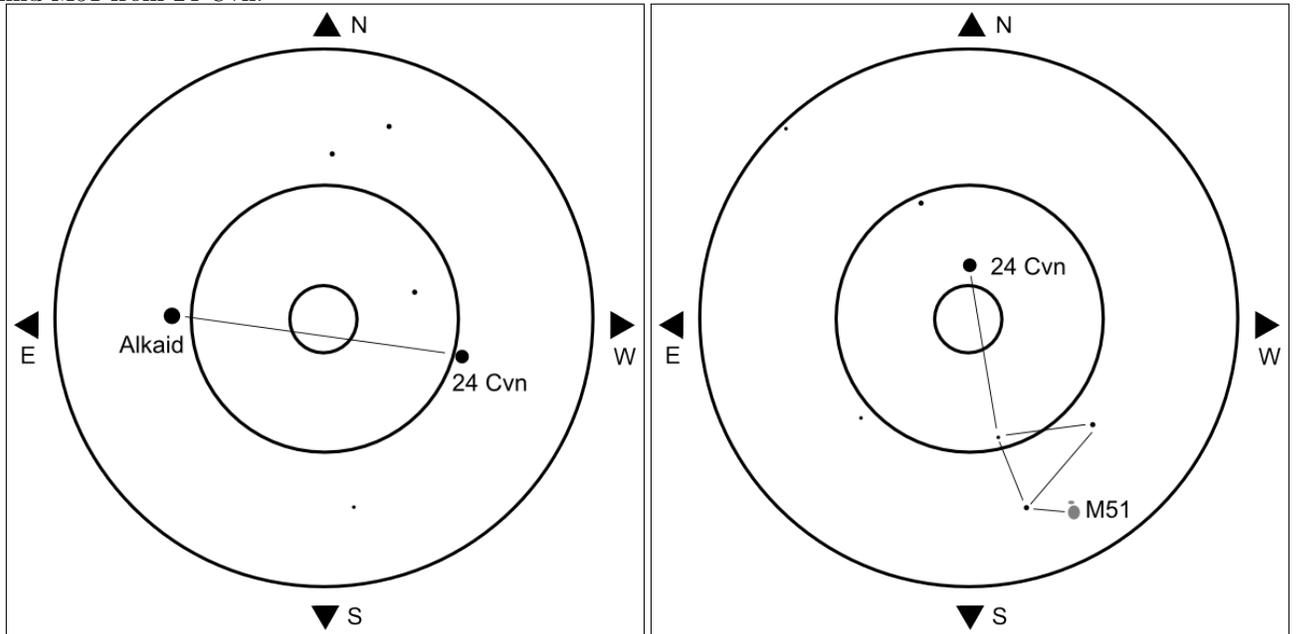
M51 is not visible without aid. With optimal conditions, the small brighter center of M51 lies just at the threshold of visibility.



## Star Hopping

- Center Alkaid, the outermost bright star in the handle of the big dipper, in the finder.
- Searching westward, you will encounter 24 Cvn roughly 2 degrees to the west of Alkaid.
- Center 24 Cvn. Now search southward. Within 2 degrees, you will encounter a triangle of faint ( $m=+7$ ) stars within 1 degree of each other.
- M51 is less than 0.5 degrees west of the southernmost star in the triangle.

Below are two finder views, the left showing how to find 24 Cvn from Alkaid, and the right showing how to find M51 from 24 Cvn.



## Viewing

- Brightness: +8.4
- Size: 11' X 7'
- Use the telescope with a low or high magnification eyepiece. This is also a good target for a CCD.
- Dates: M51 is highest at sunset during March, April, and May.

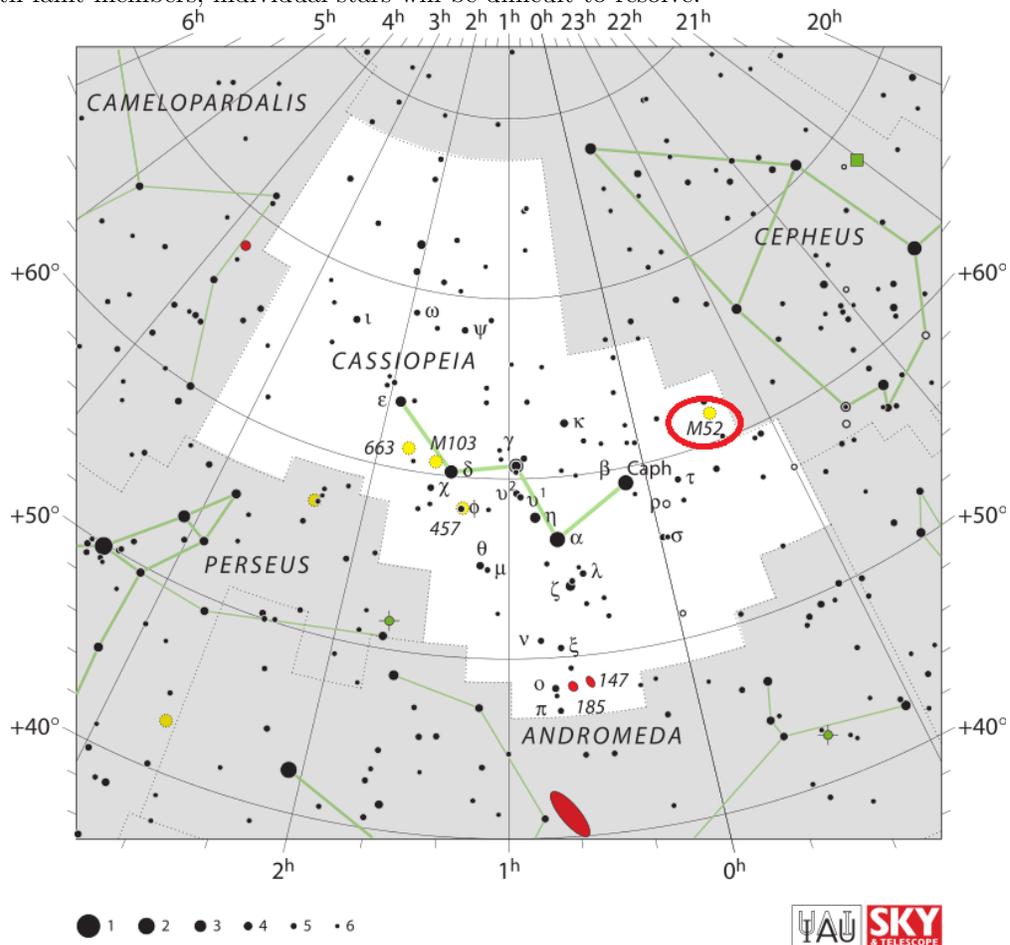
## Description

- Type: spiral galaxy
- Distance: 23 million light years.
- M51 is smaller than the Milky Way (60,000 ly across), and has a smaller companion galaxy.

# M52: Open cluster in Cassiopeia (Challenging? not checked)

## Finding

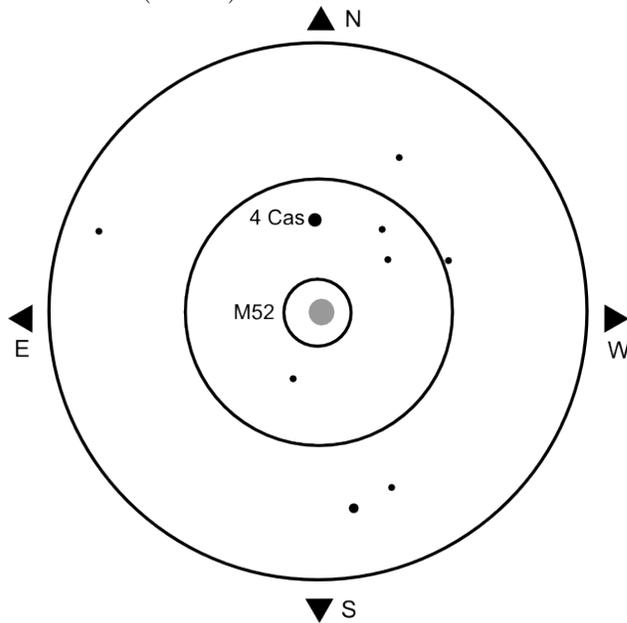
M52 is relatively easy to spot in a finderscope or telescope on any reasonably clear night. A dense cluster with faint members, individual stars will be difficult to resolve.



## Star Hopping

- Find the stars  $\alpha$  and  $\beta$  Cassiopeia.
- M52 is located 5 degrees from  $\beta$  Cassiopeia in the direction opposite of  $\alpha$  Cassiopeia.

Below is a schematic of the view in a finderscope centered on M52. M52 is less than a degree south of the star 4 Cas (m=+5).



## Viewing

- Brightness: +5.0
- Size: 16'
- Use the low or high magnification eyepiece in a modestly sized telescope.
- Dates: M52 is up throughout the Fall.

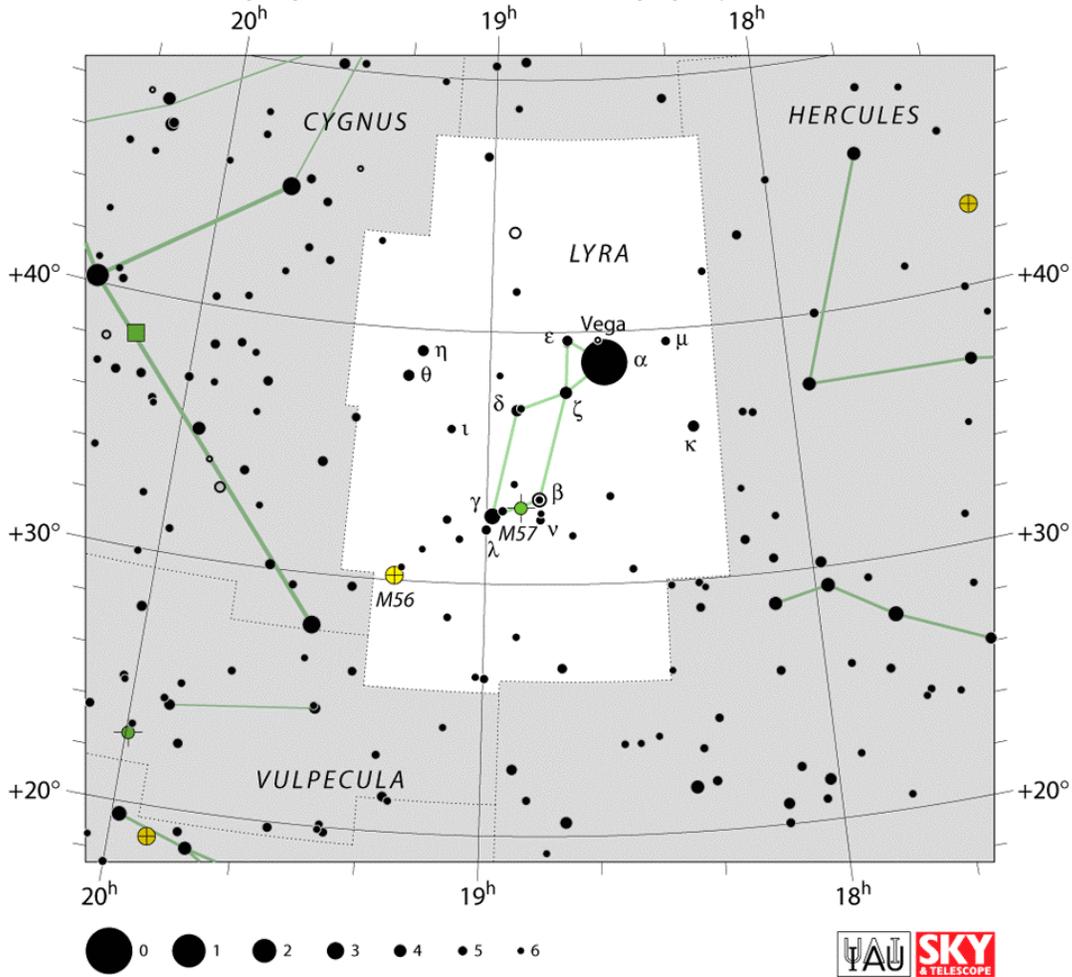
## Description

- Type: open star cluster
- Distance: 5,000 light years

# M57: The ring nebula (Challenging)

## Finding

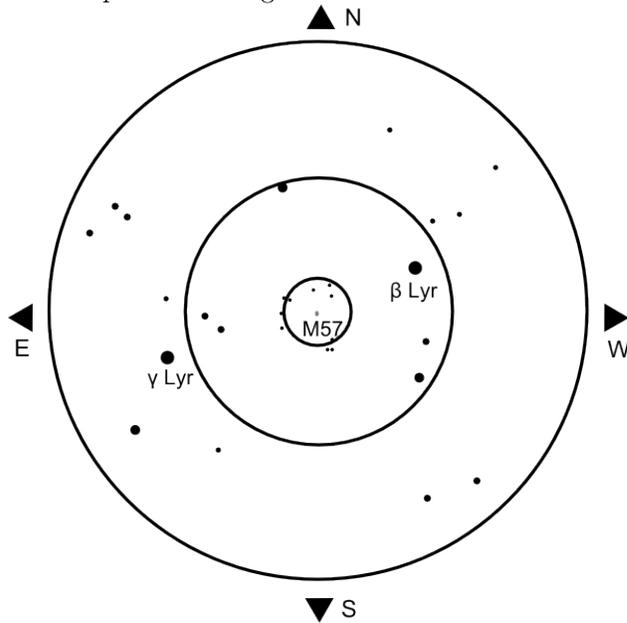
The ring is far below the threshold of visibility with even binoculars or a finder. It is easy to point your telescope at, thanks to bright guide stars, but it is a challenging object to see because it is so faint.



## Star Hopping

- Find  $\gamma$  and  $\beta$  Lyra. Separated by less than 3 degrees, both will fit into the view of the finder.
- Center the finder halfway between the two.

The finder view below shows M57 nearly centered between  $\gamma$  and  $\beta$  Lyr. NOTE: M57 is the bull's eye of a circle of 9th and 10th magnitude stars, which are included in the finder view even though they are generally not visible in a finder scope. The circle of stars is roughly 0.5 degrees across, is often visible in the telescope, and can help when finding M57.



## Viewing

- Brightness: +8.8
- Size: 4' X 4'
- Use low or high magnification eyepieces for viewing.
- Dates: All of Fall, or early Spring.

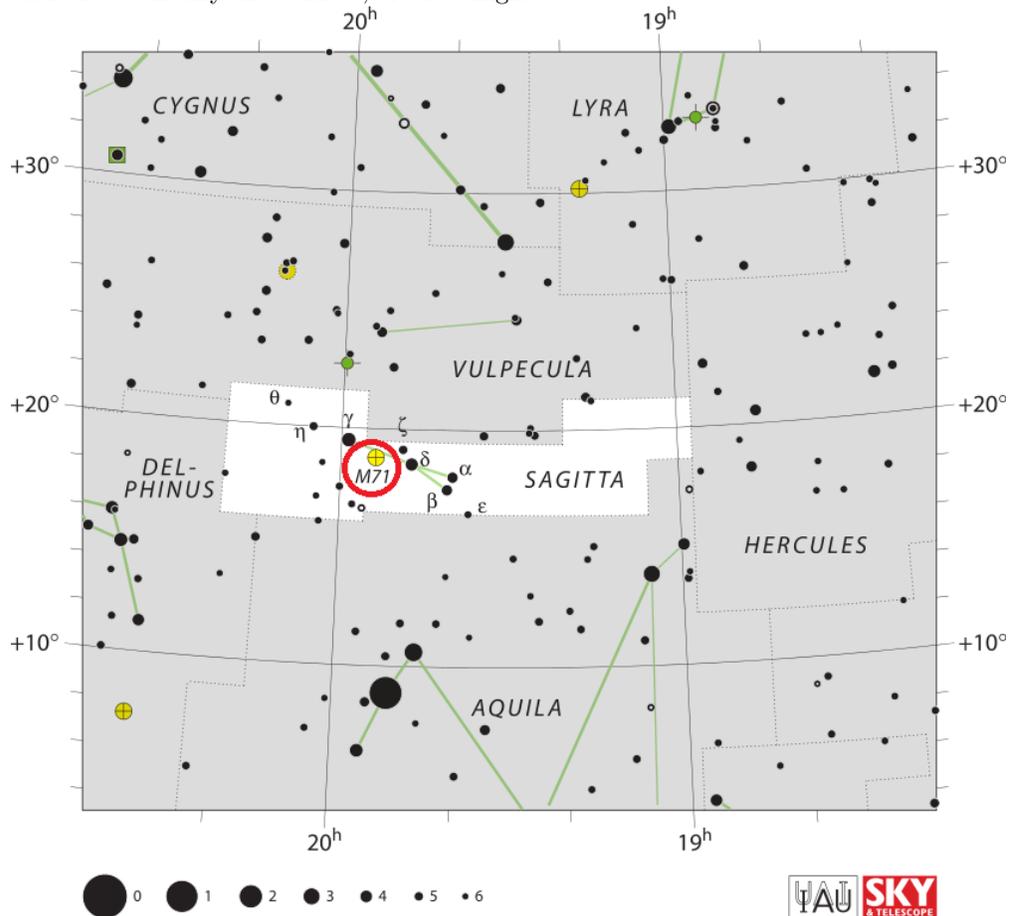
## Description

- Type: planetary nebula
- Distance: 2,300 light years.
- On the order of 10,000 years - planetary nebula are small, short lived objects..

# M71: Globular cluster in Sagitta (VERY Challenging)

## Finding

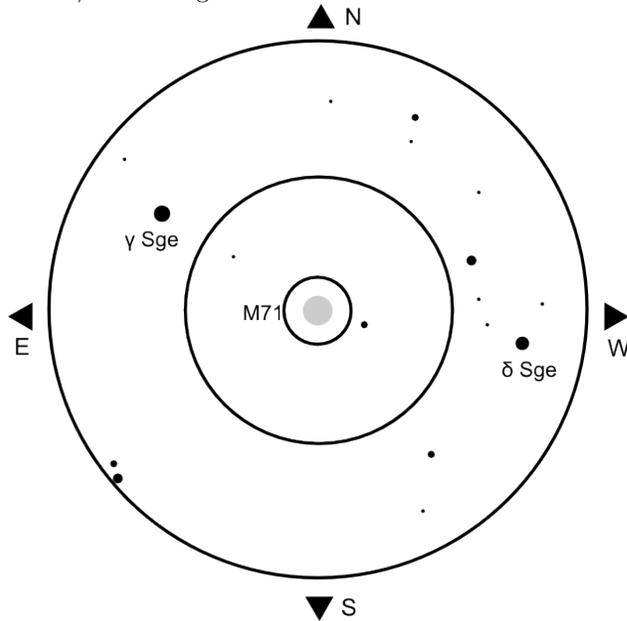
M71 is not visible in the finder or binoculars. The cluster is only visible through a telescope as a faint, circular cloud on only the darkest, clearest nights.



## Star Hopping

- Find the star Altair in the constellation Aquila.
- The constellation Sagitta is 10 degrees north of Altair, and may require your finderscope to see.
- $\gamma$  and  $\delta$  Sagitta are the two easternmost bright stars.
- M71 is halfway between  $\gamma$  and  $\delta$  Sagitta.

Below is a schematic of the view in a finderscope when M71 is centered. Note that M71 is halfway between  $\gamma$  and  $\delta$  Sagitta.



## Viewing

- Brightness: +6.1
- Size: 7'
- Use the high magnification eyepiece in a modestly sized telescope.
- Dates: M71 is up throughout the Fall.

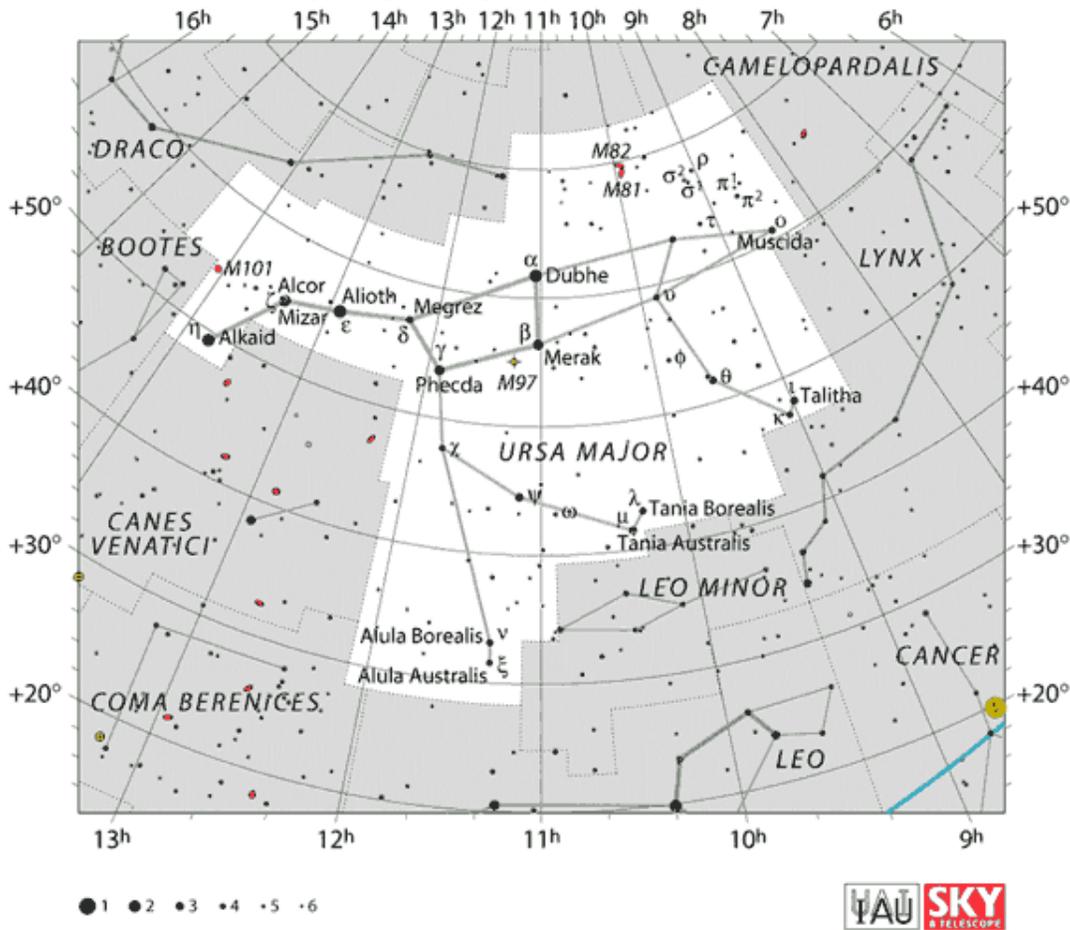
## Description

- Type: globular cluster
- Distance: 13,000 light years
- M71 is 13 light years across, and contains more than 20,000 stars.

# M81: Bode's Galaxy + M82 (Cigar galaxy) (VERY Challenging)

## Finding

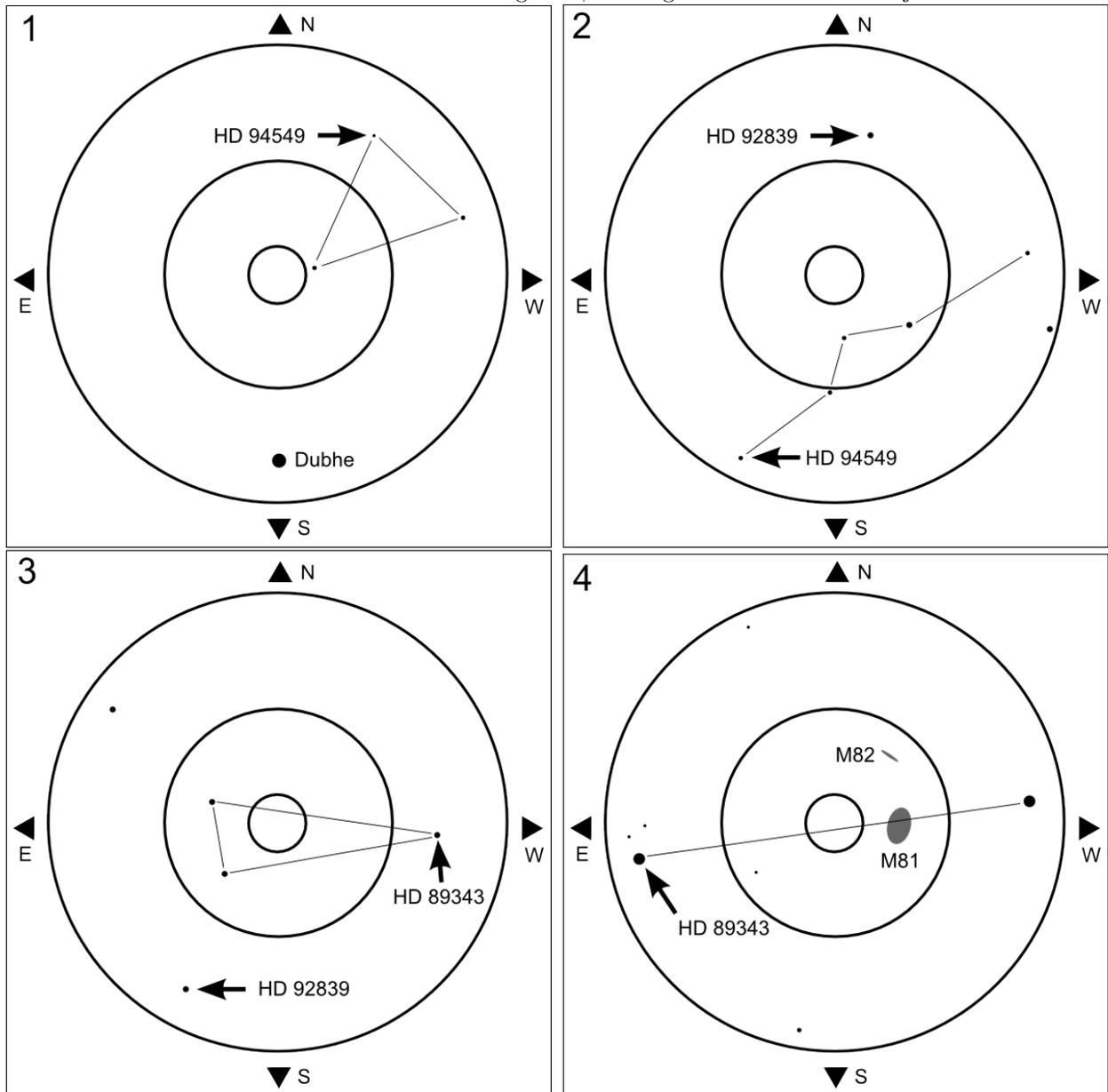
M81 is not visible without aid. With optimal conditions, through the telescope you will see M81 as a brighter center, surrounded by a faintly glowing oval region.



## Star Hopping - detailed (many hops)

- Find Dubhe, the bright star at the top and front of the upright big dipper, and center it in the finder scope.
- Looking through the finder scope, search northwards two degrees. Three faint 6th and 7th magnitude stars make a triangle (picture 1).
- Search 2 degrees north west of the indicated triangle star (HD 94549). You will find several more faint stars which make a line, and one which is 2 degrees north of the line (picture 2).
- Search 2 degrees north of the second indicated star (HD 92839), and you will find a triangle of 5th and 6th magnitude stars (picture 3).
- Search 3 degrees west of the 3rd indicated star (HD 89343). M81 is on a line between 6th magnitude stars (picture 4).

Below are 4 finder views that are useful for finding M81, starting at Dubhe in Ursa Major.



## Viewing

- Brightness: +6.9 (M81), +8.4 (M82)
- Size: 27' X 14'
- Use the telescope with a low or high magnification eyepiece.
- Dates: M81 is up throughout the Spring semester.

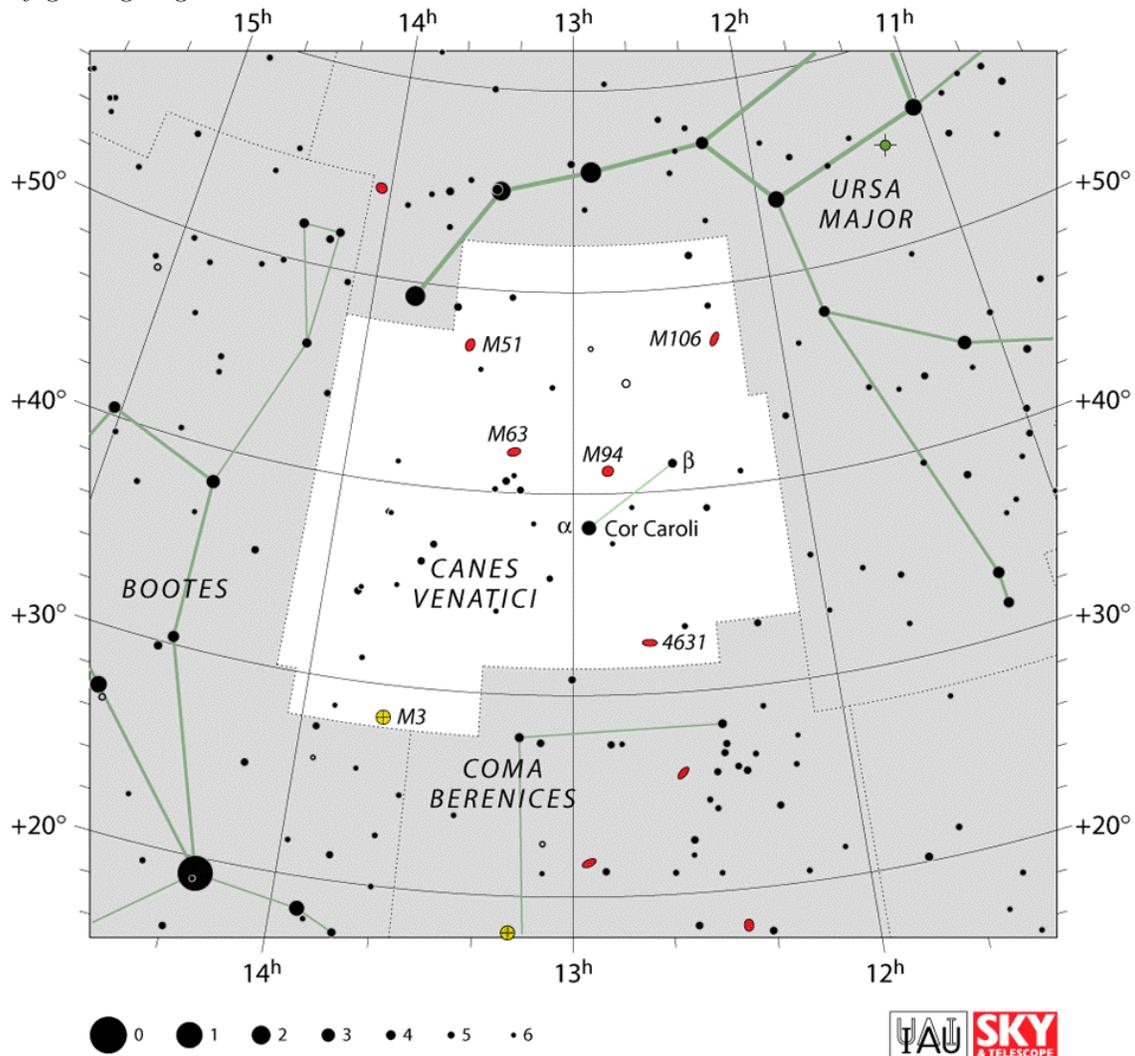
## Description

- Type: spiral galaxy
- Distance: 12 million light years.

# M94: Cat's Eye Galaxy - not checked

## Finding

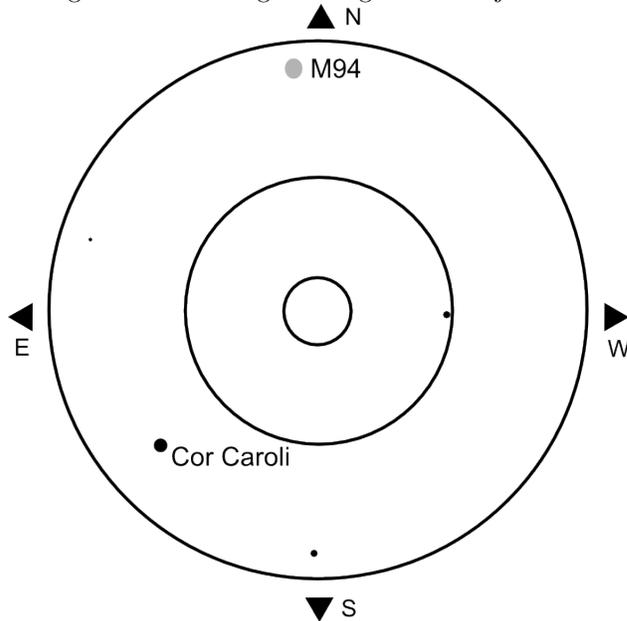
M94 is not visible without aid. M94 will be faintly visible in a finder or binoculars only on the clearest, darkest nights. With optimal conditions, through the telescope you will see M94 as a brighter center, surrounded by a faintly glowing ring.



## Star Hopping

- Find α CVn (Cor Caroli) between the Big Dipper and Bootes.
- Looking through your finder, move 3 degrees north and 1 degree west of Cor Caroli.
- Alternatively, M94 is 3 degrees east of (17 minutes after) β CVn.

In the finder view below, in addition to Cor Caroli ( $m=+2.85$ ), there are two sixth magnitude stars, which together make a right triangle. M94 is just under 4 degrees north of the southernmost of those stars.



## Viewing

- Brightness: +8.5
- Size: 11' X 9'
- Use the telescope with a low or high magnification eyepiece. This is also a good target for a CCD.
- Dates: M94 is highest at sunset during March, April, and May.

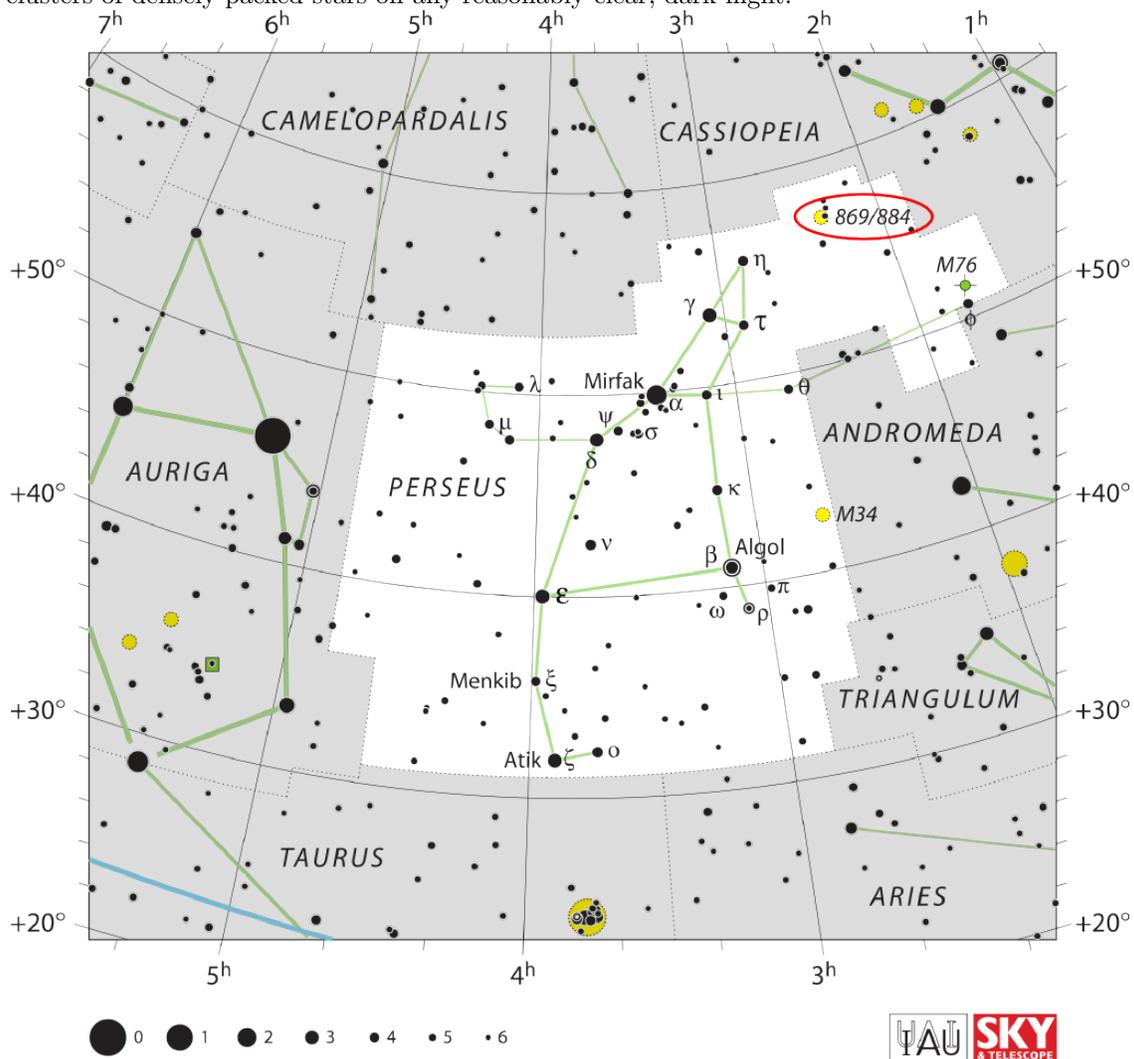
## Description

- Type: spiral galaxy
- Distance: 16 million light years.
- M94 is half the diameter of the Milky Way, and has far fewer stars (40 billion).

# NGC 869+884: Double cluster (Challenging)

## Finding

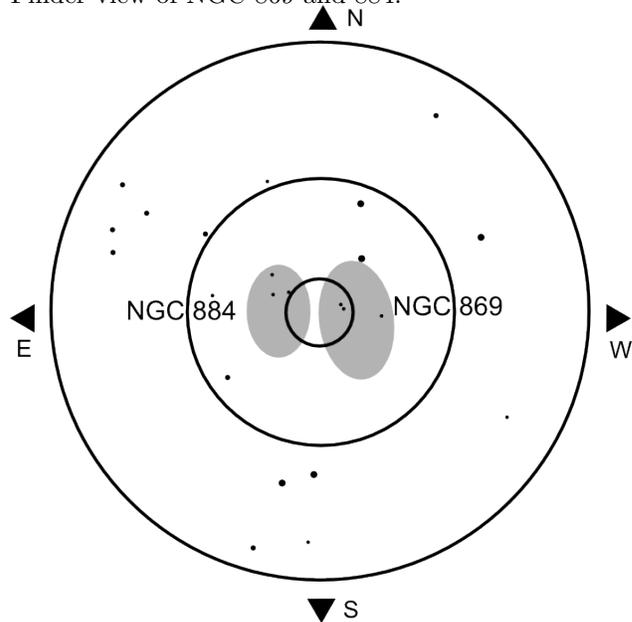
The double cluster is visible without aid as a faint target on a dark night, halfway between Perseus and Cassiopeia. In binoculars, a finder scope, or a low magnification view through a telescope, it will resolve into two clusters of densely packed stars on any reasonably clear, dark night.



## Star Hopping

- Locate the constellation Perseus.
- Find and center  $\eta$  Perseus in the finder.
- The double cluster is about 5 degrees west of (or 0.5 hours before)  $\eta$  Perseus.

Finder view of NGC 869 and 884.



## Viewing

- Brightness: +3.7
- Size: 70' X 40'
- Use the finder and low magnification eyepiece for viewing.
- Dates: Late Fall and Spring.

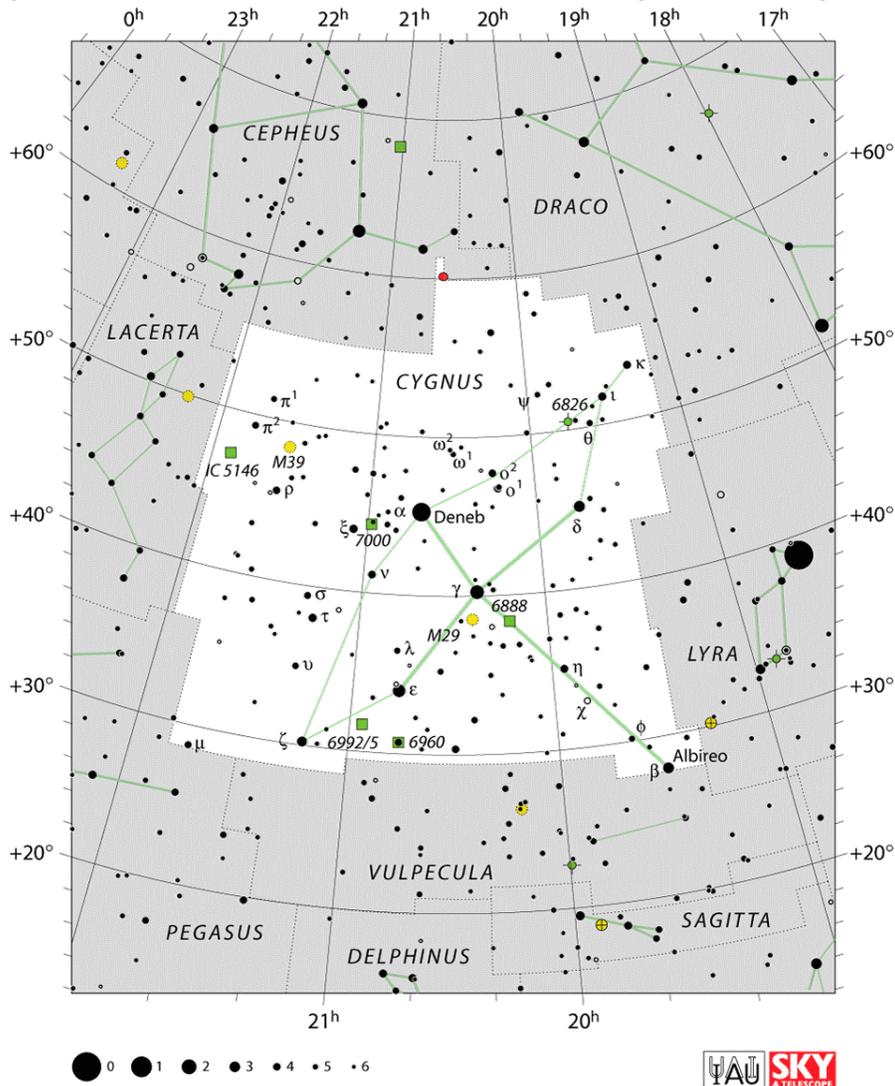
## Description

- Type: 2 open clusters
- Distance: 7,600 light years
- Both clusters are very young, in the cosmic sense, possibly containing 10,000 stars between them both.

# Albireo - binary star (Easy)

## Finding

A moderately bright target, Albireo is visible without aid, as the 5th brightest star in Cygnus. Albireo is the brightest star at the beak of the swan opposite the 4 bright stars making the wings and tail.



## Viewing

- Brightness: yellow subgiant ( $m=+3.18$ ) and blue dwarf ( $m=+5.09$ )
- Size: 35" separation
- Best viewed with a high magnification eyepiece. While not resolved in a finder scope, even small telescopes will show both stars.
- Dates: the entire Fall semester

## Description

- Type: binary stars (with striking color contrast)
- Distance: 400 light years
- The stars are actually far from each other in space, and have not been observed long enough to determine their orbit (which must be at least 100,000 years).

# Dates

A rough idea of which times of year are best for viewing deep sky objects early in the night. Green means the object is up and visible some time between the hours of 8pm and 9pm. Orange means the object is up, but not visible (due to N. Charleston glare). Red means the object is not up.

		1/1	1/16	2/1	2/16	3/1	3/16	4/1	4/16	5/1	5/16	6/1	6/16
		1/15	1/31	2/15	2/28	3/15	3/31	4/15	4/30	5/15	5/31	6/15	6/30
Open Star Clusters	M7												
	M11												
	M25												
	M35												
	M44												
	M45												
	M52												
	NGC 869												
	Albireo												
Globulars	M3												
	M13												
	M22												
	M71												
Galaxies	M31												
	M33												
	M51												
	M81												
	M94												
Nebulae	M1												
	M8												
	M17												
	M27												
	M42												
	M57												

		7/1	7/16	8/1	8/16	9/1	9/16	10/1	10/16	11/1	11/16	12/1	12/16
		7/15	7/31	8/15	8/31	9/15	9/30	10/15	10/31	11/15	11/30	12/15	12/31
Open Star Clusters	M7	Red	Green	Red	Red	Red	Red						
	M11	Green	Red	Red	Red								
	M25	Green	Red	Red	Red								
	M35	Red	Green	Green	Green								
	M44	Green	Red										
	M45	Red	Green	Green	Green	Green	Green						
	M52	Orange	Green	Green	Green	Green	Green						
	NGC 869	Orange	Orange	Orange	Orange	Orange	Green						
	Albireo	Green											
Globulars	M3	Green	Green	Green	Green	Green	Orange	Orange	Red	Red	Red	Red	Red
	M13	Green	Green	Green	Green	Green	Green	Orange	Orange	Red	Red	Red	Red
	M22	Red	Green	Red	Red	Red	Red						
	M71	Green	Red										
Galaxies	M31	Red	Red	Red	Red	Red	Red	Orange	Orange	Green	Green	Green	Green
	M33	Red	Red	Red	Red	Orange	Orange	Green	Green	Green	Green	Green	Green
	M51	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Red	Red
	M81	Green	Orange										
	M94	Green	Green	Green	Green	Orange	Orange	Red	Red	Red	Red	Red	Red
Nebulae	M1	Red	Green	Green	Green								
	M8	Green	Red	Red	Red	Red	Red						
	M17	Green	Red	Red	Red								
	M27	Green											
	M42	Red	Green	Green									
	M57	Green	Orange	Orange									