

# Central Coast Astronomy Virtual Star Party

February 13<sup>th</sup> 7pm Pacific

Welcome to our Virtual Star Gazing session! We'll be focusing on objects you can see with binoculars or a small telescope, so after our session, you can simply walk outside, look up, and understand what you're looking at.

CCAS President Aurora Lipper and astronomer Kent Wallace will bring you a virtual "tour of the night sky" where you can discover, learn, and ask questions as we go along! All you need is an internet connection. You can use an iPad, laptop, computer or cell phone. When 7pm on Saturday night rolls around, click the link on our website to join our class. [CentralCoastAstronomy.org/stargaze](http://CentralCoastAstronomy.org/stargaze)

## Before our session starts:

**Step 1:** Download your free map of the night sky:

[SkyMaps.com](http://SkyMaps.com)

They have it available for Northern and Southern hemispheres.

**Step 2:** Print out this document and use it to take notes during our time on Saturday. This document highlights the objects we will focus on in our session together.

## Celestial Objects:

**Moon:** The moon is 2 days past new, which is really good for star gazing. Be sure to look at the moon tonight with your naked eyes and/or binoculars!

**Mercury** is rising right before the sun and may be a good target near the end of the month. **Mars** is up high but is shrinking in size as the weeks progress.

\*Image credit: all astrophotography images are courtesy of NASA unless otherwise noted. All planetarium images are courtesy of Stellarium.

## **Main Focus for the Session:**

1. Gemini (The Twins: Castor and Pollux)
2. Canis Minor (The Small Dog)
3. Canis Major (The Large Dog)
4. Orion (The Hunter)

**Notes:**

## Gemini (The Twins)

Gemini, "The twins Castor and Pollux", ancient Greek constellation.

Castor, Alpha Geminorum. To the naked eye Castor is a white star in the head of the northern twin in Gemini. It is the 23rd brightest star in the sky with a magnitude of 1.58 visual. Castor is 49 times brighter than our sun and is 51 light years distant. In a small telescope it splits into a nice pair of white stars currently 5.4" apart. The brighter of this pair is magnitude 1.94 visual while the fainter of the pair is magnitude 2.92 visual. Castor was discovered as a double star by C. D. Cassini in 1678.

In 1803 William Herschel announced that Castor was a pair of gravitationally bound stars and the first true binary pair discovered. These two stars have an orbital period of about 460 years and will reach a maximum separation of 7.2" in 2080.

Additionally, each of these stars are very close spectroscopic binaries with the brighter component having a period of just over 9 days and the fainter star having a period of just under 3 days. Note that there is a faint red star about 72" distant which has a magnitude of 9.3 visual which is bound to this system with a period of over 10,000 years. This red star is composed of a spectroscopic binary of two red dwarfs with a period of 19.5 hours.

Pollux, Beta Geminorum. To the naked eye Pollux is an orange in the head of the southern twin. It is the 17th brightest star in the sky at magnitude 1.16 visual. Pollux is 35 times brighter than our sun and is 35 light years distant. Pollux is 11 times the diameter of our sun. Note that Pollux is brighter than Castor yet it is listed as the Beta star in Gemini.

M 35, Shoe Buckle Cluster, open cluster. It has a magnitude of 5.1 visual and diameter of 28'. M 35 is about 2,700 light years distant, has over 2000 member stars and has an age of about 125 million years. This cluster was discovered by the Swiss observer Phillippe de Cheseaux in 1746. M 35 is called the Shoe Buckle Cluster because it glitters on Castor's northern shoe. It is faintly visible to the naked eye under dark skies and nice in 7x50 binoculars.

NGC 2158, open cluster. This rich cluster has a magnitude of 8.6 visual, a diameter of 5' and a distance of 12,000 light years. It is only 30' southwest of M35 yet is over four times the distance. NGC 2158 was discovered by William Herschel on November 16, 1784. It contains about 1,000 stars and is 2 billion years old.

IC 443, Jellyfish Nebula, Supernova Remnant. It is about 2.5 degrees southeast of M 35 in the foot of Castor. This object is about 45' east northeast of Eta Geminorum which is also in the northern foot of Castor.

IC 443 is about 30'x15' in size and about 5,000 light years distant. It was discovered between 1888 and 1894 by means of photography by E. Barnard and Max Wolf. IC 443 is very faint, requiring a 12" scope or greater and the use of an O-III filter. The APOD for March 7, 2019 has a nice image of the Jellyfish Nebula.

NGC 2392, Eskimo Nebula, planetary nebulae. The Eskimo Nebula has a magnitude of 9.2 visual, a size of 47"x43", a central star of magnitude 10.5 visual and a distance of about 3,800 light years. It was discovered by William Herschel on January 17, 1787. This planetary nebula is called the Eskimo Nebula due to its appearance on photographs showing a furry parka with a face inside. It is about 140' east southeast of Delta Geminorum "called Wasat", near the southern hip of Pollux.

## Canis Minor (The Small Dog)

Canis Minor (The Small Dog) is an ancient Greek constellation.

Procyon, Alpha Canis Minoris. Procyon means "Before the Dog" in Greek since it rose before Sirius. This star is the 8th brightest star in the sky with a magnitude of 0.35 visual. It is a white main sequence star with a distance of 11.3 light years. Procyon is 1.7 times the mass, 2.3 times the diameter and 6 times the brightness of our sun.

A companion to Procyon was deduced from variations in the proper motion and a period of 40 years was calculated in 1861. It took until 1896 for J. M. Schaeberle to observe it using the 36" refractor at Lick Observatory. Called Procyon B, this companion is a white dwarf with a magnitude of 11.0 visual. It has 65% the mass of our sun, a diameter twice that of Earth and a period of 40.7 years around Procyon. Separation between the two stars varies between 2.2" and 5.0" and currently should be 4.6". This is not a target for most amateur telescopes.

## Canis Major (The Large Dog)

Canis Major (The Large Dog) is an ancient Greek constellation.

Sirius, Alpha Canis Majoris, "The Dog Star". This is the brightest star in our sky, excepting our sun, with a magnitude of -1.46 and a distance of only 8.6 light years. Sirius is 2.35 times the mass, 1.8 times the diameter and 23 times as bright as our sun. It is the nearest naked eye star with the exception of the Alpha Centauri system. Sirius has a white dwarf companion which while unseen was deduced by its motion through space and a period of 50 years was calculated in 1851. This white dwarf was first

visually observed on January 31st, 1862 by the famous American telescope maker, Alvin G. Clark, while testing an 18.5" refractor he built. At the time it was the largest refracting telescope in the world and Clark was installing his creation at the Dearborn Observatory.

This white dwarf, often called "The Pup or Sirius B" does have a period of 50 years and is magnitude 8.7 visual. It has a mass 99% of our sun and a diameter a little over twice that of Earth. The Pup's separation from Sirius varies from 3" to 11.5". Next maximum separation will be in 2025. Observing the Pup requires very steady seeing, a scope 6" or larger and high powers.

M 41, open cluster. This star cluster has a magnitude of 4.5 visual, a diameter of 40' and a distance of 2,260 light years. M 41 was discovered by Hodierna in 1654. It has an age of about 190 million years. M 41 can be seen with the naked eye without difficulty on dark nights, as a nebulous patch 4 degrees south of Sirius. In binoculars it is a nice cluster.

NGC 2359, Thor's Helmet, Wolf-Rayet Nebula + star. Thor's Helmet has a magnitude of 9.0 visual and a size of 13'x11'. It was discovered by William Herschel on January 31, 1785. A magnitude 11.5 visual Wolf-Rayet star lights this nebula as its fierce stellar wind snowplows gas and dust into a bubble around it. Thor's Helmet can be seen in an 8" scope and an O-III filter really makes the nebula stand out. NGC 2359 is located in the northeast corner of Canis Major.

NGC 2362, Tau Canis Majoris Cluster, open cluster. NGC 2362 has a magnitude of 3.8 visual, a diameter of 7', a distance of 5,100 light years and an age of only 5 million years. It was discovered by William Herschel on March 6, 1785. NGC 2362 is located 2.7 degrees east northeast of Delta Canis Majoris. This is a beautiful star cluster tightly surrounding Tau which outshines them all. NGC 2362 can be observed in a 2" telescope under dark skies and good seeing.

Winter Albireo (h 3945) is a colorful double star. This double star is located 1 degree 40' north and a little bit west of the Tau Canis Majoris cluster. John Herschel discovered this double on January 23, 1835. It appears as a magnitude 5.0 visual, yellow star and a magnitude 5.8 visual, blue star, with a separation of 27". This is not a binary system, the stars are totally unrelated. The yellow star is 2,280 light years distant and the blue star is 345 light years distant.

## Orion (The Hunter)

Orion (The Hunter) is an ancient Greek constellation

Betelgeuse, Alpha Orionis, irregularly pulsating variable red supergiant star.

Betelgeuse means “The Armpit of the giant” when translated from the Arabic. It is listed as the 11th brightest star in the sky with an average magnitude of 0.7 visual. This star can vary in brightness from magnitude 0.0 visual at its brightest to below magnitude 1.0 visual at its dimmest. During the great dimming from late 2019 to early 2020 it dropped to magnitude 1.61 visual in early February 2020.

John Herschel first noticed this star’s variability in 1836. Betelgeuse is about 430 light years distant and about 55,000 times brighter than our sun on average. It was the first star to have its diameter measured by a beam interferometer on December 13, 1920 at the Mt. Wilson Observatory. Its diameter is 650 times that of our sun. If Betelgeuse replaced our sun its surface would be in the asteroid belt. It is also the first star to have its surface imaged by the Hubble Space Telescope. Currently Betelgeuse is core burning Helium to carbon and oxygen.

Rigel, Beta Orionis, blue-white supergiant star and binary star. Rigel is from the Arabic Rijl Jauzah al Yusra “Left Leg of the Giant”. It is the 7th brightest star in the sky with a magnitude of 0.1 visual. Rigel is 23 times the mass and is 43,000 times the brightness of our sun. It is about 860 light years distant. The companion to Rigel has a magnitude of 6.7 visual and a separation of 9.0”. William Herschel discovered this companion on October 1, 1781. The companion to Rigel is also a spectroscopic binary with a period of 9.86 days. This bluish companion can be seen in a refractor as small as 2” if the seeing is steady enough.

M 42, Great Orion Nebula, H II region. star birth region. M 42 is a blowout in a large molecular cloud where the radiation from young stars have punched a hole through the gas and dust. It has a magnitude of 3.7 visual, a size of 90’x60’ and a distance of 1,300 light years. M 42 was first mentioned by Nicholas-Claude Peiresc in 1611. In the center of the Orion Nebula is the Trapezium, a close grouping of four stars forming a small trapezoid, denoted A-D from west to east. There are two fainter stars, E & F, in the Trapezium, but they require very steady seeing. In Infrared the Trapezium is a part of a newly born cluster of stars.

M 43, small part of the Great Orion Nebula. It has a magnitude of 6.8 visual and a size of 6’x3’. M 43 was discovered by Jean-Jaques de Mairan in 1733. This small object appears as a faint patch of nebulosity around a 7th magnitude star north of M 42. M 43 is separated from M 42 by a lane of dark nebulosity.

Sigma Orionis, multiple star system. Sigma appears to the naked eye as a magnitude 3.7 star, making a right angle to the belt of Orion at the eastern most star, Zeta. This multiple star system is about a degree southwest of Zeta. Sigma A&B are a very close binary with a separation of 0.25" and appears as a single yellow star in amateur scopes. On the western side of A/B at a separation of 11.5" is star Sigma C with a magnitude of 8.8 visual. On the eastern side of A/B at a separation of 12.7" is star Sigma D with a magnitude of 6.6 visual. Further on the eastern side at a separation of 41.5" is Sigma E with a magnitude of 6.3 visual. This shows up as a beautiful line of four stars in my 8" scope.

B 33, Horsehead Nebula, dark nebula. At a distance of about 1,200 light years, the Horsehead Nebula is located 0.5 degrees south of Zeta Orionis. This object is a dark nebula about 6'x4', silhouetted against an emission nebula, IC 434 which is probably illuminated by Zeta Orionis. The shape of this dark nebula looks like a horse's head, hence the nickname. Williamina Fleming discovered the Horsehead Nebula on a photographic plate in 1888 at the Harvard College Observatory.

NGC 2024, Flame Nebula, emission nebula, star birth area. The Flame Nebula is just 15' northeast of Zeta Orionis. It has a magnitude of 7.2 visual and a size of 30'x30'. NGC 2024 was discovered by William Herschel on January 1, 1786. It appears as a bright nebula with a dark tree of nebulosity superimposed on it. The flame Nebula is best seen by moving Zeta Orionis out of the field. Infrared images show an open cluster being born in the Flame Nebula.

M 78, reflection nebula. It has a magnitude of 8.0 visual, a size of 8'x6' and a distance of 1,300 light years. M 78 was discovered by Pierre Mechain in 1780. This object can be seen as a faint spot in 10x50 binoculars, about 2.5 degrees northeast of Zeta Orionis.

## Equipment Recommendations:

### Binoculars for Astronomy:

Celestron Cometron 7x50 Binoculars (\$35)

Orion's UltraViews 10x50 (\$140)

### Cell phone mount:

These grab hold of the eyepiece and keep the lens of your camera steady for imaging on a spotting scope, binoculars, or small telescope. You can find these for about \$15 on Amazon: <https://amzn.to/3h3GjE6>

### Beginner telescopes:

For kids: 8" Dobsonian Telescope: <https://bit.ly/2XEFaeK>  
or build it yourself: <https://bit.ly/3h4UkS8>

For adults: (it's going to depend what you want to look at)

8" Newtonian Reflector <https://bit.ly/3f3C0qS> (easy to use, good all-around scope for deep sky objects, planets, moon)

8" Schmidt-Cassegrain <https://bit.ly/3dJKG59> (more compact, good all-around scope for planets, galaxies, nebulae, astrophotography)

90mm Refractor <https://bit.ly/37aG8lX> (harder to use, best for planets and moon observing)