

Central Coast Astronomy Virtual Star Party

Sept 19th 7pm Pacific

Welcome to our Virtual Star Gazing session! FALL is full of star clusters, galaxies, gas giant planets and interesting star systems! We are going to focus 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. www.CentralCoastAstronomy.org/stargaze

Before our session starts:

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

www.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 two days after new, which is really good for star gazing!

Planets:

Sept 22: Equinox. The sun will be shining right on the equator and the amount of time for both day and night will be just about equal throughout the world.

Mars will be at Opposition on Oct 13th, which means it's at its closest approach to Earth and since its face will be fully illuminated by the sun and visible all night long, it's really the best time to view and photograph Mars with a medium-size telescope. Be patient and use tracking as you wait for the air to steady down. It's worth the effort when you see the poles through an 8" scope!

Mercury is in the West, and since it never gets far from the sun, it's going to appear low in the sky in the evening.

Jupiter and Saturn continue to be amazing to watch together in the Southern part of the sky. Both Saturn and Jupiter are close to each other.

With a pair of binoculars, you should be able to see the moons of Jupiter like the image here, all lined up with a brighter center dot.

(Saturn's moons will be all over the place, except when the rings are viewed edge-on from Earth, which happens about every 15 years, and our next one is in 2025.)

Zodiacal Light: If you are up at 4:30-5:30 AM and there's no moonlight, you may get a glimpse of the *zodiacal light* in the east. It is a cone-shaped glow on the horizon visible in the eastern sky before morning twilight in the autumn, and in the western sky just before evening twilight in spring.

This season, also look for Venus peeking through the conical pattern! This effect is caused by sunlight reflecting off dust particles known as "cosmic dust" / "interplanetary dust cloud". The particles are leftovers from meteorite collisions and comet trails. You'll notice that the Zodiacal Light is yellow (because the sun is a yellow star), while the light from the Milky Way is white!

Main Focus for the Session:

1. Asterisms
 2. Cepheus (King)
 3. Cassiopeia (Queen)
 4. Perseus (Hero)
 5. Andromeda (Queen's Daughter)
 6. Pegasus (Hero's Steed)
- 1. Asterisms:** These are patterns or groups of stars that have a popular name, but they're not a constellation (usually they are smaller than a constellation). For this month, we have two asterisms.

First, the Great Square, part of Andromeda and Pegasus.

Find the "W" part of Cassiopeia: Connect the end handle star (Alkaid) of the Big Dipper with the end handle star (Polaris) of the Little Dipper, and point straight to Cassiopeia!

2. Cepheus: Mu Cephei, Herschel's Garnet Star, is a red supergiant about 100,000 times brighter and larger than the orbit of Jupiter. It's one of the largest stars visible with your naked eye, and because it's a pulsating variable, the magnitude fluctuates between 3 to 5. It's hidden behind a lot of dust, or it would be a lot brighter.

NGC 188 is a 5 billion year old open cluster 5,000 light years away about 4 degrees from Polaris, although it's still considered to be in the constellation of Cepheus. Discovered in 1831 by John Herschel, this one is particularly interesting because, unlike most open clusters that drift apart due to gravitational interaction, this one is one of the oldest open clusters ever discovered. It's further from the center of our galaxy than we are. This is mag 10, so it's going to be pretty dim in binoculars or a small telescope.

3. Cassiopeia: This is a constellation in the northern sky visible year round if you're north of 34°N latitude.

NGC 457, Owl Cluster, discovered in 1787, is an open cluster visible in binoculars at a mag of 6.4 about 7900 light years away. It has a number of super bright stars, including a red supergiant.

Eta Cassiopeia is a true binary star with period of about 480 years. Back in 1779, Herschel discovered using parallax measurements that it lies about 19 light years from the sun. In binoculars, you'll just see one star, and it's interesting to note that this is what our sun would look like at 19 light years distant. The two stars, yellow (mag 3.5) and a bright red dwarf star (mag 7.4) is separated by 13 arc seconds.

NGC 7789, open cluster discovered by Caroline Herschel in 1783. It's a mag 6.7, so you can see it in binoculars between sigma (σ) and rho (ρ) Cassiopeia. When you look at it, you'll see loops of stars and dark lanes that look like the top view of a rose's petals (image below).

M 52 is an open cluster about 4,600 light years away, and was discovered in 1774. M 52 is visible with binoculars (mag 5.0) about 35' from the Bubble Nebula (image right).

The southern half of this object is affected by gas and dust between us and this object, so it doesn't appear to be quite as bright.

4. Perseus is one of the original 48 constellations.

Algol, also known as the “Demon Star” or “Eye of Medusa”, is a multiple star system of three stars, where a third star orbits the binary pair, known as an eclipsing variable star system. It has a 69 hour cycle: for 59 hours, it will stay the same magnitude, and then take 5 hours to change from mag 2.1 to 3.4, and then 5 hours to go back up again.

This star system was the 2nd variable star ever discovered, and first eclipsing binary. It's 97 light years away.

In binoculars though, you'll only see one star. The two stars bigger stars are separated by about 20% of the Sun-Mercury distance (that's really close!). The orange star is 4 times brighter than our sun, and the blue is 100 times brighter than our sun. The orange star was initially more massive, and grew quickly and gave some of its mass to the blue one. The third star actually changes the spectrum of the system every couple of years.

The Double Cluster are naked eye objects (mag 3.7) made of open clusters NGC 869 & NGC 884 about 7,500 light years from Earth. Both clusters are relatively young, and surrounded by an extensive halo of stars. There are over 300 blue-white super giant stars in each of the clusters and 5 red supergiant stars (8th mag).

M 34 is an open cluster about 1630 light years away (image on previous page), binocular object (mag 5.2) discovered sometime before 1650, and contains about 400 stars. You will be able to see it naked eye with very dark skies.

5. Andromeda

The Andromeda Galaxy, M31, originally known as the Andromeda Nebula, is a barred spiral galaxy about 2.5 million light years from Earth. It's the nearest major galaxy to the Milky Way, and the furthest object that can be seen by naked eyes.

M 32 is a close satellite galaxy to M 31, and can be seen in binoculars under good conditions. M 110 is another close satellite galaxy to M 31, can be seen in binoculars under really good conditions.

Satellite galaxies orbit their own centers in addition to orbiting the main galaxy (Andromeda in this case). Our Milky Way has a number of satellite galaxies (the biggest is the Large Magellanic Cloud).

NGC 404, Mirach's Ghost, a galaxy very near to Beta Andromeda, easily seen in an 8" telescope (mag 11.7). It's known as the "Ghost" because NGC 404 is lost in the glare of the red giant star of Mirach. It's about 8 million light years distant.

In the image (right), this object is shown in visible light on the left and ultraviolet on the right using NASA's Galaxy Evolution Explorer, both views are identical in their field of view.

You can see the galaxy come to life (see the ring in blue?) which contains new stars, an amazing discovery for scientists!

Gamma Andromeda is seen as a bright gold-yellow star, and it's actually a quadruple star system 350 light years from Earth, and the third brightest light in Andromeda.

6. Pegasus:

M15 is a globular cluster in the constellation Pegasus discovered in 1746 and is one of the oldest known globular clusters, home to 100,000 stars. This is a binocular object (mag 6.2) that you will be able to see with binoculars (it will look like a fuzzy star). There's also a magnitude 6 star is just to the East of it forming a nice pair in binoculars.

Earth-orbiting satellites have detected to bright x-ray sources in M15, making it the first x-ray source detected in this constellation.

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

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)