Central Coast Astronomy Virtual Star Party

August 22nd 7pm Pacific

Welcome to our Virtual Star Gazing session! SUMMER is the time for warm, late nights sparkling with stars, planets and meteor showers! We are going to focus on objects you can see with binoculars or 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 three days after new, which is really good for star gazing!

Planets:

Aug 13 - Venus is at its best spot, which is as high as it ever gets above the horizon in the early morning.

Jupiter and Saturn continue to be amazing to watch together just after sunset in the south-eastern 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.)

Meteor Shower:

Perseid Meteor Shower on Aug 11, 12, and 13 is a favorite because it typically has between 40-50 meteors per hour on the peak nights. Even though people usually only look at meteor showers for a couple days, the meteor showers actually last for a couple of weeks, not days. You can see Perseids for 10 days after the peak (which is when the moon is going to be absent). The full range for this shower is July 17th – Aug 29th.

The Perseids meteors are the particles left behind by Comet Swift-Tuttle, a large 16-mile diameter comet (discovered in 1862) that takes 133 years to orbit the sun (it was last here in 1992). Chinese astronomers first recorded this meteor shower in 69 BC. It was *this* comet that Italian astronomer Giovanni Virginio Schiaparelli first discovered the link between meteor showers and comets.

Where to find these? You don't have to just look near Perseus and Cassiopeia- they are going to be all over the sky. And don't bother with a telescope. Instead, use your eyes and look up! More info here: https://earthsky.org/?p=165416

Main Focus for the Session:

1. Asterisms
2. Lyra: Vega, Double Double, Ring Nebula M 57
3. Cygnus: Deneb, Alberio, Veil Nebula, M 29, Northern Cross
4. Vulpecula Dumbbell Nebula M 27, the Coathanger/Brocchi's Cluster
5. Aquila: Altair, Fish hook of stars at the tail of the eagle
6. Scutum : M11

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).

The **Summer Triangle** is an asterism. Notice that asterisms include stars from different constellations: **Vega** from the constellation Lyra, **Deneb** from the constellation Cygnus, and **Altair** from the constellation Aquila all make up the Summer Triangle!

2. **Lyra** is a tiny constellation that has one of the brightest stars in the night sky (Vega). It also has a number of neat objects you can see with your eyes and also with binoculars!

The **Double Double** is a star that appears to be two stars through binoculars, and each of those stars also resolves into two stars through a telescope!

> δ**2 Lyr** is a double star with a separation of 86 seconds of arc, so it's a good test for your eyes to be able to see the separation with your binoculars.
>
> β **Lyr** is an eclipsing binary system where the stars are so close they become egg-shaped and material flows between them.
>
> An eclipsing binary is a star where the brightness varies periodically as one star passes in front of the other.

The **Ring Nebula M57**, found along the short side of the parallelogram, was the second planetary nebula discovered in 1779 by Charles Messier. The nebula disc is roughly 1 arc minute across, which is too small to see with 10 x 50 binoculars. You will need at least an 8 inch telescope to see the image in the lower left.

3. Cygnus the Swan

Cygnus has a double star right on its tail, **Deneb**, which is a pulsating variable star that is mag 1.2, the brightest star in Cygnus. It's also going to be the Earth's "Pole Star" in about 8,000 years (currently it's Polaris).

Double stars are more common than single stars! A binary system is one where there are two suns that orbit around a common center of mass and are also gravitationally bound to each other. Astronomers estimate about 85% of the stars are in binary systems, some with triple suns or more!

There are also visual doubles, which mean the stars look like they are orbiting each other, but they just happen to look like it – they are not orbiting each other.

Doubles can orbit a common center, or they can appear to be in the same group but it's an optical illusion, and you need to take data to figure it out. And even then, it's sometimes hard to tell!

Albireo will appear to your naked eye as one star, but when you use binoculars or a small telescope, you see two stars of very different colors. The brighter yellow (mag 3.2) is contrasted with the fainter blue companion (mag 5.4). They're separated by 35 seconds of arc.

<u>What is a second of arc?</u>

A full circle consists of 360 degrees. One degree can be divided into 60 minutes of arc – this is not the minutes of time on Earth, it's a distance measured along a curve. Each minute of arc contains 60 seconds of arc, so a second of arc is an angle that is 1/3,600 of a degree. When we stand on Earth and look at the sky, the full moon covers about one-half degree of arc, which is equal to 30 minutes of arc, or 1,800 seconds of arc.

A second of arc is a *tiny* angle. If you look at the head of a pin from the distance of the length of two football fields, the diameter of the pinhead would be 1 second of arc wide. Now 35 of those tiny pin heads is about how far these two stars are separated by.

With 7X or 10X binoculars, you should be able to see double star separations of 35" - 40" (seconds of arc) depending on their magnitudes.

Scientists are still not sure if Albireo is a true binary star system, meaning that the stars aren't just appearing to be next to each other, they really do orbit around a common point. The stars are about 430 light years from us, so it is hard to tell. Astronomers are measuring the velocities of the stars to be able to tell the path that each star is on.

The **Veil Nebula** is a supernova remnant of hot gas and dust cloud in Cygnus, just above the right wing. A star, 20 times the mass of our sun, exploded over 10,000 years ago and scattered particles that you can observe in an area of the sky about 6 times the diameter of the full moon.

If you scoot along the wing toward the body of Cygnus, you'll find **M29**, an open cluster ("Cooling Tower" or "Little Sisters"), mag 6.6. that isn't as bright as it could be, because there's so much dust in the way between us and M29.

The wings and body of Cygnus are also known as the asterism "The Northern Cross".

4. **Vulpecula** is Latin for "little fox", and is one of the 88 constellations. It's a tiny line between two faint stars, so it's not an easy one to find.

The **Dumbbell Nebula M27** was the very first planetary nebula discovered in 1764 by Charles Messier. You'll find it in the constellation Vulpecula, mag 6.35, spanning 8 arc minutes, making it a good target for binoculars. Calculations by astronomers have shown that the size of this central white dwarf is larger than most other known white dwarf stars.

The **"Coat Hanger"** (or **"Brocchi's Cluster"**) is a bright group of stars on the border between the constellations Vulpecula and Sagitta. Since the group of stars look like a coat hanger, it's an asterism that star gazers named and enjoy finding with their naked eyes as well as with binoculars.

5. **Aquila** is a constellation, and is Latin for "eagle". The brightest star is **Altair**, one of the three stars of the Summer Triangle. Can you see the **fish hook** of stars at the tail of the eagle?

NGC 6781 (below) is a dim planetary nebula ("Snowball Nebula"), mag 6.7.

V Aquila is a carbon star and a variable star which has a nice reddish color when at minimum. It is located near the second brightest star (12 Aquila) in the fish hook.

There is a curve of three faint stars above 12 Aquila going to the East which points to V Aquila. You can see V Aquila as a red star in your 8X50 finder scope (and also in binoculars) along with the three stars pointing to it.

Alpha Aquila, Altair, is an interesting star. It is spinning so fast that it is over 25% wider at the equator than at the poles. If you could double its spin rate it would come apart!

6. The **Wild Duck Cluster, M11** is an open cluster of stars in the constellation **Scutum** about 6,000 light years away, first discovered in 1681. The triangle of stars resembles a flying flock of ducks is just next to the fish hook, mag. 6.3.

Open clusters are one of the two types of star clusters (the other is **globular**). They are usually found within the galactic plane and nearly always found within the spiral arms of galaxies. They have a few hundred stars and aren't very populated, kind of like living in the country instead of the city. The fuzzy blue stuff (nebulosity) is gas and dust that can sometimes be seen, depending on the "seeing conditions" and age of the stars.

**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)