## June Skies over the Pinnacles

June 2022

## June's Four Principal Phases of the Moon

June 7	First Quarter	
June 14	Full Moon	
June 21	Last Quarter	
June 29	New Moon	



Before I get into this month's topic I thought I'd show you some of what we saw in the early morning of May 16 as the Moon emerged from the shadow of the Earth. Image #1 was made at about 12:45AM and the last at about 1:50AM. Look carefully at images 6, and 7 and you see a star on the lower right of the eclipsed side as the Moon goes about its orbit around the Earth. You can clearly see the curve of Earth's shadow as the Moon emerges back out into sunlight. Clouds intervened towards the end of the eclipse.

Ever wonder how this would have looked if you were on the Moon and looking up at the Earth?



# Sunday? Sun Day?

Sundael



### On June 5 we plan a different sort of "star party". The star we will be learning about is our Sun!

Our Sun, like all stars, exists because of a tension between two forces. The first is all that energy that it produces by combining simpler elements, like hydrogen into heavier elements, like helium. This is called **fusion** and it 'wants' to blow the star apart. You've noticed that the sun hasn't blown up. That's because of gravity. So, the physical size of our spherical Sun, 864,000 miles, is determined by the balance of outward pressure (fusion) and inward pressure (gravity).



The body of the Sun consists of an inner core, where the hard work of fusion takes place. Surrounding the core is the radiation zone where energy produced in the core tries to get out. It can take many thousands of years for photons, the little packets of light produced by fusion, to make it from here to the convection zone. It is here that super hot solar plasma moves away from the radiation zone and back down again.

# Magnetic Lines of the Sun



Solar Minimum



Unlike the Earth, the Sun isn't a solid body. But, like the Earth, it has a magnetic field, represented by the neat green lines on the left and the squiggly green lines on the right. Over a cycle that lasts 11 years, the Sun's magnetic field goes from neat and boring (left) to wild and crazy (right). That's because not all parts of the Sun rotate at the same rate like the solid Earth does. Some lines punch in and out of the Sun's surface, causing **sunspots** and things like flaming prominences.



The sun is entering one of those wild ane crazy parts of its 11-year cycle. When one of these squiggly magnetic lines breaks through the Sun it often carries with it some of the super hot plasma. If the magnetic line twists completely around it can cause a short-circuit between the negative and the positive ends and we get a sort of explosion, called a **Coronal Mass Ejection** or **CME** of solar plasma blown into space.

Now, if the **CME** fires off in the direction of Earth we can have all sorts of fun! In just a few days, a load of hot, magnetic particles from the sun can reach Earth. This puts pressure on Earth's stable magnetic field and some of these magnetic particles ride down on our magnetic field near the Earth's north and south poles.





The beautiful northern Aurora Borealis and southern Aurora Australis are seen when these charged particles are brought close to the Earth, at north and south magnetic poles. They then collide with elements in our atmosphere. When this happens, electrons of the atoms in our atmosphere are 'bumped' up to a higher orbit and then fall back into place. When the electrons resume their place, one photon is released. That's the light we see!





Having all this extra magnetism washing over the earth's magnetic field can produce extra electricity across our electrical and communications grids and wreak havoc, including power outages and loss of cell phone service.



I never talk about observing the sun without sounding this warning. Never look in the direction of the sun unless you look through an approved filter or have specialized equipment. The ONLY exception to this rule is viewing a total solar eclipse, when the entire disk of the sun is covered by the Moon.



I took this picture of the eclipsed Sun during the great eclipse of 2017. Here you see the Sun's faint outer atmosphere, called the **corona.** It's perfectly safe to look now. In fact the **corona** is only about as bright as the full Moon.



There are three safe ways of viewing the sun's image that don't cause a dangerous amount of light and heat. The first, shown below, uses a shoebox with a very small hole poked in one end. The pinhole end of the box is pointed at the sun and a little image of the sun is projected inside the box at the opposite end.



Second, shown on the left, uses a special reflective filter over the front of a telescope before pointing it at the Sun. In this picture, an aluminized mylar filter reflects 99.99% of the Sun's light and heat away before it gets to the telescope.

The third method, shown below, uses a **heliostat**. A small version is made using a flat mirror and a projection lens. A large image of the Sun is projected about 60 feet away. At left, you see the soccer-ball size image of the Sun on the garage door.



We'll be viewing the Sun on June 5 using these methods.





#### Attractions in June



Just as it is getting dark, look to the west and find the thin crescent Moon forming a neat triangle with the Gemini stars, Castor and Pollux in the north western sky.



#### June 4

In case you're up before dawn, check out five planets, all in a almost straight line stretching from east to south.



June 5

*Sunday, Sun Day, Sundae!* Join us at the Forestry Outreach Center to enjoy a short presentation about the Sun, a Zoom presentation with an amateur solar astronomer in Florida (The Sunshine State) and live, safe, viewing of the sun with specialized instruments, starting at 2PM!



This evening, catch the thickening crescent Moon close to the familiar mane of the constellation Leo, just a hand's width from Leo's brightest star, Regulus.





Summer Solstice! This is the northern hemisphere's longest day of the year. To be exact, this happens at 5:14 EDT. Now summer begins and the daylight period shortens until December 21.





The thinnest crescent of the Moon, just one day before new, can be seen just a few fingers from the planet Mercury in a unique predawn show.

