





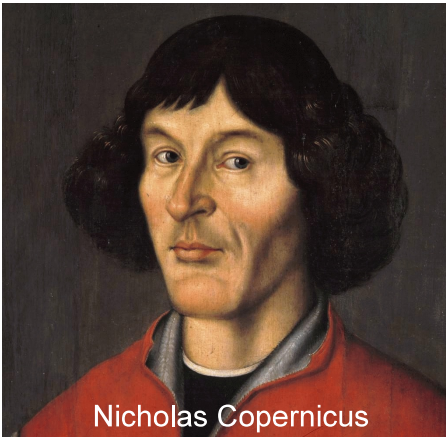
November Skies over the Pinnacles

November 2022

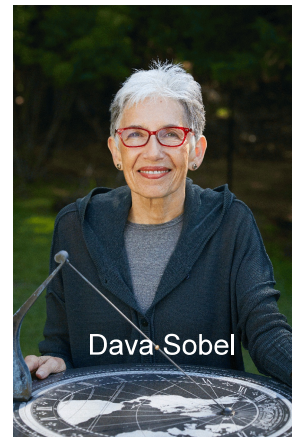
November's Four Principal Phases of the Moon

November 1	First Quarter	
November 8	Full Moon	
November 16	Last Quarter	
November 23	New Moon	

Science belongs to all of us.



Nicholas Copernicus



Dava Sobel

Lately, I've been reading author, Dava Sobel's book about Nicolas Copernicus' struggles in publishing his important and dangerous 'alternative' description of the true nature of the universe. Sobel's book is called, **A More Perfect Heaven**. Copernicus was an ordained official of the Catholic Church at the time of the Protestant Reformation. Astronomy was an important pursuit but most of the time Copernicus dealt with minor legal matters in his district in Poland. His most important book, called *Dē revolutionibus orbium coelestium* (**On the Revolutions of the Celestial Spheres**) was published in 1543 when he was near death. At his time, and later, most people held the belief that everything in the universe revolved around the Earth. Both the Catholic and new Protestant churches enforced this **geocentric**, or 'Earth-Centered' belief. Copernicus stated his new theory that said that the universe didn't revolve around the earth but that it revolved around the Sun and the Earth was just one of six planets that revolved around the Sun. The present-day 'solar system' was thought to include all space and only 6 planets were known in his time. This new theory was known as the **heliocentric**, or 'Sun-centered' system.

Publication of **On the Revolutions of the Celestial Spheres** happened 30 years after Copernicus first thought of it because he was afraid of how people would react to his heliocentric theory, especially since he was a Catholic church official.

In 1539, Georg Joachim Rheticus, a Protestant mathematics professor met Copernicus and later convinced him to publish **On the Revolutions of the Celestial Spheres**. After Rheticus managed to get the book published, he was enraged to find that the printer had inserted the following sentences into the book's introduction.

And if any causes are devised by the imagination, as indeed very many are, they are not put forward to convince anyone that they are true.

In other words, the printer, without any knowledge of astronomy, decided to cast doubt that Copernicus work, created out of years of observations and calculations. It represented a real attempt to show the universe as it really is. Rheticus spent most of the rest of his life trying to get this “disclaimer” removed.

In 1980, astronomer and educator, Carl Sagan, presented a multi-part television series called “Cosmos, A personal Voyage” on the Public Broadcasting System (PBS). This series and its companion book convinced thousands to pursue astronomy as a hobby or as a profession. To this day, it is still being broadcast continuously somewhere on our planet.



In 2014, astronomer and Director of the Hayden Planetarium, Neil deGrasse Tyson, launched an updated television series called “Cosmos, A Spacetime Odyssey” on the FOX network.



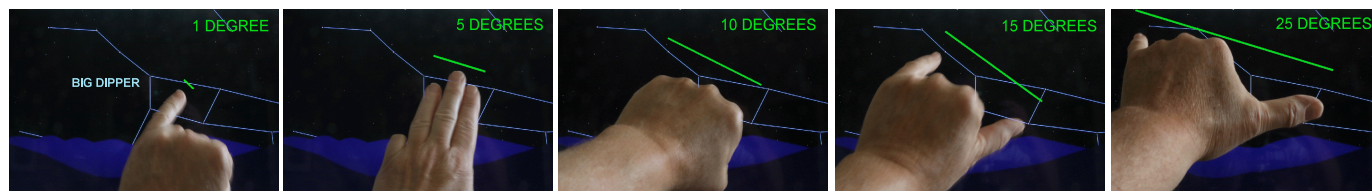
As you may know, the management of the FOX network is skeptical of science and the scientific method. Despite this, Dr. Tyson stressed the methods of science as a central tenant of his newer series. Still, the FOX network felt the need to end each episode that, to me, is a modern-day version of the one used as part of the introduction of **On the Revolutions of the Celestial Spheres**. Below is FOX’s disclaimer.

The views expressed in the
interviews and commentary are
solely those of the individuals
providing them and do not reflect
the opinions of Twentieth Century
Fox Film Corporation, its
affiliates or employees.

History may not repeat but, as Mark Twain observed, “it does rhyme”.

Attractions in November

Astronomers use a measuring scale of **angular distance** to show the apparent distance that separates two objects in the sky. A trip all the way around the sky would take 360 degrees. Here's a handy guide to estimate **angular distance** that you can use when you're out under the stars.



When you hold your hand all the way out and hold three fingers out, like the scout's salute, your fingers create an **angular distance** of 5 degrees, about the width of the bowl of the Big Dipper. When I talk about the distance between, say, the Moon and Saturn, I'll say that they are separated by so many degrees.

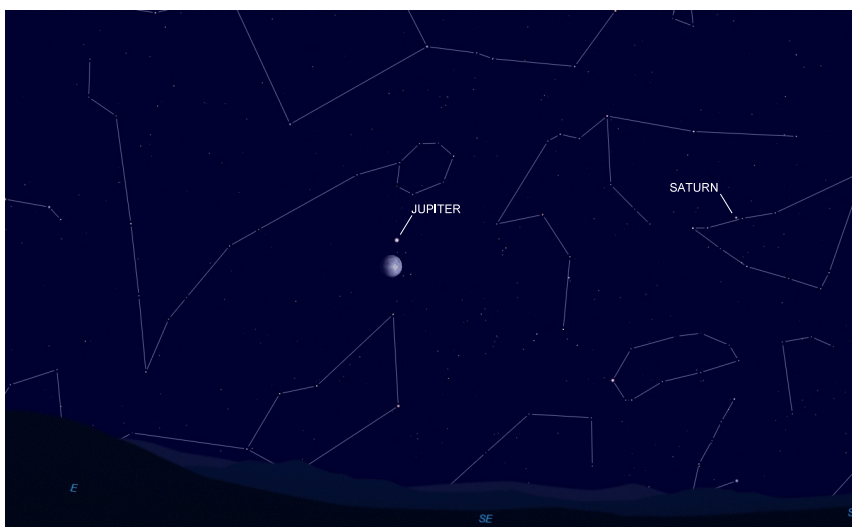
November 1

Head about around 7:30 PM and check out the planet Saturn just about 4 degrees above the first quarter Moon.



November 4

Now go out around 7:30 PM to see Jupiter about 3 degrees above the Gibbous Moon in the southeast.



November 6

Hooray!



November 8

More time for evening stargazing!

Here's a "Double-Bill" event for you! First, set your alarm to rise before the sun and look for the setting Moon wearing an umber veil. Moonset is at around 6:15 AM. The moon will be fully eclipsed by the earth's shadow for the last total lunar eclipse visible to us until March 14, 2025! Check out the November issue of *Sky & Telescope* Magazine (p. 34) for a nice explanation of lunar eclipses.

Grab an early dinner and meet us at Brushy Fork at 6 PM for a guided evening walk along Brushy Fork Creek to look for some elusive glowing night creatures. At the end of our night stroll we'll break out into a meadow to catch the rising Full Moon in the East. I'll bring a small telescope and we'll learn some interesting facts about our nearest celestial neighbor. Dress for a chilly hike.

November 12

Before the Moon rises around 9PM, check out the planet, Mars, rising in the east just between the 'horns' of Taurus the Bull. This is a good time to compare the color of red Mars and the brightest star in Taurus, Aldebaran.



November 18

This (early) morning is the best time to catch the annual Leonid meteor shower. If you keep careful track of how "shooting stars" appear, you might notice the periods of more than usual meteors streaking across the sky. That's because this year the Earth will plow through the debris left by this shower's parent comet, 55P/Temple-Tuttle, on three separate trips through the inner solar system in the years 1600, 1733 and 1800.

November 24

Happy Thanksgiving!



November 28

Look to the southern evening sky to catch a repeat pairing of Saturn and the Moon, almost what you saw on November 1. What does this tell you about the number of days it takes the Moon to orbit the Earth? This time the pair are separated by about 6 degrees.