

# SANDRA F. PRITCHARD MATHER PLANETARIUM NEWS

## 2022-2023 Season

*The Mather Planetarium at West Chester University*



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*"Now, my suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose."*

*- J. B. S. Haldane*

Greetings! I hope everyone is enjoying these last few weeks before school starts up. Even though our doors have been closed, we've been busy at the Mather Planetarium this summer. Our new projector was installed and our staff have been hard at work learning the new operating system. Some of us are, well, older and new computer stuff just doesn't come as easily as it used to. We've added more movie shows to our calendar this fall so check out the line-up on our webpage. As always, we look forward to seeing you under the dome!

## Live Shows for the 2022-2023 Season

**September 9, 2022** - JWST: The First Images

**January 27, 2022** - Jupiter: King of the Planets

**October 21, 2022** - Spectacular Saturn

**February 24, 2022** - Black Holes Don't Suck

**November 11, 2022** - Dethroning the Earth

**March 31, 2022** - Our Amazing Sun

**December 9, 2022** - Once in a Blue Moon

**April 28, 2022** - Twinkle, Twinkle Little Star

In addition to the above live shows, we offer pre-recorded movies.  
Check our website for dates and titles of movie shows.

## Faces and Phases

### New Faces:

Some of you may have already noticed a couple of new faces at the Mather Planetarium but I wanted to officially introduce them. Starting this past spring, Erin Shaughnessy and Hunter Mills have been running the movie shows at the Mather Planetarium. Erin and Hunter are both computer science majors here at WCU; Erin is a senior this year while Hunter is in the accelerated master's program.



Erin and Hunter will be giving short sky tours before each of our movie shows this fall. These are great shows for the whole family. Come and visit them!

### Lunar Phases:

Most elementary school students learn the names for the various shapes of the Moon - the lunar phases. And at some point in middle school the cause of the lunar phases is taught. But many adults incorrectly attribute the phases of the Moon to the Earth's shadow. Let's take a closer look at what really creates the different shapes of the Moon.

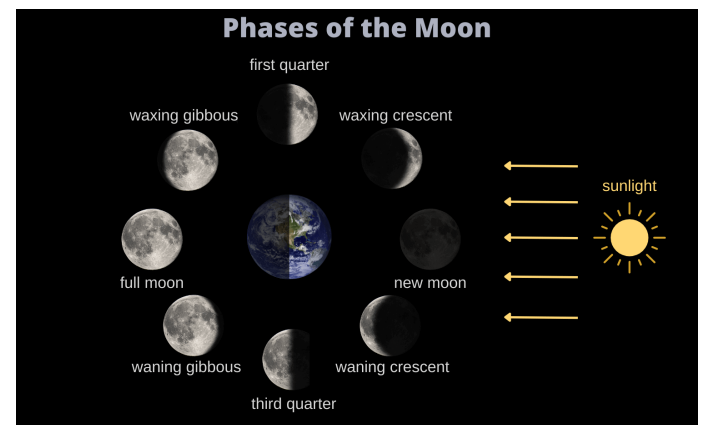
**Moonlight:** The first thing we need to understand is that the Moon doesn't make any visible light of its own. The light we see on the Moon is simply reflected sunlight. If the Sun were to shut off then we wouldn't be able to see the Moon at all, even though it would still be there.

**3-D:** Next, we need to remember that the Moon isn't just a circle, it's a sphere. It's a 3-dimensional object which means it will look different than a flat circle when light shines on it.

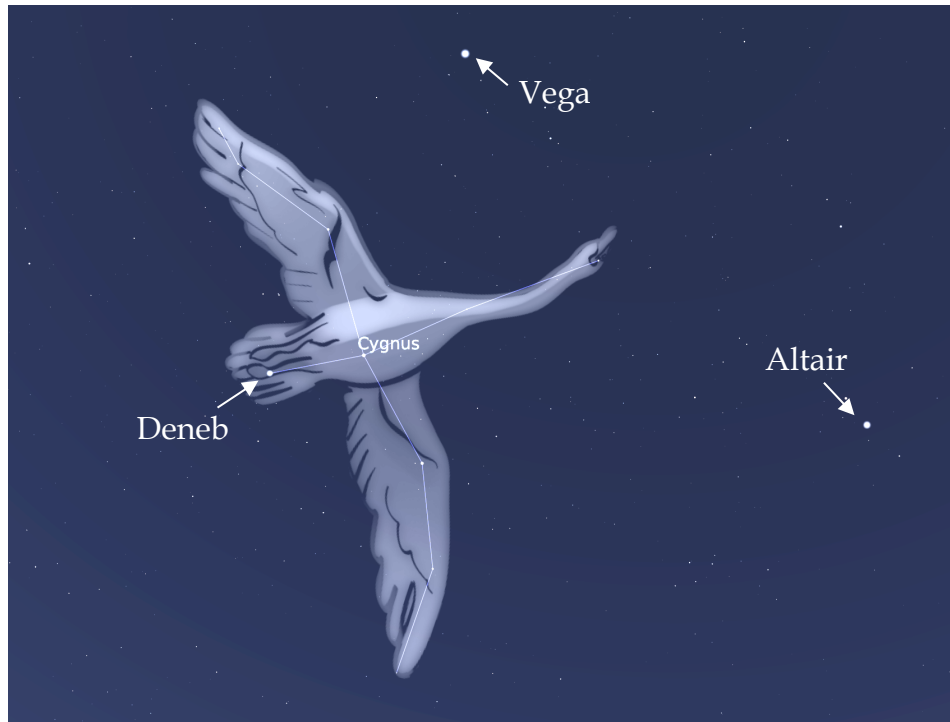
**Orbit:** The last piece of information that we need to consider is that the Moon orbits the Earth. It takes roughly 28 days for the Moon to make one orbit.

If we combine all these things, we find that the phases of the Moon don't require the Earth's shadow at all. As the Moon moves around the Earth, the Sun will shine on half of it - the half facing the Sun. Sometimes that's the same side that the Earth sees but sometimes it's not. During a full Moon, the side of the Moon that is facing the Sun is the same side that's facing the Earth, so we see it all lit up. However, during a new Moon the side of the Moon that is facing the Sun is opposite the side that faces the Earth, so we see a dark Moon. We can think of the light and dark sides of the Moon as just the daytime and nighttime sides, just like on the Earth. And just like on Earth, the part of the Moon that is experiencing daytime is always changing.

If the Earth's shadow were the cause of the lunar phases, then we'd never see a gibbous-shaped Moon since the Earth's circular shadow wouldn't be able to produce that shape. Also, the full Moon would need to be up in the daytime sky while the new Moon would only be up at night, which is exactly backwards from what we observe.



The only time the Earth's shadow plays any role in how the Moon appears is during a lunar eclipse. In this case, the Earth's shadow falls on what would normally be a full Moon. It only lasts for a few hours as the Moon continues in its orbit and moves out of the Earth's shadow. The regular lunar phases are just the day-night cycle on the Moon!



## Looking Up: Cygnus

Cygnus is one of my favorite constellations. It's easy to see from the Northern hemisphere, being high in the sky away from buildings and lights. It doesn't take too much imagination to see it as a swan, as the Greeks did. And it has a nice bright star - Deneb, Arabic for "tail" - to help you find it. Deneb is one corner of the Summer Triangle, with Cygnus flying through the middle.

There are many stories in Greek mythology involving people being turned into swans. One story involves Helios, the sun god, who rode across the sky in his chariot. One day his mortal son, Phaethon, wanted to try driving the chariot. Against his better judgement, Helios allowed it but Phaethon couldn't control the chariot and Zeus was forced to strike down the chariot and the boy with a lightning bolt to keep him from scorching the Earth. The boy and chariot plummeted into the river Eridanus. Phaethon's friend, Cygnus, was distraught by his death and spent days diving into the river to collect all of Phaethon's bones to give him a proper burial. The gods were so moved by Cygnus' devotion that they transformed him into a swan and placed him in the sky.

There are a couple of interesting objects hiding in Cygnus. First, there's a beautiful double star named

Albireo. You can see it with the unaided eye in a dark sky; it's the star in the middle of the swan's neck. It won't look very impressive until you take a peek with a telescope. Then you'll see that it's not actually a single star but rather two! One star is bright blue while the other is gold. The different colors indicate that these two stars are different temperatures. Such a gorgeous pair!

Another object that's lurking in Cygnus is Cyg X-1, a black hole! First discovered in 1964, it is one of the strongest x-ray sources in the sky as seen from Earth. Cyg X-1 is a binary system comprised of blue supergiant star and a black hole. The mass of the black hole is estimated to be just over 20 times the mass of the Sun. As the two objects orbit a common point, material from the supergiant's stellar wind is swallowed by the black hole, giving rise to the X-rays that astronomers observe. There's no need to worry about this black hole causing problems for us. It's far away and actually on the small side, considering that we have a super-massive black hole at the center of our galaxy that's 4 million times the mass of the Sun!