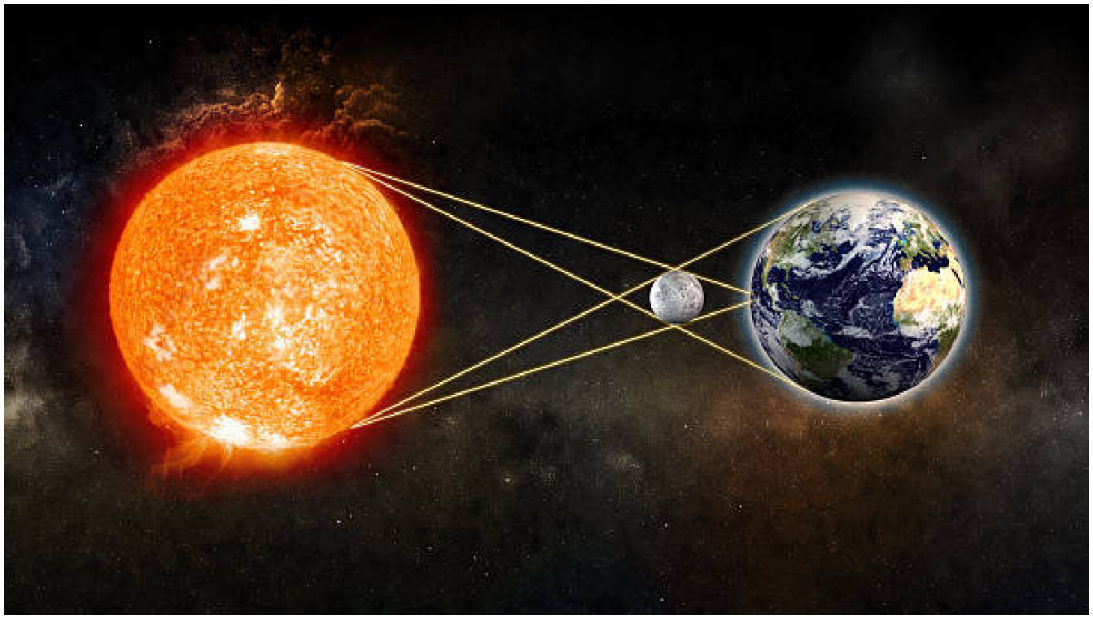
HOW DO ECLIPSES OCCUR …….

Earth, our home planet, is locked in an elliptical path around the sun. This elliptical path is known as the orbit of our planet. Earth travels around the sun along that orbit and completes one revolution in approximately 365 days and 6 hours. This is roughly the length of one year.

Just as Earth moves around the sun in an elliptical orbit every year, our natural satellite the moon also revolves around the Earth. It takes about 27.322 days for the moon to complete one revolution around our planet. So, Earth revolves around the sun, and the moon revolves around Earth.

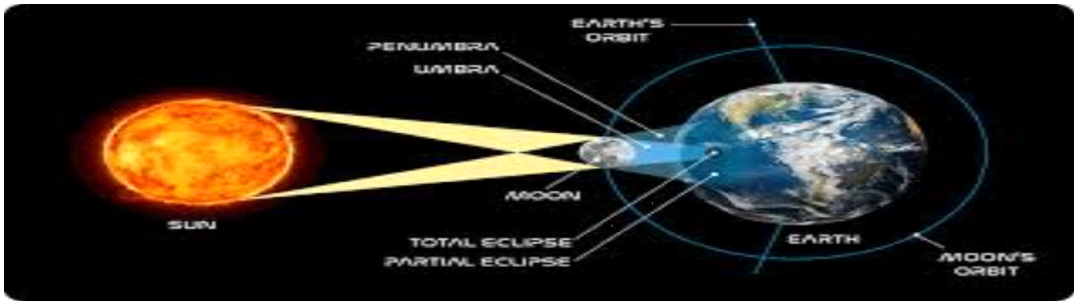
SOLAR ECLIPSE

Due to all the interrelated motion happening between these three celestial bodies, several physical phenomena occur. When the new moon, during its revolution around the Earth, moves between the sun and the Earth, it blocks out the sun's rays, which casts a shadow on parts of the planet. This is called an eclipse of the sun or a **solar eclipse**. In other words, a solar eclipse happens when the moon passes in a direct line between the sun and the Earth.



The moon is infinitesimally small compared to the sun, so why is it ever able to cover part of or sometimes even the entire sun? Although the moon is indeed about 400 times smaller than the sun, it also happens to be around 400 times closer to us than the sun. This is why both the moon and the sun appear to be the same size in our sky.

The moon is very small compared to the sun and to Earth, which is why the moon's shadow isn't big enough to engulf our entire planet. Therefore, the moon's shadow is always limited to a certain area. This area changes even during an eclipse, as both the celestial bodies are in constant motion with respect to one another.

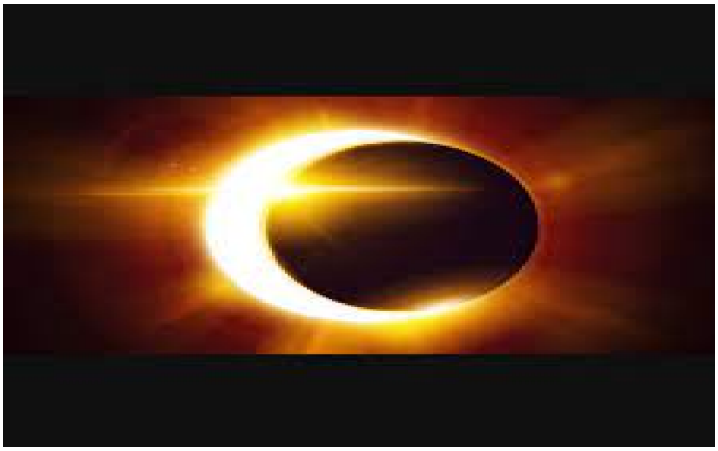


When the moon eclipses the sun, it casts two types of shadows on Earth: the first is **the umbra** which is a small and very dark shadow. If you're in a place on Earth where the umbra is cast, the entire central portion of the sun will be blocked out from your perspective. The second type of shadow is known as the **penumbra** ; it is a larger and relatively lighter shadow than the umbra. If the penumbra passes over you, then only a small part of the sun will be blocked out from your point of view.

Depending on the type of shadow the moon casts on Earth, solar eclipses are broadly classified into four types:

The first is a **Total solar eclipse**. This is the most spectacular of all eclipses because, during a total solar eclipse, the entire sun is completely blocked out by the moon. This can only happen when the moon is near perigee, the point of the moon's orbit when it is closest to the Earth. It can only be seen within the umbral shadow, known

as the path of totality.



Next up is **a partial solar eclipse**. This type of eclipse is observed when the moon covers only a part of the sun and casts a penumbra on Earth. Since it only covers a part of the sun, this phenomenon is known as a partial solar eclipse.People outside the path of totality see only a partial eclipse, where the moon passes in front of the sun off center, never fully covering its surface

When the moon passes through the center of the sun, but it's disk isn't big enough to cover the entire disk of the sun, then an **annular solar eclipse** occurs. When this happens, the sun's outer edges remain visible, making it look like a shiny, fiery ring in the sky. Unlike a total eclipse, during an annular eclipse, the moon doesn't completely block out the sun.

The fourth type of eclipse is the rarest of all; when the moon's position between the sun and the Earth is so delicately balanced that Earth's curvature plays a role, we call it **a hybrid solar eclipse**. During this type of eclipse, some parts of the Earth witness an annular solar eclipse, while other parts see a total solar eclipse. For that reason, this type of eclipse is also known as an annular total solar eclipse.

Types of Shadows

When the moon does eclipse the sun, it casts two types of shadows on Earth. The smaller, darker shadow is known as the umbra, and the larger shadow is known as the penumbra.

Use certified eclipse-watching glasses that are shaded thousands of times darker than typical sunglasses.

Make a pinhole viewer by poking a small hole in a piece of cardboard and projecting the sun's image onto a flat surface.

Phenomena During a Total Eclipse

Just before the moon completely covers the sun, low-lying valleys on the moon's edge will be the only spots that sunlight continues to pass through. These remaining brilliant shafts of light are known as Baily's beads. As the moon completely covers the sun's surface, a single bead of light remains, known as the diamond ring, signaling the onset of totality.

Enjoying Totality

During totality, none of the sun's rays reach your eyes, so it's safe to take off your eclipse glasses. However, remember to put them back on before any sunlight starts to peek through again, as even a few seconds of exposure can cause serious damage.

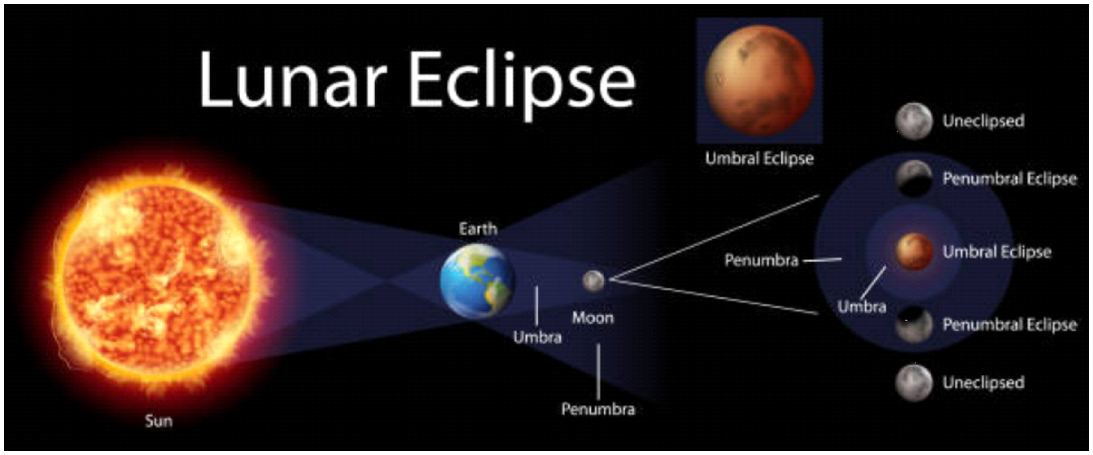
Effects on Animals and Plants

Animals and plants have been known to alter their behavior during a total eclipse. Songbirds may stop singing, crickets may start chirping, and flowers might even start to close up.

The Future of Solar Eclipses

The moon moves about one and a half inches away from Earth each year. It's estimated that in about a billion years, the moon will be too far away from Earth to completely cover the sun.

LUNAR ECLIPSE



Since the moon continuously revolves around the Earth, it's only natural that it sometimes comes between the sun and the Earth, while at other times it goes behind

the Earth, so that the Earth comes between the moon and the sun. This is a lunar eclipse. The moon completes one revolution around our planet in approximately 27 days and rotates at the same rate as it revolves around the Earth; however, since the Earth rotates on its axis and also moves in its own orbit around the sun, from our perspective, the moon appears to orbit us every 29 days.

Earth casts two types of shadows on the moon - **umbra and penumbra** - when it is oriented between the sun and the moon.

Lunar eclipses can be divided into three types,

The first being **a total lunar eclipse**. The most picturesque and dramatic of all, a total lunar eclipse happens when the moon, Earth, and the sun are perfectly aligned so that the moon falls under the umbral shadow of our planet. During a total eclipse, Earth completely blocks any sunlight from reaching the moon. Due to this, the moon loses its characteristic whitish-gray color and becomes a "sunset red". This happens due to refraction from the Earth's atmosphere. The shorter, blue wavelengths of sunlight are scattered outward by the atmosphere, while the longer red wavelengths are refracted inward toward the moon, giving it a reddish tinge during a total lunar eclipse.

Next is **a partial lunar eclipse**, which happens when the moon, Earth, and sun align in such a way that only part of the moon passes through the umbral shadow cast by the Earth.

During a partial eclipse, you can see Earth's shadow covering a small part of the moon's surface. Then there's a **penumbral lunar eclipse**. As the name suggests, you can see this type of eclipse when the moon passes through Earth's penumbral shadow. This celestial event is so subtle that many of us don't even notice it visually, as the moon appears only slightly darker than its usual hue.

You can watch a lunar eclipse if you're on the nighttime side of Earth, and for those who were wondering, it's safe to watch a lunar eclipse with the naked eye. In contrast, it's highly dangerous to watch a solar eclipse with the naked eye. Observing a solar eclipse without appropriate precautions can potentially cause permanent eye injuries. The light from the sun that reaches the Earth consists of a broad range of radiation, from ultraviolet radiation at wavelengths longer than 290 nanometers all the way to radio waves existing in the meter range. The tissues in our eyes transmit a considerable portion of this radiation to the back of the eye - the light-sensitive retina. This can result in damage.When observing a solar or lunar eclipse, it is important to protect your eyes by wearing appropriate eye gear. These celestial events have the power to unite people and bring millions of stargazers out into the streets every year. In the past, such events were feared and considered bad omens, but humanity has made significant progress in understanding the forces of nature.

Why Aren't There Eclipses Every Month?

There is not an eclipse every month because the moon's orbit is usually tilted a few degrees north or south in relation to the Earth.

A lunar eclipse occurs when the earth blocks some or all of the sun's direct light from reaching the moon. This cosmic event only takes place during a full moon, which happens once every 29 and a half days, or the length of one full orbit of the moon around the earth. However, the moon's orbit is tilted a few degrees in relation to the earth, so the earth, moon, and sun don't always align perfectly, resulting in not having an eclipse every month.

Types of Shadows

When the earth does eclipse the sun, it casts two types of shadows on the moon. The larger shadow is known as the penumbra, and the smaller, darker shadow is known as the umbra.

Observing Lunar Eclipses

Lunar eclipses occur up to three times a year and can be observed from the entire nighttime half of the earth. Unlike during a solar eclipse, it is safe to look at the moon with the naked eye during a lunar eclipse.

It is only because of the distances of the sun and moon from the earth that we are able to witness total lunar eclipses. However, billions of years from now, as the moon moves away from the earth, it will be too far away to fall completely within earth's umbral shadow.

Until then, we can occasionally enjoy seeing our own planet's shadow cast upon the largest object in the night sky.

Myths and stories about Eclipses……..

*As per Hindu mythology ,the sun and the moon from time to time,are seized and swallowed by a demon named Rahu and his detached body known as Keth.This is because solar and lunar eclipses occur.

*Other beliefs include that a lunar eclipse, as per ancient Aztecs ,occurs as a result of the moon being cut.In parts of Mexico,beliefs say that if a pregnant woman sees an eclipse, it would result in her unborn child's face being cut off in a piece.

*The ancient people were unaware of the scientific reasons for eclipses and generally believed that it was the punishment or wrath of God's over them.

*It is used to be a scary event with the disappearance of the sun's light.It was also believed that a dragon tris to swallow the moon which is why drums were played on solar eclipses to make the dragon run away and prevent solar eclipses.

*In China, people believed that a fire dog tried to swallow the sun from heaven which resulted in eclipses.

*In Benin,belief says that an eclipse occurs when there was a fight between the Sun and the Moon .To reconcile the Sun and the Moon, people used to solve their persistent issues with each other.

*People of North-West coast America believed that the Sun and the Moon were lovers and During Eclipses, they secretly loved each other.

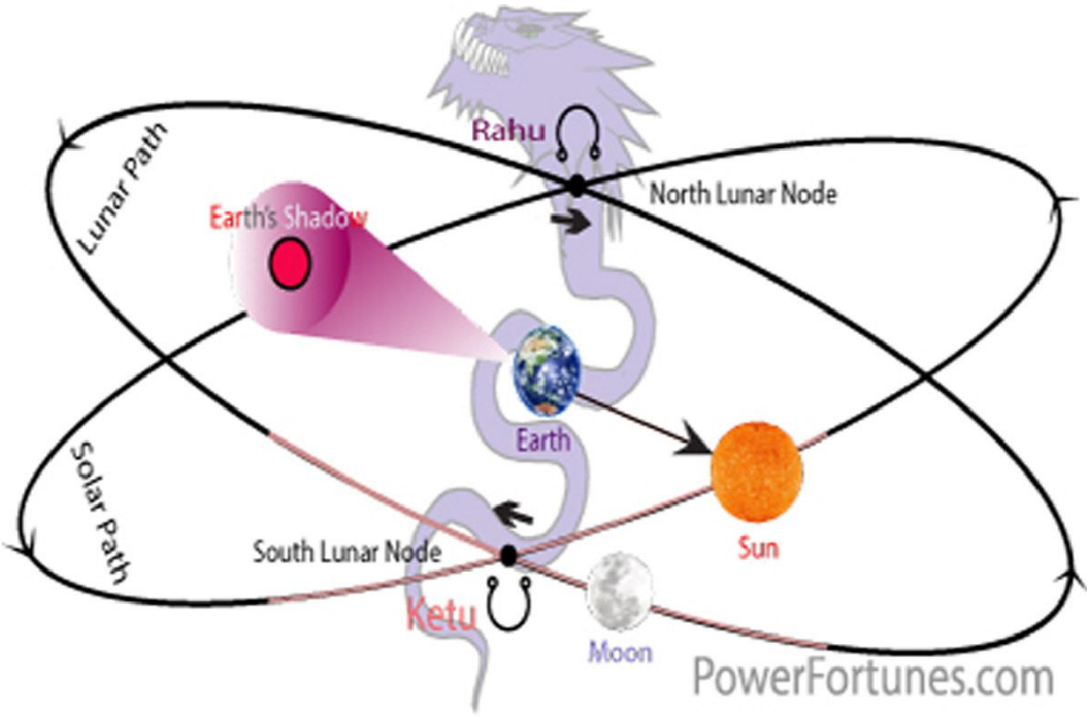
Without a scientific explanation, the darkening of the Sun (or Moon) during an eclipse would be a startling event, to say the least. Throughout history, eclipses have been seen as a disruption of the natural order, and many groups have believed them to be bad omens. Many ancient (and not so ancient) peoples had spiritual explanations for solar and lunar eclipses to help them make sense of these seemingly inexplicable and random phenomena. Read on to learn some of these theories from around the world.

Chinese

In ancient China it was commonly held that solar eclipses occurred when a celestial

dragon attacked and devoured the Sun. Chinese eclipse records are some of the oldest in the world and go back more than 4,000 years; at least one simply states "the Sun has been eaten."They also believed that the same dragon attacks the Moon during lunar eclipses. It was a tradition in ancient China to bang drums and pots and make loud noise during eclipses to frighten that dragon away. Evenmore recently, in the nineteenth century, the Chinese navy fired its cannons during a lunar eclipse to scare the dragon that was eating Moon. To frighten away the dragon and save the Sun, people would bang drums and make loud noises during an eclipse. Since the Sun always returned after this ruckus-making, it is easy to see how the tradition was perpetuated. Interestingly, it seems the ancient Chinese were not particularly bothered by lunar eclipses, and one text from about 90 BCE dismisses them as "a common matter."

Indian



Ancient Hindu mythology provides a rather graphic and disturbing explanation for solar eclipses. According to legend, a cunning demon named Rahu sought to drink the nectar of the gods and thus attain immortality. Disguised as a woman, Rahu attempted to attend a banquet of the gods and was discovered by Vishnu. As punishment, the demon was promptly beheaded, and it is his decapitated head flying across the sky that darkens the Sun during an eclipse. Some versions say that Rahu was actually able to steal a sip of the nectar but was beheaded before the elixir

reached the rest of his body. His immortal head, in perpetual pursuit of the Sun, sometimes catches and swallows it, but the Sun quickly reappears, as Rahu has no throat.

Incan

The Inca of South America worshiped Inti, the all-powerful sun god. Inti was generally believed to be benevolent, but solar eclipses were understood to be a sign of his wrath and displeasure. Following an eclipse, spiritual leaders would attempt to divine the source of his anger and determine which sacrifices should be offered. Although the Inca rarely practiced human sacrifice, it is thought that an eclipse was occasionally deemed serious enough to do so. Fasting was also common, and the emperor would often withdraw from public duties during and following an eclipse.

Native American

According to Choctaw legend, a mischievous black squirrel gnawing on the Sun is the cause of eclipses. Like the Chinese dragon, the squirrel must be frightened away by the clamor and yells of the event's human witnesses. Ojibwa and Cree peoples have a story that a boy (or sometimes dwarf) named Tcikabis sought revenge on the Sun for burning him. Despite the protestations of his sister, he caught the Sun in a snare, causing an eclipse. Various animals tried to release the Sun from the trap, but only the lowly mouse could chew through the ropes and set the Sun back on its path.

West African

The Batammaliba are an ancient people of northern Togo and Benin. According to their legend, human anger and fighting spread to the Sun and the Moon, who began to fight with each other and caused an eclipse. The legendary first mothers, Puka Puka and Kuiyecoke, urged the villagers to demonstrate peace to the Sun and Moon to convince them to stop their brawl. During an eclipse, Batammaliba people make amends for old feuds and peacefully come together to encourage peace between the celestial bodies.

Egyptian

Surprisingly, ancient Egyptians did not leave any explicit records detailing solar eclipses, though such an event would undoubtedly have been observed by these astronomy-savvy sun worshippers. Some scholars have suggested that perhaps eclipses were highly distressing and were deliberately left unrecorded so as to not "endow the event with a degree of permanence" or tempt the sun god Re (Ra). One Egyptologist has suggested that various references to an apparently metaphorical form of blindness align with historical eclipse dates and may be symbolic records of these events. Or perhaps papyrus records were simply lost to time.