Of demons and dragons - the history of solar eclipses

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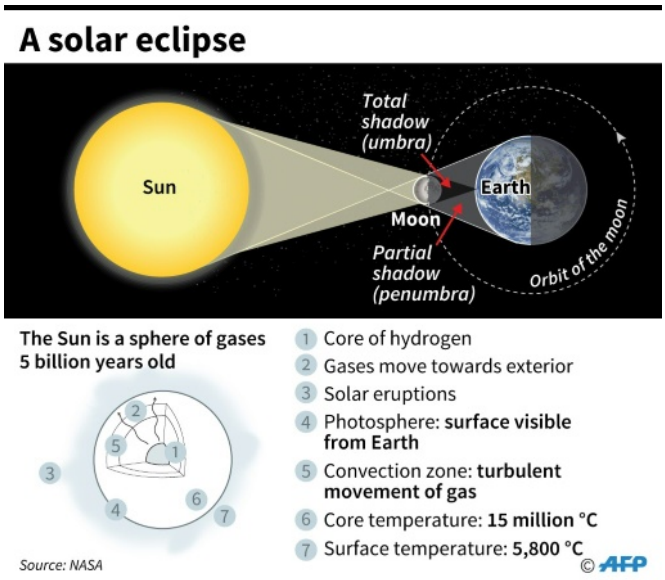

A solar eclipse occurs when the moon is positioned between the Sun and the Earth.

A dragon eating the Sun. Make that a giant toad. A demon. No, a vampire!

Depending on which ancient society you were part of, these were among the ravenous monsters blamed whenever the life-giving star at the center of our existence disappeared behind the Moon for a full solar eclipse.

Before we had science, humans relied on superstition to make sense of the fear-inspiring phenomenon of night falling in the middle of the day, causing the temperature to plummet and birds to stop singing.

The ancient Chinese banged on pots to frighten away Sun-gobbling dragons. Aboriginal Australians got a medicine man to throw sacred stones and boomerangs at the evil.

Robert Massey, acting executive director of the Royal Astronomical Society in London, said that before the scientific age solar eclipses were "regarded as bad omens."

"That's hardly surprising... If you didn't know what was going on, it's easy to see why you would be extremely worried," he told AFP.

It was not until we could accurately predict the path of the Moon around Earth, of the Earth around the Sun, and the distances between all three, that total eclipses became less alarming.

But this took millennia.

Full solar eclipses are a tough nut to crack as they require a precise line-up of the Sun, Moon and Earth.

The Moon orbits Earth at a slightly tilted angle, with the result that it mostly passes too high, or too low, to block out the Sun.

But once about every 18 months or so, our satellite crosses on just the right plane to block out the Sun's light and cast a shadow somewhere on Earth.

Off with their heads

To observe one twice in the same place would entail a wait of several hundred years—further complicating early attempts at deciphering these events.

According to surviving records, efforts were already underway more than 4,000 years ago.

Many failed.

The so-called "drunk astronomers", Hi and Ho, for example, were executed on the emperor's orders for failing to predict an eclipse over China in 2137

BC.

In 585 BC, claimed Greek historian Herodotus, Thales of Miletus predicted a total eclipse that stopped a bloody battle in its tracks. Modern-day astronomers doubt such a calculation would have been possible.

As knowledge grew, eclipse forecasters were enjoying moderate success by the Middle Ages.

"By the time of the Renaissance, certainly by the time of the invention of the telescope (in the early 1600s) and the works of Copernicus, it's hard to believe that many people would still have regarded a total eclipse as a particularly fearful event," said Massey.

Nicolaus Copernicus, who died in 1543, formulated a map of the Universe with the Sun, not Earth, at its center.

But it took the work of 17th and 18th century astronomers Johannes Kepler, Isaac Newton and Edmond Halley to really pin down the mechanics of our solar system.

This made it possible to predict where on Earth an eclipse will be visible from, giving rise to a new era of eclipse chasers.

For hundreds of years, eclipses offered the only way to observe the Sun's atmosphere, or corona, to learn more about its temperature, composition and magnetic properties.

Usually obscured by the Sun's blinding brightness, the corona becomes visible during an eclipse as a ring of light encircling the black disk that is the Moon.

Terrifying, ghostly

Nowadays, scientists can use a coronagraph for the same purpose.

"However, a phenomenon called diffraction blurs the light near the disk in a coronagraph, making it difficult to get clear pictures of the inner parts of the corona," according to NASA.

"So, total solar eclipses remain the only opportunity to study these regions in clear detail in visible light."

In what is arguably the most important eclipse-related discovery, the 1919 solar blackout allowed English astronomer Arthur Eddington to confirm Albert Einstein's theory of general relativity.

Teams deployed to Brazil and the island of Principe compared the position of stars near the Sun with previously photographed locations, to conclude that the Sun's gravity does bend starlight passing by it, as Einstein predicted.

Nowadays, scientists can predict eclipses with near pinpoint precision of less than a second, according to the European Space Agency (ESA).

"Eclipses can be perceived as a celebration of rationalism," states an ESA document. "Wonder can replace the fear of our ancestors."

Yet, some superstition remains.

NASA has had to publish a list of "eclipse misconceptions" on its website.

These include that eclipses harm unborn babies, poison food being prepared when they occur, and portend bad luck or ill health.

"Total solar eclipses are terrifying and their ghostly green coronae look frightening, so it is natural to want to make up fearful stories about them," said the agency.

But it insisted: "there is nothing other than human psychology that connects eclipses with future events in your life."