

HIGH LIGHTS

A Beginner's Guide to Astronomy

THE MOON - Earth's only natural satellite has been the subject of fascination for mankind for thousands of years. In cosmological terms it is located practically on our doorstep and yet only twelve astronauts have stood upon its surface. Where did it come from? What is it made of, and why is it so important to us?

There are many theories as to its origin. The '*Giant Impact Hypothesis*' is currently the most widely accepted theory in which a Mars-sized planet named *Theia* collided into the Earth soon after it was formed 4½ billion years ago. The impact was so violent that it caused a giant ring of red-hot rocky debris to spray into space, which over many millions of years came together as a sphere through the force of gravity. This theory explains the Moon's low density, lack of a substantial iron core and chemical similarities between rock samples brought back by astronauts and samples taken from Earth. Computer simulations have shown this hypothesis is plausible and that the Moon may have formed remarkably quickly after the initial impact.



There are several reasons why the moon is crucial to life on earth. Its gravitational pull slowed the Earth's spin and stabilised its axial tilt. It shields Earth from ultra violet radiation, moderates the climate, drives ocean tides and influences biorhythms. These effects ultimately played a pivotal role in shaping the conditions necessary for life to thrive on our planet.

ITS JUST A PHASE - Probably the most striking feature of the Moon is how much of the sunlit surface is visible from Earth at a given time, and by how much it changes over the course of a month. The amount visible depends on the relative positions of the Earth, Moon and Sun, and it changes gradually over several days as a result of the Moon's orbital motion. Various *Lunar Phases* have recognised names and they repeat on a 29½ day cycle: viz.

								
New	Waxing Crescent	First Quarter	Waxing Gibbous	Full	Waning Gibbous	Last Quarter	Waning Crescent	New
Day № 0	4	7	11	15	18	22	25	29½

Full moon occurs when the Moon's orbit places it directly opposite the Sun as seen from Earth. It is one of the most powerful and evocative moments in the lunar cycle and has been celebrated, named, and ritualized by cultures around the world for centuries. People have given names to the full moons to mark time, track the seasons, and to honour the cycles of nature. Farmers used them to plan planting and harvesting cycles, while others used them for rituals, festivals, and storytelling.

There are several Full Moon naming traditions. - The following are the names listed by, "*The Centre for Astronomical Heritage - South Africa*" and are those referenced in the 'SKY GUIDE Southern Africa'.

Month	First Full Moon	Second Full Moon
January	Mantis Moon	Leopard Moon
February	Dassie Moon	-
March	Harvest Moon	Ochre Moon
April	Diamond Moon	Gold Moon
May	Frost Moon	Fire Moon
June	Sisters Moon	Honey Moon
July	Meerkat Moon	Protea Moon
August	Peace Moon	Dusty Moon
September	Spring Moon	Blue Crane
October	Whale Moon	Elephant Moon
November	Milk Moon	Wool Moon
December	Springbok Moon	Eland Moon

A BLUE MOON is a generic term used to name the second full moon in a month or the third full moon in a season with four full moons. This occurs on average once every 2-3 years. The next blue moon will occur on Thursday May 20 2027, and will be a seasonal blue moon because it will be the third of the four full moons in Autumn.

Despite the name, the full moon does not appear blue under normal atmospheric conditions! The phrase 'Blue Moon' appears to trace back to a 16th-century saying¹, "the moon is blue," which was used to describe something considered impossible or absurd. Over time, the meaning shifted to indicate rarity rather than impossibility, giving rise to the common saying "once in a blue moon".

BASIC FACTS – The Moon is the fifth largest natural satellite in the Solar System. Only three of the satellites of Jupiter and one of Saturn are larger. With a diameter of about 3475 km, it is 50% larger than the dwarf planet Pluto but only one-quarter the diameter of the Earth. Its mass is a mere 1.2% that of the Earth and yet it is still more massive than all of the main-belt asteroids combined. The relatively small mass and low density cause the Moon's surface gravity to be only one-sixth that of earth. This means a 7 kg bag of potatoes would only weigh ~1.2 kg on the Moon - i.e. about the same as a small bag of sugar.

¹ A 1528 satire, *Rede Me and Be Nott Wrothe*, contained the lines, "Yf they saye the mone is belewe / We must beleve that it is true." The intended sense was of an absurd belief, like the moon being made of cheese. There is nothing to connect it with the later metaphorical or calendrical meanings of "blue moon". However, a confusion of *belewe* (Middle English, "blue") with *belæwan* (Old English "to betray") led to a false etymology for the calendrical term that remains widely circulated, despite its originator having acknowledged it as groundless. *Cit. Wikipedia, "Blue Moon"*.

The Moon orbits the Earth² in an elliptical path at an average distance of 384,784 km. Covering that distance by car, traveling at a constant speed of 120 kph, would take about 4½ months. So, if you wish to spend Christmas Day on the Moon, you would need to set off by August 13 at the latest. You should also consider leaving soon, as the Moon is drifting farther away - by about 3.8 cm each year. And don't forget to dress appropriately: temperatures there vary between -173°C and +127°C over two-weeks.

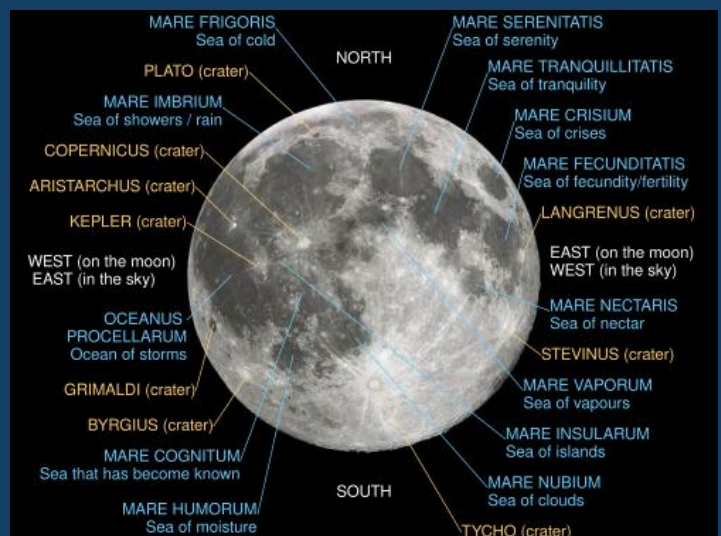
An obvious feature of the Moon is that we always see the same face pointing toward us regardless of its phase or location in the sky. This is the result of gravity causing the Moon's axial spin to become tidally locked to the Earth over millions of years. The Moon does spin, but only once in 29½ days; the same as the Lunar Phase cycle. Surprisingly, although its spin is tidally locked to the Earth, it is still possible to see slightly more than half of the Moon's surface overall owing to an effect called *libration*. Subtle variations in the Moon's orbital velocity, and the inclination of its orbit, creates the illusion that the Moon slowly 'wobbles' on its axis. This allows an astute observer to see an additional amount of the otherwise, 'Dark Side'. The result is that 59% of the Moons surface is observable overall, but never more than 50% at a time.

OBSERVATION – The Moon is one of the easiest objects in the sky to observe except for a few days either side of new moon when it is obscured by the glare of the Sun. If you do decide to observe the Moon at those times, then please take care. The 'young' crescent moon always appears close to the Sun and there is a very real risk of serious eye injury when observing it. **SAFETY FIRST:** -

NEVER LOOK AT THE SUN WITHOUT SUITABLE EYE PROTECTION!

The crescent moon is a particularly pretty sight to see, especially if a chance alignment brings it close to Venus or to a bright star. It is also a time to look out for, 'Earth Shine', commonly called, 'The old Moon in the New Moon's arms'. This is an effect caused by sunlight reflected from Earths atmosphere illuminating the otherwise unlit surface and thereby revealing the greyed out disk of the Moon. Send us a photo if you manage to capture an image.

Full moon allows the observer to see the greatest contrast between the dark and lighter regions on the surface. The darker regions, called *mare* (Latin for 'Sea') are large dark basaltic plains formed by lava that once flowed into ancient impact basins. Full moon is also a time when the bright white rays from the impact crater, *Tycho*, are most conspicuous. They are extensive and observers with keen eyesight can see them without optical aid. Tycho is 85 km in diameter, 4.7 km deep and was probably created by the impact of an asteroid or comet 8 to 10 km in diameter, some 108 million years ago.



credit: Peter Freiman and Gregory H Revera. CC BY-SA 3.0

² Technically, the Earth and Moon orbit each other, but the *barycenter* (the Centre of Gravity) lies well inside the surface of the Earth. The Earth appears to 'gyrate' rather than orbit.

Observing the Moon through a pair of binoculars is a rewarding but challenging experience. The best time to observe it is within a few days either side of the first or last quarter. Within that window the shadows along the *terminator* (the line dividing the lit and unlit regions) reveals the greatest detail.

To see the larger craters and mountain ranges, binoculars with a magnification between 8x and 10x are ideal. Binoculars with a magnification of 12x or higher will show greater detail but unless the observer can mount them on a tripod or rest them on a sturdy platform, the image will be so unsteady as to render them unusable. The attached series of photographs (fig 1) were taken using a cellphone attached to a pair of 10x50 binoculars. It is possible to discern craters 50 km in diameter using this setup.

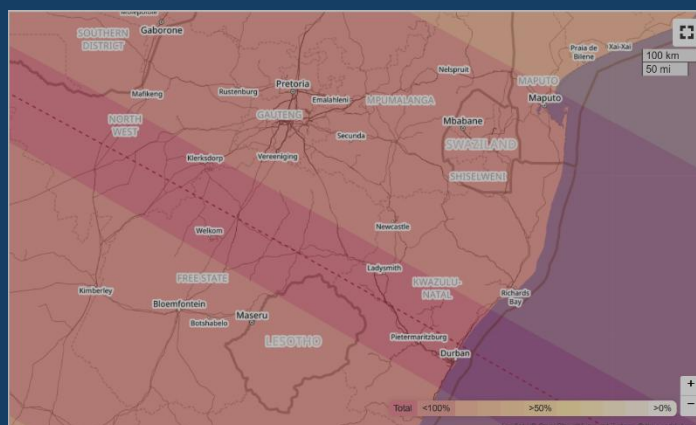


Partial Lunar Eclipse Aug 2026
Credit: Stellarium

UPCOMING EVENTS – At 6:30am on 28th Aug 2026, there will be a **partial lunar eclipse** during which a maximum of 93% of the full moon will be obscured by Earth's shadow. The eclipse will begin at 3:23am and end at 9.02am. The best time to observe it will be between 4:30am and 7:50am when the Moon passes through the darkest part of the shadow (The *Umbra*). Send us a photograph if you manage to take a picture.

A Total Solar Eclipse (TSE) is a spectacular event when the new moon aligns perfectly with the Sun blocking it completely from view for several minutes. One occurs on average every 18 months. Unfortunately the TSE on 12-Aug this year will not be visible from South Africa because the path of totality does not cross Africa.

The next Total Solar Eclipse visible from South Africa will occur on 25-Nov-2030 when the path of totality will pass over Durban. See you there!?



Total Solar Eclipse: Forecast path of totality: 25th Nov 2030
Credit: www.timeanddate.com

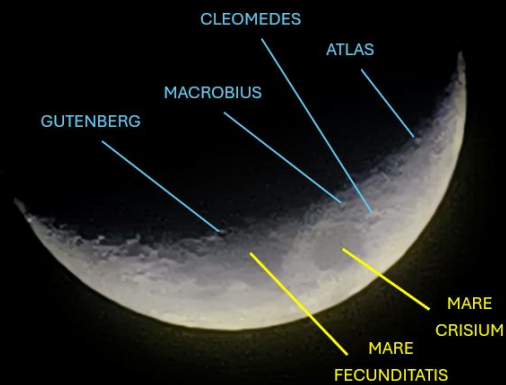
References

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Patrick Moore on the Moon; Cassell, 2001

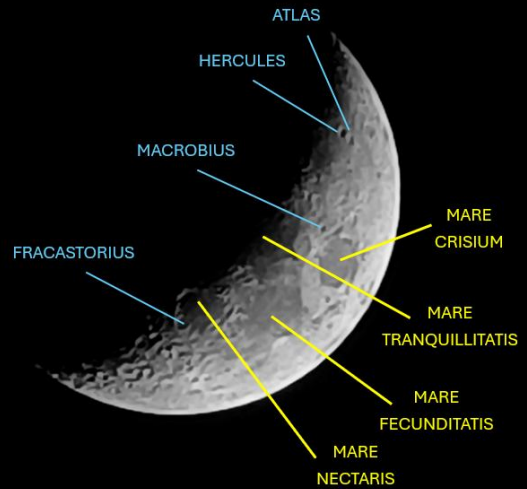
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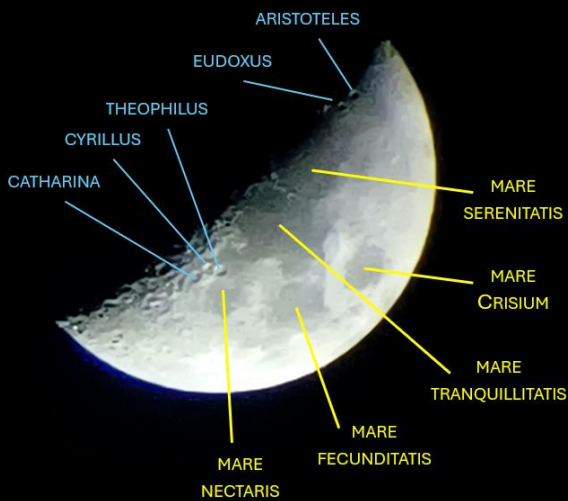
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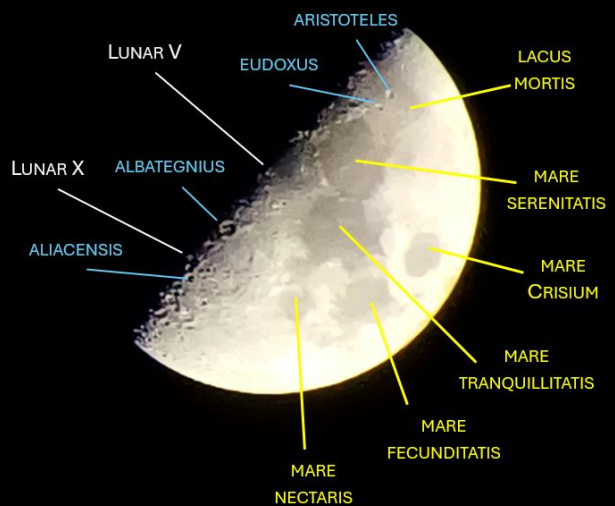
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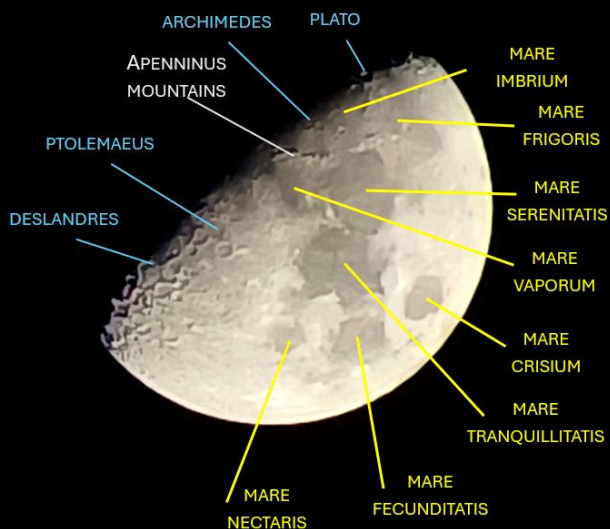
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DAY 7



DAY 8



DAY 9



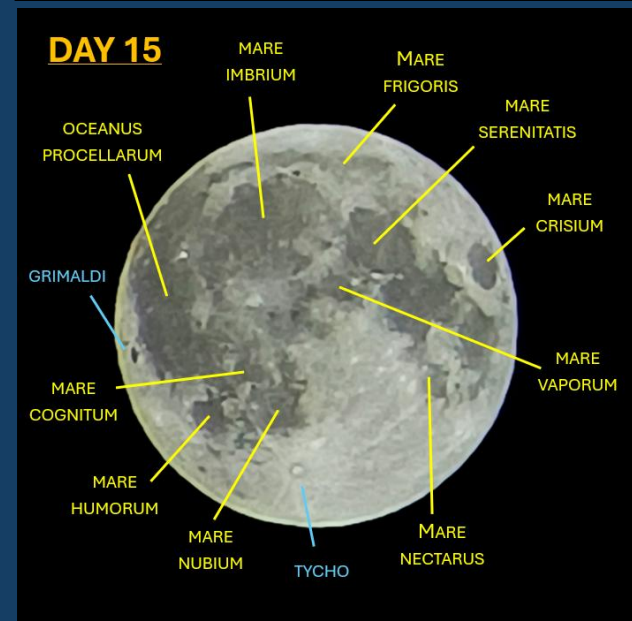
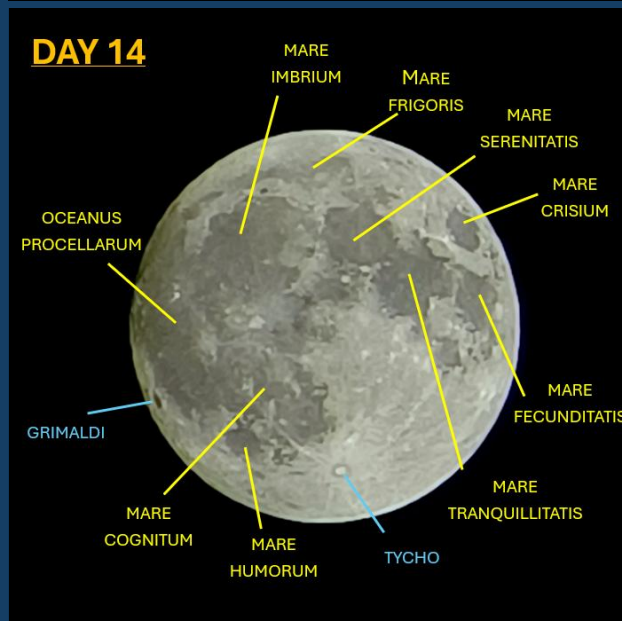
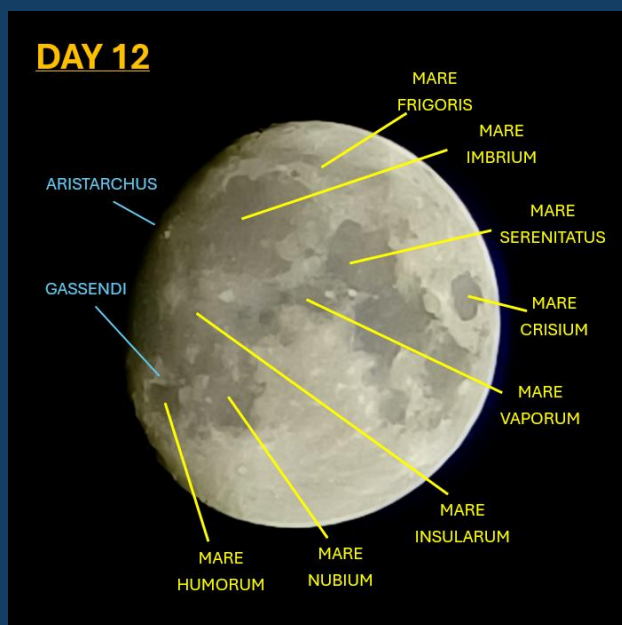
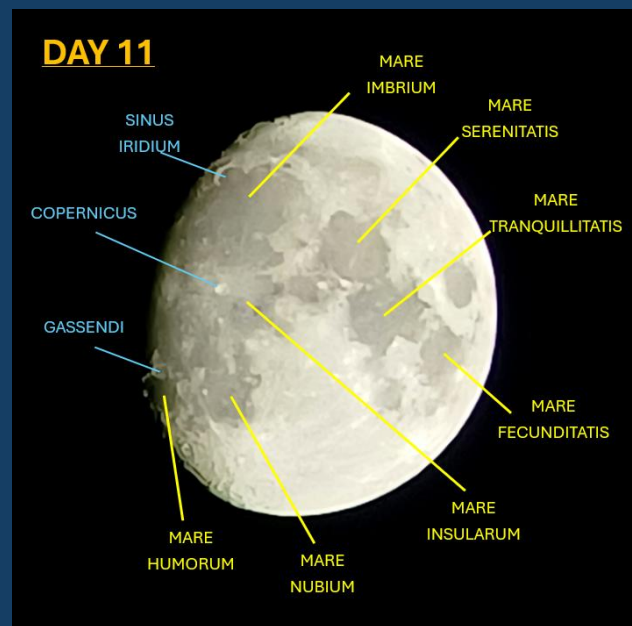
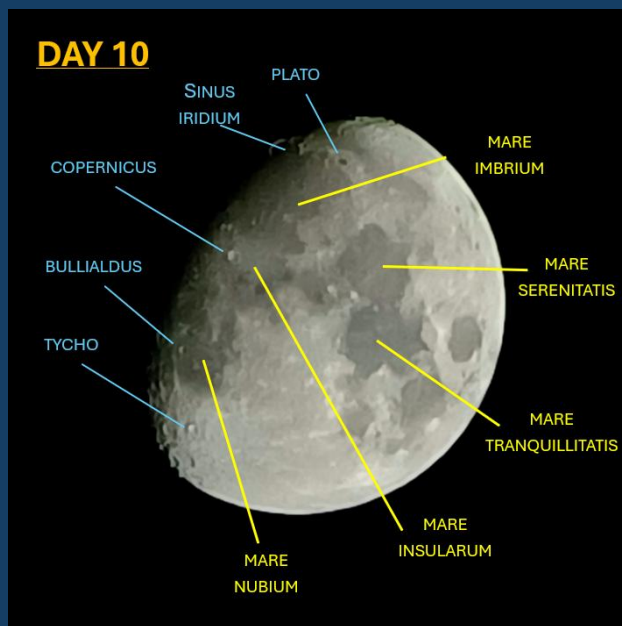


Fig 1: A series of photographs showing the progression of the Moon's phase between 18 - 29 Jul 2026. Images taken on a cellphone using a pair of 10x50 binoculars.