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Eclipse of the moon, August 2007 - Features - The Lab - Australian Broadcasting Corporation's Gateway to Science

[This is the print version of story <http://www.abc.net.au/science/features/lunaeclipse2007/default.htm>]

Eclipse of the moon August 2007.....

No matter where in Australia you are on August 28, you'll be in for a top show once the sun goes down. A total **lunar eclipse** will be visible right across the country from sunset. The only problem with all that family-friendly moon viewing is dealing with the mind-bending questions the kids are going to ask. ABC Science's **Bernie Hobbs** has whipped up some answers to the most likely questions, and shattered a few **lunar** myths to boot.



What's a lunar eclipse?

Lunar eclipses happen when the moon moves into the Earth's shadow. In a total **lunar eclipse**, the moon and earth are lined up so that the whole of the moon is in shadow for a while. If they're not completely aligned, only a part of the moon will end up shaded (a partial **eclipse**).

You've probably seen the earth's shadow hundreds of times without noticing – it's right there every day at sunset. As the sun goes down, the earth's shadow rises in the eastern sky – making it a deep blue while the rest of the sky is pale blue or reddish.

Is the moon just going through a phase?

The moon looks like it's going through all its different phases in one night during a total **eclipse**, but it's not – it's a full moon all night long.

We see the phases of the moon because the moon orbits us each month, so its position compared with the earth and the sun changes through its monthly cycle.

Like the earth, half the moon is always lit by the sun, and half is in shadow. Because the moon orbits us once each month, we're always seeing it at different positions relative to the sun. The different positions show us a different combination of the moon's light and dark sides – these are the phases of the moon.

So when we see a quarter moon, it's because the moon is facing us at right angles to the sun. Crescent moons are at a 45 degree angle to the sun, and the gibbous moon is at 135 degrees.

Why does it only happen when there's a full moon?

Lunar eclipses can only happen when the earth is between the sun and the moon, and that can only happen at full moon.

So why doesn't it happen every full moon?

If **intelligent design** existed maybe it would. But whoever flung the planets into orbit was off the mark by about 5 degrees when it came to lining up the moon with the earth. So most times when there's a full moon the moon completely misses the earth's shadow – it passes above or below it. The sun, earth and moon only line up properly a few times a year.

If they happen a few times every year, how come we hardly ever see them?

If you were rich enough and nerdy enough you could see them all. You'd just fly or sail to whichever part of the earth was going to see the **eclipse**. But those of us who live in one place and have cheaper hobbies have to wait for the conditions to be just right, and for the hour of totality to not clash with bedtime.

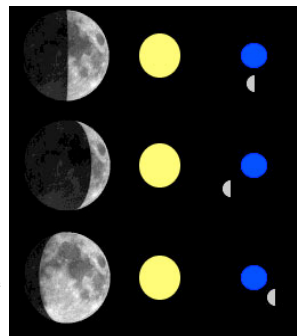


It's hard to talk **lunar** eclipses without resorting to the old basketball, tennis ball and marble analogy – but you'll look a bit suss if you drag those out of the picnic basket on the night. *Pic: iStockphoto*



Above: The earth's shadow makes the moon appear to change phases during a total **lunar eclipse** *Pic: F Espenak*

Below: Phases of the moon (on the left - quarter, crescent and gibbous) and the respective positions of the sun (yellow), moon (grey) and earth (blue) *Pic: NASA*



Why does the moon look red during an eclipse?

The moon usually looks white because it's reflecting white light from the sun. It doesn't have an atmosphere, so there's no air or dust to filter the light and change its colour.

But during a total **eclipse** the only light that reaches the moon has already been filtered by the earth's atmosphere. Once light hits all that gas and dust, it gets scattered. Long wavelength reddish light tends to bounce right out into space - it's the light that reaches the moon. Shorter wavelength blue light keeps bouncing around off molecules and doesn't really get a chance to escape. (That's why the sky usually looks blue - the red light bounces away, so blue is all that's left).

How come we can look directly at a lunar eclipse?

The moon's light is only ever reflected from the sun, so it's never all that bright. And during a **lunar eclipse** you're seeing a smaller amount of even dimmer reflected light that's already been filtered through the earth's atmosphere.

Sunlight and solar eclipses are another thing altogether. Sunlight will burn your retina (the business end of your eyeball) in a fraction of a second, so you should never look directly at the sun. And even though most of the sun's light is blocked out during a solar **eclipse** (when the moon blocks the sun from view), the rim of sunlight around the moon is incredibly bright, and because of the darker sky your pupils are dilated so more sunlight will hit your retina in a short time. So never look at the sun during an **eclipse** - or at any other time.

Where's the best place to see it from?

That would be the moon. If you're there, you'll see the earth doing a good impersonation of a solar **eclipse** - blocking out the sun's light and being surrounded by a red halo (the light passing through our atmosphere).

If the moon's out of your budget, just go to a place that's got a good view of the eastern horizon and no cloud cover. You don't need binoculars or a telescope - they'll help you make out detail of the moon but it's spectacular without them.

And if clouds get the better of you, check back here from August 28 on - we'll have an animation of the whole shebang for anyone who missed out!



If terra-lunar geometry was more thoroughly thought out, we'd have a total **lunar eclipse** every full moon.
Pic: NASA



The 'Blood' moon at totality. The light reaching & being reflected from the moon has already been filtered through the earth's atmosphere, removing the blue colour. *Pic: NASA*

City (local time)	Enters Earth's Shadow (Umbra)	Mid Eclipse	Leaves Earth's Shadow (Umbra)	Sunset/Moonrise
Adelaide	6:21 pm	8:07 pm	9:54 pm	5:51 pm
Darwin	6:21 pm	8:07 pm	9:54 pm	5:51 pm
Brisbane	6:51 pm	8:37 pm	10:24 pm	5:40 pm
Sydney	6:51 pm	8:37 pm	10:24 pm	5:40 pm
Melbourne	6:51 pm	8:37 pm	10:24 pm	5:40 pm
Hobart	6:51 pm	8:37 pm	10:24 pm	5:40 pm
Perth	4:51 pm	6:37 pm	8:24 pm	5:55 pm



Lunar myths for shattering...

Lunar eclipses don't cause an extra gravitational pull or a super high tide

High tides are biggest at the full moon and the new moon - that's because at those times the sun and the moon are lined up and the sun's gravity adds to the moon's effect. **Lunar** eclipses can only happen at the full moon (it's the only time when the moon can be behind the earth), so you'll always have a high tide, but the shadow passing over the moon doesn't have any affect at all.

That's because gravity is determined by mass and distance - if the moon got heavier, or moved closer to us it would have a greater affect on our tides.

The full moon does look bigger on the horizon

It definitely doesn't change size during the night, but the full moon looks huge when it rises on the eastern horizon. It's not because of any lensing effect from the atmosphere - it seems to just be an optical illusion. Down low there are plenty of other objects to compare the moon's size with, whereas up high it's surrounded by near black sky so there's no perspective.

Add to that the flattening effect our brains pull when looking up in a dome and we end up thinking it's smaller and further away when it's fully risen.

A blue moon isn't the second full moon in a calendar month

That idea came from a typo in a 1946 issue of Sky and Telescope magazine. A science reporter used the mag as the source for her astronomy radio program about blue moons in 1980. The program was heard - and used - by the authors of a children's almanac, which ended up being the source for a question in Trivial Pursuit. The definition isn't right, but this 60 year old typo is so entrenched in folklore and pop culture it might as well be.

(Sky and Telescope magazine have well and truly made up for their misprint. They did an extremely tedious analysis of 40 editions of the Maine Farmers' Almanac, the source for the 1946 article and it looks like a blue moon in 19th century Maine was actually the third full moon in a season that's got four full moons).

Crime/madness are not more common at full moon.

This myth has been around for centuries, and the basic idea is that humans and Earth are both mostly water, so if the moon causes tides it could well affect us. Testimonials from nurses and police have kept the idea chugging along, and it got a massive boost in the 70s from psychiatrist Arnold Lieber's best-seller "**Lunar** Effects: Biological Tides and Human Emotions".

Lieber claimed to have found higher homicide rates during full moons, and to accurately have warned hospitals and police to expect extra workloads at that time. The only problem with his claims is their total dodginess - 30 years of research hasn't found any evidence of a link between moon phase and accidents, lunacy or crime. And his warnings to health carers and the folks in blue were off the mark way more often than they were right.

Mars won't appear to be the size of the full moon this August 27 or at any other time.

If it did, we'd be in serious trouble. It would mean the planet had hurtled towards us through space and anything that could achieve that wouldn't be

slowed down in a hurry. If you've heard of this, you probably got forwarded an email during any August since 2003, when Mars was actually at its closest to Earth in 60,000 years. Mind you, even that night it was still about 56 million km away.



If you enjoyed this feature you might like...

[Total Lunar Eclipse - July 16, 2000](#): ABC Science Online's coverage of the 2000 total **lunar eclipse**. Complete with **Lunar Eclipse** Facts and recipes for your very own Moon-B-Que. (Published July 2000)

[Chasing the Sun in Turkey](#): Darren Osborne went to Turkey to watch the 2006 total solar **eclipse**. Follow his escapades as he prepares for the trip, visits Gallipoli, takes in the **eclipse**-fever and finally experiences 3 minutes of total solar **eclipse** - an amazing on-the-ground account of one of nature's most incredible sights. (Published March 2006)

[Great Moments in Science Solar Eclipses - Eclipses and Intelligent Aliens](#):

In February, 1999, Dr Karl and family travelled for 16 hours so that we could have one minute and five seconds of intense joy - seeing the **eclipse** of the Sun, at Tennant Creek in the Northern Territory. But an **eclipse** can be more than just fun, and scientific study - according to one scientist, if your planet has solar eclipses, it might have **intelligent** life. (Published July 1999)

[Great Moments in Science Solar Eclipses - The Saros Cycle](#): Astronomers have always kept records of the planets and in times past could predict the seasons, and tell you when to plant your crops. They also kept records of eclipses, and worked out a repeating pattern that happens - the "Saros Cycle". (Published July 1999)

[Great Moments in Science Solar Eclipses - The chances of an eclipse](#):

How long would you have to sit in one spot before a total **eclipse** of the Sun is guaranteed to throw a shadow over the top of you - 50 years? 50,000 years? or 5 million years? Dr Karl's done the sums. (Published November 1999)

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