

Eclipse of the Sun 29 April 2014

Warning: It is very dangerous to look directly at the Sun, especially through binoculars or telescopes. **SERIOUS EYE DAMAGE MAY RESULT.** A safe method of indirectly observing the Sun's disc is described below.

General Information



Figure 1 – The partial phase of the total solar eclipse of 14 November 2012 seen through cloud and a suitable solar filter. Photo Nick Lomb

On Tuesday 29 April 2014 a partial eclipse of the Sun will be visible throughout Australia, but not from New Zealand. For most of Australia the eclipse takes place in the late afternoon, ending at sunset.

The eclipse can also be seen from parts of Antarctica, with the greatest eclipse occurring in the Australian Antarctic Territory at a spot about 1000 km from Casey Station. There the Moon covers 99 per cent of the Sun's disc, with only a small ring or annulus of sunlight left around its edge.

Elsewhere in Australia the sight of the Sun setting while still partially eclipsed as in Figure 2 should be spectacular for those with a clear view towards the western horizon. However, full eclipse precautions will be necessary at all times, even when the Sun is near the horizon. See the section *How to watch the eclipse safely* later in this Factsheet.

The last solar eclipse visible from Australia was the annular eclipse of 10 May 2013 that was visible as a partial eclipse for most of the country, while the last total eclipse was on 14 November 2012 that was visible from parts of the Northern Territory and parts of Queensland near Cairns. The next total eclipse to be seen from Australia will just touch the coast of Western Australia on 20 April 2023. Earlier, on 9 March 2016 there will be a total eclipse passing to the north of Australia, which will be visible as a partial eclipse on the northern and western parts of the continent.

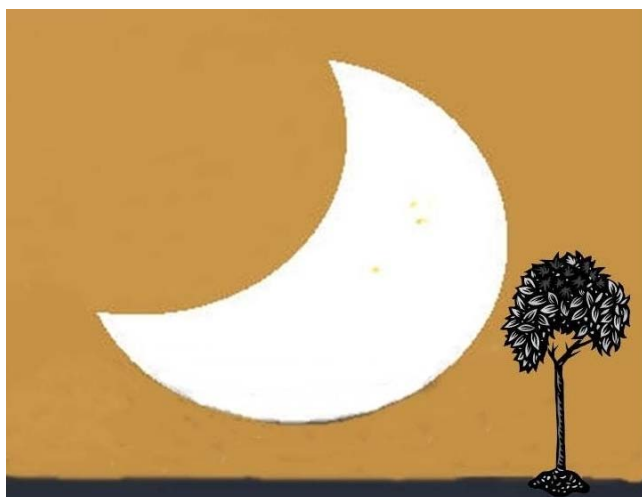


Figure 2 – The Sun just before maximum eclipse about to sink below the horizon, as seen from Sydney at 5:13 pm AEST on 29 April 2014. Diagram Nick Lomb

Table of partial eclipse times

Following are the circumstances in LOCAL TIME for Australian capital cities (eclipse not visible from New Zealand).

Place	Start partial eclipse	Maximum eclipse	End partial eclipse	Sun elevation maximum	Maximum percentage of Sun's width covered
Adelaide	3:25 pm	4:37 pm	5:36 pm*	23°	61
Brisbane	4:31 pm	after sunset	5:18 pm*	9°	36
Canberra	4:08 pm	5:12 pm	5:23 pm*	13°	56
Darwin	4:21 pm	4:56 pm	5:28 pm	30°	10
Hobart	3:51 pm	5:00 pm	5:17 pm*	13°	72
Melbourne	3:58 pm	5:07 pm	5:36 pm*	17°	64
Perth	1:17 pm	2:42 pm	3:59 pm	41°	59
Sydney	4:14 pm	5:15 pm	5:17 pm*	11°	52

All times in local time. * sunset time – before eclipse ends

How solar eclipses occur

A solar eclipse occurs when the Moon, in its circuit around the Earth, blocks all or part of the Sun's disc as seen from the surface of the Earth. Only by observing from within the cone-shaped **umbra** of the Moon's shadow can we see the Sun's disc completely obscured; from within the lighter **penumbra** at least part of the Sun remains visible and we witness only a partial eclipse.

Although a solar eclipse of some kind occurs somewhere on Earth at least twice each year, in only some of these events does the Moon completely cover the Sun; usually the umbra misses the Earth altogether, passing 'above' or 'below' our planet. Even when the umbra does intersect the Earth, we are very close to its end where the width of the shadow is very small. So as the Moon's shadow moves from west to east across the Earth's surface due to the orbital motion of the Moon, it traces out a quite narrow path – at most about 270 km wide.

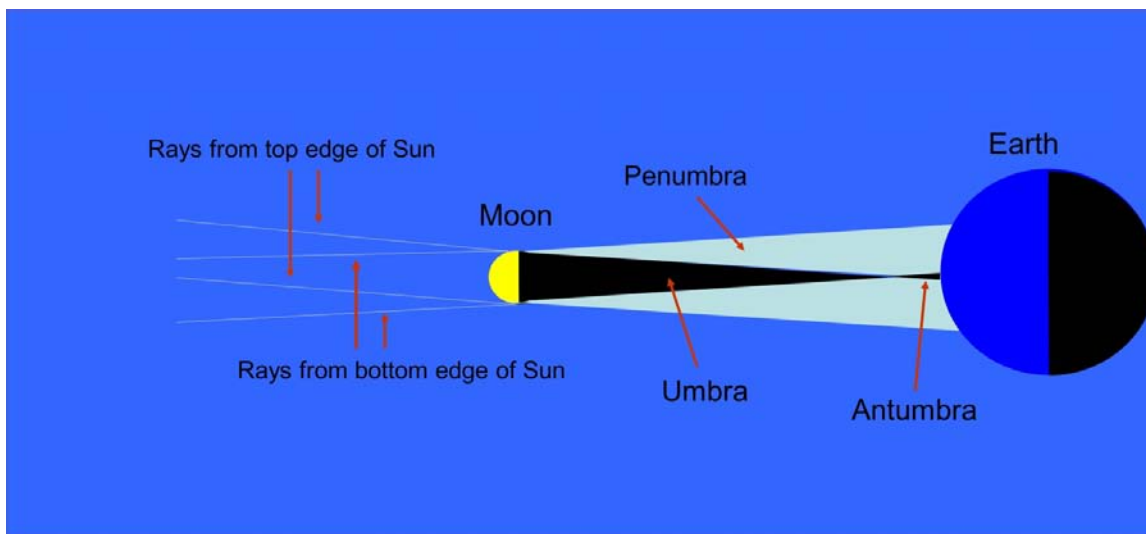


Figure 3 – How an annular eclipse occurs

Only those people lucky enough to be within the path of totality will see the brief spectacle of the Moon completely cover the Sun. People on a large surrounding area of the Earth's surface will witness a **partial** eclipse. Sometimes the Earth's surface is actually beyond the cone of the umbra and we see an **annular** eclipse (see Figure 3). In these eclipses a ring of sunlight appears to surround the Moon at mid-eclipse and the Sun is not completely covered from any location. This is the situation for the eclipse on 29 April.

How to watch the eclipse safely

The best way is to contact your local observatory or local amateur astronomical society (see <http://astronomy.org.au/amateur/amateur-societies/>). However, it is possible to safely watch the eclipse yourself using a small telescope to project the image, as shown in Figure 4. The diameter of the telescope's lens or mirror should be less than 80-mm (or 'stopped down' to this size) to prevent damage to your telescope and eyepieces. With your back to the Sun aim a telescope towards it (this is not as difficult as it sounds – use the shadow of the telescope) and focus its image onto a white card held about 20 cm behind the eyepiece. **DO NOT LOOK THROUGH THE TELESCOPE!** Viewing the projected image is quite safe, but looking through the telescope will cause almost instant blindness. The little finderscope on the side of many telescopes is dangerous too, so remove it. Never leave the telescope unattended and ensure that children are supervised at all times.

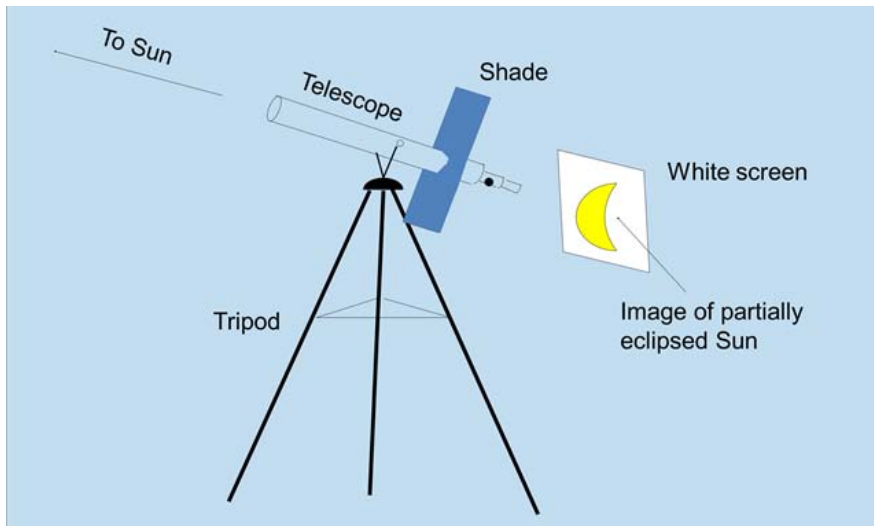


Figure 4 – How to project an image of the Sun through a telescope.

Never look through the telescope at the Sun! Remove its little finderscope if it has one.

If you do not have access to a telescope you can also use a large piece of card with a hole or holes of about 2 mm across. With your back to the Sun, hold the card so that the sunlight passes through the hole and onto another card held about a metre away. This 'pinhole method' will give you an image of the Sun that is small, but good enough to make out the missing 'bite' on the disc. You may also notice during the eclipse that there are images of the eclipsed Sun under leafy trees where the gaps between the leaves form little 'pinholes' of their own!

Another way to view the eclipse is to use eclipse viewing devices that conform to the European Community standard EN 1836:2005 and carry the 'CE' mark. These devices include cardboard framed 'eclipse glasses' and they are safe to use if their instructions are followed. Do not use these devices with binoculars, telescopes, cameras or other optical instruments. Children using the 'eclipse glasses' must be carefully supervised to ensure that they do not peek at the Sun directly. Suitable 'eclipse glasses' with the CE mark are normally available from reputable astronomy shops and public observatories and planetariums.

A simple and safe way to photograph the partial eclipse is to take pictures of the projected image. Do NOT attempt to photograph the Sun directly unless you have prior experience in solar photography. Permanent damage both to eyes and to photographic equipment may result.

For advice on techniques and equipment needed to directly image the Sun contact your local amateur astronomy group, public observatory or planetarium.

This information was prepared for the ASA by Dr Nick Lomb (nickl@phm.gov.au) of Sydney Observatory (<http://www.sydneyobservatory.com.au>).

ASA Factsheets are an initiative of the Astronomical Society of Australia's Education and Public Outreach Chapter. Other sheets are available from the ASA's Australian Astronomy web site (<http://astronomy.org.au/>).



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