



Eclipse of the Sun 10 May 2013

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 – An annular eclipse of the Sun observed through cloud. This was the annular eclipse of 21 May 2012 that could be seen from parts of Japan. Courtesy Flickr and Yakinik
<http://www.flickr.com/photos/yakinik/7237714668/>

On the morning of Friday 10 May 2013 an annular eclipse of the Sun will be visible along a track crossing northern Australia. Such an eclipse occurs when the Moon is in a more distant part of its path around the Earth so that its apparent size is a little smaller than the disc of the Sun and hence a ring or annulus of sunlight is left around its edge. People in Australia outside the path of annularity will be able to see a partial eclipse of the Sun.

This annular eclipse is the first to be visible from Australia or New Zealand since 16 February 1999 with the next one not until 9 March 2035. There have, however, been total eclipses visible from Australia with the last being on 14 November 2012 that was visible from parts of the Northern Territory and parts of Queensland near Cairns. The next total eclipse from Australia will just touch the coast of Western Australia on 20 April 2023. Moreover, an annular eclipse passing over a small area of Antarctica on 29 April 2014 will be visible as a partial eclipse from Australia.



Figure 2 – The path of annularity over northern Australia. The map is drawn by Andy Chong and is taken, with permission, from the 2013 Australasian Sky Guide
http://www.powerhousemuseum.com/publications/publications_item.php?id=251

The Northern Territory town of Tennant Creek lies on the path of annularity (see Figure 2). From there the partial phase begins at 6:55 am and ends at 9:33 am. The annular eclipse lasts 3 minutes 2 seconds with the maximum at 8:07 am when 95% of the Sun's width is covered by the Moon.



Figure 3 – The partial phase of the total solar eclipse of 14 November 2012 seen through cloud and a suitable solar filter. Photo Nick Lomb

People in Australia outside the path of annularity will be able to see a partial eclipse of the Sun (see Figure 3). The partial eclipse will also be seen in parts of New Zealand. The Table below gives the details for each location. Note that to avoid the possibility of serious eye damage precautions must be taken as mentioned in the warning above.

Table of partial eclipse times

Following are the circumstances in LOCAL TIME for Australian and New Zealand capital cities.

Place	Start partial eclipse	Maximum eclipse	End partial eclipse	Sun elevation maximum	Per cent of Sun's width covered
Adelaide	7:09 am	8:15 am	9:29 am	13°	50
Auckland	11:06 am	11:49 am	12:34 pm	35°	8
Brisbane	7:41 am	8:58 am	10:28 am	30°	52
Canberra	7:50 am	8:55 am	10:10 am	21°	38
Darwin	6:58 am	8:07 am	9:28 am	16°	76
Hobart	8:06 am	8:59 am	9:57 am	16°	23
Melbourne	7:50 am	8:52 am	10:02 am	17°	37
Perth	Sunrise		7:45 am		79
Sydney	7:50 am	8:57 am	10:14 am	24°	39
Wellington	11:37 am	11:49 am	12:01 pm	31°	1
All times in local time					

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.

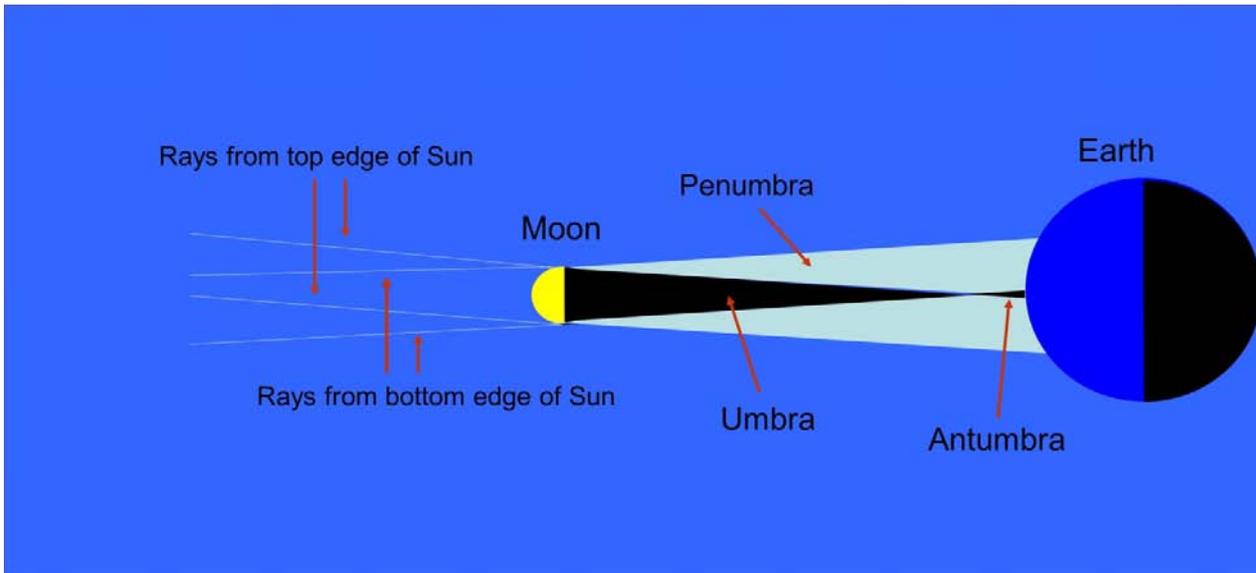


Figure 4 – How an annular eclipse occurs

Only those people lucky enough to be within the path of totality will see the brief spectacle of the Moon completely covering 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 4). 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. That is what is happening on 10 May 2013.

How to watch the eclipse safely

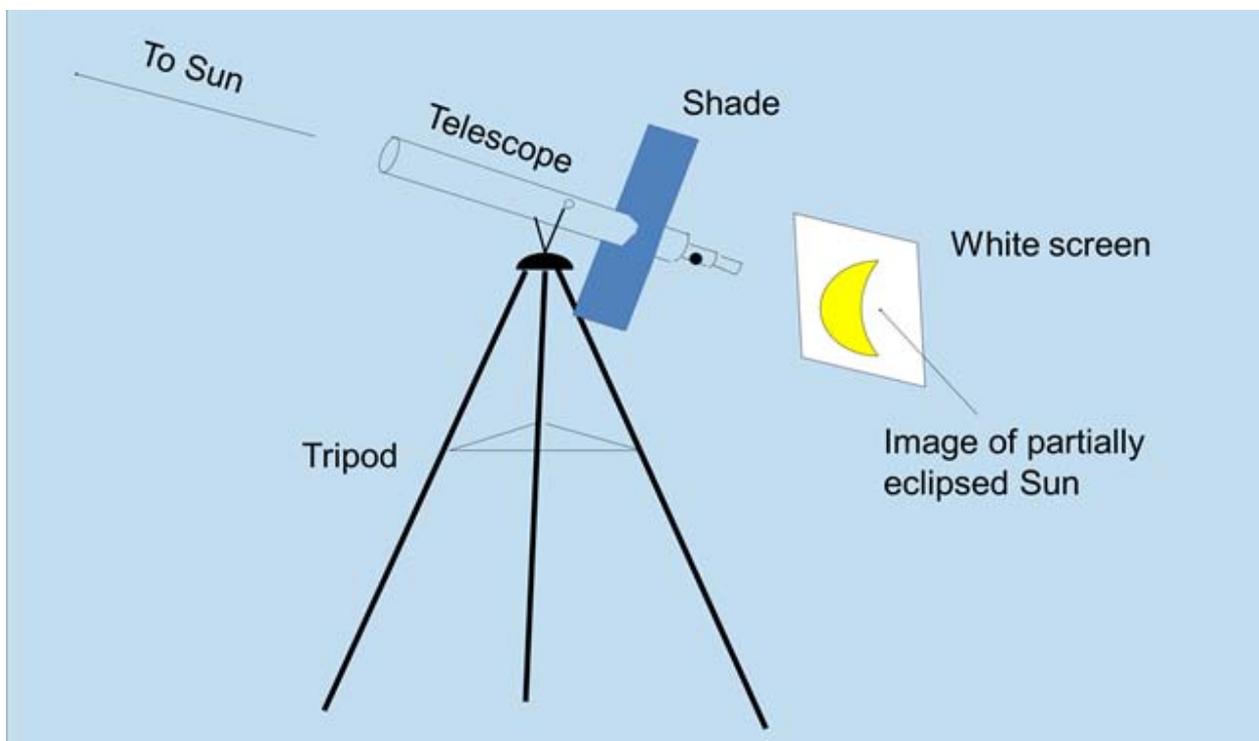


Figure 5 – How to project an image of the Sun through a telescope.
Never look through the telescope at the Sun! Remove its little finderscope if it has one

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 5. 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.

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 either the annular or 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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