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## RINGS AROUND THE SUN AND THE MOON

Sometimes, we see circular rings of light that appear around the Sun or the Moon. These are called *halos* and *coronas*. The rings are not actually around those objects; they are formed by the way that light from the Sun or the Moon passes through ice crystals or water droplets in Earth's atmosphere, producing circular patterns. When admiring rings around the Sun, care must be taken not to stare directly at the Sun, as this can result in eye damage.

## HALOS

A halo is a large ring formed when light is refracted (bent) as it passes through high-altitude hexagonal (six-sided) ice crystals. The light is refracted for the same reason that a glass of water will make a pencil appear bent when it is immersed. The ring is whitish except for a narrow tinge of red on the inside and violet on the outside of a solar halo. There are two halo sizes, as shown in the diagram. One is about equal in distance around the Sun or the Moon to the apparent distance between your thumb and little finger when your outstretched hand is held at arm's length: this is called the 22-degree halo. The other is a little over twice this distance away, and is called a 46-degree halo. These two angles come about because of the particular way in which light is bent by the crystals.



A 22° solar halo, photographed from Tasmania in 2009. To view a halo safely, block the Sun with your hand. Image: Martin George



Halos are seen in two different sizes, equal to approximately one, or two, hand spans held at arm's length. **Take care not to stare at the Sun!** 

## CORONAS

A corona appears as a set of circular coloured rings centred on the Sun or the Moon. It is caused by an effect known as *diffraction* when light passes amongst water droplets, or ice crystals that are smaller than usual. Solar coronas are harder to see than lunar ones, because of the glare of the Sun. The size of a corona, and the number of coloured rings, can vary according to conditions in the atmosphere. A larger corona is a sign of smaller atmospheric particles. When the colours in the corona are pure, this is an indication that the particles are all about the same size.



The central part of a lunar corona seen on a partly cloudy night from Tasmania in 2008. Image: Martin George

## OTHER EFFECTS

There are several other related phenomena that can be seen because of our atmosphere. These include rainbows, which are commonly seen; *parhelia* (also called 'sun dogs' or 'mock suns'), appearing as bright patches to the left and right of the Sun; *parhelic circles*, which can



A parhelion (left), photographed just before sunset from Tasmania in the 1980s. Above the Sun (right) can be seen a pillar. Image: Martin George

extend all around the sky at the same altitude above the horizon as the Sun and are centred overhead; *pillars*, seen as vertical shafts of light above the Sun; and other rings or partial rings of light.



Part of a parhelic circle, seen from Thailand in 2016. Image: Martin George



A rainbow, photographed in New Zealand in 2009. Image: Martin George



