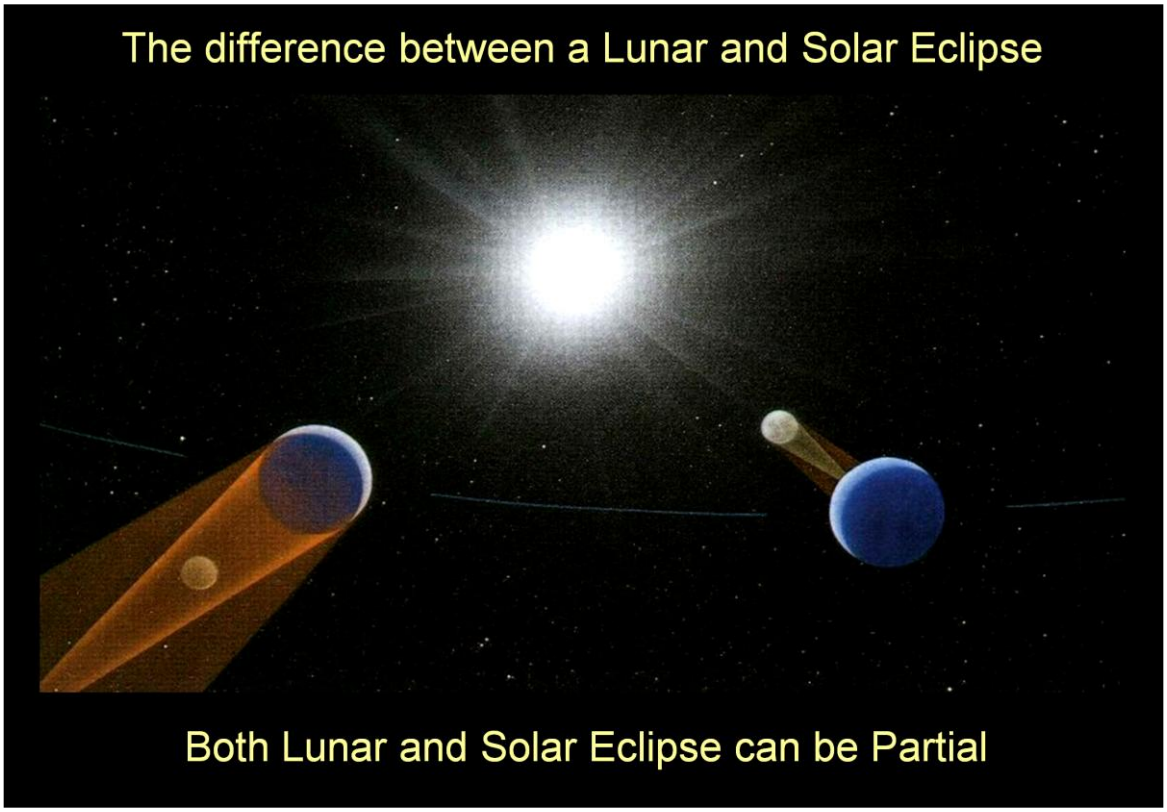
The Lunar Eclipse
16th May 2022

Steve Harris



Lunar eclipses always occur at night, because the sunlight has to be shining on the opposite side of Earth (where it is daytime).

Earth’s shadow is projected on to the Moon that is facing the night side of Earth.

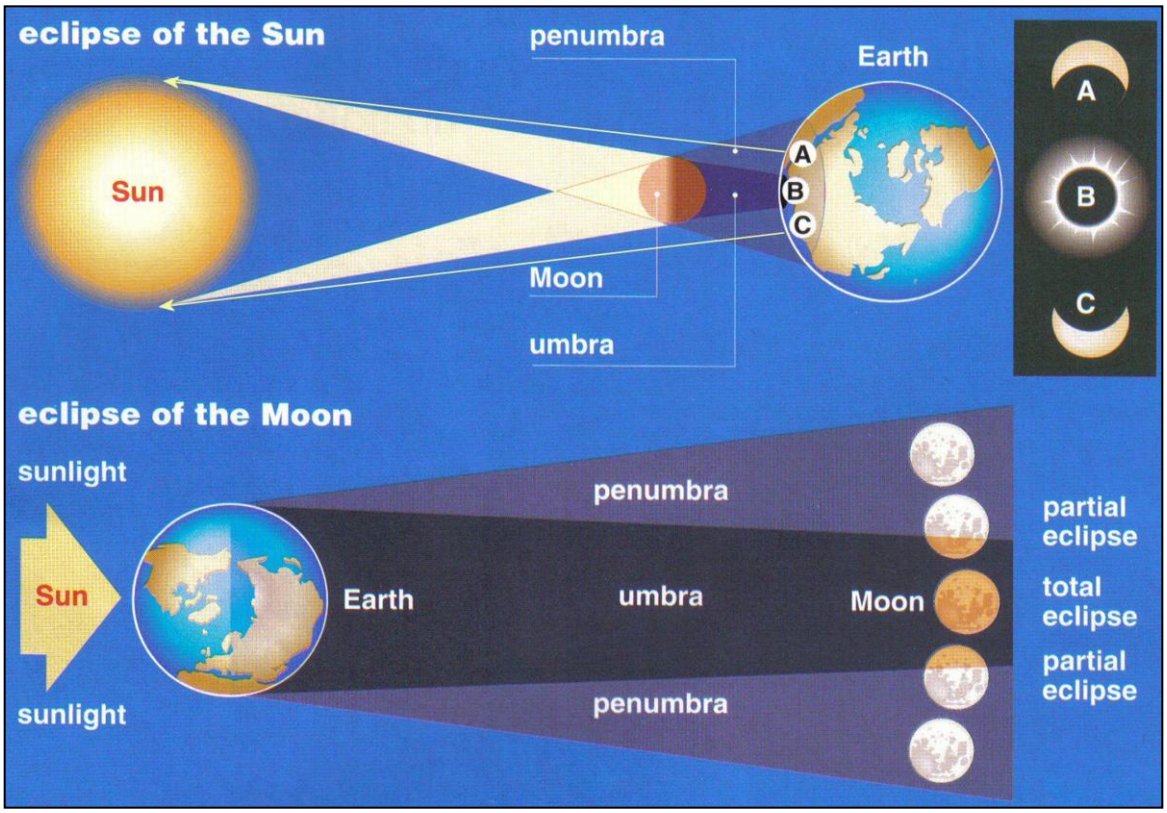
The Moon will also be full because it is in direct line with Earth but further out.

So we are looking from the dark side of Earth towards the bright side of the Moon that is fully illuminated by Sunlight.

As the Moon moves into the Earth's shadow, the shadow will be seen to start moving across the face of the Moon.

The edge of shadow is not as sharp as in a solar eclipse because Earth’s atmosphere blurs the edge.

The shadow will creep across the Moon until the whole surface is covered. Not all Lunar Eclipses are 'total‘.



Lunar Eclipses do not always occur when the Moon passes between Earth and the Sun.

The Moon's orbit is tilted at about 5º so it more often passes above or below Earth's shadow.

A Lunar Eclipse occurs when the Moon passes through the shadow cast by Earth.

This type of eclipse is more common than the Solar Eclipse simply because the shadow of Earth is larger than that of the Moon.

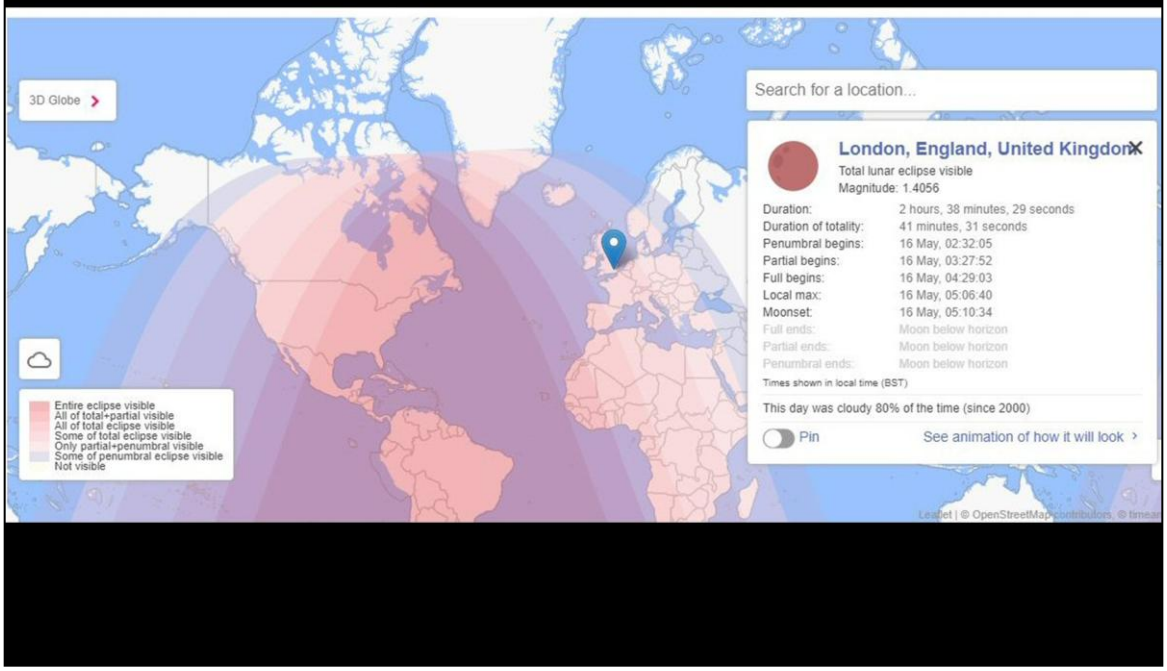
As Earth orbits the Sun and our Moon orbits Earth, there are occasions when all three are aligned.

A lunar eclipse will occur when Earth is between the Sun and Moon and the Moon passes through the Earth's shadow.

As the Sun is much larger than Earth the shadow of Earth is conical and becomes smaller the further it is projected from Earth. This area of full shadow is called the Umbra.

Around the Umbra is a partial shadow where the Sun is not completely obscured by Earth. This area is called the Penumbra.

So what will we see of this Lunar Eclipse



The chart above shows where in the world the Lunar Eclipse can be seen. The darkest pink area is the area where the lunar eclipse can be seen in its entirety.

In the progressively lighter areas to the sides of the ‘Totality’ area (dark pink) progressively less of the eclipse will be seen.

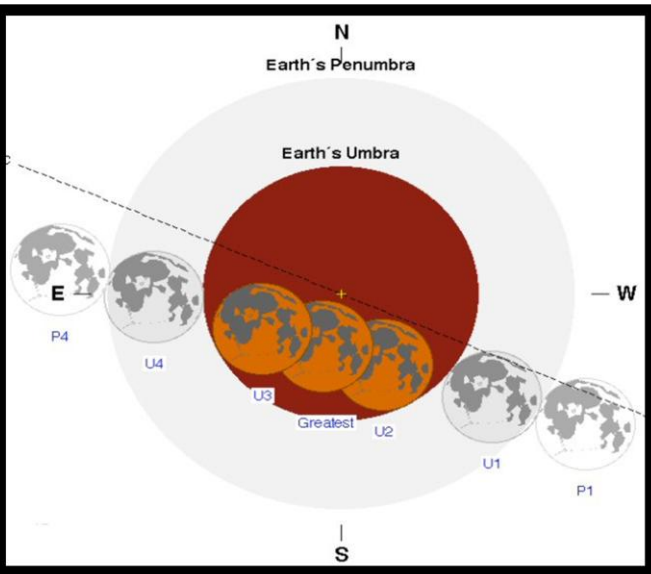
Areas to the west of totality (to the left on the diagram) will see a partial eclipse.

In the lightest pink zones only the beginning of partial eclipse will be seen but more of Lunar Eclipse will be seen in the progressively darker pink zones.

In the central dark pink zone the entirety of the eclipse will be seen. Zones to the east (to the right on the diagram) will also see progressively more of the eclipse in the darker pink zones.

The UK (indicated by the location symbol) is in the third zone where the beginning of the eclipse will be seen. All of the developing partial eclipse will be seen until full totality starts.

Unfortunately for us the later stages of totality and final partial phases will be missed as the Moon sets over the western horizon at 05:00.



The times for the eclipse to be seen from Newbury are:

02:33	Enters the outer shadow (Penumbra)	P1
03:28	Enters the inner shadow (Umbra)	U1
04:30	Starts 'Totality'	U2
05:06	Greatest Totality	
05:00	Moon sets over western horizon	

As the orbit of the Moon around Earth is tilted the Moon does not pass through Earth's shadow every month. It may pass above or below the main shadow (Umbra).

If it only passes through the Penumbra the shadow will be almost indiscernible and will pass largely unnoticed, this produces a Partial Lunar Eclipse.

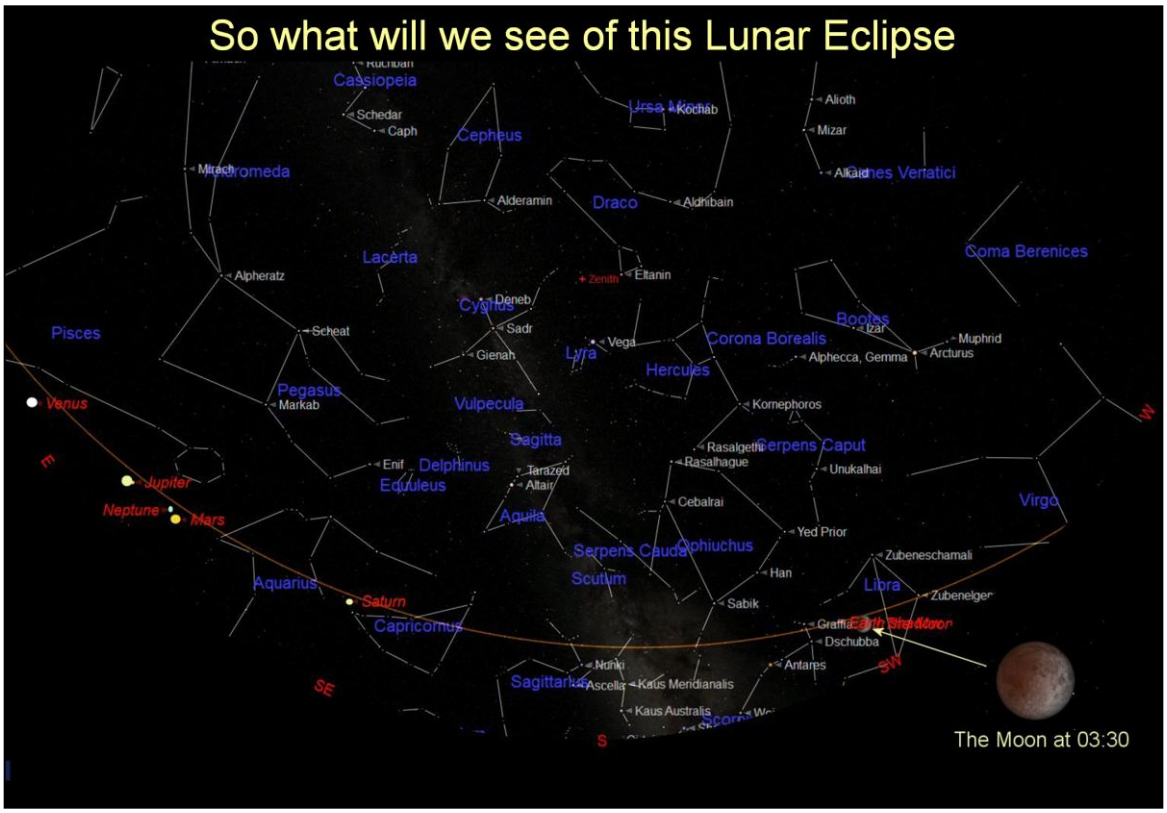
The diagram below shows the path that the Moon will take as it passes through Earth's shadow.

At position P1 the Moon starts to enter the Penumbra and a faint shadow will begin to cross the Moon.

At position U1 the Moon enters the Umbra and the more obvious shadow will be seen on the left limb of the Moon.

Between positions U2 and U3 the Moon will be completely inside the Umbra (Totality). At this point the Moon will sink over the western horizon 05:00.

At U4 it will have moved out of the Umbra and at P4 will have left the shadow altogether and the eclipse will be over.



Although the Lunar Eclipse will be over for us by 05:00 it will be seen in its entirety in the USA.

However for those of us in the UK who have braved the early morning cold and missed out on a full night's sleep, there could be an early morning treat while the eclipse is progressing.

Most of the planets will be rising over the eastern horizon before the Sun rises.

While the Lunar Eclipse is developing on the western horizon the planets will be rising over the eastern horizon.

The planets rise at: Saturn (02:30), Mars (03:30), Neptune (03:30), Jupiter (03:40) and Venus (04:00).

The eastern horizon will be starting to brighten but the brighter planets Venus, Jupiter should still be visible in the pre dawn sky.

Imaging the Lunar Eclipse

Most people have access to at least one of the three types of camera shown above.

1. Most modern Mobile Phones have very good cameras and can be used to image the Moon.
2. Compact Cameras can be used and they can be mounted to a Tripod.
3. A Digital Single Lens Reflex (DSLR) is perfect for imaging the Moon

A Mobile Phone can also be fitted to a Telescope

A Mobile Phone can be used to take images of the Moon.

There are two ways that the imaging can be done.

1. Take pictures directly with the Mobile Phone hand held.
2. Mounted directly on the focuser of a telescope (using the telescope as a telephoto lens).

A Compact Digital Camera can be used to take images of the Moon.

There are three ways that the imaging can be done.

1. Take pictures directly with the Compact Camera hand held or on a tripod.
2. Mount the Compact Digital Camera on a equatorial mounted telescope (Piggy Backed).
3. Mounted directly on the focuser of a telescope (using the telescope as a telephoto lens).

Any DSLR (Digital Single Lens Reflex Camera) can be used to take images of the Moon.

There are three ways that the imaging can be done.

1. Take pictures directly with the DSLR fitted with a Telephoto Lens.
2. Mount the DSLR on a equatorial mounted telescope (Piggy Backed).
3. Mounted directly on the focuser of a telescope (using the telescope as a telephoto lens).

The DSLR mount shown was manufactured from a junk drawer.

The Camera Hot Shoe Mount shown, can be bought from Amazon for about £6.

The DSLR Camera Hot Shoe mount base can be drilled for securing using screws or small bolts.

The Finder Mount Shoe can be bought from astronomy shops for about £7.

If a finder is not to hand then they can be bought, complete with Mount, from Astronomy shops.

Skywatcher manufacture two sizes of Finder a 50 x 9 (£45) model and a 30 x 6 model (£26).

The smaller one is perfectly adequate, has a wider field of view and the lesser light gathering capability will not be a problem.

My Sony DSLR Piggy Backed on My SW120

Any DSLR (Digital Single Lens Reflex Camera) can be used to take images of the Moon.

The image above shows the DSLR attached to a telescope mounting.

A compact Camera can also be mounted like this.

The Equatorial Mounting can be used so the camera can track the Moon for longer exposures.

My Sony DSLR Piggy Backed on My SW120

The image above shows the mounting arrangement used to attach the DSLR on a equatorial telescope mounting.

Most mountings have a camera attachment thread incorporated on the Tube Clamps.

The camera is screwed on to the thread and secured using a lock nut.

This method of camera mounting is known as a ‘Piggy Backed’.

My Sony DSLR Piggy Backed on My SW120

The image above shows the DSLR secured to a screw thread on the telescope mount.

This allows the camera to be pointed to the object in the sky using the main telescope and finder scope.

The telescope mount can also provide tracking for longer exposure images.

It does not matter that the camera is mounted sideways this can be rotated on a computer.

Any DSLR (Digital Single Lens Reflex Camera) can be used to take images of the Moon.

There are two ways that the imaging can be done.

1. Take pictures directly with the DSLR fitted with a Telephoto Lens.
2. Mount the DSLR on a equatorial mounted telescope (Piggy Backed).
3. Mounted directly on the focuser of a telescope (using the telescope as a telephoto lens).

My Sony DSLR mounted to the Focuser of my SW120

The image above shows the DSLR fitted to the focuser of a 120mm Skywatcher refracting telescope.

It also shows the remote shutter operating button that is a really good accessory to reduce vibration when shooting images.

It is worth pointing out the camera strap should be looped around the finder scope mounting.

This is in case the pinch screws holding the camera should slip and drop the camera.

Focusing the image is done using the telescope focuser.

There is also a video cable fitted to display a larger image on a TV screen.

Any DSLR Camera can be used to take images of the Moon through a telescope.

The more versatile DSLR camera has the advantage that it can be mounted on a telescope

This allows the telescope to be used as its primary optical device (lens [or mirror]).

This can be done by removing the camera lens and fitting an adaptor that will fit directly into the telescope focuser.

The image above shows the mounting ‘T’ Adapter that replaces the DSLR lens assembly.

The author used a Barlow Lens body with the Barlow Lens removed.

This Barlow Lens has a ‘T’ Adaptor thread incorporated in its body.

The Sony/Minolta adaptor

The Adaptor Ring used for the Sony/Minolta DSLR Camera.

This adaptor has the ‘snap-on’ connection to clip into the Sony DSLR camera body.

The central hole has a standard ‘T’ Type camera mounting thread.

The image above shown the Barlow Lens Body screwed into the ‘T’ Ring Adaptor. The Barlow Lens has been removed.

The assembled adaptors ready for fitting to the DSLR

The image above shows the DSLR with its Lens Assembly removed.

There is an arrow mark on the ‘T’ Adaptor Ring to align with the red dot on the camera.

To fit the adaptor it is aligned with the red dot then pushed in and rotated until it is clicked into place.

The DSLR Camera is now ready to be attached to the telescope focuser.

The DSLR mounted to the focuser

Cables for TV and Remote Shutter Button

The image above shows the DSLR fitted to the focuser of a 120mm Skywatcher refracting telescope.

It also shows the remote shutter operating button that is a really good accessory to reduce vibration when shooting images.

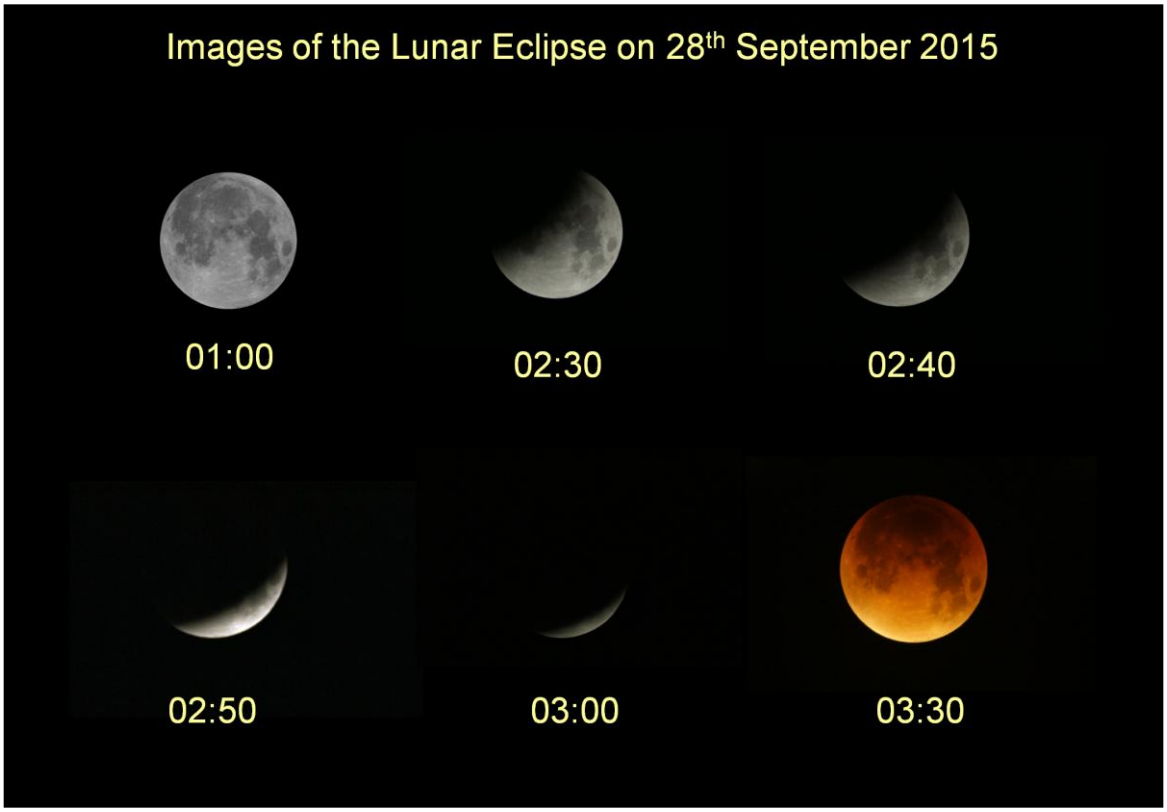
It is worth pointing out the camera strap should be looped around the finder scope mounting.

This is in case the pinch screws holding the camera should slip and drop the camera.

Focusing the image is done using the telescope focuser unit.

The camera above also has a ‘video out’ outlet that allows the image to be displayed on a larger screen such as a TV monitor.

This feature is a great improvement over trying to focus the image on the camera’s small ‘built in’ screen.



The set-up shown in the previous slides was used to image the Lunar Eclipse on 28th September 2015.

The images above show the eclipse sequence as the phases appeared.

Conditions were near perfect to see the Lunar Eclipse on the morning of 28th September.

The sky was clear, not too cold and there was just light dew.

Earth's shadow first became obvious at the edge of the Moon at about 02:00 BST.

The edge of the shadow is not as clearly defined as the silhouette of the Moon appears as it passed in front of the Sun during a Solar Eclipse.

This is due to sunlight passing through the atmosphere around the edge of Earth that causes blurring at edge during a Lunar eclipse.

The orange glow started to appear at about 03:15.

At mid eclipse the Moon will be completely inside the umbra of Earth's shadow and will remain completely inside the Umbra until 5:00.

During this time the moon may almost disappear from view but this is not always the case; often an amazing effect can be seen.

All the light falling on the Moon from the Sun should be blocked by Earth but some does get past.

The thin surface layer of our atmosphere acts rather like a lens and bends some sunlight around the curved surface of Earth and separates out the colours.

The red light is refracted by Earth's Atmosphere on to the Moon surface.

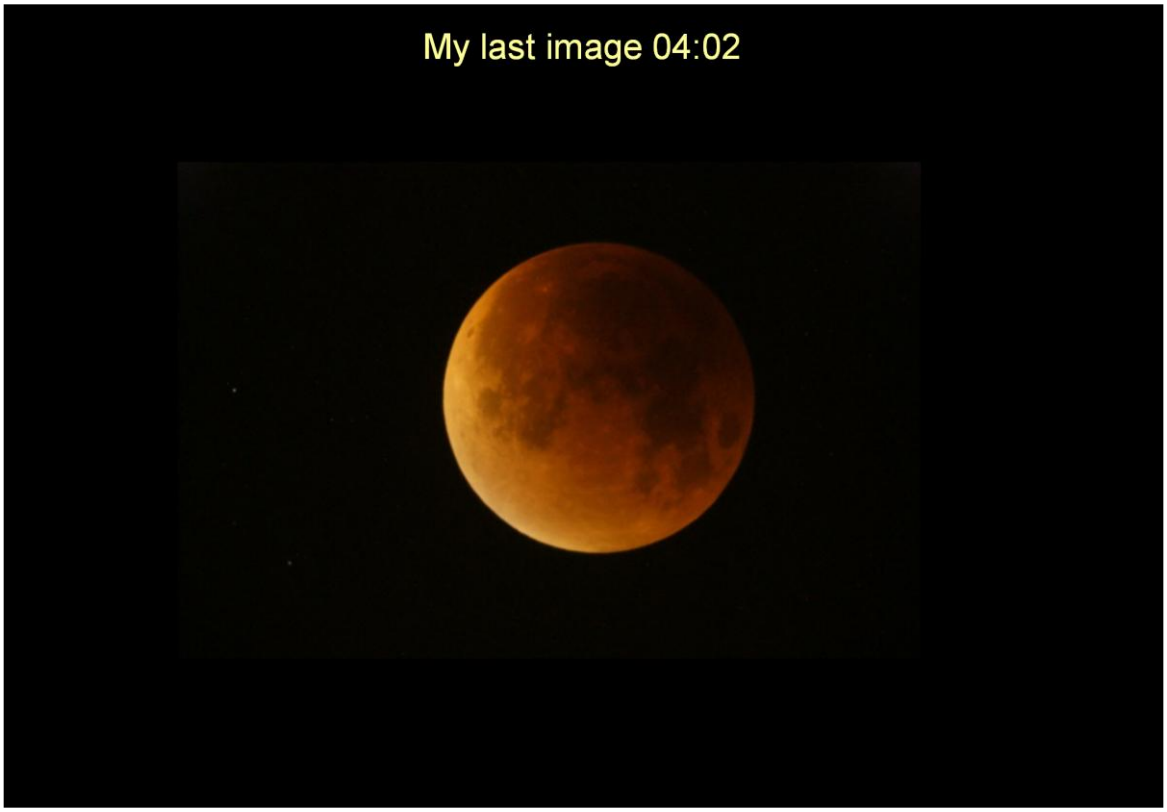
As the light is bent the colours are separated in the same way that a prism separates light into the spectrum.

The red part of the sunlight is bent more and is able to illuminate the surface of the Moon.

Most of the remaining colours of the sunlight are scattered and miss the Moon so the surface becomes bathed in red light.

So during the Eclipse on 16th May between 04:30 and 05:00 the Moon will be in Totality.

This means it will completely inside the central Umbra of Earth's shadow and will appear as an eerie orange globe hovering in the sky.



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While the Lunar Eclipse is developing on the western horizon the planets will be rising over the eastern horizon at: Saturn (03:30), Mars (04:00), Venus (04:30), Jupiter and Neptune (04:30).

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This presentation is available on the

Newbury Astronomical Society Website:

www.naasbeginners.co.uk