



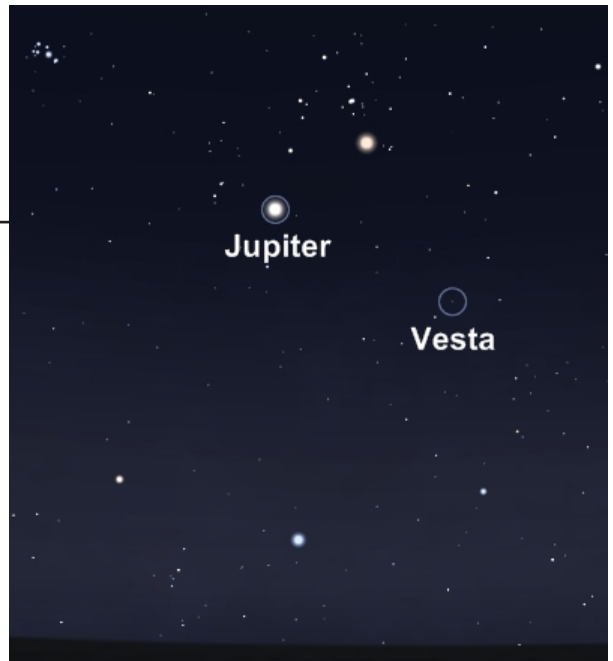
Earth & Beyond Teaching opportunities for 2012

This special edition has been prepared to assist you with planning when to cover the 'Earth & Beyond' strand of the Science Syllabus in 2012. It has been prepared so far in advance (October 2010) because I wish to alert you to the many and unique astronomical events that will be occurring throughout 2012 that can be taken advantage of in your teaching.

Regards,

Paul Floyd.

www.nightskyonline.info



Above: Jupiter and the asteroid Vesta. 9 December 2012.

Jupiter will be very easy to see with the unaided eye. Your students will need binoculars or a small telescope to locate Vesta.

Date	Event
Sunday 4 March	Mars at opposition
Mid-March	Venus and Jupiter close in the evening sky.
Friday 16 April	Saturn at opposition
Monday 4 June	Partial Lunar Eclipse
Wednesday 6 June	Venus transits the Sun
Mid-August	Spica, Mars and Saturn line up in the evening sky.
Tuesday 14 August	See Venus during the day
Wednesday 14 November	Total Solar eclipse (Far North Queensland) Partial Solar Eclipse from rest of Eastern Australia
Monday 3 December	Jupiter at opposition
Sunday 9 December	Asteroid Vesta at opposition

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Sample Curriculum Links

Listed below are example curriculum links for the astronomy events listed in this newsletter.

Queensland Yrs K - 10 Science Syllabus (1999)

Earth & Beyond Strand

1.1 Students identify and describe obvious features of the Earth and sky (including landforms and clouds).

1.2 Students describe obvious events (including day and night) that occur on the Earth and in the sky.

2.1 Students identify and describe changes in the obvious features of the Earth and sky (including changes in the appearance of the moon).

3.2 Students discuss regular and irregular events in time and space that occur on the Earth and in the sky.

D3.4 Students explore the relationship between distance and the perceived size of objects.

Draft Australia Science Curriculum (Draft Version 1.1.0 September 2010)

Science Understandings

Yr. 5 S.U. 2 'Regular and predictable motions of objects in the Solar System'.

Yr. 7 S.U. 3 'Observable effects of Earth's rotation on its axis and orbital motion around the Sun'.

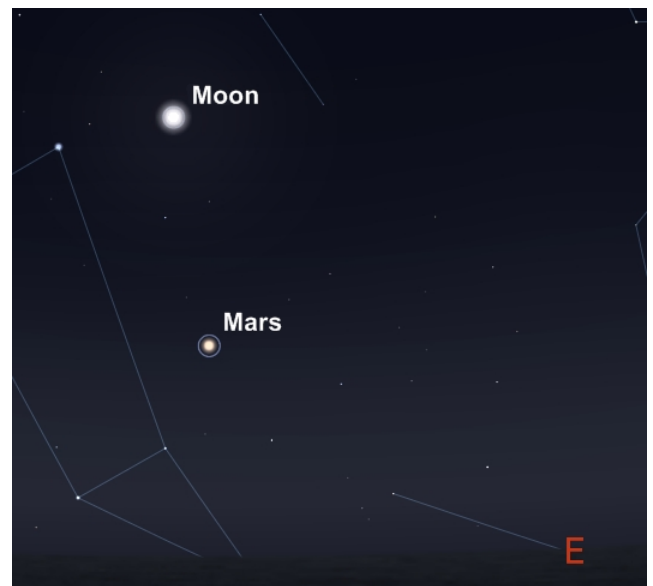
Mars at opposition

What? Mars reaches opposition on Sunday 4 March 2012. This astronomical term means that Mars will rise as the Sun sets and then sets as the Sun rises the following morning. It occurs every 26 months. Opposition is also when Mars is at its closest to the Earth, and therefore easiest to locate in the night sky.

Where do my students look? Look low above the Eastern horizon for a pale orange bright star as evening twilight ends.

When? Mars will be at opposition on the night of Sunday 4 March 2012. Note that Mars will continue to be visible for many months after opposition. After opposition, Mars will appear higher in the sky as each night goes by and slowly grow dimmer as the Earth moves away from Mars.

Equipment requirements? None. Mars can be easily seen with the unaided eye. It appears as a bright star to the unaided eye.



Above: If your students aren't familiar with the night sky, use the Moon as a signpost. On Wednesday 7 March 2012, the Moon will be located above Mars. Look above the Eastern horizon once evening twilight has ended.

Venus and Jupiter Conjunction

What? In March 2012, Venus and Jupiter will be easily visible to the unaided eye close together in the evening twilight sky. Mid-month, the two planets will rapidly and noticeably change position relative to each other as they, and the planet Earth (on which we are living) move at different speeds in their respective orbits.

Where do my students look? Look above the Western horizon as evening twilight ends.

When? The most noticeable change will occur over the period 10 – 20 March 2012.

Equipment requirements? None. Venus and Jupiter can be easily seen with the unaided eye. Both appear as bright stars to the unaided eye.



Above: Jupiter and Venus 15 March 2012.

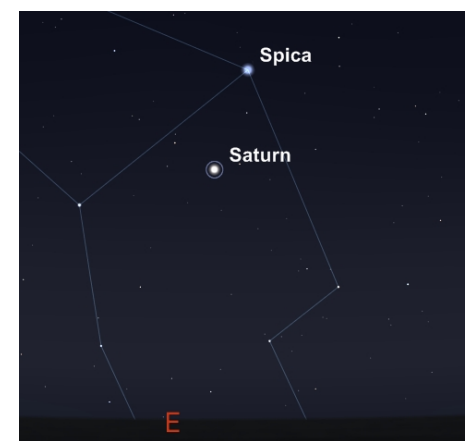
Saturn at opposition

What? Saturn reaches opposition on Monday 16 April 2012. This astronomical term means that Saturn will rise as the Sun sets and sets as the Sun rises the following morning. It occurs once every (approximately) 54 weeks. Opposition is also when Saturn is at its closest to the Earth, and therefore easiest to locate in the night sky.

Where do my students look? Look low above the Eastern horizon for a pale yellow bright star as evening twilight ends.

When? Saturn will be at opposition on the night of Monday 16 April 2012. Note that Saturn will continue to be visible for many months after opposition. After opposition, Saturn will appear higher in the sky as each night goes by and slowly grow dimmer as the Earth moves away from Saturn.

Equipment requirements? None. Saturn can be easily seen with the unaided eye. It appears as a pale yellow bright star to the unaided eye.



Above: Saturn and the star Spica 16 April 2012.

Southern Delta-Aquarid Meteor Shower

What? Over the period 12 July – 18 August each year, the Earth passes through a dust cloud left behind by an unknown object (most likely a now non-active comet). This dust impacts the Earth's atmosphere at 144,000 kilometers per hour, creating brief but bright streaks of light referred to as meteors or 'shooting stars'. The Earth passes through the densest part of the cloud on Saturday 28 July.

Where do my students look? Look above the Northern horizon. Note that this meteor shower is best observed from a dark sky location.

When? Saturday 28 July - between Midnight and the start of dawn the next morning. Up to 20 meteors will be visible to the unaided eye under dark sky conditions.

Equipment requirements? None. From a dark sky location, the meteors be easily seen with the unaided eye.

Partial Lunar Eclipse

What? A partial Lunar eclipse occurs on the evening of Monday 4 June 2012. A partial Lunar Eclipse occurs when the Moon travels partially through the otherwise invisible Earth's shadow. At maximum eclipse, the upper right hand side of the Moon will be covered by the Earth's shadow.

Where do my students look? Look high above the Eastern horizon. Look between the times listed below for the darkest part of the Earth's shadow to cover the Moon.

When? The Partial Lunar eclipse occurs on the evening of Monday 4 June 2012. The Partial phase of the Lunar eclipse starts at 7.59 pm AEST and ends at 10.06 pm AEST.

Equipment requirements? None. However, a pair of binoculars will provide a better view of the eclipsed Moon.

Transit of Venus

What? Venus will transit (pass in front of) the Sun on Wednesday 6 June 2012. During the transit, Venus will be visible as a small disc on the face of the Sun. This is an extremely rare event (last occurring in 2004 and before that in 1882) and will next occur on 11 December 2117. It is extremely unlikely that many of your students will be alive to see the next transit – making it a once in a lifetime event.

Where do my students look? This event happens in front of the Sun. Warning! Staring directly at the Sun without suitable eye protection will result in permanent eye damage.

When? The transit starts at 6.09am AEST and ends at 2.49pm AEST on Wednesday 6 June 2012.

Equipment requirements? To observe this event safely, students can use a pinhole in a piece of cardboard to project an image of the Sun onto a piece of white paper. Using this method, Venus will just be visible as a tiny dark patch on the projected image of the Sun. Refer to the end of this newsletter for more information on safe solar observing.

See Venus during the day

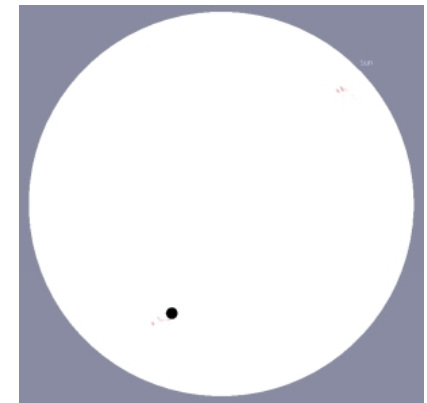
What? Contrary to what many people expect, you can see Venus during the daytime. The ideal time to do this is when the Moon is located near Venus. This is because the Moon is much easier to locate as well as focus on. By co-incidence, on Tuesday 14 August 2010, when the Moon is located near Venus, Venus will also almost be at its maximum Western elongation from the Sun meaning that Venus will be at its brightest making it easier to locate.

Where do my students look? Look above the Northern horizon at 9am. Locate the Crescent Moon approximately 40 degrees above the horizon. Look to the upper left of the Moon to locate Venus. Venus is approximately 2 degrees or four Moon widths from the Moon. Note that standing so that the Sun is blocked by a building will make locating the Moon and Venus much easier to locate.

When? 9am Tuesday 14 August 2012. As an aside, Venus reaches its greatest Western elongation (46 degrees) from the Sun on 15 August 2012.

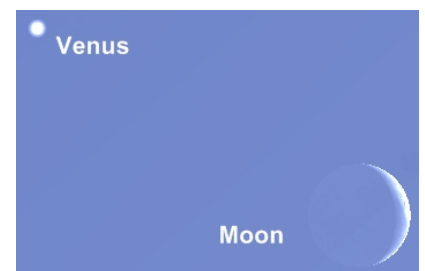


Above: Partial Lunar Eclipse 4 June 2012 9 pm AEST



Above: Venus transiting the Sun on 6 June 2012 12 pm AEST.

Below: Venus and crescent Moon 9am 14 August 2012.



Mars, Saturn and Spica

What? In August 2012, Mars and Saturn will be easily visible close together in the evening twilight sky to the unaided eye. Mid-month, Mars will change position relative to Saturn as it, and the planet Earth (on which we are living) move at different speeds in their respective orbits. Saturn is also moving in its orbit but its much greater distance from the Earth means that it doesn't move noticeably over this time period. Spica (the brightest star in the ancient Greek constellation Virgo 'The Virgin') acts as a fixed reference point to compare the movement of both planets to.

Where do my students look? Look low above the Western horizon at the end of evening twilight.

When? 10 – 20 August 2012

Equipment requirements? None. However, a pair of binoculars will provide a better view of the event. Note that a small telescope will show Saturn's rings, and Titan (Saturn's largest moon).

Mercury easily visible in the evening twilight

What? Contrary to what many people expect, if you know when to look, Mercury is very easy to see. In late October and the first week of November 2012, Mercury's position in its orbit means that it can be easily located in the evening twilight. Keep in mind that like all planets, Mercury only looks like a star to the unaided eye.

As an aside, the other 'star' you will notice moving above Mercury (relative to the stars) is really the planet Mars. It moves noticeably over this same period.

Where do my students look? Look low above the Western horizon as evening twilight ends.

When? 14 October – 6 November 2012 will see Mercury at its best. As an aside, Mercury reaches its greatest Eastern elongation (24 degrees) from the Sun on Saturday 27 October 2012.

Equipment requirements? None.

Solar Eclipse

What? On the morning of Wednesday 14 November, a Solar eclipse will occur when the Moon passes between the Earth and the Sun. If you are lucky enough to live in F.N.Q., you will be able to observe a Total Solar Eclipse. Elsewhere in Australia, the eclipse will only be a partial one.

Where do my students look? This event happens in front of the Sun. Warning! Staring directly at the Sun without suitable eye protection will result in permanent eye damage.

When? The morning of Wednesday 14 November 2012. Note that the exact eclipse start/finish times and the appearance of the Sun will be determined by your location in Eastern Australia. For Eastern Australia, maximum eclipse will have passed before school starts. This website will have exact times for the eclipse published on it in 2012.

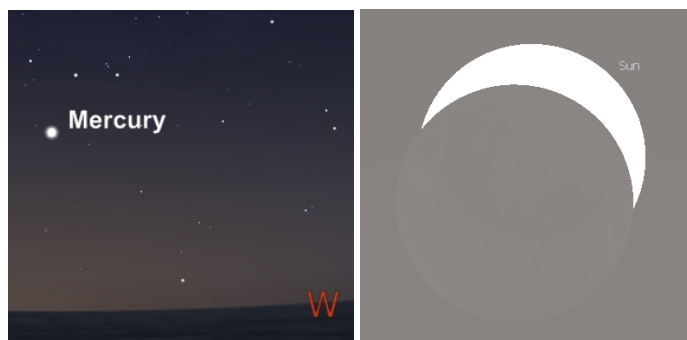
Equipment requirements? To observe this event safely, students can use a pinhole in a piece of cardboard to project an image of the Sun onto a piece of white paper. Using this method, the eclipsed part of the Sun will clearly be missing from the projected image of the Sun. Refer to the end of this newsletter for more information on safe solar observing.



Above: Mars, Spica and Saturn will be easy to see with the unaided eye.

Below left: Mercury will be easy to see in late October 2012.

Below right: From Brisbane, November's Solar Eclipse will only be partial but will still be impressive.



Jupiter at opposition

What? Jupiter reaches opposition on Saturday 3 December 2012. This astronomical term means that Jupiter will rise as the Sun sets and sets as the Sun rises the following morning. It occurs every approximately 13 months. Opposition is also when Jupiter is at its closest to the Earth, and therefore easiest to locate in the night sky.

Where do my students look? Look low above the Eastern horizon for a pale yellow bright star as evening twilight ends.

When? Jupiter will be at opposition on the night of Saturday 3 December 2012. Note that Jupiter will continue to be visible for many months after opposition. After opposition, Jupiter will appear higher in the sky as each night goes by and slowly grow dimmer as the Earth moves away from Jupiter.

Equipment requirements? None. Jupiter can be easily seen with the unaided eye. It appears as a bright star to the unaided eye.

Asteroid Vesta at opposition

What? The asteroid Vesta will be at opposition on Sunday 9 December 2012. This provides your students with an opportunity to view a main belt asteroid using only a pair of binoculars or a small telescope. It will only appear as a faint star in either but your students will have the satisfaction of finding for themselves the brightest asteroid in the main asteroid belt. More on Vesta can be found at http://en.wikipedia.org/wiki/4_Vesta.

Where do my students look? Look after twilight low above the Eastern horizon. Note that Vesta is not visible to the unaided eye, and a finder chart will be required. The image at right provides an approximate guide to where Vesta will be.

When? Around Sunday 9 December 2012 after evening twilight has ended.

Equipment requirements? A detailed finder chart and a pair of binoculars or a small telescope will be required to locate Vesta.

Solar Observing Safety

Warn your students that looking directly at the Sun will result in long term damage to their eyes from the ultraviolet radiation given off by the Sun. You will inevitably have students say that they have looked at the Sun and they can still see. What they can't feel is the damage being caused by the ultraviolet radiation given off by the Sun. The only exception to the 'Don't look at the Sun' rule is for those lucky students who happen to be located in Far North Queensland where the Total Solar Eclipse will be total (i.e. none of the Sun is left uncovered by the Sun). For the brief couple of minutes that this happens, you can look at the Sun. Technically speaking, you will be looking at the Moon as the Sun is behind it though.

Safe Solar Observing Techniques

1. Pinhole projection method (described in the newsletter).
2. Use of a pair of binoculars or telescope to project an image of the Sun onto a piece of paper. I would advise not doing this at school with younger students, as you cannot guarantee that students won't look at the Sun (through the telescope or binoculars) before you can stop them.
3. Looking at the Sun directly but safely using a pair of solar viewing glasses purchased from an astronomy telescope shop. These cost less than \$10 and are safe to use.
4. Looking at the Sun through a telescope or pair of binoculars equipped with a specialist solar filter purchased from an astronomy telescope shop. These are effective but expensive.