

# IFAS Astronomy Calendar 2016

A night sky filled with stars, with a silhouette of a person and a telescope on a tripod in the foreground. The person is standing on the left, looking towards the right. The telescope is mounted on a tripod in the center. The background is a dark blue night sky with many small white stars. The foreground is dark, with the silhouettes of trees and a person.

*Capturing the starlight*

## Welcome

Welcome to the 2<sup>nd</sup> edition of the IFAS calendar, highlighting many items of interest during 2016 for the keen sky watcher. Our first calendar was a great success and let IFAS buy and distribute 1,500 eclipse shades free in time for the March 20th solar eclipse. Due to various issues we have been unable to print up the calendar in time for distribution before the start of 2016. As a result we have made the calendar freely available for people to download. Until the 2017 calendar, we wish you the astronomer's adieu; Clear skies!

Contact us, link up with the Irish astronomy community, or find details of a club near you via [www.irishastronomy.org](http://www.irishastronomy.org)

The IFAS Calendar Team

### Acknowledgements

Pictures for use in the calendar were sent in by contributors to the IFAS forum but we have not included them in the free pdf due to copyright. That said, there is a chance we can print the calendar in the New Year: We will let people know via the forum if this comes to pass. We'd like to thank all who sent an image for consideration. The standard was very high and shows the interest in astronomy and space both at home and abroad.

We'd also like to thank everyone who wrote in with their suggestions on how to improve the calendar content and also those who bought the 2015 edition which helps the aims of IFAS to foster a wider interest in astronomy.

### Other publications

*Sky-High 2016* ([www.irishastrosoc.org](http://www.irishastrosoc.org)) or *The Handbook of the British Astronomical Association* ([www.britastro.org/](http://www.britastro.org/)) give expanded coverage of phenomena during the year. We also recommend subscribing to a monthly magazine for updates of any transient events like comets.

Other annual sky guides such as Paul Money's *Nightscenes 2016*, *Night Sky 2016* published by Collins, or *Stargazing 2016* published by Philips, may be picked up online or in bookstores. Each are full colour with monthly charts. Guy Ottewell's very useful *Astronomical Calendar 2016* can be purchased from the store at [www.universalworkshop.com/index.htm](http://www.universalworkshop.com/index.htm)

The US Naval Observatory have now made their annual *Astronomical Phenomena* booklet freely available online — see [aa.usno.navy.mil/publications/index.php](http://aa.usno.navy.mil/publications/index.php)

Comments, queries, & criticisms can sent to the author, John Flannery, at [aurorawatcher@gmail.com](mailto:aurorawatcher@gmail.com)

# Celestial sights for 2016

## Eclipses

A total solar eclipse on March 9th tracks across Sumatra, Borneo, Sulawesi, and a narrow span of the Pacific Ocean. East Asia, Australia, and Pacific regions, see a partial eclipse.

The penumbral lunar eclipse on March 23rd is visible from the Americas, Asia, and Australia. This eclipse has a maximum magnitude of 77%. Nothing will be seen of the penumbral lunar eclipse of August 18th as the Moon's disk barely brushes the outer edge of the northern part of the Earth's penumbral shadow.

An annular solar eclipse on September 1st starts in the Gulf of Guinea then makes landfall in Gabon before crossing Central Africa and the N part of Madagascar. Last sighting of annularity is off the southwest coast of Australia.

A penumbral lunar eclipse on September 16th is visible from Eurasia, Africa, and Australia. The event is in progress at moonrise from the UK/Ireland. The Moon dips 90% of the way into the southern part of our penumbral shadow so observers will see a subtle dimming of the northern limb of the Moon.

## Transit of Mercury

Mercury will transit the Sun when it passes through inferior conjunction on May 9th. This last occurred thirteen years ago for observers in the UK/Ireland. Mercury takes 7½ hours to fully cross the Sun but its disk size measures only 12 arc-seconds so the planet's silhouette is too small to be seen with the unaided eye using eclipse shades. A suitably filtered telescope will let you follow the event or use eyepiece projection.

Ingress occurs at 11:12 UT (12:12 Irish Summer Time) and Mercury exits the Sun's disk at 18:42 UT (19:42 IST). The next transit visible from here is on November 11th, 2019. See [en.wikipedia.org/wiki/Transit\\_of\\_Mercury](http://en.wikipedia.org/wiki/Transit_of_Mercury) for more details.

## The Planets

The calendar highlights occasions when two or more planets lie close to each other or when the Moon glides by. Of particular interest though is the opportunity to see all of the five planets known to the ancients in one sweep with the unaided eye before dawn during the last week of January and into the second week of February.

## The Moon

The Moon fascinates during the year. Sometimes high when Full, as during the winter months, or shyly hiding behind a distant treeline when low and Full each summer. We've listed occasions when the thin lunar crescent can be spotted soon after, or just before, New, as well as other opportunities to be surprised by the Moon's ever-changing aspect.

## Occultations

A daylight occultation of Venus occurs on April 6th, while the planet Jupiter lies a scant 4° from the Sun when occulted on September 30th. This is a very risky event to observe due to Jupiter's nearness to the Sun. Neptune is occulted 3 times in 2016 from the UK/Ireland — compute local circumstances via [eco.mtk.nao.ac.jp/cgi-bin/koyomi/occultx\\_p\\_en.cgi](http://eco.mtk.nao.ac.jp/cgi-bin/koyomi/occultx_p_en.cgi)

Asteroid occultations are only given for stars brighter than magnitude 10.0. A space-saving exercise means that we only list occultations by the Moon for stars brighter than magnitude 5.5 that take place before midnight, except in the case of Aldebaran and the Hyades when some will occur during the early hours of the morning and are worth observing. More detailed occultation lists can be created on [CalSky.com](http://CalSky.com) or via OCCULT, a software package developed by IOTA (see [occultations.org/](http://occultations.org/)).

## Comets

Comet Catalina in January's morning sky may be the highlight for observers this year when predicted to peak around magnitude 6 in January. It crosses Boötes, skims the handle of the Plough, and the tail of Draco during that month. A bright comet can appear at any time so do check [britastro.org/section\\_front/10](http://britastro.org/section_front/10) for updates. Remember Fred Whipple's wise words; "If you must bet, bet on a horse, not on a comet."

## Meteor showers

The Full Moon spoils the view of some of the major annual showers this year but there is still lots to keep the observer busy. The Perseids put on a great show in 2015 and may do so again. Jupiter perturbs the Perseid dust stream every 12 years, nudging it closer to Earth. Such an encounter last happened in November 2014 which may lead to an amazing Perseid display in 2016.

## Asteroids

We list opposition dates for eight of the first ten numbered asteroids or those brighter than magnitude 9.5 during 2016. (4) Vesta and (9) Metis skip a year and will next be at opposition on January 18th, 2017 and February 21st, 2017 respectively.

## Spaceflight

Space launch dates can change at any time but some of the missions this year include *Juno* arriving at Jupiter, a two-pronged assault on Mars with NASA's *InSight* and ESA's *ExoMars*, while China plan to loft their 2<sup>nd</sup> generation space station *Tiangong-2* into orbit some time in the early Summer. Commercial flight is still in focus as a number of private agencies plan tests of their heavy launchers — in Boeing's case, theirs is a crew transport. Keep an eye on the space news sites for regular updates.

# Some words to know

## Scale in the sky

A total solar eclipse is one of nature's greatest sights. The diameter of the Sun is 400 times that of the Moon. It is also 400 times further away. The happy circumstances that let us enjoy eclipses are due to the fact both the Sun and Moon have the same **apparent** (or angular) **diameter** in the sky of half a degree.

Degrees are sub-divided into 60 arc-minutes (60') with each made up of 60 arc-seconds (60"). This allows us measure angles in the sky or the apparent size of a celestial object. The Full Moon measures an average of half a degree, or 30', in diameter.

## Finding your way around

Two systems exist to find your way round the sky. The first is altitude and azimuth. **Altitude** is measured in degrees from a point on the horizon to the overhead point (the zenith) at 90°. **Azimuth** is measured 360° right around the horizon starting from true north equal to 0°. East is 90° azimuth and so on.

Astronomers also use a kind of celestial longitude and latitude called right ascension and declination to help them accurately plot the position of an object in the sky. Using these coordinates will let you track down that comet you've just read about or pick your way through a deep-sky catalogue.

**Right ascension** is expressed in hours (h), minutes (m) and seconds (s) running eastward from 0 to 24 hours right around the sky. The zero point of right ascension is the vernal equinox — the point where the Sun crosses the celestial equator, moving from south to north.

**Declination** is how many degrees, minutes, and seconds north (+) or south (-) of the celestial equator an object is.

## Star light, star bright

The **magnitude** of a star refers to its brightness, not to its size. The scale of magnitudes is a logarithmic one. A difference of one magnitude is a difference of 2.512 times in brightness. A difference of five magnitudes is one of a 100 times in brightness. The lower the magnitude number, the greater the brightness.

The apparent brightness of a star depends on its true brightness and distance. The term magnitude if not qualified, refers to apparent brightness. **Absolute magnitude** is the magnitude a star would show if it lay at a standard distance of 10 parsecs.

## The planets

Mercury and Venus are tied to the realm of twilight though Venus can be well placed in a dark sky after sunset or before sunrise when at a favourable elongation. Mars, Jupiter & Saturn may be seen right throughout the night when at opposition.

Mercury and Venus are closer to the Sun than the Earth while Mars, Jupiter, Saturn, Uranus, Neptune and the Dwarf Planets are further out. The planets are always to be found in the **zodiac** — a band which cuts the sky in half that lies either side of the ecliptic. The **ecliptic** is the plane of the Earth's orbit projected on to the celestial sphere. Mercury and Venus seem to swing from one side of the Sun to the other but viewed from Earth they never get further away than the positions known as **greatest elongation**. The other planets can be anywhere in the zodiacal band.

The moment Mercury or Venus are directly between the Earth and Sun is known as **inferior conjunction**. They are at **superior conjunction** when they pass behind the Sun. The other planets outside our orbit can only pass through superior conjunction.

When the outer planets are in **opposition** they are opposite the Sun to us and are on the celestial meridian at midnight. The **celestial meridian** is an imaginary line that starts at the north point of the horizon, rises directly through the North Celestial Pole (NCP) to the zenith and continues on down to the southern point of the horizon.

Venus and Mercury show phases like the Moon. Mars can look gibbous, i.e. not quite full. Jupiter can show very slightly less than full at **quadrature** in amateur telescopes.

The outer planets can sometimes exhibit a phenomenon known as **retrograding**. A consequence of them lying further from the Sun than us is that they orbit more slowly than the Earth. Therefore, at opposition, the Earth can overtake an outer planet causing its apparent movement against the stars to grind to a halt, move back to the right, halt, and then resume direct motion.

## Lunar hide-and-see

During its journey round the sky the Moon may hide or **occlude** a star or planet. The disappearance of an object at the Moon's limb can be quite sudden due to the lack of a lunar atmosphere. A star may also be occulted by an asteroid but such an event is generally only seen with a telescope over a narrow track.

## Useful web sites

### Looking up ...

- [www.skymaps.com](http://www.skymaps.com)
- [earthsky.org/astronomy-essentials](http://earthsky.org/astronomy-essentials)
- [in-the-sky.org](http://in-the-sky.org)
- [www.calsky.com](http://www.calsky.com)

### Irish interest ...

- [www.irishastronomy.org](http://www.irishastronomy.org)
- [www.astronomytrail.ie/](http://www.astronomytrail.ie/)
- [www.boards.ie/vbulletin/forumdisplay.php?f=267](http://www.boards.ie/vbulletin/forumdisplay.php?f=267)

### Phenomena and satellite passes ...

- [www.spaceweather.com](http://www.spaceweather.com)
- [www.atoptics.co.uk](http://www.atoptics.co.uk)
- [www.heavens-above.com](http://www.heavens-above.com)

### News ...

- [www.universetoday.com](http://www.universetoday.com)
- [www.space.com](http://www.space.com)
- [spaceflightnow.com](http://spaceflightnow.com) and [www.astronomynow.com/](http://www.astronomynow.com/)

### Blogs, forums, and podcasts ...

- [www.planetary.org/blogs/emily-lakdawalla/](http://www.planetary.org/blogs/emily-lakdawalla/)
- [scienceblogs.com/startswithabang/](http://scienceblogs.com/startswithabang/)
- [astrobob.areavoices.com/](http://astrobob.areavoices.com/)
- [www.cloudynights.com](http://www.cloudynights.com)
- [astrosociety.org/education/silicon-valley-astronomy-lectures/](http://astrosociety.org/education/silicon-valley-astronomy-lectures/)

### Education ...

- [www.unawe.org/](http://www.unawe.org/)
- [www.astrosociety.org/education/](http://www.astrosociety.org/education/)
- [todayinsciencehistory.com/](http://todayinsciencehistory.com/)





### Equipment and astrophotography ...

- [www.calgary.rasc.ca/downloads/](http://www.calgary.rasc.ca/downloads/)
- [www.ktectelescopes.ie](http://www.ktectelescopes.ie)
- [www.astropix.com](http://www.astropix.com)







## Time in the 2016 calendar

Except where noted, times in the calendar are given in Universal Time (UT). This is the 24-hour system starting at mean midnight as measured at Greenwich. It is the same as Greenwich Mean Time (GMT). To translate UT into Summer Time just add one hour. Summer Time in 2016 begins on March 27th at 01:00 when the clocks go forward one hour. Summer Time ends on October 30th at 01:00 when clocks go back one hour (remember, "Spring forward, Fall back"). Some interesting articles are at [www.rmg.co.uk/explore/astronomy-and-time/time-facts](http://www.rmg.co.uk/explore/astronomy-and-time/time-facts) & [www.timeanddate.com/time/dst/](http://www.timeanddate.com/time/dst/)






# January 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p><b>Mercury</b> is an evening sky object for the first week or so of January before inferior conjunction. The planet then moves into the morning sky when it will be low in the south-east the last week of the month. You'll find <b>Venus</b> rising about 3 hours before the Sun on the 1st but that time gap will halve by the 31st. <b>Mars</b> rises during the early hours and can be found in Virgo up to mid-month before it crosses into Libra. The planet's distinctive orange-red tint now becomes quite pronounced as Mars brightens from 1.3<sup>m</sup> to 0.8<sup>m</sup>. <b>Jupiter</b> rises with Leo during the late evening and nestles close its border with Virgo. <b>Saturn</b> can be found in Ophiuchus and rises more than two hours before the Sun. Mercury's appearance in the morning sky towards the end of January allows us see all five classical planets in one sweep before sunrise until about mid-February. This last occurred in December 2004 when the five were in the right order of their increasing distance from the Sun.</p>				<p><b>1</b></p> <p>New Year's Day (Irl/UK)</p>	<p><b>2</b> 05h 30m </p> <p>Smallest Last Quarter Moon of the year (404,277 km distant)</p> <p>Earth is at perihelion (23h 00m) -- 0.9833 AU</p>	<p><b>3</b></p> <p>AM: Mars (1.2<sup>m</sup>) lies 5° to the Moon's lower left</p> <p>Summer solstice in northern hemisphere of Mars</p>
<p><b>4</b></p> <p>Quadrantids peak at 08h</p> <p>1866: Joel Metcalf born (US astronomer)</p> <p>Bank Holiday (Scotland)</p>	<p><b>5</b></p>	<p><b>6</b></p> <p>Pluto in conjunction with the Sun</p>	<p><b>7</b></p> <p>AM: Saturn (0.5<sup>m</sup>) and Venus (-4.0<sup>m</sup>), 2° apart, are just to Moon's right</p>	<p><b>8</b></p> <p>Jupiter stationary in Leo, begins to retrograde</p>	<p><b>9</b></p> <p>AM: Saturn and Venus are now just 5' apart</p>	<p><b>10</b> 01h 31m </p> <p>PM: Mercury (2.4<sup>m</sup>) 1¼° to the 16-hour old Moon's left very low in the WSW as dusk falls</p>
<p>BT Young Scientist Exhibition, RDS, Dublin</p>						
<p><b>11</b></p>	<p><b>12</b></p> <p>Stargazing Live on BBC 2 (airs on the 13th and 14th also)</p> <p>1716: Antonio de Ulloa born (Spanish explorer)</p>	<p><b>13</b></p>	<p><b>14</b></p> <p>Mercury at inferior conjunction</p> <p>Orthodox New Year</p>	<p><b>15</b></p> <p>2006: <i>Stardust</i> mission ends with comet sample return</p>	<p><b>16</b> 23h 26m </p> <p>Biggest First Quarter Moon of the year (370,586 km distant)</p> <p>Moon occults mu Psc (4.8<sup>m</sup>) at 18h 39m</p>	<p><b>17</b></p> <p>Mars crosses into Libra</p> <p>(528) Rezia predicted to occult HIP 49947 (a 9.1<sup>m</sup> star in LMi) from W coast of Ireland at 07h 48m</p>
<p><b>18</b></p> <p>AM: Sweep SE to SW and you'll spot Venus, Saturn, Mars, and Jupiter arrayed along the ecliptic before sun-up. Mercury joins the quartet by the end of the week</p>	<p><b>19</b></p> <p>PM: Moon occults some of the Hyades cluster tonight - use calsky.com to generate the predictions for your site</p> <p>2006: <i>New Horizons</i> launched towards Pluto</p>	<p><b>20</b></p> <p>Moon occults Aldebaran - 03h 22m to 03h 58m</p> <p>Sun enters Capricornus</p>	<p><b>21</b></p>	<p><b>22</b></p> <p>1816: Catherine Bruce Wolfe born (American philanthropist and patroness of astronomy)</p>	<p><b>23</b> 01h 46m </p>	<p><b>24</b></p> <p>AM: All five classical planets will be visible in the morning sky at the same time for the next couple of weeks</p>
<p><b>25</b></p> <p>Burns Night (Scotland)</p>	<p><b>26</b></p>	<p><b>27</b></p> <p>late-PM: Jupiter (-2.3<sup>m</sup>) lies 1¾° to the Moon's upper left as both rise</p>	<p><b>28</b></p>	<p><b>29</b></p> <p>This week notice how the harsh white of Venus contrasts with the orange tint of Mars. Jupiter has a creamy texture while Saturn shows a yellowish cast. Mercury seems to be a golden or pinkish hue.</p>	<p><b>30</b></p> <p>Galway Star Party, Galway, Ireland</p>	<p><b>31</b></p> <p>1966: <i>Luna 9</i> launched (USSR). First spacecraft to soft-land on the Moon</p>





# February 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p>1 03h 28m </p> <p>AM: Mars (0.8<sup>m</sup>) lies 2° to the Moon's lower left</p> <p>(101) Helena predicted to occult HIP 57107 (a 7.1<sup>m</sup> star in Vir) thru N of Ireland at 07h 16m </p>	<p>2</p> <p>IAS/IFAS astrophotography exhibition, Botanic Gardens, Dublin (to the 21st)</p> <p> (866) Fatme to occult HIP 34030 (8.5<sup>m</sup> star in Gem) on Feb 1<sup>st</sup> from W to SE Ireland at 01h 47m</p>	<p>3</p> <p>AM: Saturn (0.5<sup>m</sup>) lies 7° to the Moon's lower left</p>	<p>4</p> <p>AM: Saturn now lies to the right of the Moon</p>	<p>5</p> <p>European Astrofest, London</p>	<p>6</p> <p>AM: Mercury (-0.1<sup>m</sup>) 4½° lower left of, and Venus (-3.9<sup>m</sup>) 3¼° lower right of, a thin crescent Moon</p>	<p>7</p> <p>AM: the Moon 30½ hrs from New is low in ESE</p> <p>Mars is at western quadrature</p> <p>Mercury greatest elongation west (25° 33')</p>
<p>8 14h 39m </p> <p>Chinese New Year (Year of the Monkey)</p>	<p>9</p> <p>PM: Look for the 28-hour old Moon low in WSW</p>	<p>10</p> <p>1916: JB Sidgwick born (UK astronomer-author)</p>	<p>11</p>	<p>12</p> <p>Progress cargo flight to the ISS (mission 63P)</p>	<p>13</p> <p>AM: Mercury (-0.1<sup>m</sup>) &amp; Venus (-3.9<sup>m</sup>) now just 4° apart</p> <p>Space-X <i>Dragon</i> flight to ISS</p> <p>Moon occults xi<sup>1</sup> Cet (4.4<sup>m</sup>) at 19h 16m</p> <p>IAA/IAS meeting @ Dunsink</p>	<p>14</p> <p>Venus crosses ecliptic, going north to south</p> <p>Valentine's Day</p>
<p>15 07h 46m </p> <p>(5) Astraea at perihelic opposition (8.7<sup>m</sup>) within 1° of Regulus in Leo</p> <p>Galileo Day</p>	<p>16</p> <p>Moon occults gamma Tau (3.6<sup>m</sup>) at 01h 17m</p> <p>1816: Kasper Schwiezer born (Swiss astronomer)</p>	<p>17</p> <p>Sun enters Aquarius</p>	<p>18</p> <p>Watch Jupiter inch toward sigma Leo (4.0<sup>m</sup>) over the next two weeks. They are closest on March 3<sup>rd</sup></p> <p>Start of the Northern Ireland Science Festival (runs to 28th)</p>	<p>19</p>	<p>20</p> <p>Institute of Physics in Ireland one-day themed meeting, Hilton Hotel, Belfast</p>	<p>21</p> <p>Moon occults xi Leo (5.0<sup>m</sup>) at 17h 47m</p>
<p>22 18h 20m </p> <p>1966: flight of two dogs, Veterok and Ugolyok, on <i>Kosmos-110</i> — they spend a record 22 days in space and land safely</p>	<p>23</p> <p>PM: Jupiter (-2.5<sup>m</sup>) lies 3¼° to the Moon's left when both rise tonight</p>	<p>24</p> <p>1866: Pytor Lebedev born (Russian physicist)</p>	<p>25</p>	<p>26</p> <p>AM: Venus (-3.9<sup>m</sup>) about 1½' from 19 Cap (5.8<sup>m</sup>)</p> <p>1616: Galileo is formally warned by the Inquisition</p>	<p>27</p> <p>1966: <i>Venera 2</i> flyby of Venus (USSR)</p>	<p>28</p> <p>Neptune in conjunction with the Sun</p>
<p>29</p> <p><b>Mercury</b> is a morning sky object for the first 10 days of the month after which it will be lost to view. <b>Venus</b> heralds the approaching sunrise these mornings but is now getting rather low. A clear south-eastern horizon is a prerequisite to easily seeing the planet by the end of February when its altitude is only 2° at the beginning of civil twilight. Mars rises not long after midnight at the end of February. The Red Planet lies just over 1° from the magnitude +2.7 star alpha Librae on February 1st with the Last Quarter Moon nearby on the same date. Mars is at western quadrature on the 7th when telescope users can note its gibbous phase. <b>Jupiter</b> rises with Leo during the early evening and can be found above the eastern skyline only 45 minutes after sunset by the end of the month. The planet brightens a notch from magnitude -2.4 to -2.5 during February and continues to dominate the evening sky. The Moon is just one day past Full when near Jupiter on the night of the 23rd, making for a dramatic sight when both appear. Saturn rises 3½ hours before the Sun at the beginning of February and by an hour earlier by the end of the month. Of interest is a plan to use the <i>Hubble Space Telescope</i> this month to search for planets around Proxima Centauri when the star is predicted to pass in front of a more distant star and a micro-lensing effect may be noted. The original paper by the search team can be downloaded from <a href="http://arxiv.org/abs/1401.0239">arxiv.org/abs/1401.0239</a></p>						

# March 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	<p><b>1</b> 23h 11m </p> <p>early AM: Mars (0.3<sup>m</sup>) lies 4½° to the right of the Moon as it rises</p> <p>1966: <i>Venera 3</i> impacts Venus (USSR)</p> <p>St. David's Day (Wales)</p>	<p><b>2</b></p> <p>AM: Saturn (0.5<sup>m</sup>) lies 2¼° below the Moon</p>	<p><b>3</b></p> <p>Most southerly Moon of the year</p> <p>Scott Kelly and Mikhail Korniyenko are due to land after their one-year mission onboard the <i>ISS</i></p>	<p><b>4</b></p> <p><i>Insight</i> Mars lander and <i>Mars Cube 1 &amp; 2</i> launch (NASA)</p>	<p><b>5</b></p> <p>Predicted maximum of the variable Mira Ceti</p>	<p><b>6</b></p> <p>Saturn at western quadrature</p> <p>Mothersing Sunday</p>
<p><b>7</b></p> <p>AM: Venus (-3.8<sup>m</sup>) lies 2½° below the Moon — both are very low in ESE</p> <p>Cambridge Science Festival starts today and runs until March 20th</p>	<p><b>8</b></p> <p>Jupiter (-2.5<sup>m</sup>) reaches opposition in Leo. The disk measures 44.45"</p>	<p><b>9</b> 01h 54m </p> <p>Total Solar Eclipse (not visible from Irl/UK)</p> <p>PM: 17-hour old Moon may be visible very low above the W skyline</p>	<p><b>10</b></p> <p>Comet P/Ikeya-Murakami (2010 V1) at perihelion. It may be 9.0<sup>m</sup> in February when well placed in Leo</p> <p>2006: <i>MRO</i> goes into orbit around Mars (US)</p>	<p><b>11</b></p> <p>British Science Week starts (runs to the 20th)</p>	<p><b>12</b></p> <p>Sun enters Pisces</p>	<p><b>13</b></p> <p>Mars crosses into Scorpius</p>
<p><b>14</b></p> <p>2 week window opens for launch of <i>ExoMars</i>, ESA's Mars orbiter and <i>Schiaparelli</i> lander</p>	<p><b>15</b> 17h 03m </p> <p>Moon occults 130 Tau (5.5<sup>m</sup>) at 20h 01m</p> <p>(10) Hygiea reaches opposition (9.4<sup>m</sup>) just 13' from the star 87 Leonis</p>	<p><b>16</b></p> <p>AM: Mars lies close to β<sub>1</sub> and β<sub>2</sub> Scorpii</p> <p>Moon occults 26 Gem (5.2<sup>m</sup>) - 19h 01m to 20h 02m</p> <p>1966: <i>Gemini 8</i> launch</p>	<p><b>17</b></p> <p>(6) Hebe at opposition (9.8<sup>m</sup>) in Coma Berenices</p> <p>Big Bang Science Fair in NEC, Birmingham, UK (16th to 19th)</p> <p>St Patrick's Day (Irl/NIr)</p>	<p><b>18</b></p> <p><i>ISS</i> Expedition 47 crew launch (Skripochka, Ovchinin, and Williams)</p>	<p><b>19</b></p> <p>Earth Hour will be held from 8:30pm - 9:30pm</p>	<p><b>20</b></p> <p>Spring Equinox, 04h 30m</p> <p>Venus at aphelion</p> <p>1916: publication of <i>The Formal Foundation of General Relativity</i></p>
<p><b>21</b></p> <p>PM: Jupiter (-2.5<sup>m</sup>) lies 3½° to the Moon's left</p> <p>1866: Antonia Maury born (US astronomer)</p>	<p><b>22</b></p>	<p><b>23</b> 12h 01m </p> <p>Penumbral lunar eclipse (mag. 0.801) - not visible from Irl/UK</p> <p>Mercury superior conjunction</p> <p>World Meteorological Day</p>	<p><b>24</b></p>	<p><b>25</b></p> <p>Saturn stationary in Ophiuchus, begins to retrograde</p> <p>Good Friday</p>	<p><b>26</b></p> <p>Moon occults kappa Vir (4.2<sup>m</sup>) - 02h 54m to 04h 04m</p> <p>Edinburgh International Science Festival (runs to April 10th)</p>	<p><b>27</b></p> <p>Summertime begins, clocks forward 1 hour</p> <p>Easter Sunday</p>
<p><b>28</b></p> <p>Moon occults eta Librae (5.4<sup>m</sup>) at 01h 24m</p> <p>Bank Holiday (Irl)</p>	<p><b>29</b></p> <p>AM: Moon lies near both Mars and Saturn</p> <p>Moon occults 24 Oph (5.9<sup>m</sup>) emerges 06h 25m</p>	<p><b>30</b></p> <p>Orbital ATK <i>Cygnus</i> supply flight to the <i>ISS</i></p> <p>2006: Marcos Pontes is first Brazilian in space</p>	<p><b>31</b> 15h 17m </p> <p>PM: Mercury (-1.5<sup>m</sup>) lies 38' from Uranus but both are very low as dusk falls</p> <p>1966: <i>Luna-10</i> launched. First spacecraft to orbit the Moon (USSR)</p>	<p><b>Venus</b> is now a difficult object and can be considered lost to view until maybe mid-August when Venus returns to the evening sky. <b>Mars</b> rises not long after midnight all month and brightens to -0.5 during the period. <b>Jupiter</b> reaches opposition on March 8th in eastern Leo and is visible all night as a brilliant magnitude -2.5 object. The planet's disk measures 44" in diameter -- smaller than the maximum possible due to Jupiter now being close to its aphelion point (reached in 2017). <b>Saturn</b> can be found in Ophiuchus and is at western quadrature on March 6th when telescope users will notice the globe's shadow cast on the rings, giving a three-dimensional appearance to the view. <b>Mercury</b> is too close to the Sun to be seen this month.</p>		

# April 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p><b>Mercury</b> reaches greatest elongation east (19.9°) on the 18th and is visible in the western evening sky for all of April. It is brightest at the beginning of the apparition. The slender curl of the 32½-hour old Moon lies 6° to the left of Mercury on the 8th. This is a fine opportunity to notice earthshine, caused by sunlight reflected off the day side of the Earth on to the night side of the Moon, allowing you make out the rest of the disk faintly lit. <b>Venus</b> rises less than 20 minutes before the Sun and will not be seen. <b>Mars</b> brightens from magnitude -0.5 to -1.4 and pops into view above the south-eastern skyline during the late evening by the end of April. The planet spends most of the month in Ophiuchus. Cream-coloured <b>Jupiter</b> (-2.4<sup>m</sup>) will be seen under the body of Leo high in the SE sky after nightfall at the beginning of April and on the meridian at the same time of evening by the end of the month. <b>Saturn</b> (0.3<sup>m</sup> to 0.2<sup>m</sup>) is rising only half an hour after Mars all month and can be found in southern Ophiuchus.</p>				1	2	3
				Global Astronomy Month starts	Society for the History of Astronomy conference in Bath, England	Mars crosses into Ophiuchus
4	5	6	7 11h 24m 	8	9	10
Start of National Dark Sky Week (to April 10th) Cassini flyby of Titan at an altitude of 990 km	Space-X <i>Dragon</i> supply flight to the ISS 1991: <i>Compton Gamma-Ray Observatory</i> launch	Daylight occultation of Venus by the Moon from 07h 38m to 07h 50m	Closest New Moon of the year at 357,229 km Kelling Heath Star Party, UK (to the 10th) 1866: Erik Fredholm born (Swedish mathematician)	<i>PM</i> : Mercury (-1.0 <sup>m</sup> ) lies 6½° to the Moon's right ISTA conference, LIT, Limerick, Ireland (to 10th)	Uranus at solar conjunction NEAF, Suffern, New York (to April 10th) 1816: Charles Delaunay born (French astronomer)	Moon occults some Hyades cluster stars from 19h 57m — use calsky.com for details
11	12	13	14 03h 59m 	15	16	17
2006: <i>Venus Express</i> goes into orbit round Venus (ESA)	Yuri's Night <i>see yurisnight.net</i>		(168) Sibylla predicted to occult HIP 54675 (a 9.3 <sup>m</sup> star in Leo) on a line thru the S of Ireland at 21h 28m	Cosmos 2016, Athlone, Ireland — <i>see www.midlandsastronomy.com</i>		
18	19	20	21	22 05h 24m 	23	24
Mercury greatest elongation east (19° 56') Sun enters Aries Pluto stationary in Sagittarius, begins retrograde		Moon occults theta Vir (4.4 <sup>m</sup> ) at 23h 58m		Lyrids peak at 01h Most distant Full Moon of 2016 at 403,340km. Disk measures 29' 37" Earth Day	<i>St. George's Day (Eng)</i>	<i>PM</i> : Mars (-1.2 <sup>m</sup> ) lies 4½° below the Moon
25	26	27	28	29	30 03h 29m 	
<i>PM</i> : Saturn (0.2 <sup>m</sup> ) is 4½° to the Moon's lower right		(3) Juno at opposition (10.0 <sup>m</sup> ) in Virgo	Mars crosses the ecliptic, going north to south	<i>Progress</i> cargo flight to the ISS (mission 64P)	Mars crosses into Scorpius	









# June 2016





Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p>Mars is low in the SE in Libra when the sky darkens after sunset and is stationary on the 30th after which its direct motion resumes. Mars very slowly fades from magnitude -2.0 to -1.4 during June but far outshines the stars in the region of sky where it currently lies. Contrast the burnt orange of Mars with the yellowish hue of the low summer Moon when it lies near the planet on the evening of the 17th. <a href="#">Mercury</a> and <a href="#">Venus</a> are too deep in the Sun's glare to be seen this month.</p>		1	2	3	4	5 03h 00m 
6	7	8	9	10	11	12 08h 10m 
<p>Moon occults 26 Gem (5.2<sup>m</sup>) - 21h 21m to 22h 10m</p> <p>Venus is at superior conjunction</p> <p><a href="#">Bank Holiday (Irl only)</a></p>	<p>Venus crosses ecliptic going south to north</p> <p>Cheltenham Science Festival (to the 12th)</p> <p><a href="#">Ramadan begins</a></p>	World Oceans Day	<p>Moon occults xi Leo (5.0<sup>m</sup>) - 22h 37m to 23h 20m</p> <p>Spacefest in Tucson, Arizona (to the 12th)</p>		<p>(8) Flora at opposition (9.4<sup>m</sup>) in Ophiuchus</p> <p><i>PM:</i> Jupiter (-2.0<sup>m</sup>) lies 2½° to the Moon's upper right &amp; close to chi Leo</p>	
13	14	15	16	17	18	19
	<p>Neptune stationary in Aquarius, begins to retrograde</p>	<p>Moon occults kappa Vir (4.2<sup>m</sup>) - 22h 08m to 23h 28m</p>	<p>The Sun is not far below the horizon this time of year so Earth's shadow cast in space is low in the sky. Therefore many satellites can be seen as they catch the Sun's rays at their great height.</p>		<p><i>PM:</i> Saturn (0.1<sup>m</sup>) lies 2¾° below the Moon</p> <p>Solarfest at Dunsink Observatory, Dublin</p>	<a href="#">Father's Day</a>
20 11h 02m 	21	22	23	24	25	26
<p>Summer solstice, 22h 35m</p>	<p>Moon occults 43 Sgr (4.9<sup>m</sup>) - 21h 53m to 22h 57m</p> <p>Sun enters Gemini</p> <p>1916: Herbert Friedman born (US astronomer)</p>		<p>Robert Boyle Summer School, Lismore, Ireland (to the 26th)</p> <p>2016 Oxfordshire Science Festival, UK (to July 3rd)</p>		<p>Observers in NE Ireland and the northern part of the UK will see Neptune reappear from occultation by the Moon at 23h 41m (soon after moonrise)</p>	
27 15h 42m 	28	29	30	<p><a href="#">Jupiter</a> is in the south-western sky after sunset and now starts its slow slide towards the Sun along with the spring constellations over the next few months. The planet sets before midnight by the end of June and also fades a little to magnitude -1.9 in this time. The Moon is close to Jupiter on the evening of June 11th. <a href="#">Saturn</a> reaches opposition on June 3rd in Ophiuchus when it is magnitude 0.0 and 1,349 million kms from Earth. The planet's disk is just over 18 arc-seconds in diameter for telescope users and the rings are tipped more than 26° earthward. Interestingly, the apparent size of Saturn's globe is roughly the same as that of Mars (which reached opposition last month and lies nearby) at this time.</p>		
<p>June Boötids peak</p> <p>Starmus, Tenerife, Canary Is. (to July 2nd)</p>		<p>1916: birth of L'udmila Pajdušáková (first Slovak female astronomer)</p>	<p>Mars stationary in Libra, direct motion resumes</p> <p>Orbital ATK <i>Cygnus</i> resupply flight to the <i>ISS</i></p> <p>Asteroid Day</p> <p>Inspirefest, Dublin (runs to July 2nd)</p>			

# July 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p><b>Venus</b> might be spotted the last few days of July just above the northwest horizon before the end of civil twilight. You'll need binoculars when searching — start looking a little after sunset lest you accidentally sweep up the Sun in the field of view. <b>Mars</b> sets before midnight by the end of July but still dominates the dim zodiacal constellation Libra. It's slow fade from magnitude -1.4 to -0.8 during the month is due to Earth's faster motion round the Sun as we leave Mars behind in its orbit. Mercury is too deep in the evening twilight to be seen this month. <b>Jupiter</b> (-1.7<sup>m</sup>) is getting lower in the western sky these evenings along with Leo and will set only 90 minutes after the Sun by the end of July. NASA's <i>Juno</i> spacecraft is due to arrive at Jupiter after a five-year journey including a gravity assist flyby of Earth in October 2013. <b>Saturn</b> (0.2<sup>m</sup>) is in the S sky after dark and sets in the early hours at the beginning of July but just after midnight by the 31st. <b>Mercury</b> is too deep in the evening twilight to be seen during July.</p>				1	2	3
4	5	6	7	8	9	10
<p>11h 01m </p> <p>Earth reaches aphelion at 16h 00m (1.017 au) 2006: first long duration mission by an ESA astronaut (Thomas Ritter)</p>	<p>Autumn equinox in N hemisphere of Mars</p>		<p>Mercury at superior conjunction 1816: Rudolf Wolf born <b>Eid ul-Fitr</b></p>	<p>PM: Jupiter (-1.8<sup>m</sup>) 6½° to the Moon's upper left Pluto is at opposition in Sagittarius (14.1<sup>m</sup>)</p>		
11	12	13	14	15	16	17
<p>Venus at perihelion Farnborough Air Show (open to the public on the 16th and 17th)</p>	<p>00h 52m </p> <p>Bank Holiday (Nlr only)</p>		<p>PM: Mars (-1.1<sup>m</sup>) lies 7° below the Moon 1966: China launches a T-7A (S2) carrying the dog Xiao Bao</p>	<p>PM: Saturn (0.2<sup>m</sup>) is 4½° to the Moon's lower left St Swithun's Day 2006: Twitter launched</p>	<p>PM: Venus and Mercury are ½° apart. Both set by the end of civil twilight. Binoculars may help but only search after sunset</p>	<p>PM: Saturn and Mars are almost equidistant from 2.3<sup>m</sup> delta Sco</p>
18	19	20	21	22	23	24
<p>1966: <i>Gemini 10</i> launch</p>	<p>22h 57m </p>	<p>Sun enters Cancer</p>	<p>Festival of Curiosity in Dublin (runs until the 24th) 2011: Landing of STS-135 <i>Atlantis</i> marks the end of the US Space Shuttle program</p>		<p>ESOF 2016 Manchester, UK (runs to 27th)</p>	
25	26	27	28	29	30	31
	<p>23h 00m </p> <p>Biggest Last Quarter Moon of the year</p>	<p>S delta Aquarids peak at 21h 1866: First successful transatlantic cable is completed</p>		<p>Moon occults gam Tau (3.6<sup>m</sup>) - 03h 25m to 04h 08m</p>	<p>alpha Capricornids peak Uranus stationary in Pisces, begins retrograde <i>Progress</i> cargo flight to the ISS (mission 65P)</p>	







# September 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p><b>Mercury</b> is quite prominent in the morning sky the second half of the month — the fleet-footed little world is rising almost two hours before the Sun by the 30th. <b>Venus</b> continues to frustrate attempts to see it these evenings but can be found about 3° to the lower right of the slender crescent Moon on the 3rd. Things improve slightly as the month goes on but Venus will still be quite low and setting only an hour after the Sun on September 30th. The disk of <b>Mars</b> shrinks below 10" this month as Earth's faster speed outpaces the planet. It remains on view for up to three hours after sunset. Mars is at eastern quadrature on the 13th when the disk will appear gibbous in a small telescope. The planet fades from magnitude -0.3 to 0.1 during the month.</p>			<p><b>1</b> 09h 03m </p> <p>Annular Solar Eclipse - not visible from Ir/UK</p>	<p><b>2</b></p> <p><i>PM:</i> Jupiter (-1.7<sup>m</sup>) 3½° to the Moon's upper left</p> <p>Neptune (7.7<sup>m</sup>) reaches opposition in Aquarius</p> <p>Saturn is at eastern quadrature</p>	<p><b>3</b></p> <p><i>PM:</i> Venus (-3.8<sup>m</sup>) 3½° to the Moon's lower right</p> <p>Mars enters Ophiuchus</p> <p>OSIRIS-REX launch (asteroid sample return)</p>	<p><b>4</b></p> <p>2006: <i>SMART-1</i> impacts the Moon (ESA)</p>
<p><b>5</b></p> <p>Comet 226P/Pigott-LINEAR-Kowalski at perihelion (may be 10<sup>m</sup>)</p>	<p><b>6</b></p> <p>British Science Festival, Swansea, UK (to the 9<sup>th</sup>)</p>	<p><b>7</b></p>	<p><b>8</b></p> <p><i>PM:</i> Saturn (0.5<sup>m</sup>) is 3¼° to the Moon's lower left</p> <p>1966: First episode of Star Trek aired by NBC</p>	<p><b>9</b> 11h 49m </p> <p><i>PM:</i> orange Mars (-0.2<sup>m</sup>) lies 7° below the Moon</p>	<p><b>10</b></p>	<p><b>11</b></p> <p>(18) Melponeme (8.7<sup>m</sup>) and (1) Ceres (8.2<sup>m</sup>) less than 1° apart in Cetus</p>
<p><b>12</b></p> <p>1966: <i>Gemini 11</i> launch</p>	<p><b>13</b></p> <p>Mercury at inferior conjunction</p> <p>Mars is at eastern quadrature</p>	<p><b>14</b></p>	<p><b>15</b></p> <p>Moon occults Neptune - 19h 05m to 19h 54m</p>	<p><b>16</b> 19h 05m </p> <p>Penumbral lunar eclipse (mag 0.775) - visible from Ireland/UK</p> <p>Sun enters Virgo</p>	<p><b>17</b></p>	<p><b>18</b></p> <p>Moon occults nu Psc (4.5<sup>m</sup>) - 21h 20m to 22h 04m</p> <p>2006: First Persian in space (Anousheh Ansari)</p>
<p><b>19</b></p>	<p><b>20</b></p> <p><i>InSight</i> landing on Mars (NASA)</p> <p>Moon occults mu Cet (4.3<sup>m</sup>) - 00h 06m to 00h 40m</p>	<p><b>21</b></p> <p>Moon occults sig Tau (5.1<sup>m</sup>) - 23h 11m to 23h 22m</p> <p>Jupiter crosses the celestial equator N to S</p> <p>1866: H. G. Wells born</p>	<p><b>22</b></p> <p>autumn equinox, 14h 21m</p> <p>Mars enters Sagittarius</p>	<p><b>23</b> 09h 56m </p> <p>Moon occults 130 Tau (5.5<sup>m</sup>) — reappears 03h 38m</p>	<p><b>24</b></p> <p>Moon occults 26 Gem (5.2<sup>m</sup>) — reappears 02h 01m</p>	<p><b>25</b></p>
<p><b>26</b></p> <p>Jupiter at solar conjunction</p> <p>Pluto stationary, direct motion resumes</p> <p>Venus crosses ecliptic, going N to S</p>	<p><b>27</b></p> <p>Mars passes within 2° of the Lagoon Nebula (M8) over the next few nights</p>	<p><b>28</b></p> <p>Mercury greatest elongation west (17° 53')</p>	<p><b>29</b></p> <p>(11) Parthenope reaches opposition (9.2<sup>m</sup>) in Cetus</p> <p><i>AM:</i> Mercury (-0.6<sup>m</sup>) is 2° to the Moon's lower left</p>	<p><b>30</b></p> <p>Daytime occultation of Jupiter (16h 45m - 17h 49m). Risky as the planet is only 4° from the Sun</p> <p><i>ISS Expedition 49</i> crew launch (Borisenko, Ryzhikov, &amp; Kimbrough)</p>	<p><b>Jupiter</b>, now in Virgo, might be seen the first few days of September very low in the evening sky close to the sunset glow. The planet is at solar conjunction on the 26th but crosses the celestial equator on September 21st. Jupiter will remain at a minus declination until April 2026. <b>Saturn</b> (magnitude 0.5) sets 3¼ hours after the Sun at the beginning of September but by an hour earlier on the 30th. <b>Neptune</b> is at opposition on September 2nd when it can be found in Aquarius.</p>	





# October 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<p><b>Mercury</b> is a morning sky object up to conjunction on the 27th and is well placed the first half of the month when it rises nearly 1½ hours before the Sun. Both it and Jupiter are less than 1° apart on the 11th. <b>Venus</b> is still too low to easily catch the eye but given a clear western horizon you should spot it in the evening sky. The planet sets a little over an hour after the Sun all month. <b>Mars</b> swims through the rich region of the Milky Way in Sagittarius this month and passes close to 2.8<sup>m</sup> lambda Sagitarii marking the knob on the pot's lid in the constellation's distinctive teapot asterism. The planet dims only slightly from magnitude 0.1 to 0.4 during the period. <b>Jupiter</b> should be picked up during the second week of October in the morning sky. The magnitude -1.7 giant is rising about 2½ hours before the Sun by the 31st. <b>Saturn</b> can be found in Ophiuchus where it has been all year. The constellation intrudes into the zodiac &amp; planets spend less time in Scorpius than they do traversing Ophiuchus!</p>					<p><b>1</b> 00h 06m ●</p> <p>World Vegetarian Day</p>	<p><b>2</b></p> <p>1991: First Austrian and Kazakh in space (Franz Viehböck and Toktar Aubakirov)</p>
<p><b>3</b></p> <p>PM: Venus (-3.9<sup>m</sup>) is 5° to the Moon's lower left</p> <p>Islamic New Year and Jewish New Year begins</p>	<p><b>4</b></p> <p>World Space Week (runs to the 10th)</p>	<p><b>5</b></p>	<p><b>6</b></p> <p>PM: Saturn (0.5<sup>m</sup>) is 5¼° to the Moon's lower right</p>	<p><b>7</b></p>	<p><b>8</b></p> <p>PM: Mars (0.1<sup>m</sup>) lies 7° to the Moon's lower right</p> <p>Draconids peak</p> <p>International Observe the Moon Night and Astronomy Day</p>	<p><b>9</b> 04h 33m ◐</p>
<p><b>10</b></p> <p>peak of the southern Taurid meteor shower</p>	<p><b>11</b></p> <p>AM: Mercury (-1.1<sup>m</sup>) and Jupiter (-1.7<sup>m</sup>) &lt; 1° apart</p>	<p><b>12</b></p>	<p><b>13</b></p> <p>AM: Faster moving Mercury has now trebled the gap between it and Jupiter</p>	<p><b>14</b></p>	<p><b>15</b></p> <p>Uranus at opposition (5.7<sup>m</sup>) in Pisces</p> <p>Maths Week starts (runs to the 23rd)</p>	<p><b>16</b> 04h 23m ○</p> <p>Hamilton Walk from Dunsink Observatory, Dublin</p>
<p><b>17</b></p>	<p><b>18</b></p>	<p><b>19</b></p> <p>Moon occults some members of the Hyades this morning - details on calsky.com</p>	<p><b>20</b></p> <p>Moon occults 111 Tau (5.0<sup>m</sup>) - reappears 01h 36m</p>	<p><b>21</b></p> <p>Orionids peak at 05h</p> <p>(1) Ceres at opposition (7.4<sup>m</sup>) in Cetus</p>	<p><b>22</b> 19h 14m ◑</p>	<p><b>23</b></p> <p>(18) Melpomene is at perihelic opposition (8.0<sup>m</sup>) in Cetus</p>
<p><b>24</b></p> <p>2006: STEREO-A and STEREO-B launched (NASA solar mission)</p>	<p><b>25</b></p> <p>Moon occults 31 Leo (4.4<sup>m</sup>) - 02h 36m to 03h 32m</p>	<p><b>26</b></p> <p>Moon occults 59 Leo (5.0<sup>m</sup>) - reappears 06h 00m</p>	<p><b>27</b></p> <p>Mercury is at superior conjunction</p>	<p><b>28</b></p> <p>AM: Jupiter (-1.7<sup>m</sup>) lies 1½° below the Moon</p>	<p><b>29</b></p> <p>Mars at perihelion</p> <p>Society for the History of Astronomy meeting in Birmingham, England</p>	<p><b>30</b> 17h 38m ●</p> <p>PM: Mars &amp; SAO 188419 (6<sup>m</sup>) in Sgr just 12" apart</p> <p>Most distant New Moon of 2016 at 403,575 km</p> <p>Summer Time ends</p>
<p><b>31</b></p> <p>PM: Venus (-4.0<sup>m</sup>) 3° to Saturn's (0.5<sup>m</sup>) lower left</p> <p>Sun enters Libra</p> <p>Venus at aphelion</p> <p>Bank Holiday (Irl only)</p>						

# November 2016

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	1 Moon occults 49 Lib (5.5 <sup>m</sup> ) at 18h 19m un-crewed test flight of Boeing's <i>Dreamchaser</i> to take place this month	2 <i>PM</i> : Saturn (0.5 <sup>m</sup> ) is 3¼° to the Moon's lower left with Venus also nearby	3 1966: A mock-up flight of the <i>Manned Orbiting Laboratory</i> is the only one ever made. The program was cancelled in 1969	4	5 S Taurids peak at 05h <a href="#">Guy Fawkes Day</a>	6 <i>PM</i> : Mars (0.4 <sup>m</sup> ) is 5½° to the Moon's lower right Science Week Ireland starts (runs to the 13th) 1966: <i>Lunar Orbiter 2</i> launched (US)
7 19h 51m   1991: Dedication of Keck 1 telescope, Hawaii	8 Mars crosses into Capricornus	9	10 World Science Day for Peace and Development	11 1966: <i>Gemini 12</i> launch	12 Moon occults nu Psc (4.5 <sup>m</sup> ) at 19h 04m N Taurids peak at 05h	13 <a href="#">Remembrance Sunday</a>
14 13h 52m   Closest Full Moon of the year at 356,520km. The disk measures 33' 56"	15 Moon occults sigma <sup>2</sup> Tau (4.7 <sup>m</sup> ) - 17h 09m to 17h 48m	16 Moon occults 130 Tau (5.5 <sup>m</sup> ) at 19h 57m	17 Leonids peak at 10h	18 1966: highest altitude is reached by a projectile fired from a gun (180km)	19	20 Neptune stationary in Aquarius, direct motion resumes
21 08h 33m   alpha Monocerotids peak	22	23 Sun enters Scorpius	24 <i>PM</i> : Mercury & Saturn 4° apart but will likely not be seen as Mercury sets before end of civil twilight	25 <i>AM</i> : Jupiter (-1.8 <sup>m</sup> ) 2¼° to the right of the Moon 1816: Lewis Rutherford born (US astronomer)	26	27
28 Moon occults eta Lib (5.4 <sup>m</sup> ) - reappears 17h 03m Winter solstice in the N hemisphere of Mars <i>AM</i> : look for the Moon only 28 hours from New	29 12h 18m  Sun enters Ophiuchus 1866: Ernest W Brown born (UK astronomer)	30 <i>PM</i> : Saturn (0.5 <sup>m</sup> ) is 4½° to the Moon's lower right <i>ISS Expedition 50</i> crew launch (Novitsky, Whitson and Pesquet) <a href="#">St Andrew's Day</a> (Scot)	Venus and Saturn are close at the beginning of the month in the evening sky but the gap between the two will grow as Venus pulls further from the Sun and gains in altitude. <a href="#">Venus</a> sets nearly 3 hours after the Sun by the end of November. A small telescope will show the planet with a distinctive gibbous phase. <a href="#">Saturn</a> is quite low now and will possibly be lost to view by the last week of November. The rings remain wide open and in giant binoculars or a small telescope you can spot Saturn's largest moon Titan as a 8.3 <sup>m</sup> speck of light. Titan orbits Saturn in just under 16 days and lies about four ring-widths from the planet when at greatest elongation. <a href="#">Mars</a> passes into Capricornus the second week of the month where it dominates this bright-star poor constellation. The planet has now receded far from Earth with the disk size now roughly a third that during its opposition six months ago. <a href="#">Jupiter</a> has the early hours before sunrise to itself when it can be found in Virgo as a -1.7 <sup>m</sup> object. <a href="#">Mercury</a> is not visible this month.			

# December 2016

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<p><b>Mercury</b> ends the year as an evening sky object and is visible right up to the third week of December. <b>Venus</b> is a brilliant seasonal bauble hung above the SW evening skyline. The crescent Moon in the area the first 3 days of December makes for a lovely sight. <b>Mars</b> moves into Aquarius on the 15th and is setting during mid-evening. The planet ends the year as a magnitude 0.9 object with the disk measuring a little under 6" in diameter. Both Jupiter &amp; Saturn are morning sky objects. <b>Jupiter</b> rises during the early hours where it can be found amongst the stars of Virgo. <b>Saturn</b> will be picked up towards the end of the month after superior conjunction on the 10th. A telescope will let you follow the <b>Neptune occultation</b> on the 6th.</p>			1	2	3	4
5	6	7 09h 03m 	8	9	10	11
PM: Mars (0.7 <sup>m</sup> ) is 4° to the Moon's lower right	Neptune occulted by the Moon at 22h 33m - sets before reappearance	A lunar phase wheel demonstrates that the First Quarter Moon rises at noon and is highest at sunset. See <a href="http://www.bobcrelin.com/moonwheel.html">www.bobcrelin.com/moonwheel.html</a> or search on Google for pdf instructions to make one yourself	PM: Mercury (-0.5 <sup>m</sup> ) lies 8° below the Moon	PM: Venus (-4.2 <sup>m</sup> ) lies 9½° to the Moon's left	PM: Venus (-4.2 <sup>m</sup> ) now 5¼° below the Moon	Mercury greatest elongation east (20° 46')
12	13	14 00h 06m 	15	16	17	18
Earliest sunset of the year at Dublin (16h 06m)	Moon occults some members of the Hyades this morning - Aldebaran occulted from 05h 21m to 05h 52m	Geminids peak at 01h Greatest northern lunar standstill of the year	Mars crosses into Aquarius	Moon occults 74 Gem (5.0 <sup>m</sup> ) - reappears 03h 21m	Saturn solar conjunction 2006: Christer Fuglesang is first Swede in space	Sun enters Sagittarius
19	20	21 01h 56m 	22	23	24	25
1972: Splashdown of <i>Apollo 17</i> brought the manned lunar program to an end. When will we go back to the Moon?		Winter Solstice, 10h 44m 1966: <i>Luna 13</i> launch	PM: Jupiter (-1.9 <sup>m</sup> ) 5½° to the Moon's lower left Ursids peak at 09h	Saturn's rings are at their maximum tilt for the year (27.762°)		Christmas Day
26	27	28	29 06h 53m 	30	31	
St Stephens/Boxing Day Bank Holiday (Irl/UK)	2006: CoRoT launched Bank Holiday (Irl/UK)	PM: Saturn (0.5 <sup>m</sup> ) lies 6° to the right of the Moon Mercury at inferior conjunction	(4179) Toutatis flyby of Earth (0.251 au) - next closest in May 2065 Uranus stationary in Pisces, now goes direct	Latest sunrise of the year at Dublin (07h 58m)	Comet 49P/Honda-Mrkos-Pajdusakova at perihelion (may reach 7 <sup>m</sup> ) New Year's Eve	