

# SPACEWATCH

the newsletter of the Abingdon Astronomical Society

**Next Talk**  
**10<sup>th</sup> October 2016**  
**Weak Gravitational Lensing**  
**Dr Elisa Chisari**  
**University of Oxford**

## EDITORIAL

Welcome back from the summer break and I hope that you are ready to go with astronomy for the new season. We did have some nice displays of noctilucent clouds over the summer and I managed to get a few images. The Perseids were also blessed with a cloudless night for the maximum and hopefully you managed to see some, if not the vast numbers that were forecast. Under the new regime a couple of ideas have come up. One suggestion is for is for specialist subsections that may converse and be able to give help outside the normal meetings, for example on imaging or visual observing. If you are interested in the idea please contact Clifford. There was also some concern over the topics for the beginners' talks in that they seem to repeat too often. As we have always asked, if there is a topic that people would like to see covered then please contact Clifford or Ian or myself and we can see what we can do. They are not set in stone but merely what we might think are interesting. We try and keep a balance of topics without going too esoteric.

We are going to also work two versions of the newsletter. This one and an extended one for the website with current images, etc. For that I will need images from members so if you have some please send them to me and I can put them in.

Another suggestion is that the Chairman sometimes gives a post-coffee break report on members' individual astronomy activities, covering the recent past or their plans for the future. This would give newcomers a fuller impression of the breadth of the Society beyond being a receptive audience for talks. All information presented would be with the explicit consent of the members involved.

## THE NIGHT SKY THIS MONTH

by **Bob Dryden**

**Sun & Earth:** We reach the autumn equinox on September 22nd at 14.21 UT, after which the nights are longer than the days.

**Mercury:** Mercury passes through inferior conjunction on September 12th and then it reappears in the morning sky, reaching greatest elongation on September 28th when it will be 18° from the Sun. Throughout this session Mercury increases in brightness. Before September 24th it is below +0.0 magnitude, then brightens to -0.5 mag. by the 28th, before reaching -1.0 mag. by sessions end on October 10th.

The planet will be rising around 80 minutes before the Sun near the 24th September, and about 90 minutes before the Sun by 28th September when it will be 16° high in eastern Leo by sunrise. After that, Mercury quickly drops back into the solar glare and will be increasingly difficult to find. On the morning of 29th September the crescent Moon will be approximately 1° from Mercury.

Between the 9th and 13th October Mercury passes within a degree of Jupiter (closest on the 11th) but this event will be an extremely hard observation to make due to morning twilight.

**Venus:** Venus is technically visible in the evening sky, but it is rather difficult to see despite shining at a bright -3.9 magnitude. Presently it is 5° high at sunset and sets 45 minutes later. By the time we reach October 10th it has only gained one degree in altitude at sunset, and it sets an hour later. The solar elongation increases from 25° to 35° during this session and if you manage to find the planet in your telescope then you will see the phase is a large gibbous one. As a guide, on October 3rd the thin crescent Moon will be approximately 3° above Venus, low in the south west.

**Mars:** The red planet fades slightly, going from -0.1 magnitude in mid-September, to +0.2 mag. by mid-October. It also decreases in apparent diameter, from 10" to 8.4". But the planet is still easily visible to the naked eye and detail is still visible on the disc in a telescope. Mars starts the session in Ophiuchus at approximately 12° above the southern horizon at sunset, and it sets around 3 hours later. Although it moves in to Sagittarius on 21st September, by mid-October Mars is still 12° high in the south at sunset due to its fairly rapid eastward motion against the stars. It will be at a low altitude though, so telescopic views may not be too great.

While Mars and Saturn have spent the last couple of months reasonably close together (and they start this session about 10° apart), they are now moving apart.

**Jupiter:** Jupiter is too close to the Sun to be seen, with solar conjunction occurring on 26th September.

**Saturn:** To be found in the constellation of Ophiuchus, Saturn is an easy naked eye object at +0.5 magnitude, just above the first magnitude star Aldebaran. The rings are wide open at 26° so will be easily visible in a small telescope although the low altitude might make the view rather poor. The planet starts the session around 15° above the horizon at sunset, and takes a further 3 hours to reach the horizon itself. By sessions end in October, Saturn is setting 2 hours after the Sun which means it is to all intents and purposes too low for telescopic viewing. On the evenings of 5th and 6th October the crescent Moon passes Saturn (although not too closely, around 8° away on the 5th and 5° away on the 6th).

## LAST MONTH'S TALK

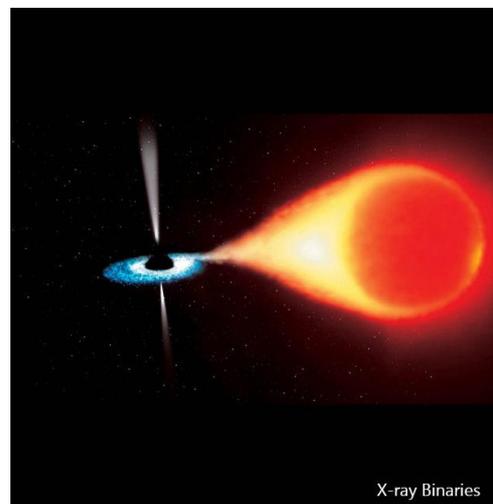
by Gwyneth Hueter

June talk, 2016

Dr Paul Roche is one of the team behind the Faulkes Telescope Project based in Cardiff, which enables educational establishments to contribute to astronomical research. He entertained us with the latest on x-ray binaries, a subject close to his heart, having done his doctorate on them. These are stellar objects, or what once were stellar objects, orbiting so close together that there is an exchange of material. The primary will be typically a massive beast of 20 to 30 solar masses, with a small companion which is not directly visible but is drawing material off it. (Incidentally, the June 2015 talk dealt with the smaller versions of these binaries as we see them as cataclysmic variables) The two components orbit around a common centre of gravity, usually near or within the body of the primary. Telescopic observation can then infer the existence of the secondary by the wobble of the primary as it orbits the secondary. Dr Roche likes to describe the primary as a wobbly sumo wrestler.

I have been calling the larger of the two objects the primary but in reality it is the secondary, because the two components are likely to have evolved together out of the same cloud of stuff. They will have been O or B stars, the most massive and short lived stars, so much so that they will be concentrated among the arms of the galaxy, near to where they formed, unlike our Sun, which has wandered far from its birthplace by now. The biggest supergiants will live 2-30 million years and may have masses 50-100 times that of our Sun.

X-ray binaries are called this because they give off x-rays. This is because the area where the material flows from one component to the other is extremely heated. The accretion disc around the original primary will be so energised that the connecting funnel can reach a temperature of a few million degrees.



X-ray Binaries

The largest of these are called micro-quasars because they are seen to have a jet coming out of the disc and also may give off gamma radiation rather than just x-rays.

**Uranus & Neptune:** Both of these planets are well placed for observation, with Uranus in Pisces and Neptune in Aquarius. Uranus is rising around 19.30 UT in mid-September and culminating at 46° around 02.00 UT. It reached opposition on 15th October so rises as the Sun sets and is visible for most of the night. Shining at +5.7 magnitude it is easy to see in binoculars as long as you have a finder chart.

Neptune is just past opposition as this session begins so is visible all night. By mid-October it is already 10° high at sunset and culminates in the south at 22.00 UT. Slightly fainter than Uranus, Neptune shines at +7.8 magnitude which means it is also visible in binoculars but is a little bit harder to see.

**Occultations:** There are two lunar occultations worth mentioning this time. The first occurs on 18th September at 22.01 UT when the +4.5 magnitude star, nu Pisces, reappears from behind the lunar limb. The Moon will be 24° high in the east, but, unfortunately, it will be just 2 days past Full so the observation may be tricky.

The second occultation is another reappearance, this time sigma<sup>1</sup> and sigma<sup>2</sup> Taurus. They are +5.1 and +4.7 magnitude respectively, and the reappear at 23.05 and 23.19 UT on 21st September. The waning gibbous Moon will be 17° high in the east (just above Aldebaran).

**Eclipse:** Although we have an eclipse to watch, it is not going to be very spectacular as it is just a Lunar Penumbral eclipse. This means the moon will pass through the outer reaches of the faint part of the Earth's shadow and so will be very difficult to detect. However, it is an eclipse, and so you might well want to have a look at it. It occurs on 16th September, and it starts at 16.54 UT and lasts for 3 hours 59 minutes. Unfortunately, the Moon does not rise in the UK until 18.13 UT so we will miss the first half of the show. Greatest eclipse is at 18.55 when the Moon will be 5° high in the east. 90% of the Moon will be within the shadow, with just the southern tip of the lunar disc still in sunlight. The eclipse ends at 20.54 UT when the Moon will be 13° above the horizon. The actual penumbral shadow on the lunar disc is usually very subtle rather than blindingly obvious as during an umbral eclipse, so look very carefully to see what you can see.

**Asteroids:** Unfortunately, all the brighter asteroids on view at the moment are in the morning sky.

1 Ceres is in Cetus, and increases in brightness from +8.4 magnitude to +7.8 mag during this session (it is at its brightest at the end of October).

2 Pallas is in Equuleus until 26th September when it moves in to Aquarius. This one is fading, going from +9.3 mag to +9.7 mag.

4 Vesta remains around +8.3/+8.2 mag all this session as it moves amongst the stars of Gemini.

11 Parthenope is also in Cetus, shining at +9.6 mag in mid-September, brightening to +9.2 mag by 27th September, before fading again to +9.3 by mid-October.

18 Melpomene is just below Ceres in Cetus. It brightens from +8.8 mag to +8.0 mag which is the brightest it is going to get this apparition.

Computer simulations help to clarify the different types of systems. Analysis of HDE 226868 provides the clearest evidence that the original primary is a black hole. This binary is more famously known as Cygnus x-1, the first x-ray source we ever found. Dr Roche blinded us then with various categorisations of x-ray binaries by flavours, size, temperature, levels of magnetism, rotation, wobbliness, transientness. (The flavours refer to two types of high mass binaries, and I made those two last words up, so you'll have to look up the subject. Don't forget he did his doctorate on it...) With the transient systems the accretion disc size can vary a lot, maybe because the orbits are elliptical and when the binary components come closer together the original primary can hit the accretion disc and draw off material at great speed, giving off x-rays. One type of subset are the Be (=B type + emission) stars, which may then become standard B type stars if the accretion disc shrinks down or fades away.

A comment he tossed in was that these massive stars have few sunspots.

The variable star V404 Cygni has an invisible companion deemed to be a black hole. In June 2015 it had a big outburst with lots of variations, assumed to be lots of stuff spiralling off the accretion disc towards the black hole. Normally at 18<sup>th</sup> magnitude, it grew to 9<sup>th</sup> magnitude.

Where a neutron star is involved, orbital speeds can be very short and the neutron star can become highly magnetised as it spins. Centaurus x-3 is such a beast, a pulsar with a spin rate varying between four and eight seconds. The companion star is a massive O type star. (If anyone ever reads this, I have just realised that an O star is surely going to have a much shorter lifespan than a star that produces a 'mere' neutron star when it dies, so I can only assume that the O star was the original secondary which gorged itself on the out gassings of the original primary as it became a supergiant before turning into a neutron star. Please discuss!)

SS 433 is another well-known binary, two massive stars with bright emission lines, which move a lot, suggesting that stuff is moving at incredible speeds round and from them.

Some of the observations he has made are difficult to explain, which is why he gets schools to monitor the variability of these systems. There is evidence of accretion discs eclipsing the dark companion and also of x-rays altering the spin of an accretion disc and maybe even changing its direction. Feel free to look at the Faulkes Telescope website.

### FURTHER DISCUSSION

Why not take a look at our website? It's at: [www.abingdonastro.org.uk](http://www.abingdonastro.org.uk).

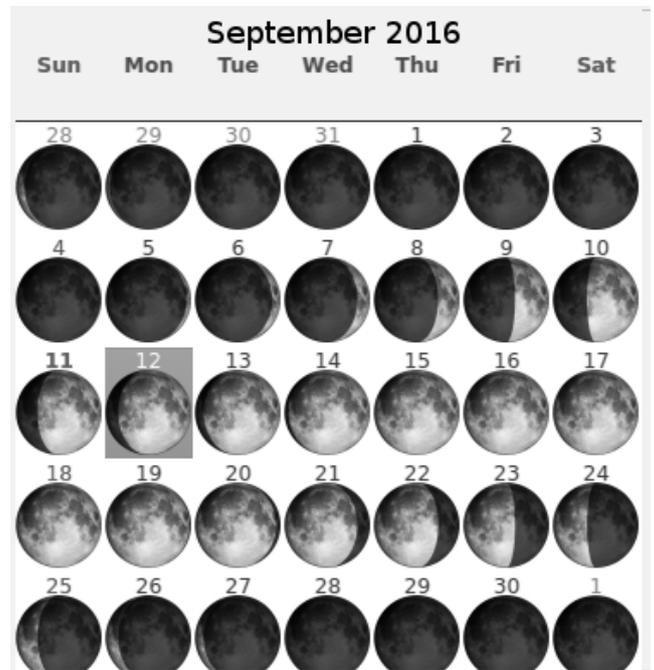
If you are not already on our internet mailing list, then why not log on to YahooGroups. The list is called 'abingdonas'. Members use the list to alert each other about celestial events and to chat about amateur astronomy. The list is quite active, with several messages most weeks. To read through previous messages click on: <http://groups.yahoo.com/group/abingdonas/>.

To join the abingdonas list, please go to <http://www.yahoo.com/groups.com>. You can also unsubscribe from the list here.

To post messages to the list, please send them to [abingdonas@yahoogroups.com](mailto:abingdonas@yahoogroups.com). Please note that you will need to sign up with a YahooID if you do not already have one. You can do this on the above page.

Further information about the mailing list can be found on the abingdonas webpage at: <http://groups.yahoo.com/group/abingdonas/>.

### MOON PHASES:



### DATES FOR YOUR DIARY

**19th September** 8pm Beginners' Meeting in the Main Hall., talks to include Choosing a Telescope, Lunar Phases and What's Up.

**Observing evening: FCN Sept 26th-29th at Frilford Heath Golf Driving Range. Contact Trevor Pitt or Steve Creasey. Also keep a look out on the Abingdon AS mailing list for any specials.**

**October 14/15th International Astronomy show in Coventry. For details see <http://www.ukastroshow.com/>**

**September 30<sup>th</sup> Rosetta lands on 67P and completes mission**

The editor of "SpaceWatch" is Owen Brazell, who would very much appreciate your stories & contributions. In particular whilst many fine images are being posted on the discussion group it would be nice to have some in the SpaceWatch. Please send any news, observations, photos, etc. to:

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