SPACEWATCH
the newsletter of the Abingdon Astronomical Society

Next Talk
12th October 2015
"10 Targets for Light Polluted Areas"
Bob Mizon MBE FRAS

THE NIGHT SKY THIS MONTH

by Bob Dryden

Sun & Earth: September 23rd sees the Sun cross the celestial equator at 08.21 UT heading south. Otherwise known as the autumn equinox.

Mercury: Although Mercury is presently in the evening sky, it is too low and too near the Sun to be visible. It passes through Inferior Conjunction on 30th September. It quickly reappears in the morning sky to start what is a very favourable apparition. The planet will probably be visible from around the 4th or 5th of October when it will rise approximately 50 minutes before the Sun although it will be rather faint at 2nd magnitude. By the end of this session on 12th October Mercury will be rising a good 90 minutes before the Sun and will have reached an altitude of 15°. Having brightened to -0.5 magnitude, it will be easily visible in the east. On the morning of 11th October the crescent Moon will be about 2° west of Mercury.

Venus: Now a morning object, Venus rises about 3 hours before the Sun, giving you plenty of time to have a look at its lovely crescent phase. By the end of this session the planet rises even earlier, a good 4 hours before the Sun. By then the phase will have increased to 0.4% (nearly half phase) as Venus moves towards greatest elongation later in October. Solar elongation increases this session from 36° in September to 45° in October. Shining at -4.5 magnitude, it will not be hard to find Venus as it rises in the east. On October 8th, Venus will be approximately 2° from the first magnitude star Regulus, and the crescent Moon will be 5° above the pair. The following morning, the Moon will be about 7° below the pair.

Mars: Another morning planet, Mars can be found in the constellation of Leo. In fact, on 25th September it passes very close to Leo's brightest star, Regulus. Mars starts this session rising 2.5 hours before the Sun and reaches an altitude of 23° by sunrise. However, the planet is shining at just +1.8 magnitude which means it will not be that easy to see with the naked eye while near to the horizon. By mid October though, Mars will reach an altitude of 32° by sunrise giving you a much better chance of finding it before daybreak. Unfortunately the apparent disc size is just 4" so even if you manage to point your telescope at it, you will not see much detail.

Jupiter: Now nearly a month past solar conjunction, Jupiter has reappeared in the morning sky. Presently it rises barely an hour before the Sun so remains quite hard to see. However, by mid October it will rise nearly three hours before the Sun and will reach an altitude of 30° by sunrise. Shining at a bright -1.7 magnitude you will have no difficulty in seeing the bright planet in the eastern sky moving amongst the stars of Leo. Towards the end of this session Jupiter approaches Mars and they are approximately 2° apart by 12th October (they will be closest on the 17th/18th).

Saturn: The current apparition is about to end and if you want to see the planet you have until the end of September. As the Sun sets, Saturn is about 15° high in the south west but you only have a short time before it to drops below the horizon. At +0.6 magnitude it is not hard to find Saturn, and the rings are wide open at 25°, but the very low altitude means telescopic views will be poor.

Uranus & Neptune: In the constellation of Pisces, Uranus reaches opposition on 12th October. To start this session, the planet is rising at 20.00 UT and culminating in the south around 03.00 UT at an altitude of 45°. By session's end, at opposition, it rises as the Sun sets and is visible for just about the whole of the night. Shining at +5.7 magnitude, Uranus is not hard to see in binoculars, but you will need a finder chart as it will look like just another star.

Neptune is further west, in Aquarius, and in mid September it is just above the eastern horizon at sunset. It culminates just after midnight, at 28° which is considerably lower than Uranus. By mid October Neptune is already 10° high and sets at approximately 03.00 UT. Neptune is fainter than Uranus at +7.8 magnitude but is still quite easily seen in binoculars if you know where to look.

Eclipse: Total Lunar Eclipse 28th September.
This is the first total eclipse we can see in its entirety from the UK since 2008. Although it occurs at a rather unsociable hour, do try to see at least some of it as the next completely visible UK total lunar eclipse isn't until 2019. This eclipse starts at 00.11 UT when the edge of the Moon encounters the Earths penumbral shadow. This is usually very hard to detect visually and most people regard the start of the eclipse to be when the Moon touches the umbral shadow. This happens at 01.07 UT.

The Moon completely enters the umbral shadow at 02.11 UT and the total eclipse begins. At this point the Moon will be 30° high in the south west. Totality lasts 1 hr 11 mins. The Moon finally leaves the umbra completely at 04.27 UT by which time it will be 15° above the horizon in the west. At this time most people will regard the eclipse to be over, but the Moon will still be in the

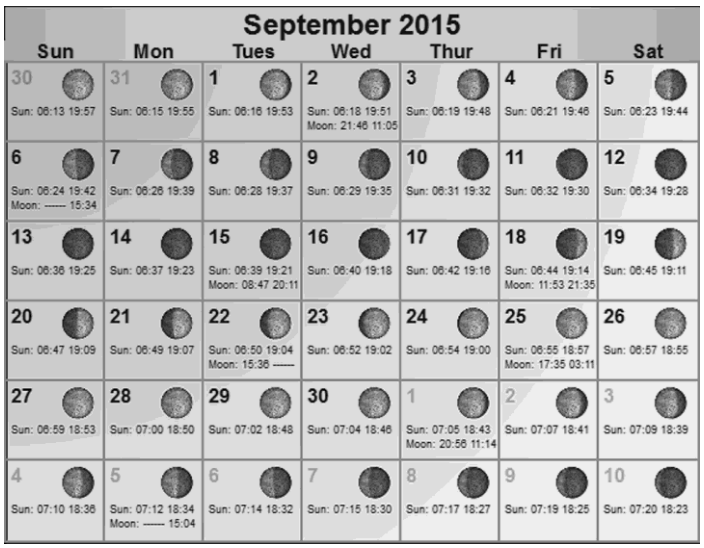
penumbral shadow, which it doesn't leave until 05.22 UT which is the real time of the end of the eclipse.

During totality the Moon will become dark, and possibly change colour (often to a coppery colour). However, it is almost impossible to predict how dark the disc will get and what colour it will become. You will have to go out and look to find out.

Asteroids: 4 Vesta brightens slightly as it crosses Cetus. It starts at +6.3 magnitude, reaches +6.2 by the end of September, and then fades to +6.4 by mid October.

15 Eunomia is fainter but on view at a more sociable hour. It begins at +8.2 magnitude in the constellation of Andromeda. It moves into Pegasus on 23rd September and by mid October it has brightened to +7.9 magnitude (which is the brightest it is going to get this apparition). A slightly harder asteroid to see is 29 Amphitrite. This is because it is rather faint, at +9.8 magnitude. Currently crossing Aries, it reaches +8.8 magnitude by mid October.

MOON PHASES:



September 2015						
Sun	Mon	Tues	Wed	Thur	Fri	Sat
30 Sun: 06:13 19:57	31 Sun: 06:15 19:55	1 Sun: 06:16 19:53	2 Sun: 06:18 19:51 Moon: 21:46 11:05	3 Sun: 06:19 19:48	4 Sun: 06:21 19:46	5 Sun: 06:23 19:44
6 Sun: 06:24 19:42 Moon: ----- 15:34	7 Sun: 06:26 19:39	8 Sun: 06:28 19:37	9 Sun: 06:29 19:35	10 Sun: 06:31 19:32	11 Sun: 06:32 19:30	12 Sun: 06:34 19:28
13 Sun: 06:36 19:25	14 Sun: 06:37 19:23	15 Sun: 06:39 19:21 Moon: 08:47 20:11	16 Sun: 06:40 19:18	17 Sun: 06:42 19:16	18 Sun: 06:44 19:14 Moon: 11:53 21:35	19 Sun: 06:45 19:11
20 Sun: 06:47 19:09	21 Sun: 06:49 19:07	22 Sun: 06:50 19:04 Moon: 15:36 -----	23 Sun: 06:52 19:02	24 Sun: 06:54 19:00	25 Sun: 06:55 18:57 Moon: 17:35 03:11	26 Sun: 06:57 18:55
27 Sun: 06:59 18:53	28 Sun: 07:00 18:50	29 Sun: 07:02 18:48	30 Sun: 07:04 18:46	1 Sun: 07:05 18:43 Moon: 20:56 11:14	2 Sun: 07:07 18:41	3 Sun: 07:09 18:39
4 Sun: 07:10 18:36	5 Sun: 07:12 18:34 Moon: ----- 15:04	6 Sun: 07:14 18:32	7 Sun: 07:15 18:30	8 Sun: 07:17 18:27	9 Sun: 07:19 18:25	10 Sun: 07:20 18:23

LAST MONTH'S TALK

by Gwyneth Hueter

June's talk.

Prof Christian Knigge is from Southampton's School of Physics and Astronomy and his 'Cataclysmic Variables' talk was basically about accretion of matter coming from one body and gravitating around another, until...!

You can get accretion fuelling outbursts in some of the most energetic objects in the universe – black hole or neutron star binaries, ultra-luminous x-ray sources, quasars or active galactic nuclei. The latter three may be exciting but have very inaccessible time scales as far as we humans are concerned, with up to one billion years between outbursts. Hmm, luckily the accretion discs associated with cataclysmic variable (CV) stars are much more accessible, with scales of a few seconds to a few hours (although they can have major explosions at intervals of tens of thousands of years – see below). CVs are binary stars with usually a white dwarf primary and a main sequence secondary.

Prof Knigge's talk dealt with some of the latest breakthroughs regarding what makes CVs so unpredictable in their outbursts. The most famous CV is undoubtedly SS Cygni, which has been studied for over 100 years. It is assumed to be a white dwarf stealing matter from another less visible secondary, with regular thermonuclear outbursts whenever an instability develops in the dwarf's accretion disc. The outbursts are reasonably regular in SS Cygni, but in another famous CV, Z Cam, there are flat periods with little variability. Changes in magnetism may be responsible. Magnetism will cause variability in rotational and orbital speeds of binaries, and is some cases it is now assumed that it is possible for a main sequence secondary star to be stripped of so much of its material that it becomes a brown dwarf. It is not clear yet what happens to its angular momentum and magnetic field after such a mass loss. It is also speculated that the white dwarf could have pinched so much material off the secondary as to cause a type 1a supernova explosion.

Brown dwarfs are obviously going to be very difficult to find, at something like 5% of a Solar mass. Some have very brief and minute variabilities.

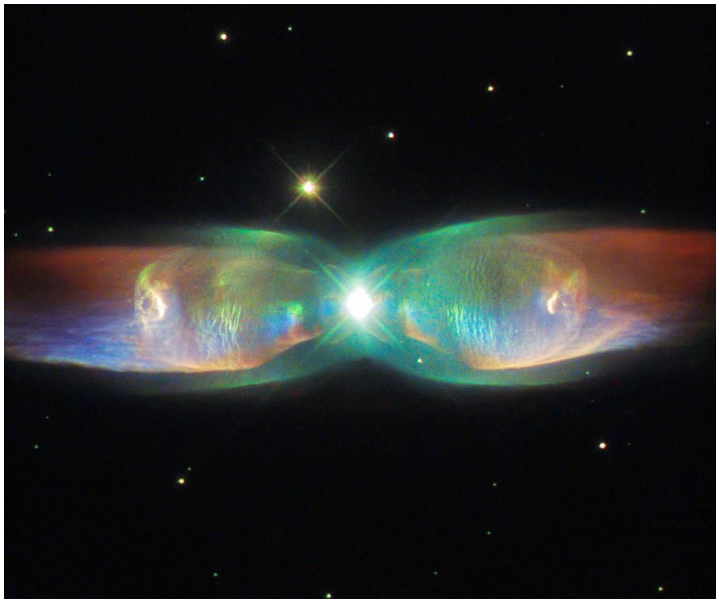
In the last ten years we have also been speculating about nova eruptions. These appear to be one of these white dwarf + secondary star binaries where the accretion disc develops such an instability that it causes a runaway thermonuclear fusion bomb on the white dwarf, resulting in as much as a 10 magnitude increase in light. But this may only happen every 10 to 100,000 years. So is there any way of knowing which CVs might blow, if they are inactive for so long between eruptions? It turns out that so much material gets blasted off in an eruption that you can see a nebula (nova shell) and that Z Cam actually has a shell. Shells can last for several thousand years and the time of Z Cam's last major eruption fits in with a Chinese record of a 'guest star' from October 77 BC.

HUBBLE SEES THE WINGS OF A BUTTERFLY: THE TWIN JET NEBULA

The cosmic butterfly pictured below in this NASA/ESA Hubble Space Telescope image goes by many names. It is called the Twin Jet Nebula as well as answering to the slightly less poetic name of PN M2-9.

The M in this name refers to Rudolph Minkowski, a German-American astronomer who discovered the nebula in 1947. The PN, meanwhile, refers to the fact that M2-9 is a planetary nebula. The glowing and expanding shells of gas clearly visible in this image represent the final stages of life for an old star of low to intermediate mass. The star has not only ejected its outer layers, but the exposed remnant core is now illuminating these layers — resulting

in a spectacular light show. However, the Twin Jet Nebula is not just any planetary nebula, it is a bipolar nebula.



The Twin Jet Nebula. Credit: ESA/Hubble & NASA. Acknowledgement: Judy Schmidt

Ordinary planetary nebulae have one star at their centre, bipolar nebulae have two, in a binary star system. Astronomers have found that the two stars in this pair each have around the same mass as the sun, ranging from 0.6 to 1.0 solar masses for the smaller star, and from 1.0 to 1.4 solar masses for its larger companion. The larger star is approaching the end of its days and has already ejected its outer layers of gas into space, whereas its partner is further evolved, and is a small white dwarf.

The characteristic shape of the wings of the Twin Jet Nebula is most likely caused by the motion of the two central stars around each other. It is believed that as the dying star and white dwarf orbit around their common centre of mass, the ejected gas from the dying star is pulled into two lobes rather than expanding as a uniform sphere. However, astronomers are still debating whether all bipolar nebulae are created by binary stars. Meanwhile the nebula's wings are still growing and, by measuring their expansion, astronomers have calculated that the nebula was created only 1,200 years ago.

Within the wings, starting from the star system and extending horizontally outwards like veins are two faint blue patches. Although these may seem subtle in comparison to the nebula's rainbow colours, these are actually violent twin jets streaming out into space, at speeds in excess of one million kilometres (621,400 miles) per hour. This is a phenomenon that is another consequence of the binary system at the heart of the nebula. These jets slowly change their orientation, precessing across the lobes as they are directed by the wayward motions of the binary system. Precession is a change in the orientation of the rotational axis of a rotating body.

The two stars at the heart of the nebula circle one another roughly every 100 years. This rotation not only creates the wings of the butterfly and the two jets, it also allows the white dwarf to strip gas from its larger companion, which then forms a large disc of material around the stars, extending out as far as 15 times the orbit of Pluto! Even though this disk is of incredible size, it is much too small to be seen on the image taken by Hubble.

An earlier image of the Twin Jet Nebula using data gathered by Hubble's Wide Field Planetary Camera 2 was released in 1997. This newer version incorporates more recent observations from the telescope's Space Telescope Imaging Spectrograph (STIS).

FURTHER DISCUSSION

Why not take a look at our website? It's at: 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.yahoogroups.com . You can also unsubscribe from the list here.

To post messages to the list, please send them to 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/ .

DATES FOR YOUR DIARY

28th Sept 8pm Beginners' Meeting in the Main Hall

Observing evening: Next Observing evening is the FCN Week Oct 5th -7th at Frilford Heath Golf Driving Range eye on the AAS group mailing list.

International Astronomy Show 2nd-3rd October Stoneleigh Park, Warwickshire. http://ukastroshow.com/

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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STAR CHART

The night sky at 10 pm (BST) on Wednesday 15th Sep 2015