Wadhurst Astronomical Society Newsletter JUNE 2015

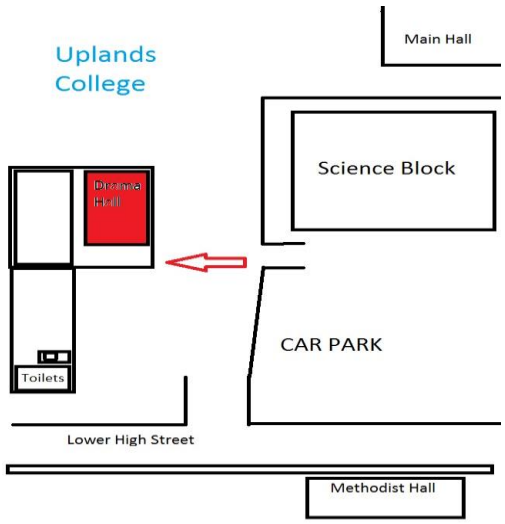
MEETINGS

MAY MEETING

Our chairman, John Vale-Taylor opened the May meeting with an announcement that sadly, Mike Wyles, our Treasurer and Membership Secretary has had to resign due to ill health. We are going to miss Mike at his table welcoming members and guests as they enter the meetings and wish him all the best. He also thanked Mike for keeping us on track financially for so many years.

John said he was grateful to both John Lutkin who takes on the role of Treasurer and also to John Wayte who will now be the Membership Secretary.

Phil Berry, our Secretary, told the meeting that the Methodist Church where we have held our meetings is closing and this is the last meeting to be held in the Upper Room of the Methodist church, having first come here in October 2005. During the past few weeks, certain members of the Committee have been searching for a new venue and have found that the Drama Studio at Uplands College across the road is available. This is where we held our meetings for many years and is where our meetings will take place from the next meeting in June until at least further notice.



From next month, our meetings will be held in the Drama Studio, Uplands College The Post Code is TN5 6AZ

Phil also mentioned that one of our members, Jim Cooper is part of the open garden charity scheme and has a large garden that will be open to the public on Sunday the 7th of June from 1400. Tickets are obtainable from the Carrillon Cottage Centre in the High Street. The garden is where the astro-barbecue is held in August and so this would be a good time to see it in full bloom and contribute to the charity as well.

Hydrogen in the Universe
Konrad Malin-Smith

We have had several talks by Konrad who was a science teacher and a lecturer in astronomy. He is also a member and past chairman of Croydon Astronomical Society and even has an asteroid named after him.

He began by saying that hydrogen makes up 75% of the universe and about 25% is helium and most of the helium has been in existence since the Big Bang but never the less there is never less than 23% helium in stars.

We were then told about the structure of the hydrogen atom, with one proton and one electron but then confused the issue by saying that the proton is really a Hadron with three quarks. Further complication follows when describing the whereabouts of the electron at any one time. It seems that it is vibrating in a cloud where only the probability of the electron's position can be predicted.

The more stable form of hydrogen is H_2 where a molecule of hydrogen contains two protons and two neutrons sharing two electrons. This is the form we mainly come across.

At atmospheric pressure, one cubic foot of hydrogen contains about 2 grams of H_2 and this is about 6×10^{23} molecules.

Konrad then went into great detail about the structure of the hydrogen atom, referring to quark-gluon plasma with names such as up and down quarks etc. He explained amongst other things that due to neutron mass being larger than the proton there is more hydrogen than helium.

Detection of hydrogen in the universe is divided into using the visible spectra and radio detection. Bright-line emission is used near "O" type stars. Light from any star passes through the slightly cooler Chromosphere of the star, which absorbs certain lines and using spectroscopy enables astronomers to identify certain chemicals in the star. Also using the visible spectrum, light coming from deep space reveals the velocity of objects moving away from us by observing the shift towards red of emission and absorption lines.

It was shown diagrammatically how energy can knock an electron out of its energy level which then falls back in, but as it falls through higher energy levels so emission lines are radiated depending on levels passed through such as hydrogen alpha, which is red. Helium gives off the Helium line, which is yellow, although if the energy input is very high the He^+ line is emitted which is blue. This identifies an "O" type star.

We were told that the proton has a spin and so does the electron. Normally they spin in opposite directions, but if there is an energy input, the electron can suddenly spin in the opposite direction. After time the energy is lost and the spin is in the opposite direction to the proton again but a radio photon is emitted at the 21.1 cm wavelength.

An image of M31 we were shown taken in neutral hydrogen showed nothing in the central area and this is because all the hydrogen had been used yet in the outer arms there is still evidence of neutral hydrogen.

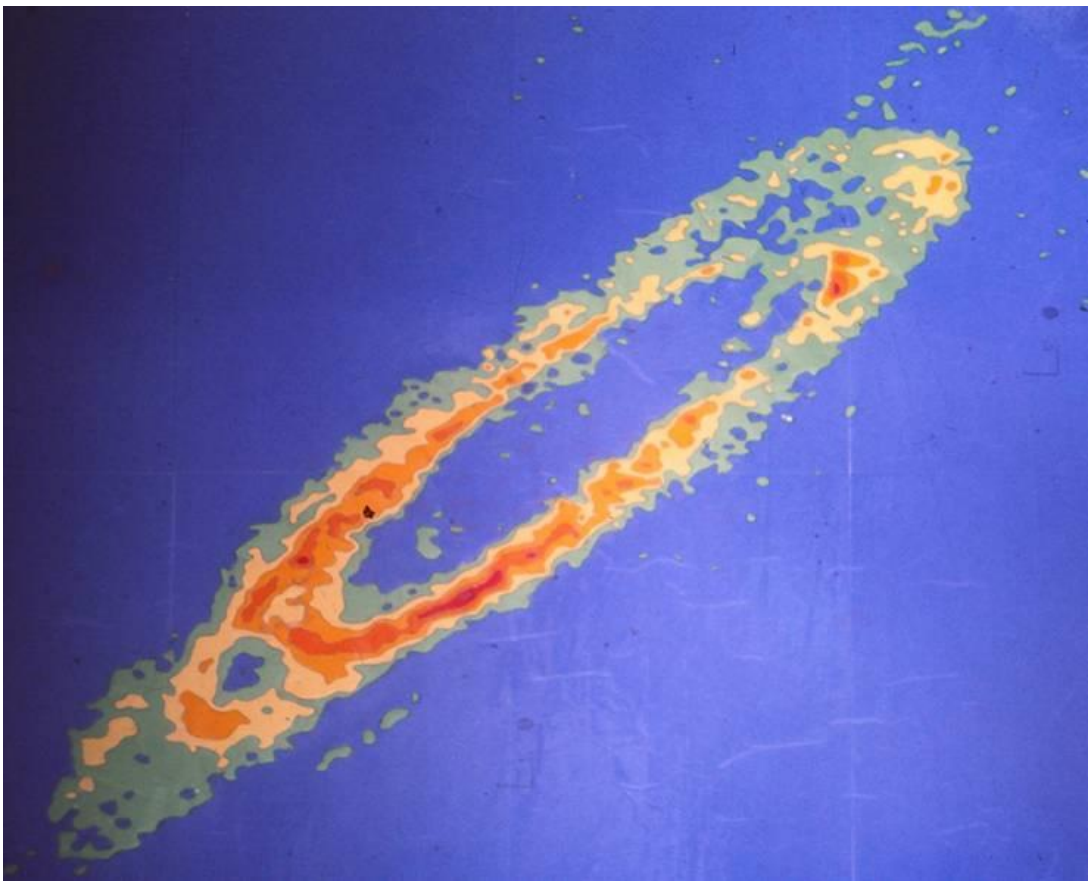
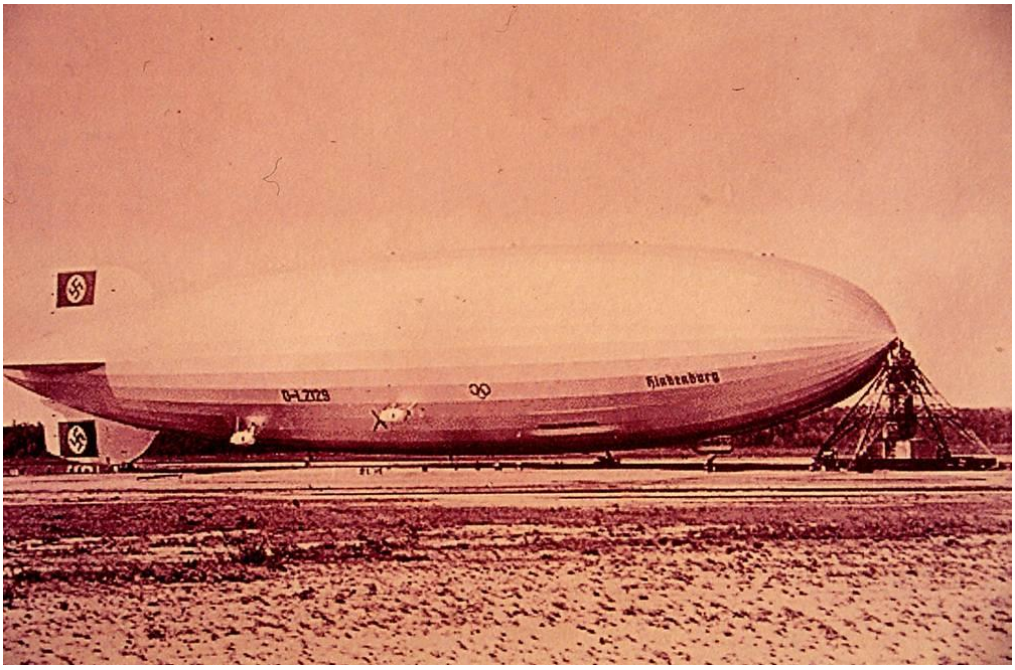


Image of M31 showing Neutral Hydrogen

The Doppler effect was mentioned next and Konrad spoke of the movement of lines as a star moves away from us and from the measured shift towards the red end of the spectrum, the velocity of recession can be calculated and he took us through some of the calculations. He said that astronomers can now measure so accurately that they can even measure the Doppler effect of a star with an exoplanet moving around it, pulling the star towards and away from us so making it possible to predict the size of the planet.

We were also told how it is possible to detect the presences of clouds of hydrogen by looking at distant quasars. Not only is it possible to detect these clouds, but also to determine their velocity and even the number of clouds that might be present and also calculate their velocities and distances.

Coming closer to home, Konrad talked about dirigible airships, in particular, the very successful German Zeppelin air ships. The Hindenburg carried a total of 10 tons of hydrogen in 16 gasbags inside an outer envelope. We were told that if this same volume had been air it would have weighed 200 tons! So the displacement gave considerable lift.



The German Airship Hindenburg

The huge disadvantage with hydrogen is that it is highly flammable, which brought about the end of the airship age when LZ129 Hindenburg caught fire whilst trying to land in New Jersey in 1937. Only America had access to helium from the earth's crust. Helium is inert and won't burn, but the Americans wouldn't let the Germans have access to it. One solution suggested by the Germans was to surround the hydrogen bags with helium inside the envelope but that never happened. Helium can't be made chemically but is the result of radioactive decay.

Konrad spent some time explaining how sub-particles such as quarks are detected using various methods such as linear accelerators and how the results are used to determine how these particles function. Neutrinos are now known to exist and are given off following a supernova, travelling at almost the speed of light and can pass through the earth without being affected, although we were told that there are now methods of detecting these events.

Finally, Konrad looked at some of the work being carried out at CERN near Geneva where hydrogen protons are accelerated to 99.9999% of the speed of light and then crashed into one another and the resulting particles analysed. The results are now so complex that photo images have given way to computer generated images of the results. The recent search was to find the Higgs Boson but now there are suggestions that there could be even more Higgs Boson particles, and so the research goes on.

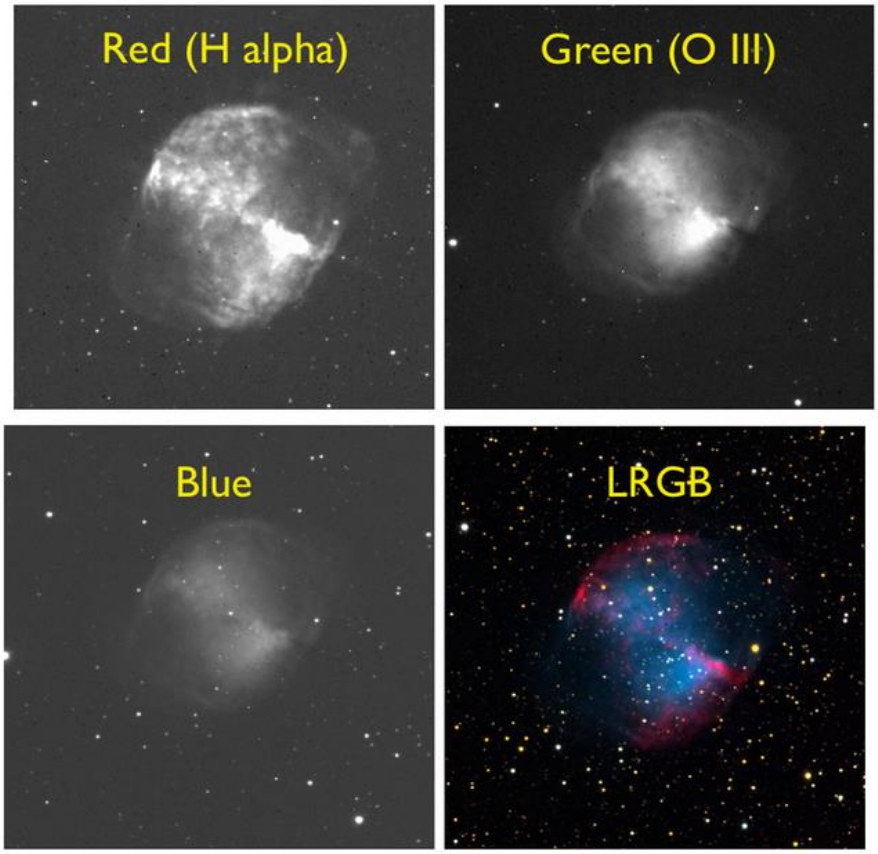
Narrow Band Filters
John Lutkin

John has given a number of useful talks on the use of filters in astronomy and this month he talks about narrow band filters.

Following a brief reminder of the basics, John described a number of important narrow band filters available and where about these bands come in the spectrum, specifically hydrogen beta (Hβ) in the blue area, Oxygen 3 (0III) in upper part of the green band, Hydrogen alpha (Hα) and Sulphur (SII)I both in the red area all designed to be very narrow band at the wavelength of their respective emission lines.

An interesting comment is that narrow band filters work on the function of incident light angle and the bandpass of the filter can be shifted in telescopes faster than f/4, significantly reducing the efficiency of the filter. For telescopes below f/4 wider bandpass filters are recommended.

An example of the use of some of some narrow band filters, and Blue a filter is shown below for M27 compared with Luminance, Red, Green and Blue filters,



M27, the Dumbbell Nebula with filters

Common filters

The two most common elements contributing to emission lines in nebulae are hydrogen and oxygen. Other elements such as sulphur and nitrogen also create prominent lines.

Hydrogen-Alpha - 656.3nm
The most dominant emission line in a star-forming region such as the Orion Nebula is H-alpha.

Hydrogen-Beta - 486.1nm
Hydrogen gives off light at several wavelengths. The second most common, after H-alpha, is the H-beta line in the blue part of the spectrum. Since the dark-adapted human eye is sensitive to blue and green but not red, H-beta filters are sometimes used for visual observations of certain nebulae.

Oxygen-III - 500.7nm
This line is in the blue-green portion of the spectrum and corresponds to the peak sensitivity of the dark-adapted human eye. The OIII line is the dominant emission from planetary nebulae.

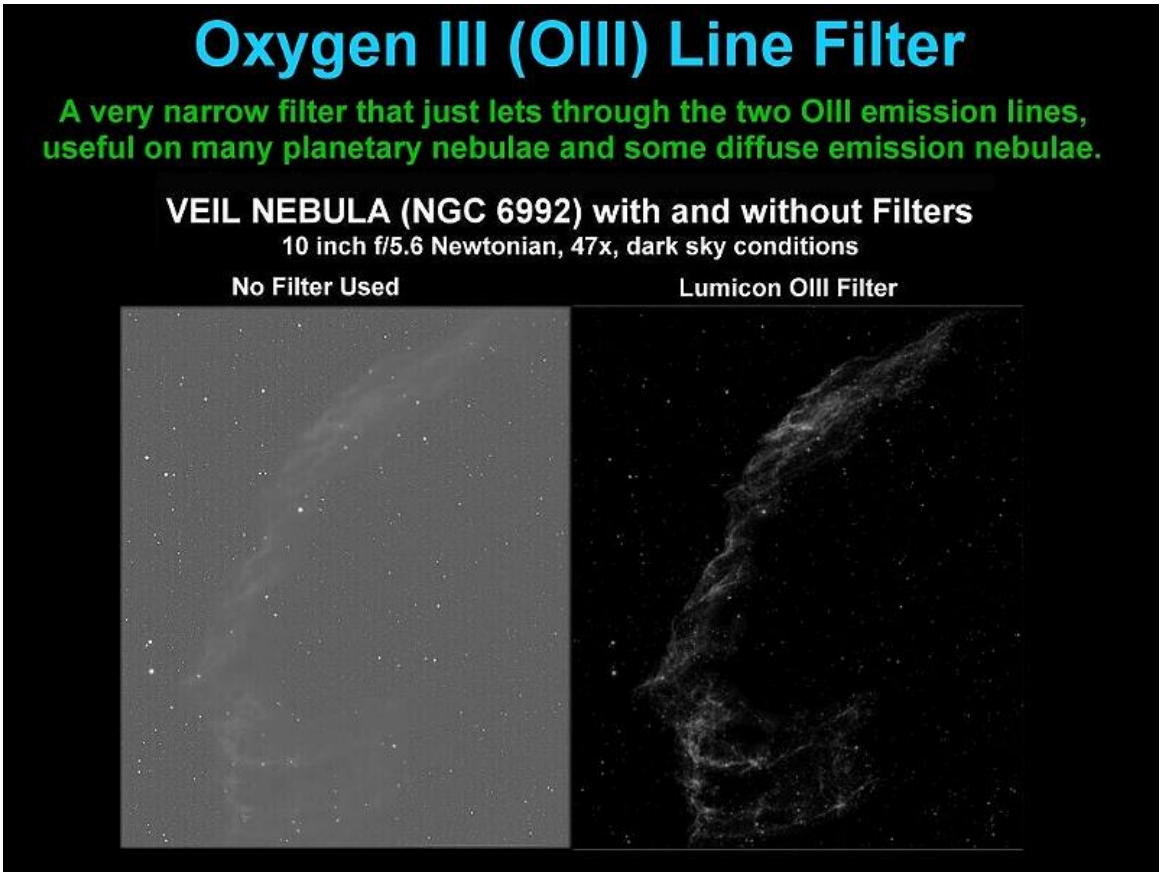
Sulphur-II - 672.4nm
Singly ionized sulphur emits light in the deep red part of the spectrum, beyond H-alpha. It is a weaker emission than H-alpha and OIII, but it is the most common filter used after these two.

Nitrogen-II - 658.4nm
Singly ionized nitrogen, like H-alpha and SII, also gives off light in the red part of the spectrum. NII is a less commonly used filter, but its use is seen often in Hubble Space Telescope pictures and it is occasionally used by amateur imagers as well.

John spoke of light coming from the Moon being reflected light from the Sun and there is an amateur in America who has built a spectrometer by passing light through a narrow slit and then using a CD, which is capable of showing the Sun's characteristic lines.

There are narrow band filters that remove the emission lines from man-made lighting such as Mercury Vapour and HP Sodium Vapour lamps. Also there are broader filters that remove continuum emission from incandescent lighting. Also Oxygen 1 and Sodium D filters can help reduce natural airglow.

Some filters can help improve to a limited extent the contrast when imaging galaxies and quite a dramatic improvement was shown using a Lumicon Oxygen 3 line filter when looking at the Veil Nebula.



Finally John referred to the use of OIII filters and gave examples where they are useful and where they are not.

Good Objects for OIII Filter	Bad Objects for OIII Filter
Veil Nebula	Horse Head Nebula
Swan Nebula	Flame Nebula
Eagle Nebula	California Nebula
Lagoon Nebula	North American Nebula
Orion Nebula	
Ring Nebula	
Dumbbell Nebula	

JUNE MEETING

Wednesday 17th June - Our Chairman, John Vale-Taylor, updates us on his journey of discovery in astrophotography

It is important to note that this meeting will take place in the Drama Studio at Uplands College across the road from where our meetings have been held recently. Details of its location are included at the start of the Newsletter. The address is: The Drama Studio, Uplands College, Lower High Street, Wadhurst TN5 6AZ.

Meetings begin at 1930 although members are invited to arrive anytime after 1900 as this is a good time to exchange ideas and discuss problems and also relax before the meeting starts.

Anyone is welcome but non-members are asked if they wouldn't mind contributing £3 towards costs.

FUTURE MEETINGS

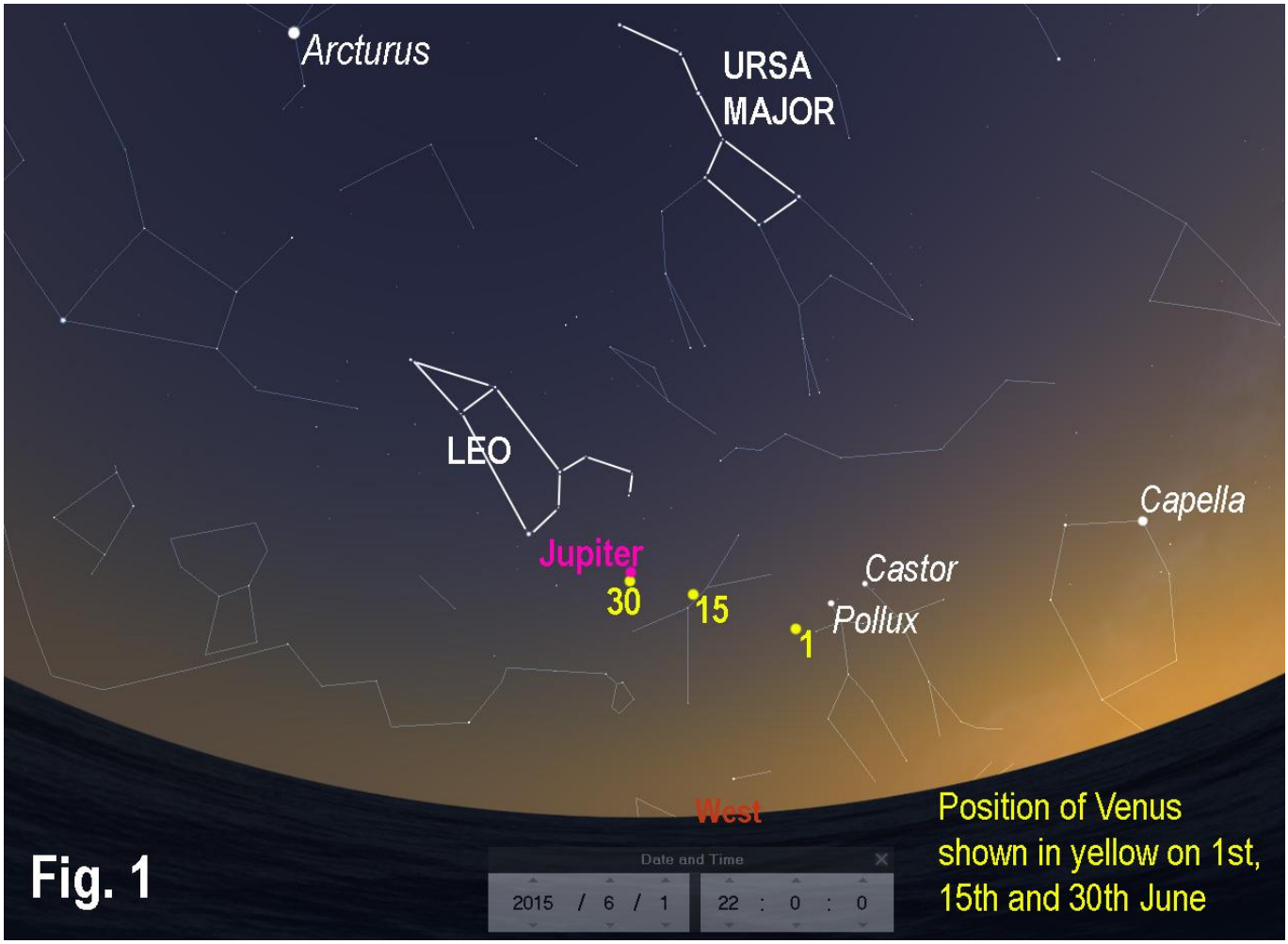
Wednesday 15th July - Our Observing Director, Brian Mills FRAS, goes back to basics with "Astronomy from the Ground Up"
Saturday 29th August – Astro-barbecue. (further details to follow)
Wednesday 16th September – Mike Maunder gives us his impression of "Observatories of the World".

SKY NOTES FOR JUNE 2015

Planets

Mercury is a morning object throughout the month, reaching greatest western elongation on June 24th. Sadly, for those of us in the UK, it will be so poorly positioned that the smallest planet will effectively be renderer unobservable. On the morning of the 24th, with the Sun 6° below the horizon at the start of civil twilight, Mercury will be just 1° in altitude!

Venus reaches greatest eastern elongation on June 6th and continues to shine like a beacon in the western sky soon after sunset. It begins the month in Gemini, but moves briskly eastwards through Cancer and into Leo, passing half a degree north of the open cluster M44 on the 13th. As this journey progresses Venus closes in on Jupiter and on the 20th the two planets form a photogenic triangle with the crescent Moon. On the night of June 30th/July 1st Venus passes less than half a degree south of the fainter Jupiter. See fig 1 for position of Venus throughout the month.



Earth reaches the summer solstice at 17.38 BST on June 21st. This is the moment when the Sun has attained its most northerly declination before heading gradually south towards the autumnal equinox. It is when we say, in general terms, that the longest day has been reached and that, from now on, the days are getting imperceptibly shorter.

Mars is in conjunction with the Sun on June 14th, and is therefore unobservable for the whole of this month.

Jupiter is still a conspicuous object 30° high in the west as the month begins, setting four hours after the Sun. However, by the end of June, this has dwindled to just two hours as this particular apparition draws towards a close. If you haven't seen the four Galilean moons, now is the time to try whilst the gas giant is still at a moderate altitude. Jupiter begins the month in Cancer, but its direct (eastwards) motion carries it into neighbouring Leo on the 10th where it will remain until August 2016. The position of Jupiter on the first of the month is shown in fig 1.

Saturn was at opposition at the end of last month and so is visible for most of the night. The ringed planet is currently moving retrograde in Libra, something it will continue to do until August 2nd when it reaches its second stationary point. Its magnitude falls slightly during the month to +0.3 whilst its angular size drops to 18.2" (18.2 arc seconds) from 18.5" at opposition. By way of comparison when Jupiter was at opposition, in February, it appeared to be more than twice the size at just over 45". Saturn's north pole remains tilted towards the Earth at an angle of just over 24° giving excellent views of the ring system. The Moon is close by on June 1st and 28th.

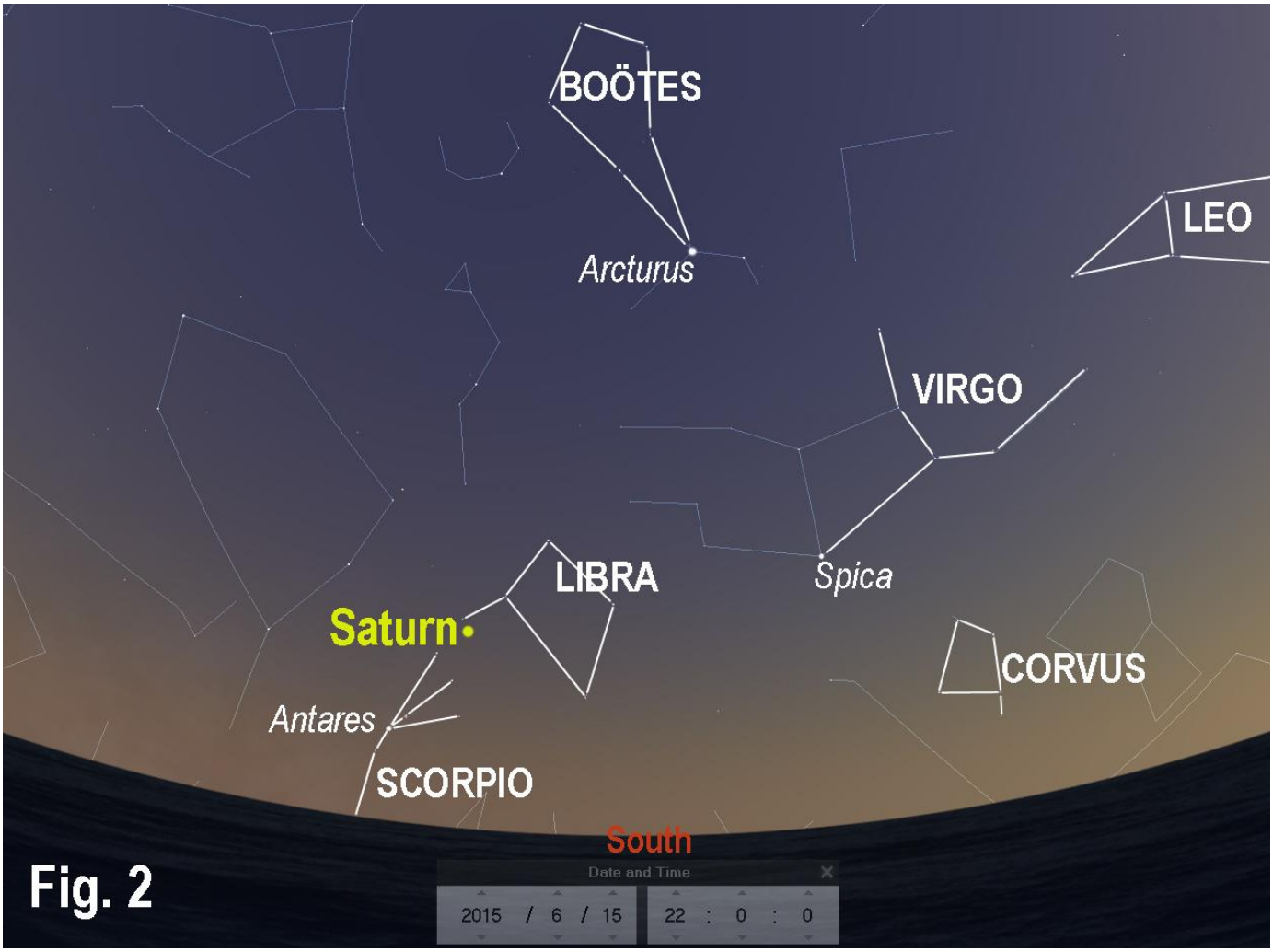


Fig. 2

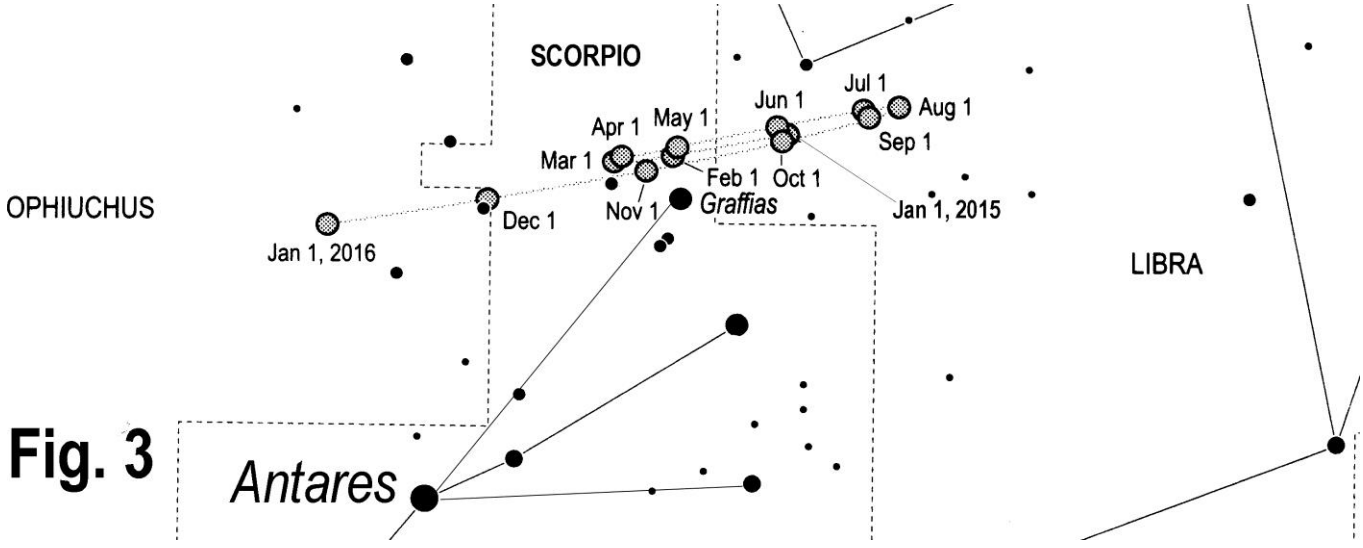


Fig. 3

Fig 2 gives the position of Saturn at 22.00 BST around the middle of the month although this will hold good for the whole of June and beyond. Fig 3 shows the path that the planet will follow from January 2015 through to January 2016. Interestingly, at the beginning of December this year, Saturn crosses the border into Ophiuchus where it remains until February 2017.
It makes me wonder how astrologers will deal with one of the major planets spending more than a year in a constellation that they never ever mention and isn't even part of their Zodiac! Stand by for more pointless drivel from people trying to foretell the future by looking at the sky. Please, someone put them out of their misery!

Lunar Occultations
In the table below I've listed events for stars down to magnitude 7.0 that occur before midnight although there are many others that are either of fainter stars or occur at more unsociable hours. DD = **d**isappearance at the **d**ark limb. The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. As is common at this time of year, with reduced hours

of darkness, the number of evening events is greatly reduced. This month there is only one event that meets the conditions mentioned above. **Times are in BST.**

June	Time	Star	Mag	Ph	Alt °	% illum.	mm
29th	22.54	ZC2390	6.7	DD	20	94	110

Phases of the Moon for June

Full	Last ¼	New	First ¼
2nd	9th	16th	24th

ISS

Below are details for passes of the International Space Station (ISS) that occur before midnight and are magnitude -2.0 or brighter. The details of all passes, including those visible after midnight, can be found at www.heavens-above.com. Please remember that the times and directions shown below are for when the ISS is at it's ***maximum*** elevation, so you should go out and look at least five minutes beforehand. **Times are in BST.**

June	Time	Mag.	Alt°	Az.		June	Time	Mag.	Alt°	Az.
1st	22.48	-2.4	41	SSE		7th	23.42	-3.5	81	SSW
2nd	21.53	-2.4	27	SSE		8th	22.47	-3.3	83	N
2nd	23.29	-3.5	84	S		9th	23.28	-3.3	59	SSW
3rd	22.34	-3.4	63	SSE		10th	22.32	-3.4	81	SSW
4th	23.15	-3.3	82	N		11th	23.13	-2.8	39	SSW
5th	22.20	-3.4	85	S		12th	22.17	-3.2	59	SSW
5th	23.56	-3.4	83	N		13th	22.58	-2.0	25	SSW
6th	23.01	-3.3	78	N		14th	22.02	-2.6	39	SSW
7th	22.06	-3.3	82	N						

Iridium Flares

The flares that I've listed are magnitude -2.0 or brighter although there are a lot more that are fainter or occur after midnight. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to www.heavens-above.com . Remember that when one of these events is due, it is sometimes possible to see the satellite before and after the "flare" although, of course, it will be much fainter at those times. **Times are in BST.**

June	Time	Mag.	Alt°	Az.°		June	Time	Mag.	Alt°	Az.°
1st	23.12	-2.7	35	258 (WSW)		16th	22.37	-5.7	17	291 (WNW)
2nd	23.06	-2.4	36	259 (W)		17th	22.41	-3.2	15	295 (WNW)
4th	23.03	-2.6	32	264 (W)		18th	21.42	-5.5	18	342 (NNW)
5th	22.57	-7.1	32	266 (W)		18th	22.43	-4.7	13	298 (WNW)
11th	22.40	-6.4	25	279 (W)		18th	23.33	-3.4	41	250 (WSW)
13th	22.36	-6.3	23	283 (WNW)		19th	22.47	-5.0	11	302 (WNW)
14th	23.47	-3.6	46	240 (WSW)		22nd	23.16	-4.5	39	257 (WSW)
15th	22.11	-2.6	12	345 (NNW)		25th	23.07	-5.3	36	262 (W)
15th	22.34	-5.1	20	288 (WNW)		29th	22.53	-2.9	31	270 (W)
16th	22.04	-3.5	13	344 (NNW)						

The Night Sky in June (Written for 22.00hrs BST mid month)

In the south Corona Borealis is close to the meridian with Boötes to the west and Hercules to the east. Hercules is far from being eye catching with no stars of the first magnitude and only two of the second, so a way of finding it easily is always useful. The simplest way to locate it is to draw a line from Arcturus, in Boötes, through Alphekka, otherwise known as α CrB, and continue it generally north eastwards. This will bring you to the faint quadrilateral known as the "Keystone" which forms the lower part of the strong man's body. With Hercules close to culminating it is an excellent time to view the two bright globular clusters, M13 and M92, that lie within its borders.

Immediately below Corona Borealis lies Serpens Caput which forms the head of the Serpent whose dismembered tail, Serpens Cauda, lies on the opposite side of Ophiuchus. Within the head section lies another moderately bright globular cluster, M5, at magnitude 5.8. The tail section contains M16, the Eagle Nebula, brought to prominence by the Hubble Space Telescope and the image it produced of one area that came to be known as the "Pillars of Creation".

Closer still to the horizon we find the very obvious group of stars that form the head and claws of the Scorpion which contains the brilliant Antares known also as "Rival of Mars" because of its ruddy hue.

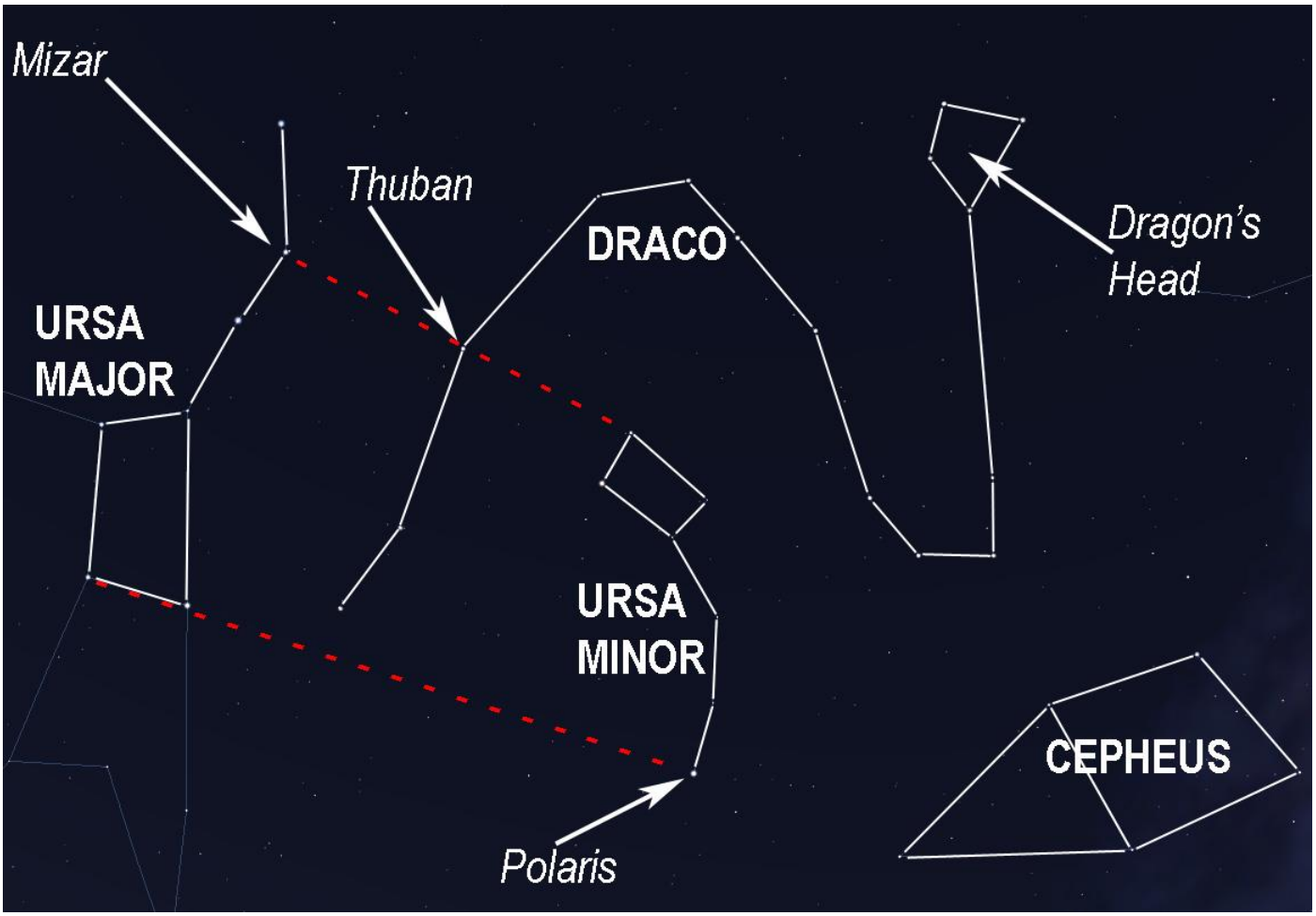
Turning to the west we see that Hydra and Cancer will soon be setting, although the celestial lion should still be visible for another month. Lying generally north east of Leo at this time are the two small constellations of Coma Berenices and Canes Venatici. Coma has the distinction of playing host to the north galactic pole so is perpendicular to the plane of the Milky Way with its associated obscuration by gas and dust. This allows a number of external galaxies to be seen, namely those in the Virgo and Coma clusters. It is also home to Melotte 111, an extremely loose open cluster than has an angular size of 5° partly due to its comparative closeness, 290 light years, to Earth. Canes Venatici is another faint constellation, on this occasion added by Hevelius in the 17th century, with the brightest member being the easily split double, Cor Caroli, whose components are magnitudes +2.9 and +5.6. Within the constellation lies the fine globular cluster, M3, at magnitude +6.3 and the superb but much fainter Whirlpool galaxy that is in the throes of interacting with the dwarf galaxy NGC 5195.

Looking north Ursa Major is beginning its descent to the west of the pole which signals that Cassiopeia and Cepheus are in the ascendancy. Within the borders of the larger bear lie a pair of galaxies M81 and M82 whose appearances are very different. The

former at magnitude 6.9 is a spiral also known as Bode's Galaxy after Johann Bode who discovered it in 1774. The latter had previously been described as both "irregular" and "peculiar", but now seems to have been accepted as a "Starburst" galaxy where massive amounts of star formation are taking place. In January 2014 Dr Steve Fossey and a number of his students, working at the UCL observatory in Mill Hill, North London, observed a type 1a supernova that flared up in M82. It reached a maximum brightness of 10.5 but was affected by extinction of approximately one magnitude due to the interstellar medium.
Ursa Minor is pointing towards the zenith whilst Draco straddles the meridian north of it, making its twists and turns that much easier to follow. The tail of the dragon, as it passes between the two bears, contains the star Thuban which five thousand years ago, thanks to precession of the equinoxes, held the title "Pole Star". (See "What objects can I look for" below).
The Summer Triangle is again on view, with Vega almost due east at an altitude of 45°, along with an attendant group of small constellations that at this time of year lie in a line between Lyra's brightest star and the horizon. As the night progresses the Milky Way through Aquila, Cygnus and Cassiopeia becomes more obvious although astronomical darkness will not return until the later stages of July. The double, Albireo, at the head of the swan is almost 35° high in the east and a delight to observe with its contrasting yellow and blue stars. A mere 8° below and a little to the west of Albireo lies the "Coathanger" asterism. It is found within the confines of the small and faint Vulpecula but lies close to the border with Sagitta, which thanks to its shape is the more easily recognised of the two.

What Objects Can I Look For This Month?

Draco (the dragon) is now high in the north and ideally positioned to have its twists and turns unravelled. First locate Ursa Major, which will be a little west of north, and use the two "pointers" to locate Polaris, the pole star. Then identify Ursa Minor to find the two stars at its northern limit. One of these stars, and the second star in the tail of the great bear (Mizar) lie either side and equidistant from Thuban in Draco, a star that 5,000 years ago was the pole star. Having located Thuban you should be able to identify the rest of the constellation.



Telescope Evening
We are hoping to organise a practical evening where members, and non-members, can bring their telescopes along and receive practical help in setting them up and using them. There are a large number of instruments purchased that get used two or three times and are then put away because the owner lacks the initial skills that are required to get started. Very often the instruction books are overly daunting to newcomers who get lost in technical jargon and instructions that seem to assume prior knowledge. The evening(s) that we are planning are intended to overcome such problems. If you feel this type of event would be of use to you, please let me know at the e-mail address at the end of this newsletter.

Brian Mills

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SAGAS web-site:
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Any material for inclusion in the July 2015 Newsletter should be with the Editor by June 28th 2015