CYGNUS

Quarterly magazine of the Norwich Astronomical Society
(Registered Charity No. 262968)

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Autumn 2017

EDITORIAL

Hello again!

It seems that one other thing I should have guaranteed are mistakes! Alas, now I am, and so begin apologies.

1. Date on front cover. Seems that we now have two Autumn 2016
2. I mistook Peter with Kieth so apologies to both Peter and Jill

With regards to Sue's article, as Sue is recovering from surgery, I have cheated and used a previous article from an old edition of Cygnus which is relevant for this season, and which Sue is happy for me to use.

Well, I have managed to aquire some articles on different areas of Astronomy, but still looking for more, in particular lenses/eye pieces, there are a lot of novices that could do with an insight (sorry for the pun lol) on what, how and why etc. also Telescopes:- again what there is, whats best and for what, building one might be of interest too.

I would like to thank every one who have sent in Articles. It is very much appreciated and I am sure all who will read them will get as much enjoyment as I have.

I look forward to any feedback, as that's how I will learn to improve, and hopefully make Cygnus better for you, so without any more, enjoy!

Tom

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COVER

Image taken by Shaun Reynolds
From
Orford

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CHAIRMAN'S REPORT

Some excellent news for the Society.. As you will recall I took on the role of Chairman temporarily at the last AGM. Over the (almost) year I have been doing my best to step up to the plate but more recently my work and other responsibilities have left me struggling to fulfil the duties as fully as I would like and as I believe the role demands. With this year's AGM looming and lots of exciting things going on at the Society I felt it was time to try and find someone with more time to give to the role and I am very pleased to announce that Roger Preece has kindly volunteered to step forward. Roger will take over the roll temporarily until the next AGM following which the role will need to be officially filled. Roger has said he would be willing to be considered for this should there be no other keen individuals. I will now spend some time working with Roger to hand over the bits and pieces I have been working on. Massive thanks to all of you for supporting me in this few months and I am sure you will join me in thanking Roger for stepping in.

In other news (and I think since the last Cygnus) we had a really enjoyable summer BBQ which was well attended and gave the NAS a great social boost. As the dark nights start to approach it will be great to see this social but continue into the observing season. You will also notice that the resumption of the Saturday working parties (with an NAS subsidized fish and chip lunch for the workers) has encouraged a great turn out by members to help maintain and develop the facilities on the site and again, as the summer draws to a close the site is looking great. Thanks to all who have helped out at these.

Membership renewals are now due and the Committee have given great consideration to ways in which to encourage more people to help out at NAS events; public, private and working parties. We settled on a great new scheme based on the loyalty card.. New membership cards will have a grid on the back upon which a record can be kept of all the times you help out at society events and, with a full card you can get a discount on the next year's membership. Debbie has communicated all of this to you already but if you have not already seen the details then it is on its way to you.

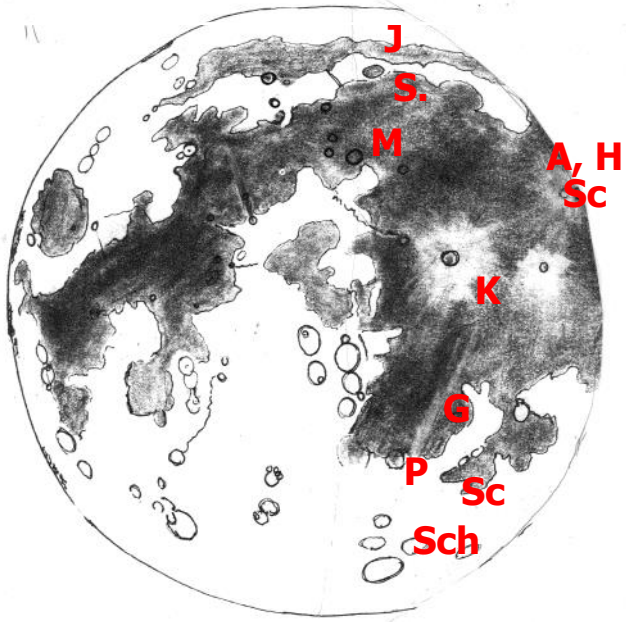
I think that is it from me. As this will be my last (I have said that before so who knows) Chairman's article so I would like to thank everyone in the Society for everything they do for the place. The committee for their tireless and fabulous management of the Society, we have a great bunch there and I am sure Roger is going to do a great job as chair.. Thanks to everyone who helps out at the public events, they are essential to encouraging new members and new ideas into the Society and are a great way to encourage more people to get excited about astronomy, to the helpers at group visits and at the various fairs and exhibitions around the county and to the members for making the NAS a truly fabulous place to be, after all, what more do you need than good friends and clear skies..

Mark Thompson

MOONWATCHERS

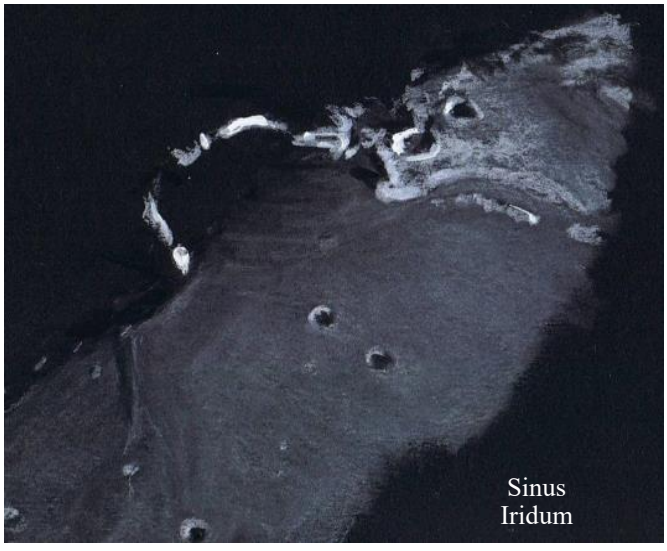
Evenings 10 and 11

CHART FOR EVENINGS 10 and 11



KEY
J. J. Herschel. **S.I.** Sinus Iridum.
A,H, Sc. Aristarchus, Herodotus, Schroter's Valley.

Evening 10.
The 10th evening of the lunation and we may hear the distant rumblings of complaining deep sky observers as the Moon moves ever nearer to Full.
North of the Mare Frigoris (Sea of Cold) look for J. Herschel, a large 156 km diameter crater. Its flat floor is a mass of crevasses, hills and craterlets and its low, eroded wall is overlapped by the 24 km diameter crater Horrrebow.
Mare Imbrium is now seen in full, a massive 1250 km diameter impact basin where NASA's Lunar Orbiter program detected the first MASCON (Mass Concentration). This series of probes identified a total of twelve regions where the internal density of the Moon was significantly increased and it is believed that this is caused by remains of the huge meteorites that formed Imbrium and other features.
On the north-west shore of Mare Imbrium another large impact created Sinus Iridum (Bay of Rainbows). No real rainbows here of course, but just about everyone who has looked at the Moon through a binocular or telescope when it is approaching this phase will have been impressed by the illuminated 'hook' of the Montes Jura projecting out from the terminator when sunlight strikes the mountains before the floor of the bay is illuminated. This effect is to my mind just as beautiful as any rainbow.
The 400 km half-crater of Sinus Iridum was formed after the Mare Imbrium impact and filled with lava from the Imbrium basin. The Montes Jura border the north of the bay, several lines of concentric mountains with peaks rising up to 4 km. They are impacted by Bianchini, a 3000 m deep crater with terraced walls, a flat floor and an off-centre hill. At the eastern end of the bay is the laplace Promontory, a 2500 m high headland. At the western end is the Heraclides Promontory which is reputed to resemble the face of a 'Moon Maiden' when the light strikes it from a certain angle. She is supposed to be seen in profile, her hair streaming out over the hills to the west. I must say I've never managed to see the maiden. Perhaps I'm always too late or too early to catch the correct lighting, or maybe she got tired of waiting for me!


Sinus Iridum

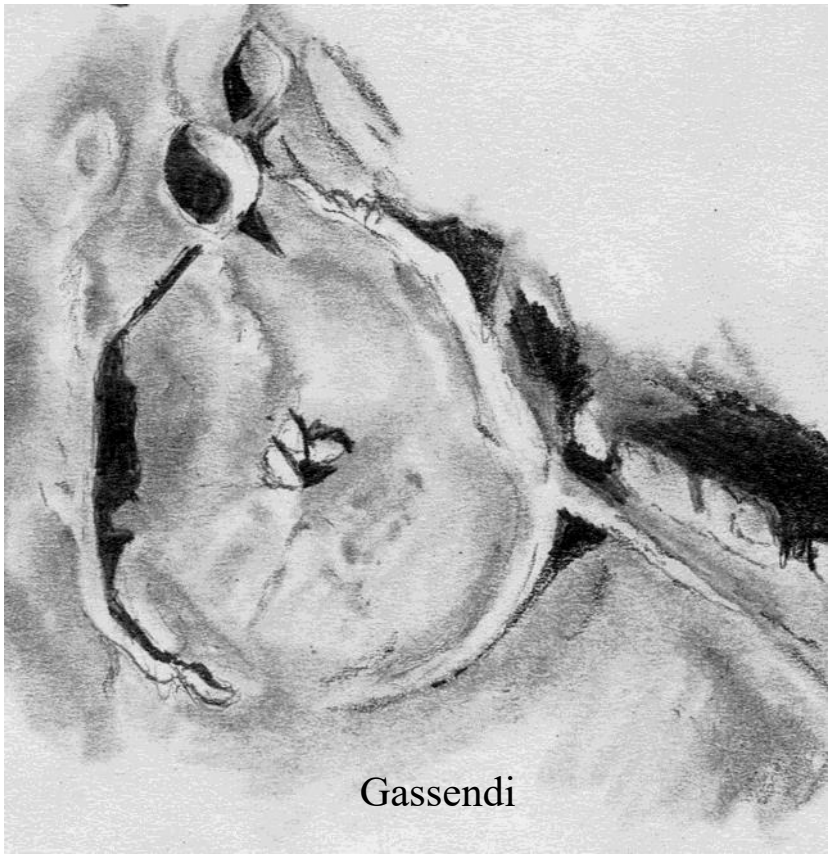
The rays from Kepler extend several hundred kilometres in all directions, and mingle with those from mighty Copernicus to the east.
Larger scopes and higher powers are perhaps best for viewing the area to the south-west of Mare Nubium. This is the rather unattractively named Palus Epidemiarum (Marsh of Epidemics) where lava from Mare Nubium flowed into a low-lying region. Bordered by the craters Campanus (50km) and Mercator, a near twin and only slightly smaller than Campanus. South of Mercator is Capuanus (60 km) an old, ruined crater with a wall that rises up to 3 km in the west but is hardly more than 500 m to the north-east. Between Capuanus and Ramsden higher powers will reveal a network of rilles known as the Ramsden Rilles and back to the north-west, between Campanus and the crater Hippalus, look out for the Hippalus Rilles. The three parallel concentric wrinkles are almost 250 km in length and are most probably associated with the formation of Mare Humorum.

Palus_Epidemiarum_Image reproduced by kind permission of SPA member David Davies

To the north of Mare Humorum (Sea of Humors) and now beautifully illuminated lies the 110 diameter Gassendi, surely one of the most wonderful of Lady Luna's treasures. Its walls to the north rise to over 3.5 km but in the south they are much lower, dipping almost to the level of the mare. The northern walls are impacted by the 33 km Gassendi A which touches the slightly smaller Gassendi B (225 km). Gasendi itself has a complex floor that is a delight to explore. In a 60 mm scope this floor appears mottled and lumpy, but in instruments of 150 mm and above numerous rilles and ridges are resolved. A fine target for imagers and a challenging one for the visual observer who aims to make a drawing! But even if you plan to do neither Gassendi is a crater on which to linger as there are so many details to take in.
Lastly on evening ten let's look at the prominent elongated Schiller, 171X71 km) This crater lies to the north-east of a large but unnamed area that is informally referred to as the Schiller Annular Plain. More of this area will be revealed on evening eleven.

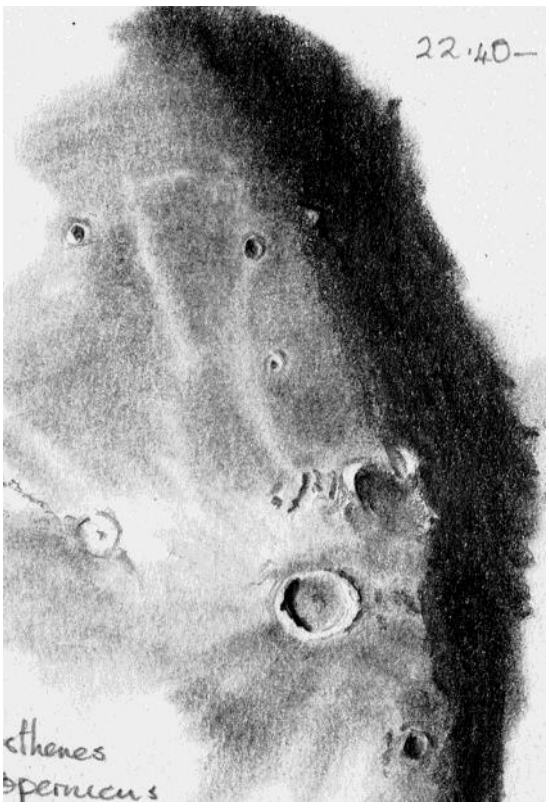
Evening 11:
The terminator, now appearing really quite smooth, advances and the bright gibbous Moon now bleaches out all but the brightest planets and stars.
All of the major mare on the nearside are now visible. Between the Mare Frigoris and Sinus Roris (Bay of Dew) to the north, is the crater Harpalus, a ray crater that some have termed 'a mini Copernicus'. It has a terraced wall 2800 m high and three peaks clustered in its centre. North of Mare Frigoris, and above J. Herschel, look out for the ruined 70 km diameter Anaximander.
South of Mare Frigoris the Montes Jura drop westwards to the Oceanus Procellarum (Ocean of Storms). It's worth using a high power to examine two peaks, Gruithuisen Gamma and Gruithuisen delta. Similar in size, the pair probably have very different origins. Gamma is a circular dome, 20 km in diameter, that rises about 1 km and can be made out even when the Sun is at a high angle (if you know where to look!). It has a flat summit with a vent, some 2 km across that should be visible with scopes of 150 mm and above. This suggests the dome is volcanic in origin. Close on the south-west is Gruithuisen Delta which has no vent. An ordinary mountain then, and probably part of the buried rampart of Mare Imbrium.

Let your eye travel south, past the crater Angstrom and the Harbinger Mountains, perhaps pausing to look at the semi -ghost crater Prinz, 50 km in diameter with its northern rim rising to 1000 m whilst its southern wall has been engulfed in lava. But what will really be demanding your attention now is the brilliant Aristarchus. This is the brightest of craters and can even be seen by earthshine. It is 3 km deep with amazingly bright terraced walls and a central peak, barely 500 m high, rises from its flat floor. It lies on a roughly square-shaped plateau that has an area of approximately 30000 square km. Some observers report this plateau as being a ruddy colour, others speak of a deep yellowish tint. The reddish hue is certainly evident in images, but visually I only see a hint of the latter.


Gassendi

This is a geologically interesting region and the majority of Transient Lunar Phenomena (TLPs) reported have been seen in this area. I've yet to see a TLP myself that couldn't be put down to the effect of our own turbulent atmosphere, but many observers, far more experienced than I, have and I live in hope. Aristarchus's rays spread out from the crater and even reach as far as Kepler and Copernicus. The crater is reckoned to be some 450 000 000 years old – younger than Copernicus, but older than Tycho.

Nearby Herodotus (35 km across) couldn't be more different. Its dark interior is without any large features and the crater is estimated to be older than the Oceanus Procellarum. Its walls are 1500 m high and have been impacted in the north.



Snaking out from the north rim of Aristarchus is Vallis Schoterii (Schroter's Valley) the easiest rille on the Moon to spot. 160 km in length, it varies from ten to six kilometres in width and has a flat bottomed floor that is 200 to 1000 m deep. It starts at an elongated depression known as 'The Cobra's Head'and heads northward. It then makes a turn to the west and eventually begins to veer south-west. Schroter's Valley is believed to be a collapsed lava tube. Look some 70 km to the north for more evidence of volcanic activity. If the Sun is low enough in the Moon's sky you should be able to make out the dome known as Herodotus Omega.

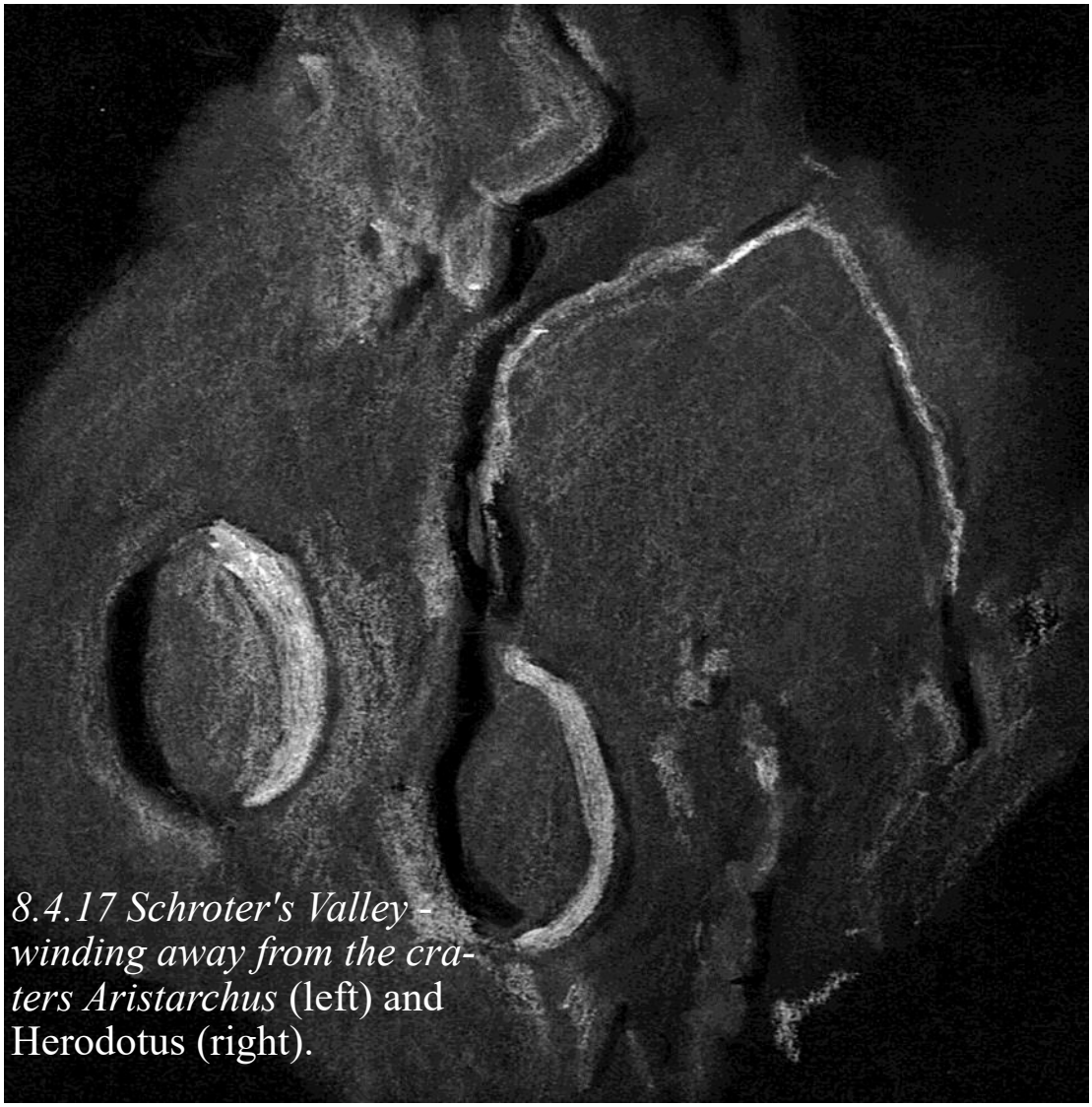
If you can drag yourself away from this fascinating area more domes await you to the west of the 41 km diameter Marius. Low magnification and a small aperture just show this as a dusty expanse but step up power with scopes larger than 150 mm and scores of domes will be revealed, looking for all the world to me like a lunar mile infestation

16.4.16 Copernicus, Eratosthenes

(probably because, at the time of writing, my garden is plagued by the little beasts!).
Down now to Mare Humorum, fully lit now and almost a twin of Mare Crisium this 380 km circular basin has concentric wrinkle ridges close to its eastern shore and on its west are the two parallel Mersinius Rilles, 230 km long. Look also for the sharply defined fault, Rupes Leibig.
Gassendi remains the showpiece in this area. Writers with more poetry about them than myself have likened Gassendi and the 90 km Gassendi A, which impacts the northern wall, to an engagement ring with a large pearl or precious stone. Do you see it as this? If so perhaps you should offer it to the 'Moon Maiden' we discussed on evening ten! Less wistful, I survey Gassendi A's 2 km high walls and triple central mountains and numerous rilles. West of Gassendi A is Mersinius. 80 km in diameter and 2500 m deep, it has a convex floor with a chain of craterlets.
Late in evening eleven, further south the crater Schickard's eastern wall makes an indentation in the terminator. Promise of more to be seen on evening twelve!
This is necessarily a very brief account of the many delights to be seen on the tenth and eleventh evenings of the lunation. Do go to reference books, maps and the internet to find out about the many other features to be seen at these times.

Clear skies and happy Moon watching,

Spadge
(Graham Sparrow)



8.4.17 Schroter's Valley - winding away from the craters Aristarchus (left) and Herodotus (right).

Lunar Photography

I thought I would add some notes alongside the images published in this copy of Cygnus.
Lunar imaging is probably the first attempt for many astronomers wanting to try some astrophotography, big, bold and easy to see and align to, with changing phases and libration to keep you amused all year round.
But as with anything in astronomy it is not quite as simple as it appears and the Moon being big and bold introduces some of its own problems.
Please excuse the simplicity of the notes below it was not intended as a treatise.

My equipment

I used a 9.25 Celestron SCT on an AZ-EQ6 in a roll off roof observatory in my garden. So yes I am lucky, but there is nothing to stop you using any mount or OTA variant as long as it can be driven (for the video shots) and so long as it is stiff enough and wobble free.
For the single shots I use a Canon 650D directly connected to the OTA via a T mount. These are very nice DSLR cameras with a good specification and reasonably priced. They have the added advantage of an articulated live view screen which can be set in just about any position so that a good focus can be achieved without doing combinations of yoga and origami…
One word of caution; add a lanyard to the camera and loop it around the finder bracket or similar. On one occasion I did not and the camera parted company with the OTA (as I had not tightened up the thumb screw), it fell with the screen in an open position and cost me £300 to get repaired.

With this set up I can get a full screen image right up to full Moon and also the waning Moon. At full Moon if I want to get any images I use a x0.63 reducer.
Use craters and features on the terminator to get focus using the magnifying feature on the touch screen of the viewer. I take my time doing this at 5X and sometimes 10X if the seeing is good. I get focus and then wait, watch and see if it has been achieved to a reasonable level. That is because the image size with the average video cam' will amplify any atmospheric wobble, you need focus, examine and if required focus again. Craters will swim in and out of focus due to the atmospheric wobble. One of the best focussing points is to pick a crater with terraces and use them and the terrace shadows to judge the best focus.

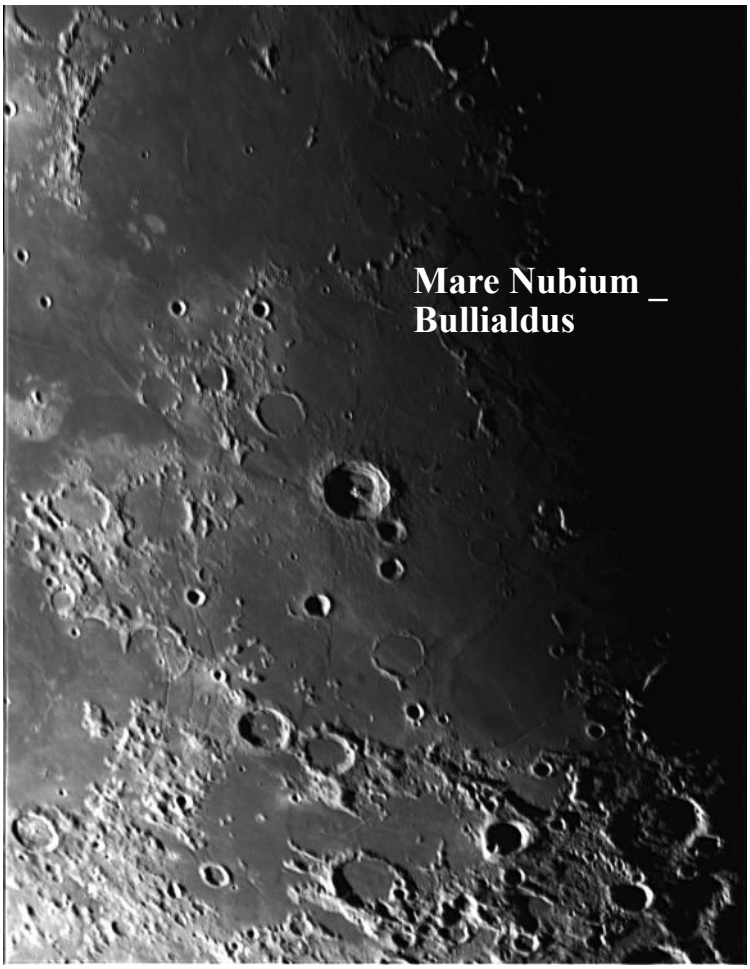
Yes there are software tools for focusing but they are really aimed at the video focusing.

For single shots I generally work at ISO 400 or 800 and then take some trial shots to judge the correct exposure. As the Moon waxes and wanes the shutter speed will have to be changed. At a ¾ Moon expect to be around 1/500 sec or faster.
I do not do lunar composites using the DSLR.

For detailed images I use an Altair Astro 178C Hypercam colour video camera. Previously I used a ZWO ASI 120MM mono. The ZWO cameras are excellent value, I upgraded as I wanted a better imaging chip and the capability to do live stacking of grey fuzzies when the nights draw in.

For the video capture I use the application called SharpCap. I have tried other packages but found Sharpcap to be IMO more user friendly. It is a personal choice.
It took me some time to get my head around exposure times and gain and how frame rates are affected. The longer the exposure time the lower the frame rate and therefore the longer the overall time taken for the shot. Gain acts a little like the ISO setting on a digital camera. Too much gain can swamp the image with too much light and introduce noise.

The point to take on-board is that if your mount tracks poorly the object of interest will drift over the time for the total frames to be shot. 1000 frames can be around 30 secs with a good frame rate or 2 minutes with a low frame rate.



It pays to experiment and see what works for you. I normally aim for around 1000 frames and spend time trying to get good focus. There are focus aids built into Sharpcap but I rarely use them, as with the DSLR I use terraced craters.
There is a very good online manual for the Sharp capsoftware http://docs.sharpcap.co.uk/2.9/

The taking of 1000 frames allows for atmospheric wobble to be averaged out by the stacking process and hopefully achieve nice sharp detailed images.

I use **Autostakkert** to stack; again a personal choice as there are other packages which folk equally swear by. Recently I have also used PIPP which does a good job of frame sorting but does not stack.

I normally try and use the best 25% of the 1000 frames taken.

Autostakkert allows you to automatically sort and stack the frames and assess quality. It takes the .AVI files produced in Sharpcap and outputs a stacked TIFF image. I then further process the TIFF in the wavelets part of Registax. This allows me to sharpen and balance the TIFF file.
The original file might look odd coloured and unfocused before wavelet processing. I use the RGB align button in Registax which brings out a nice uncoloured image and then the wavelets sliders to sharpen. There are lots of advice on using the wavelets sliders in Registax, and a lot of it conflicting. I was told initially to only use sliders 1 & 2 and a tweak on 3, then to use the sharpen button and denoise using the denoise button.

I now just use the level 6 slider and nudge that up to around 70% and then set the sharpen control above it to around 0.13. Don't ask me what it means I just find it works. Once you press 'Do All' then you should see a nice sharp image. You can adjust until you are happy, or until you see noise creeping in, then you can back off. Experiment!

Finally I have a further play with the image in Photoshop to sort out the levels and then contrast and convert to JPEG but keep a TIFF file as a backup.

Best regards

Frank Dutton

Above:
(from the top)
Crators
Ptolemaeus,
Alphonsus,
Arzechel, Thebit,
Purbach and
Regiomontanus.

Top Right:
Sinus Iridium, with
crators Bianchini,
Sharp, Mairan and
Harpalus

Right: Plato

All Images
Frank Dutton

SUE'S STELLAR SUGGESTIONS

Andromeda and the "Pearl Ear-ings" (Revisited see editors notes)

Whenever I plan an observing session, I always refer to Peter Birren's book "Objects in the Heavens". It lives in my eye piece box and is my guide and constant companion when out with my telescope. At the start of the book, he gives a new take on old stories and legends woven around the constellations. One story in particular groups together the queen Cassiopeia, the king Cepheus, their daughter Andromeda, her horse Pegasus and her savior Perseus riding on his Camelopardalis. In this story, Perseus offers gifts of two jewels, the double cluster to Cassiopeia and two pearl ear-ings to Andromeda.

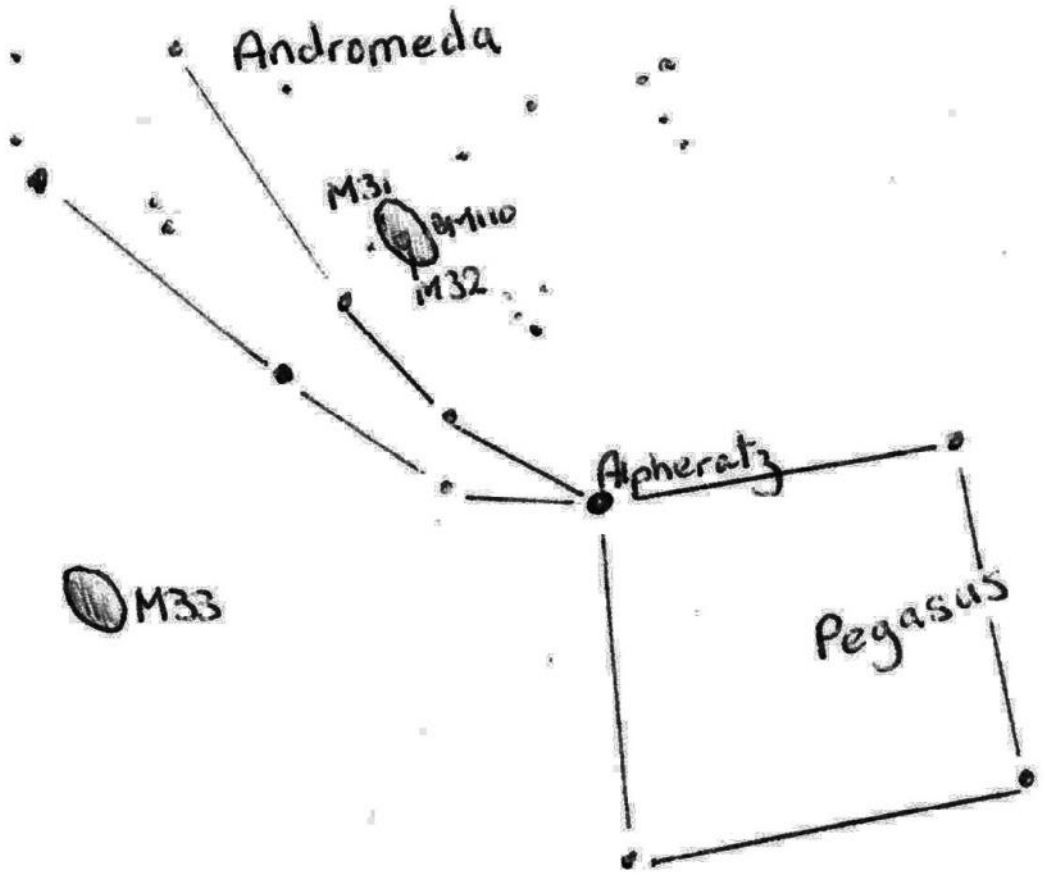
These Constellations are prominent in the Autumn sky and I would like to show you the two "Pearl Ear-ings". The Great square of Pegasus makes a very good starting point. Looking East, you will see a large square of four stars in an otherwise fairly empty part of the sky. The top left hand star is not actually part of the Pegasus constellation but is the Alpha star of Andromeda. This star has the name Alpheratz.

Alpheratz marks the head of Andromeda with two lines of fainter stars arcing left towards Perseus and Cassiopeia. From Alpheratz go to the first pair then on to the second pair. Using these two as pointesrs, take a line through them and continue up for about the same distance. On a clear night you will see a bright patch here, even without binoculars. This is the first of the Pearl Ear-rings, the Andromeda Galaxy, number 31 in Messiers catalogue. With a small telescope you will see a very bright glow. So bright that it can be difficult to make out any detail. Try using a high power eye piece, this can help improve the contrast, and see how much information your eye can tease out. Larger telescopes will reveal that it is a spiral galaxy very like our own viewed slightly edge on. With a small 'scope you will see just outside the glow above the small patch of brightness. This is a companion elliptical galaxy M110. There is another elliptical Galaxy which you may be able to see, M32. This is closer to to the center of M31 and so may be lost in the glare.

The Andromeda Galaxy has caught the attention of story tellers through the years and so most people have heard of it even if they know nothing about astronomy. Being quite easy to see naked eye and thus easy to find, it is a great place to start if you are new to astronomy yourself and would like to show friends and family an example of what can be seen in the night sky. Light from M31 has taken more than two million years to reach us, even so it is the closest major galaxy to our own Milky Way. These two dominate the local group of balaxies, of which there are about 45 altogether.

The second Pearl Ear-ring is also a member of the local group. This is the "Pinwheel Galaxy" M33 in the neighboring constellation of Triangulum. To find this, come back down from M31, through the two marker stars and continue in this direction for about the same distance again. This is a more difficult object to see with a small telescope. It is described as being of almost even brightness, very large, faint and ill defined. Low power will show a faint glow. It is one of those objects which is very dramatic and beautiful when captured by imagers but needs a large telescope and dark skies to appreciate it fully visually. When viewing these more difficult objects, it is worth taking more time to tease out as much as you can visually, and reflect on what you are seeing, looking back a great way in time as well as across a vast distance in space.

Now is the time to get back out side and find our way around the night sky once again. Enjoy the Autumn and gradually accustom to the colder nights to come.



Going Deep

Dale Holt

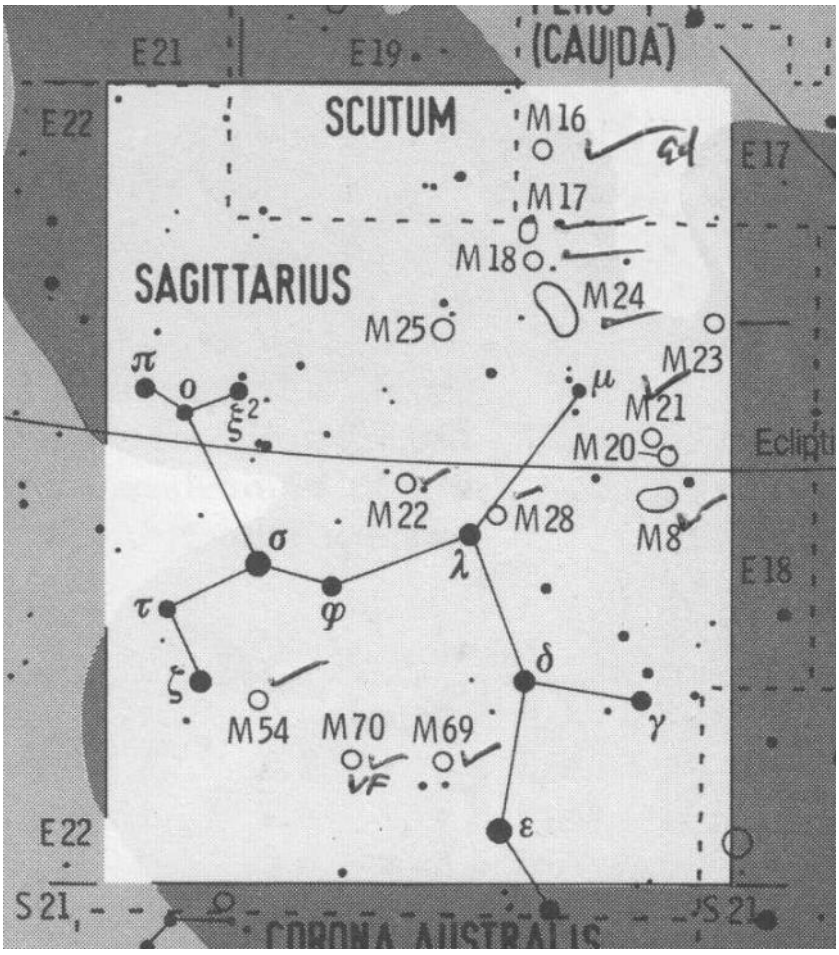
A large aperture telescope isn't the be all and end all of exciting deep sky observing! The challenge of locating a deep sky object with limited aperture is very exciting and just as challenging as glimpsing an elusive 16th magnitude member of a distant galaxy cluster.

This July I had the opportunity to observe from a friends farm in northern Italy at the latitude of 44◦ north. I was using a 20 year old 80mm F5 Chinese refractor on a simple camera tripod with no view finder, not such a problem as the field of view was large, especially at low power.

Sagittarius was well placed to the SE, with the famous (well to astronomers) tea pot asterism standing out well in a fine sky. All was well apart from the fact that a big fat I day past full moon was just starting to rise!

Using my elderly pocket copy of 'The Observers Sky Atlas' by E. Karkoschka, I revisited observations that I had made some 16 years previously from the cliff edge a few miles east of Weymouth in Dorset, using the same atlas and a fixed magnification 80mm Kowa bird spotting scope. Then my objective was to 'tick off' Messier objects that I couldn't find from my home location.

Starting with the massive and bright globular cluster **M22** which is located just to the left of λ Lambada sgr. This stunning globular is easily swept up in binoculars at mag 5.1 and 20' across and makes a great point to start the challenge I have set myself. Changing the setting on the Vixen zoom ep from 24mm to 8mm begins to show granulation in the cluster, with it becoming noticeably denser from around half way it. This globular would be a regular talking point as is M13 in Hercules if it were rather higher for us in the UK.



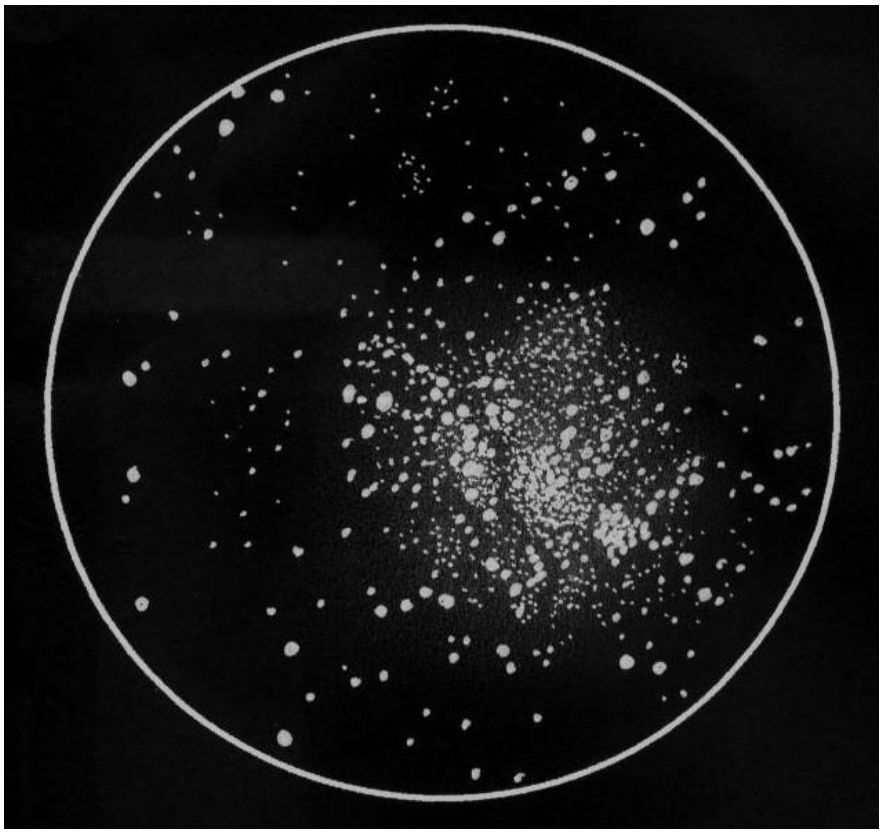
Just 1◦ north of λ Lambada sgr is globular cluster **M28** this is mag 7 and half the size of M22 so is considerably more challenging to locate in the small scope, the difference is reminiscent of that between M13 & M92 in Hercules. M28 is denser than M22 with the brighter core being noticeable. The 80mm scope offers little resolution even at 50x.

Now dropping down to the kettle bottom draw an imaginary line between ζ zeta sgr and ε epsilon sgr running roughly east west. Our next 3 target are just above this line and whilst searching I constantly returned to the line to ensure that I had not drifted too far away in my search.

Starting at espsilon, I nudged the scope a little left and then up scanning the field until I recognised a small non stellar smudge, twisting the eye piece to give a higher mag confirmed that I had located M69 at just mag 7.6 and 6' across is much harder to pick out and provides an exciting visual challenge.

With M69 in the bag we move onto M70 which lies just above our imaginary line at the mid point. It took me a good 10 or more minutes to locate this one, at mag 8 it is fainter than M69 although it is a little larger at 8' As with M70 the little scope shows no resolution just a faint grey, non stellar smudge, the beauty lies in the imagination feed by its difficulty to find and the fact that it is a ball of stars lying 30,000 light years away from Earth.

In my atlas I note that I marked M70 as very faint on my first observation of it from Weymouth all those years ago! The final target is M54 another globular cluster, at mag 7.6 it is the same as M69 and a little larger at 9', however, search as I may the moon had now risen too high, brightening the sky and washing the light from the diminutive cluster beyond my 80mm aperture. I had to give up, and I don't like to be beaten, especially when I know I was right on it but just couldn't make it out! With hindsight, I should have started at the kettle bottom with the faint ones and worked up to the brighter ones in the lid! But either way it was fun, it was challenging and every bit as exciting as observing with my 20" scope.



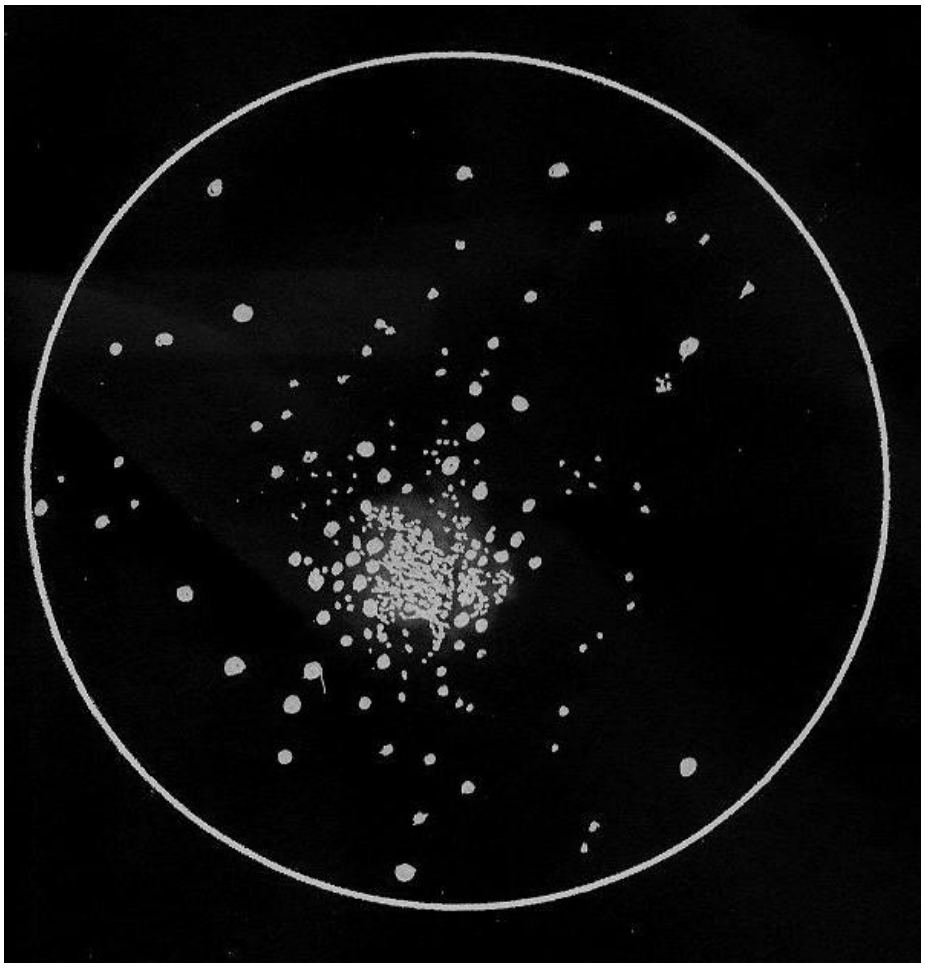
As a foot note back in Weymouth with no moon that night, I had got M54, although I remember shielding myself from the touristy glitz of Weymouth town to my right.

I have included a scan of the small 'tea pot' asterism map from the star atlas I used complete with ticks from August 2000.

Dale

Above:- M22 350mmNewt Watec 120 nvid-cam-DaleHolt

Right:- M28 350mmNewt Watec 120 nvidcam-DaleHolt



WIDE FIELD IMAGING

By
Shaun Reynaulds

As I am sure most of you know, I am a bit fanatical about my imaging, both deep sky and wide field milky way. I have been prompted by the chief (Tom!) to do a series of write ups and tutorials on the subject and I am happy to do so.

The subject of wide field is quite in depth if you want to go right into the 'nitty grttty' so to speak so I have broken it down into a few sections which I will cover over the next few editions of Cygnus and hopefully, by the end of it if you, the reader, are still awake you will have a good reference to go out there in the dark to remote spots for that 'one shot' and be successful.

The first thing I would say is probably quite obvious to the seasoned imagers and observers, which is, the time and the place.

Rushing out on the first clear night dose not mean you are going to get a great shot of the milky way, like all things astronomy, consideration of when the ideal time is right is a vital consideration. As a rough guide, the milky way 'season' is anywhere between early March through to late October. As March arrives, the Milky Way starts rising in the early hours from around 3am till astronomical darkness ends , which gives a narrow time band to capture it.

I quite like this time of year as its very low in the sky right across from South to North which is very good to start with, as it means the landscape can play a part and a few images only need to be Stitched together to capture the whole arch (stitching for panoramic's which I will cover in a future edition).

During mid summer, it is not favourable as there really is no astronomical darkness, so the contrast would be quite low and not great for bringing out that faint milky way. A very nice time of year is from August through to late September as the milky way is much kinder and rises early and is best captured just after astronomical darkness , however, be aware that by this time, it is very high in the sky and would require a considerable amount of images to stitch together to get the whole sky.

So, what's the best way to plan? The good old planetarium of course. Stellarium.org is free to download and can be set to any location and time and run through the night to see precisely where and when it rises. The other consideration is the location, seems obvious of course but with the added consideration of light pollution and sensitive DSLR cameras today, some sites may look good to the naked eye but put a long exposure to it and not only does the sky pop out but so does any light pollution with it unfortunately! So careful planning of a suitable sight is a must. If, for instance, your aim is to get the most Dynamic and spectacular central core 0f the galaxy, Sagittarius, then you really have to plan the location very well, and the time also, as it never rises more than around 5 degrees above the horizon at best. So it is vital to get the best southern sky you can , AWAY as far as possible from those pesky lights!

Also, the sky from this latitude is already looking across extra layers of atmosphere so good transparency and seeing will really help here. Those who know me will tell you I have gone to extremes to do this!! Devon is one such occasion that springs to mind. An 800 mile trip to a new location in the dark hours often by hazardous conditions have to be planned well. A useful App which many people have access to now with smart phones is one I use called TPP, (the photographers ephemeris) this wonderful App allows the user to pinpoint any location and time on the planet and see via a GPS map, the location and angles of the sun set, moon and many other useful things like precise times of twilight, nautical and astronomical darkness hours. Also, the precise angles from any given location for the sun and Moon rise and set. With these things planned, the last consideration is the equipment, Camera, tripod etc .

All this gear can be quite heavy so consideration needs to be considered when trekking out. I'll continue this further in the next addition, but one thing id like to leave you with at this point is this, **DONT** forget your house keys if venturing out in the wee hours as when you get home, the last thing you want to do is have to call your other half to let you in! I know this from bitter experience and I wouldn't recommend it!

Shaun

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CCD Imaging with Nik Szymanek

Nik Szymanek gave a member's talk on CCD Imaging in the clubroom on Friday 4th August 2017 and very good it was.

There is sometimes a tension between imagers and those who observe visually which of course never (usually) spills over into violence. With a mixture of the different interests in the audience I think Nik's talk was a fine example showing that, actually, there is a lot of common ground.

Others are better qualified to describe the many details Nik covered so I can only try and give my take on the talk. The resulting images he produces however are outstanding - I thought frequently comparable to Hubble images.

There seem to be two essential stages to achieving his stunning results.

First is collecting data – this is the emotionless bureaucratic term imagers use for what visual astronomers recognise as the thrill of seeing wonderful objects under a clear sky.

Nik uses top quality equipment in his observatory at home in Essex but also "collects data" on his travels, and uses remotely controlled observatories around the world. He mentioned combined exposure times of twenty hours or more, and a questioner asked how he could get back to ***exactly*** the same place and orientation each night. Nik's answer was comprehensive but technical – a glimpse into the depths and subtleties of software and techniques for serious imaging.

Secondly processing – this seems to me to be where the "artistic interpretation" lies. Nik described two stages, processing the raw data with Maxim software and then onto Photoshop to produce the finished picture. This was a particularly fascinating aspect of the talk when Nik demonstrated several techniques and showed "before and after" images each resulting in more and different detail. The speed and fluency with which his cursor flew around the screen and applied the multitude of options in Photoshop was testimony to his countless hours spent at the computer.

This I think leads to the key question about astronomical imaging – how do you feel about computing? Once you have bought the hardware and software there is the serious investment of time learning the software and processing the data, and the judgement to achieve the results you want. I suspect the skill and knowledge can only come from time at the screen.

Nik Szymanek speaking to NAS Members

But is it astronomy? In the hands of someone like Nik Szymanek my answer is "yes". Processes, for instance, that darkened the bright central bulge in a galaxy to better show the outer spiral structure were fascinating in their own right and clearly belong in astronomy however you pursue it.

So thank you to Nik for coming to Seething and inspiring us all by showing that imaging can be and should be an essential aspect of our hobby.

Steve Hubbard

August 2017

Star Tracker Mount

This article is going to just be a short introduction to another article I'm going to write for the next edition of Cygnus.

On Friday night (26th May), I brought along my latest toy, a star tracker mount, built for me by Phil Cowley. If you search for DIY star trackers, you will usually find information on barn door mounts and how to build them. They will vary in sophistication, allowing either manual or electronic movement to track the stars. However, it is generally accepted that the barn door is not totally accurate without a fair bit of work to create a curved drive rod, or sophisticated drive electronics to compensate for the inaccuracy of the principle of that design. The mount I have is a sector drive, and instead of the progressively opening barn door, actually takes a sector out of a circle, making part of a giant worm wheel, and drving that to track the stars for a couple of hours or so, depending on how big a sector you make.

The mount received quite a bit of interest on the night and following discussions with Paul Woolley and Tom Latham, I have agreed to write up and provide plans for the mount in the next edition of Cygnus. Sorry, but I don't have time to produce the information for this edition.

Like a traditional barn door mount the sector drive mount can be made to varying levels of sophistication starting with a simple drive motor and gearbox with a basic speed controller up to a computer controlled stepper motor drive with different speeds for stars, planets, Moon and the Sun, depending on what you want to image. At present my version is the simplest version with an electric motor and gearbox, powered by 4 D cells and a Maplin speed controller.

will finish now and leave you with a couple of images of the mount and a couple more of Cygnus taken with my Canon 60D and the standard lens, on Friday night. The image of Cygnus is made up of 15 x 120 second frames, taken at 18mm and stacked in Nebulosity. There is no other processing, with no darks, flats or bias frames. The second image is cropped to just cover Cygnus, to better show the nice round stars achieved.

Dave Cook

Cygnus Image before cropped

Cygnus Image Cropped

Geof Lewis

IMAGING THE PLANETS
Challenges, tips and tricks (Part 1)

With arguably the most interesting telescopic planets Jupiter, Saturn and Mars, currently at unfavourable altitudes for viewing or imaging from the UK, you'd be forgiven for wondering what the point of this article is right now. That said, perhaps there is some justification in that when the planets are at such low altitudes one has to work a bit harder and smarter to get passable images and anyway Tom asked me, so how could I refuse….?

There is a lot to cover in this topic, so Tom suggested that I break it into several parts, so with the 2018 Jupiter, Saturn and Mars apparitions in mind I thought 3 parts - autumn 2017, winter 2018 and spring 2018, should work.

I've been dabbling with astrophotography for about 6 years since I retired, but planetary imaging is something that I got into about 3 years ago. I soon discovered that it is a whole different ball game to capturing DSO's….!!

Unlike stars which are point sources of light, the planets show clearly defined discs when viewed through a telescope and under modest magnification will reveal phases and surface features, BUT you need near perfect conditions to photograph them well. Perfect conditions comprise both things that we can control like the telescope optics, camera, software that we use, etc. and things that we can't like the weather, seeing conditions, target altitude, etc., so I thought I'd share a few of my recent images together with some of the lessons that I've learnt along the way.

So what are the challenges and what can we do to mitigate them?

Part 1 will start with some things over which we do have some control.

Part 2 will consider the impact of seeing and atmospheric dispersion and ways to mitigate them.

Part 3 will look at software to mitigate planetary rotation to produce final high resolution images.

Telescope collimation

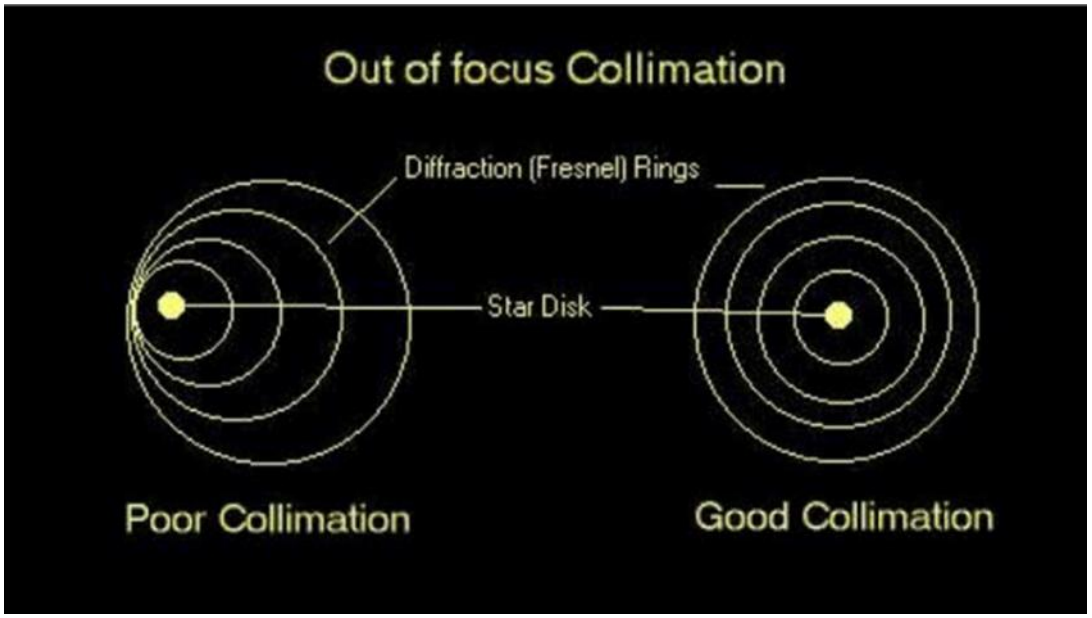
I heard it many times and initially I largely ignored it, but the most important thing to do, especially if using a reflecting telescope such as a Newtonian or Schmidt-Cassegrain (SCT), is to ensure that the scope is very well collimated. This may seem like wasted observing time in what can be very short windows of clear sky, but in my experience it is worth taking the time. It is arguably less important when imaging deep sky objects (DSOs), but absolutely critical when imaging planets, something that I've learned from personal experience (see Saturn images below).

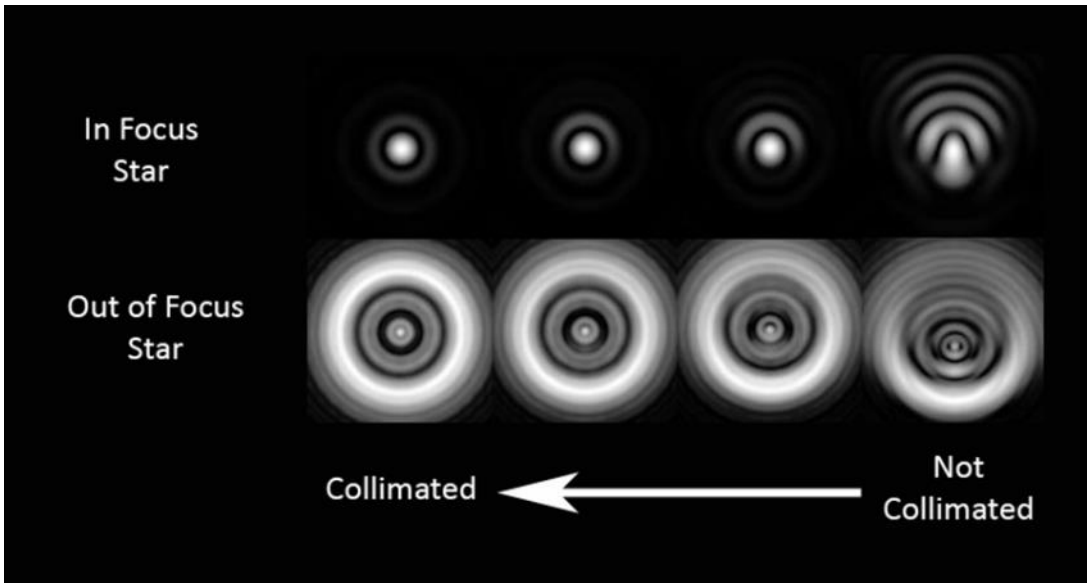
The above images are from a few years ago when Saturn's ring system was less open than as seen today. They were taken through my former 10" Meade LX200 SCT using an Imaging Source DBK21AU04.AS colour video camera. The image on the left is prior to me checking collimation, with the image on the right taken about 30 minutes later after I'd checked and corrected collimation – NB the scope was not wildly out of collimation when I checked it, however, I think that the post collimation image speaks volumes…!!

I'm not going to describe how to collimate a telescope in detail as that is a topic in its own right; however, it is relatively easy to check by viewing a bright star at high magnification during periods of good seeing.

When in sharp focus you want to see a bright central star surrounded by its airy disc with maybe one or two diffraction rings. Then checking either side of focus, i.e. defocused, you'll see the spread out diffraction rings with a central hole, in appearance somewhat like a ring doughnut. If the rings are not concentric, but bunched to one side then your scope is not well collimated and high definition planetary images will not be possible until the scope's collimation is corrected.

The below diagrams show what poor and good collimation looks like.





The method of collimating your telescope will depend on your type of scope, so you will need to refer to its manual, check for on line tutorials, or maybe ask an experienced NAS member to help you establish the correct procedure.

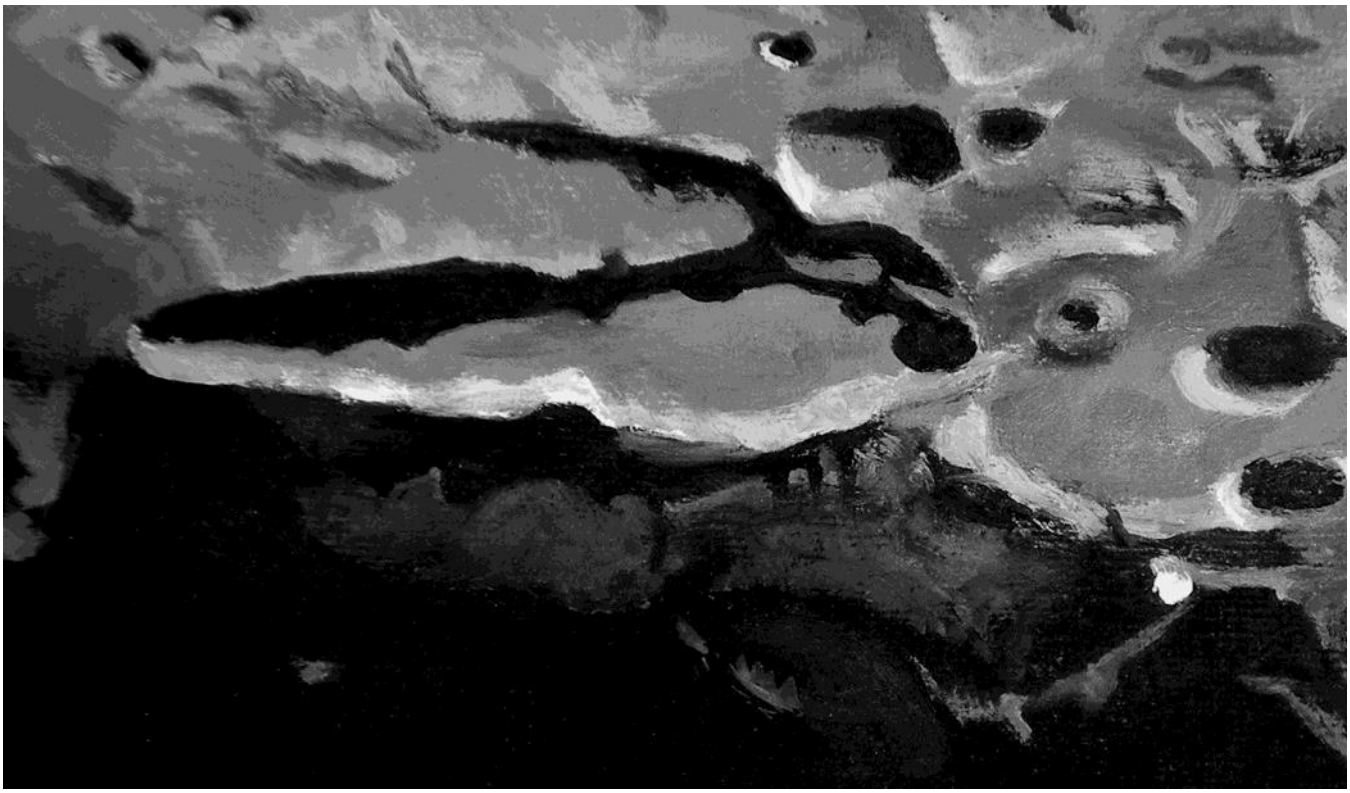
<u>Thermal currents in the telescope</u>

In Part 2, I will explain how turbulent air in the atmosphere may ruin your chances of capturing high definition planetary images, but first we should be aware that the same can happen due to thermal currents in your telescope's optical tube (OTA). If you take your scope straight from a warm environment into the cooler night air then the changes in temperature between the air inside and outside the OTA will cause thermal currents inside the OTA until thermal equilibrium has been reached. It is therefore essential to give your telescope time to cool to the same temperature as the air outside. For a large telescope like my C14 that may take several hours. Do not take a telescope straight from a centrally heated 20C+ room in your house to outside on a sub zero winter night and expect to get good results. If your scope is in an observatory then the summer day time temperatures inside can easily reach 35C+, so time needs to be given for both the air and telescope to cool before using it. This time of year I'll open my observatory roof well in advance of when I need to use the scope and shade the scope from direct sunlight as appropriate.

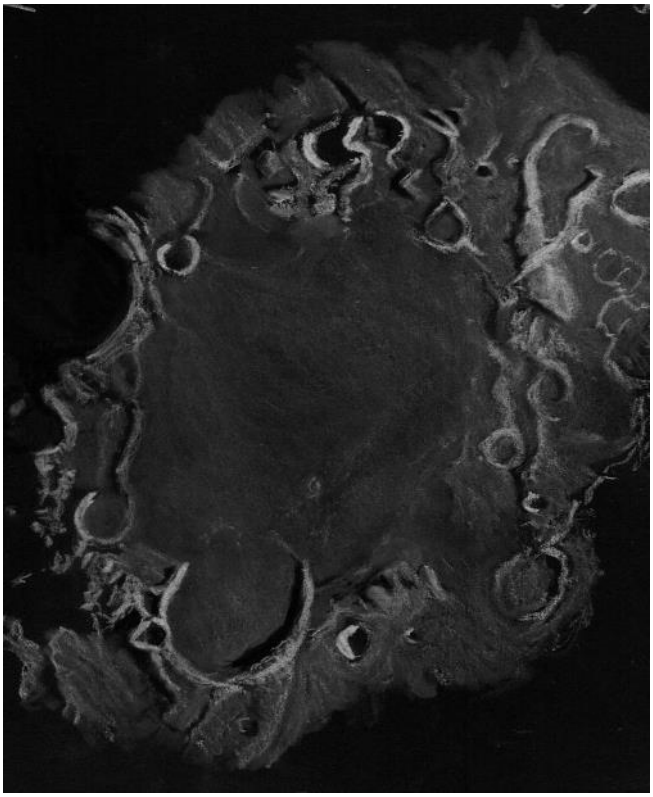
In the next issue we'll consider some things that you can't change, but about which you should be aware together with some ways to mitigate them.

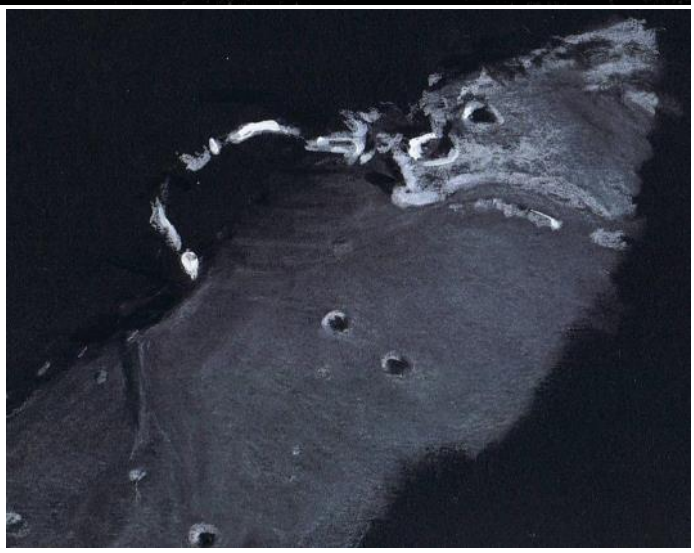
Geof

SKETCHPAD



The elongated crater Schiller.





Above. Sinus Iridum

Left. Mare Nectaris - drawn from laptop

Sketches. Graham Sparrow

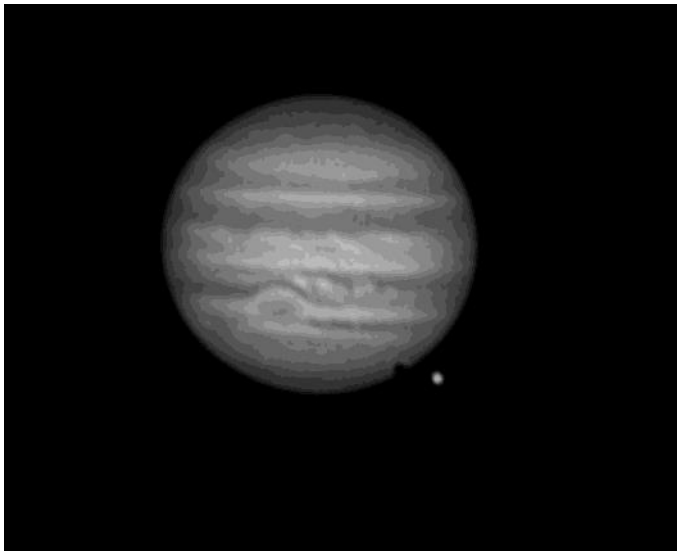
MEMBERS'IMAGES

Left: a Perseid caught by Shaun Reynolds (well done!)

Below: Jupiter with Transition of Ganymede by Mark Turner

Below Left: a Shot of the Moon with Copernicus in full view by Frank Dutton

Bottom: another Lunar shot from Frank Dutton



Above: A closeup of Copernicus by Frank Dutton
Below: By Jason Durrant

"This is a still from a time lapse video I made on the 12th May this year. The time lapse video tracks the setting sun as it goes down between the domes. The equipment used was a Canon EOS600D, Opteka 6.5mm Fisheye lens and a Skywatcher Allview Mount.
The video can be viewed on Youtube."

https://www.youtube.com/watch?v=mbj2K3fTNpI

A Spot Of Solar Observation

Andrew Gardiner

Solar Viewing – part 2. White Light Observation

Having outlined the various approaches to solar observation, I'll now begin to dig deeper into the specifics of each technique, beginning with broadband or "white light" observing.

White light is simply the entire spectrum of colours (red to blue and beyond). The intensity of sunlight is too high for direct viewing of any sort and, by its very nature, the broadband viewing of sunlight includes damaging infrared and ultraviolet wavelengths. That does not mean sunlight is "dangerous" per se – we walk in it every day with little physical impact. However we must keep the dosage per unit area low as infrared manifests itself as heat which can burn, whilst ultraviolet will invisibly and permanently damage proteins and DNA in human cells.

To avoid injury, and to view the sun unaided, we simply need to reduce the dosage to a low level with a suitable broadband filter, reducing the intensity by over 99.99% (equivalent to a "neutral density grade 5" or ND5 filter). Shade 13/14 welding glass is often quoted for such viewing however for complete safety "eclipse glasses" certified to ISO standard 12312-2 should be used. There are several brands filling this requirement including Baader Planetarium and Thousand Oaks. There has recently been a scare about "dangerous Baader products", this was only a scare and if the product is purchased from a reputable supplier, with the correct CE mark and the ISO standard quoted, there should not be an issue. Be aware that the use of these glasses is somewhat limited as the image will be small. They are excellent for eclipses when the shape of the sun is observed or when there are particularly large sunspots on the surface but they are rare events.

The second option is *aided* observation using a telescope or binoculars.

Never use these optics to view the Sun without precautions.

There are various options which I shall describe. For all of them, please remember to remove the finder scope before use – a push-on lens cap is *not* good enough.

The cheapest option is to use 'solar film' which is produced in a variety of ways and can be purchased loose in sheet form or pre-made into full filter assemblies. There are a couple of black mylar based materials available but Baader Solar Film ND5 is arguably the best producing a high resolution, natural colour image. Using basic Blue Peter techniques, Baader Solar Film for instance can be made into safe filter units by following Baader's instructions or others on the internet. These filters should be *securely* fixed to the optical tube. A simple sliding fit or an elastic band is *not* suitable. Filters should have mechanical fixings – tape, bolts or Velcro may all be suitable. If the filter assembly is easy to remove, make it more difficult to ensure the safety of your sight! For larger telescopes the stop-down aperture of the cover plate or a purpose-made reduced aperture filter is adequate and is much easier and cheaper to make – but remember to secure the entire assembly to the tube. However it is produced, the filter must not be damaged – check the filter by looking through it with a bright torch behind before use. Treat the filters with care - the larger the filter the more likely there is to be pinhole damage. Glass filters or glass encapsulated films can be used and they are less prone to physical damage however the optical quality of such filters is often not as good due to the introduction of reflective and/or refractive surfaces.

With a film filter, the light entering the entire optical train is reduced to a safe level as it is an ND5 grade filter. This means that any design of optical device can be used without fear of damage. In addition the infrared levels are reduced before entry to the optical tube therefore the air inside the tube is not subject to heating induced tube currents which can affect viewing quality,

The next options allow all the light into the telescope. This has the obvious danger of heating elements within the telescope with infrared. No standard mirror-based telescope should be used for this type of work as it is possible to severely damage the secondary mirror. There is risk of damage to refractors but only under certain conditions - if they have (usually very expensive) oil-spaced objectives it is possible to overheat the oil and cause irreparable damage. Also, if the telescope is of a Petzval type – with optical elements close to the focus of the tube - then there is a risk of heat damage to those elements. With that in mind, any non-plastic refractor of a reasonable standard will work.

Whether or not the eyepiece is mounted, it should be made as difficult as possible to accidentally look through the tube as the light is being focused to a sharp, very hot and potentially dangerous point at the end of the tube. **We must make this system safe.** The first method is to project the image through an eyepiece onto a piece of white card. This can give excellent results, good, sharp views of sunspots with magnification dependent on the eyepiece and the distance between it and the card.

The eyepiece used must be of metal and glass construction and you should try to avoid using a diagonal as the heat may damage the mirror in it. I would not risk an expensive eyepiece for projection and I would recommend allowing it to cool every few minutes.

To increase safety further it is possible to use a device known as a Herschel Wedge. This is a specialised prism diagonal which is heat tolerant and reflects under 5% of the incoming light to the eyepiece. The rest is rejected through an alternative optical path which in some designs may produce a 'hot spot' in the air that should be avoided. However, as mentioned above, 5% is still too high and needs to be reduced further – this is done with an ND3 filter installed between the wedge and the eyepiece. In the Baader and Lunt wedges this is permanently fitted, in some other designs it is not, so more care must be taken with those devices as *the filter must always be present* before viewing. At the exit of the diagonal the image is now safe and the entire light cone is enclosed which keeps everything safe. The Hershel Wedge design works well with great contrast and resolution on telescopes of up to 120mm. Both Baader and Lunt will operate on larger scope apertures but the units can run very hot. It is possible to use filters at the eyepiece after the wedge/ND3 filter assembly – a weak neutral density filter can reduce brightness further if desired and a Wratten light green filter or the Baader Solar Continuum filter will increase contrast. A neat trick is that the image presented by the wedge is polarised so putting a polarising filter on the eyepiece allows the observer to change the image brightness by simply rotating the eyepiece in its holder. A new design of wedge by Lacerta uses a slightly different prism angle (the Brewster Angle) which should optimise the polarisation of the reflected image and maximise the effect of the polarising filter. Initial results seem good and it is cheaper than the Baader unit.

How do you find the Sun? That sounds stupid but certainly is not - most telescopes have quite a narrow field of view and the Sun is surprisingly small in the sky. With no other facility, or when using a projection method, your only real option is to set the telescope up then adjust its position until the shadow is as small as possible on the ground – it should then be pointed near the Sun. Glare from the sides of the tube will sometimes give a clue of where to tweak the position. It is possible to fully filter the finder scope with Solar Film and use that but *you must remember the filter* which introduces a safety issue. The third way is to use a Solar finder – homemade or purchased – which basically consists of two vertical plates - a pinhole in one projects an image onto the other a few centimetres away. The "Dingle Scope" was a variant of this quickly made by our member Barry Dingle – I'm sure he would be more than happy to demonstrate it if asked. If using a Baader Herschel Wedge the 'waste' output illuminates a ceramic screen which can be used as a finder.

Another tip - wear a wide-brimmed hat or, better, use a dark cloth to cover the eyepiece and your head as a blackout. Contrast and views in general will be greatly improved

Lastly, what can you see? Well, to be honest at the moment not much. However when active, the primary white light feature visible will be sunspots. These are cooler areas of the solar surface related to convection currents and magnetic fields. With a moderately sized aperture and a Hershel Wedge granulation cells which look like texture on the surface are also visible. With very large scopes and a Hershel Wedge (requiring an additional infrared and ultraviolet block filter called an ERF) the spots and cells can even be seen to have activity. At the end of the series I'll describe the actual structure of these features in more depth and show direct comparison between viewing methods.

Andy

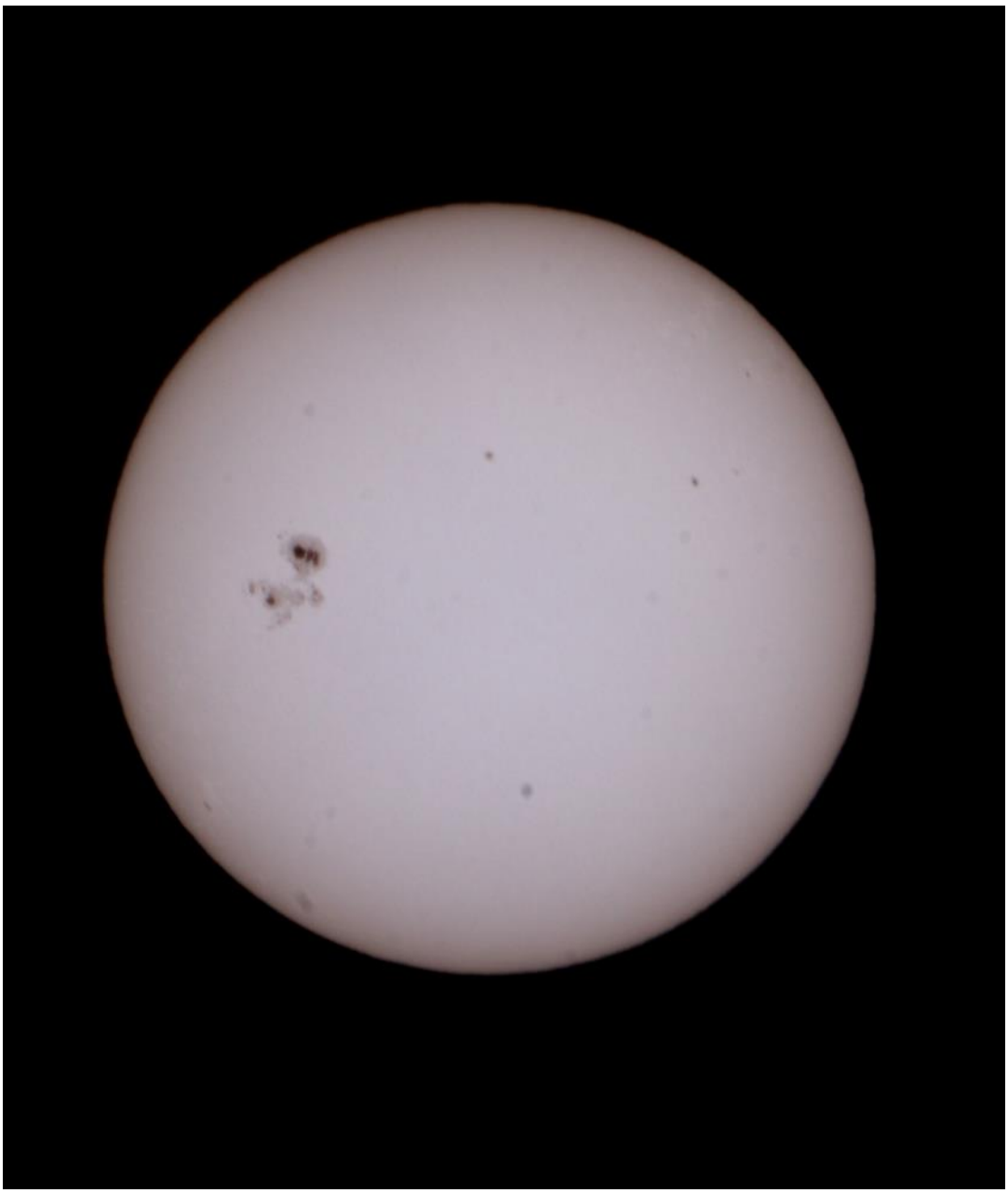


Image of sun spots taken with a "white light" solar filter

Barrie Allsop

Astronomical Spectroscopy

It has been estimated that over 80% of what we know about the universe comes from spectroscopy. The light from astronomical sources contains a lot of information. For the last century or so this has been the province of professional astronomers using big telescopes and sophisticated equipment. However in recent times a number of amateurs, mainly in France, Germany and Switzerland have made big steps in this area and have developed amateur equipment and written software to display and analyse spectra. Indeed there is even an annual Pro/Am Summer School at the Observatoire de Haute-Provence in France.

With my background in chemistry and chemical analysis, I found this particularly interesting since spectroscopy is used as a routine analytical tool in chemistry. With this in mind I launched out and bought a "Star Analyser" – a simple diffraction grating mounted in a filter cell, which converts a star image into a spectrum, and I also bought a webcam to capture the spectral images.

In order to obtain a sharp spectrum, a point source is needed. Of course, with good optics a telescope produces a star image very close to this, particularly at low focal ratios, down to say, F4. The spectrum covering the whole of the visible range of wavelengths of light.

Even with a simple diffraction grating and a webcam attached to your telescope you can obtain low resolution spectra which will allow you to:

Classify a star on the O B A F G K M scale

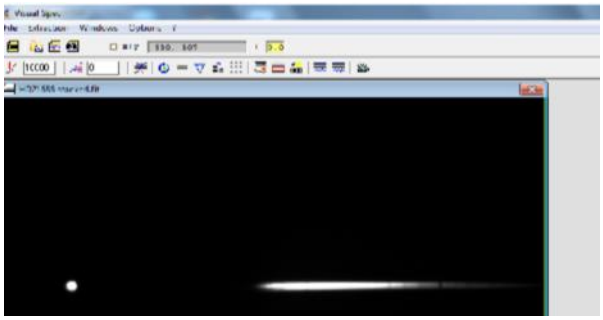
Estimate the temperature of a star

Identify some of the chemical elements present in the star

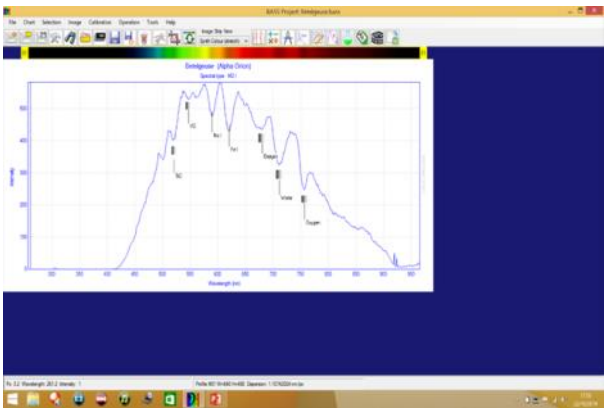
More specialist (and of course more expensive!) amateur equipment such as those manufactured by the French company Shelyak give a higher resolution spectrum and even more information about astronomical objects can be gathered ranging from the estimation of red shifts through to measuring the radial velocities (spin speeds) of objects - and all from your back garden!

In the case of the Shelyak instruments a narrower range of wavelengths is imaged and a series of these can be "stitched together" if required to form the complete visible spectrum.

The increased resolution of these instruments is achieved by using adjustable narrow slit to get even closer to the ideal point source. Because of the slit these instruments can also be used to investigate extended sources such as nebulae, and comets etc.



Star and its spectrum obtained with a diffraction grating



After processing
(in this case the spectrum of Betelgeuse)

Using either a "slitless" spectrograph such as a diffraction grating or one with a slit such as those produced by Shelyak, there are four main steps used to gather this information:

- Capture the spectrum of the star with your camera and save to your computer.
- Use software to stack your images to improve the Signal/Noise ratio as in normal astrophotography.
- Use spectral analysis software to calibrate, process and display the spectrum. There are a number of free software programs available for this which have been developed by amateurs for this purpose, such as Visual Spec and Bass Project, and ones you can buy such as RSpec.
- Use the tools within the software to obtain information about the target object.

Note the troughs in the spectrum where light has been absorbed at particular characteristic wavelengths. These can be attributed to particular elements and compounds present in the star which can be identified. The shape of the profile can also be used to estimate the temperature of the star.

The "Star Analyser" is a good way to get into astronomical spectroscopy for a modest cost (about £100) and to become familiar with the techniques involved in capturing star spectra and processing them. I've certainly had a lot of fun with it!

Barrie

Chris Grimmer

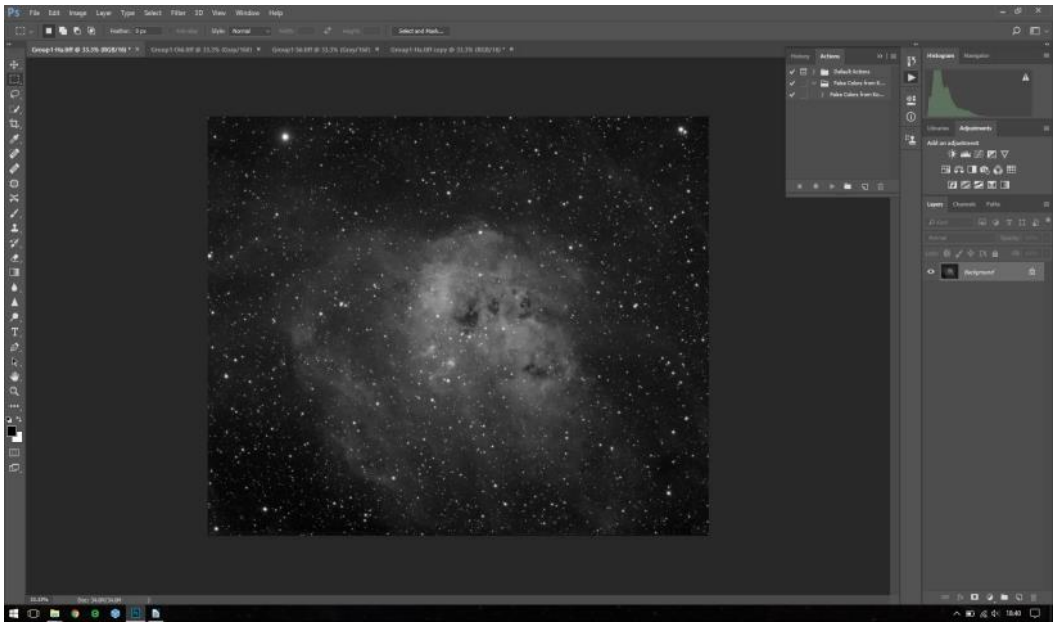
Astrophotography Image Processing

Following on from the popularity of the excellent talk from Nik Szymanek, I thought that a little more "in depth" regular Astrophotography processing guide would prove helpful. In every Cygnus, I will look to cover a different aspect of the processing techniques, mostly via Photoshop, however some of the free versions will offer similar features.

I have personally been into Astrophotography since about 2014, starting out with a DSLR and then rapidly, and quite painfully, moving to a mono CCD, filter wheels, guiders and lots of frustrating nights. Being that I am a bit of an IT Geek, I love processing images and have spent many a night reworking old data. Thankfully the practice paid off and I got short-listed in the Astrophotographer of the year awards 2016 and a double short-listing in the UK Astrophoghrapher of the year that same year.

For the first attempt at this I am going to cover how to combine individual colour channels, using layers and the Hubble Palette colour correction.

Ok so you've spent the long nights outside in the cold and damp, you have your data which you have stacked and calibrated (darks, bias and Flats etc..) so its time to hit Photoshop.



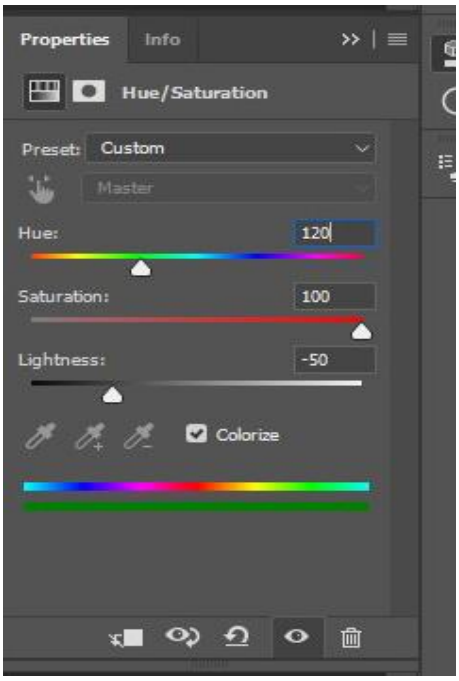
Load your 3 mono images into Photoshop and if you are using Ha, Oiii & Sii duplicate the Ha Layer as this will come in handy shortly. Starting with you original Ha image, goto – image – Mode – set to RGB. So hopefully your screen appear like this.

The Ha image becomes your first layer, so first off we need to set this to become green (as this will be a Hubble Palette image).

First off, select the hue & Saturation from your adjustment box.

Under the 3 sliders is a box called Colourise, tick this and then set the sliders to

Hue – 120 (for green)
Saturation – 100
Lightness to - -50



now you will see 2 layers in the right hand layer box, the original Ha image and the Hue/Saturation layer. In order for this process to work you need to link these 2 layers.

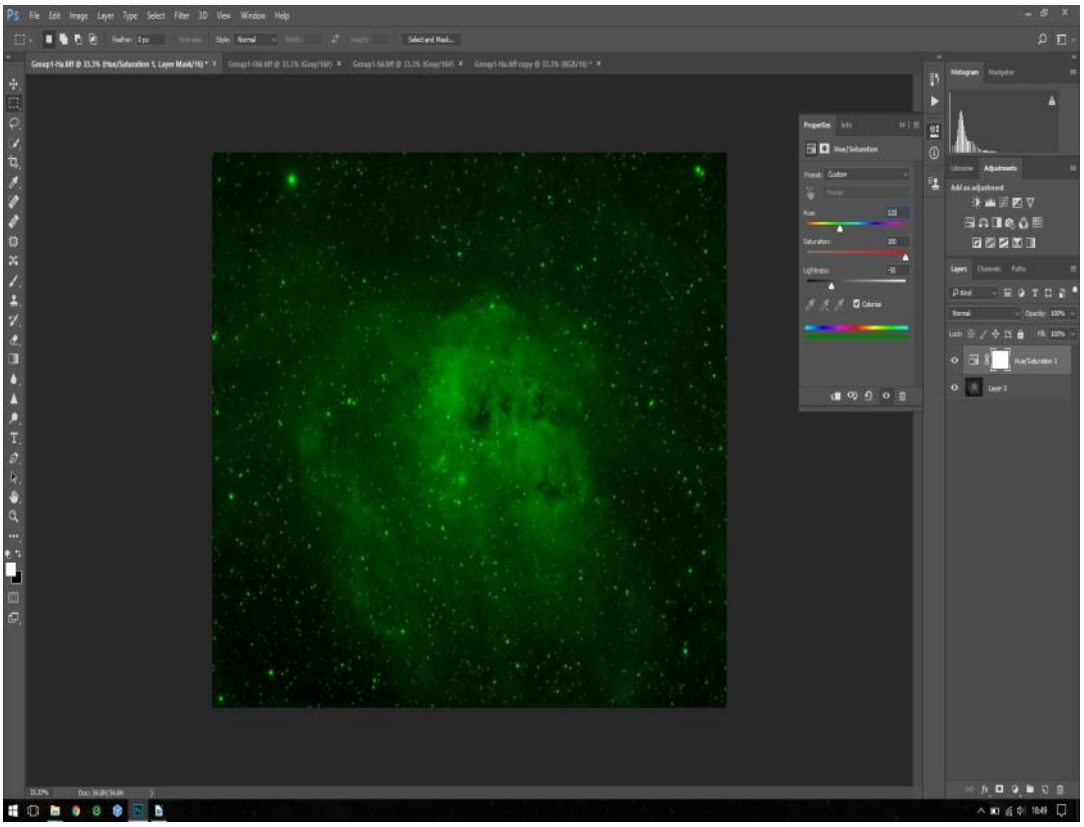
If you press and hold Alt on your keyboard and then put the cursor between the two layers you will see a little arrow appear, once you do left click and the arrow appears linking the 2 layers and that is Green sorted.

Now go to the Oiii image, hit ctrl + A to select all the image and then ctrl + C to copy it. Back to the Ha image and press ctrl + V to paste it in. You will see your bright green image turn grey again.

Select the layer you have just pasted in, this should be the top layer and then above where it says 'Normal' drop this down and Select 'Screen' and you image should turn a pastel green (you have just made the layer translucent).

Then do the same with the Sii which will be red so Hue – 0 Saturation – 100 Lightness to - -50

Now the image you see will appear a strong green, and layers should look like this. However to keep things tidy I now add a folder and drop all of these into a folder and label it colour channels.



Now this is where that extra Ha image comes in. As most of the detail in a Nebula is in the Ha and also as this tends to be the strongest and cleanest channel I add this back in as a Luminace layer. Simply copy and paste in as a new layer, select where it says 'Normal' and set this to 'Luminosity'. Now stick that in another folder called Lum.

So we have our base image, but as you can see its very Green and not the lovely Golds and Blue's that you associate with Hubble Palette images. Photoshop has an awesome feature called 'Selective Colour'

There's a few different adjustments to be done here so first up

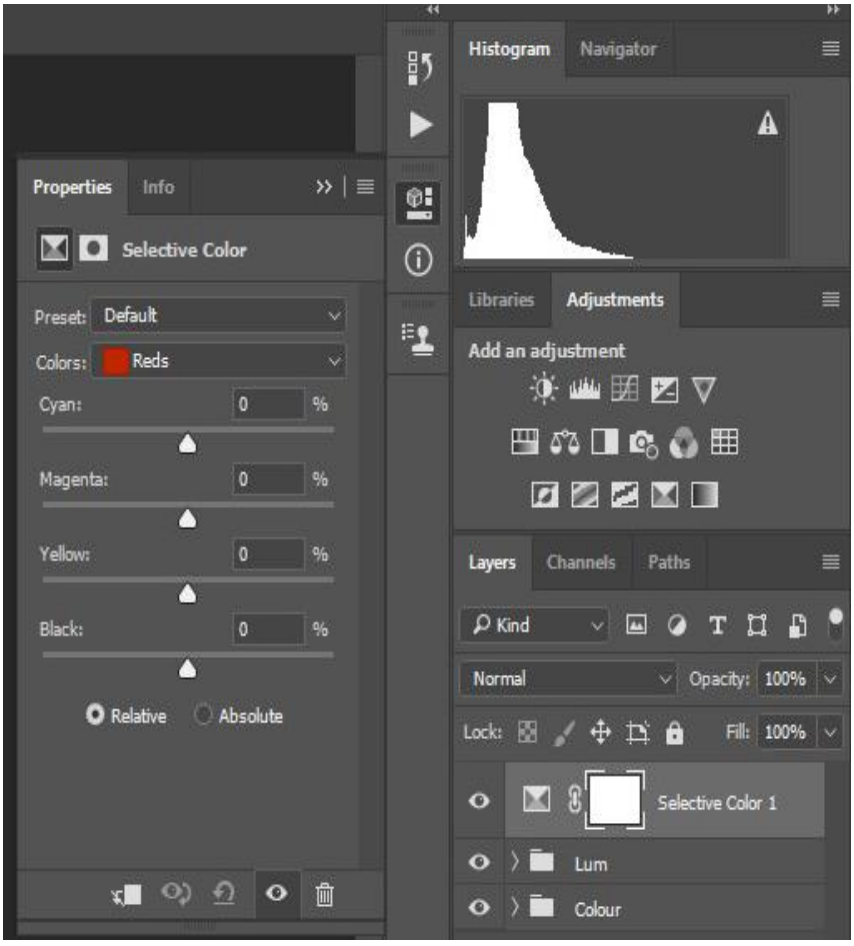
Select Green and set the sliders to
cyan -100%
Magenta -25%

Select Yellow
Cyan -100%
Magenta +25%

Select Cyans
Yellow -100%

Then close that adjustment layer and open a new one, select Cyans and set to Magenta -25% and Yellow to -100%.

I would then stick these 2 layers into a folder too, just to keep things tidy. If you want to create an image to work from, press and hold shift, ctrl, alt & then press N & then E



As I have probably just completely fried your brain I will leave it there for this time but as you can see you now have the base image that you can play around with.

Next time out I will cover Noise reduction, sharpening and layer masks.

Chris

The Heart Nebula

By Chris

A Working Party at Seething

On the day of our June working party,
There were tasks of quite a variety,
Conducted in a manner most hearty,
In the tradition of our Astronomical Society.

First there was a mystery to unravel,
How to move a great heap of gravel,
This puzzle did not long us baffle,
In ways to make the pile of stones travel.

With the use of many a shovel,
Did the work on filling the wheelbarrow shuttle,
Not really for us, a significant battle,
Of stones tipped from the barrow did rattle,

Then from work one did flee,
And with great shouts of glee,
All the team could then only see,
Was a great big pot of tea.

Now a bit of a wrench,
To get up from the bench,
For we now had to dig a trench,
But nobody took an offence.

Time to stop for lunch,
Through a mixture of cod and chips did munch,
Looking around one had a hunch,
Our group is certainly an assorted bunch.

Back to work with revived hype,
As we started to lay lots of pipe,
Making it fit, gave us a bit of gripe,
Hope that this pipe is of the correct type.

Later on there was a sudden scream,
On every bodies face there was a great big beam,
For they had all seen,
A delightful quota of ice cream.

Progress through the day did smoothly run,
An extra day out in the sun,
And a lot of constructive work done,
It really was quite good fun.

Alan Morris

Some pics from the work party in August
"Boys (and Girl) toys"

Two pics from the work party in August, begging for a caption!
Email suggestions to me at tcl1963@hotmail.com

NAS at the Forum Promoting
Astronomy Day
At the Launch of
The Norwich Science Festival

FORTHCOMING EVENTS

September

8th **Members Talk'**

Galaxy Formation in the early universe with the Atacama Large Millimeter Array Telescope. Professor Roberto Maiolino

15th/16th **Open weekend**

Saturn - The Jewel of the Solar System. Mark Thompson

October

6th **Members Talk**

The Beauty and Science of Nebulae. Professor Carolin Crawford

27th.28th **Open Weekend**

Near Earth Objects. Protecting our civilisation from the next major impact.
Chris Greenfield

November

3rd **Members Talk**

Observing Galaxies, with "Astronomy Now" Owen Brazell

24th/25th **Open Weekend**

THE DEADLINE FOR COPY FOR THE NEXT ISSUE OF CYGNUS IS
10th November 2017

This is the very latest date by which articles should reach the editor.
Sooner than that would be much appreciated .

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NEW MEMBERS

Terence Britnell and Family
Elaine Colk and Family
Joanne Edwards and Family
Peter and Jasmin Gunard
And finally, welcome back Mark Shepherd

IAS
(International Astronomy Show)
Oct Fri 13th - Sat 14th
ukastroshow.com

There is a discount on tickets for a group of 10 or more for Astronomy societies. They all have to attend on the same day, either 13th or 14th. These are for the day entrance only as lectures will be a separate fee and with no discount. The tickets go live on the 16th June and will be accessible on the website. There will be a tab for group visits.

If you wish to know more about the International Astronomy Show, pleas go to the website: ukastrowshow.com