WAS NEWS

Monthly Newsletter of the **W**orthing **A**stronomical **S**ociety

Official website: www.was.org.uk
Affiliated websites: www.observatory99.freeserve.co.uk

Number 145 **September 2001**

ALMANAC

All times U.T. for B.S.T. add one hour.

Sept / Oct.

LUNAR

Sept	Date	Time	rise	set
Full Moon	2nd	21.43	19.08	04.16
Last Quarter	10th	19.00	21.53	13.35
New moon	17th	10.27	05.11	18.43
First Quarter	24th	09.31	14.20	22.01
October				
Full Moon	2nd	13.49	18.04	05.30
Last Quarter	10th	04.20	22.32	14.37
New moon	16th	19.23	05.32	17.25
First Quarter	24th	02.58	14.30	22.45

EARTH

September	Sunrise	Sunset
2nd	05.14	18.44
10th	05.27	18.26
17th	05.38	18.10
24th	05.50	17.54
October		
2nd	0603	17.36
10th	06.16	17.18
17th	06.28	17.03
24th	06.40	16.49

PLANETS

(as at September 24th.)

	Constellation	Rises	Sets	Mag.
Mercury	Virgo	08.28	18.18	+0.3
Unfavourable				
Venus	Leo	03.14	17.12	-3.9
Brilliant morning object in East				
Mars	Sagittarius	14.50	22.03	-0.5
Visible in the Southwest				
Jupiter	Gemini	22.37	14.53	-2.2
Visible low East				
Saturn	Taurus	20.47	12.39	0.0
Morning object in the east				
Uranus	Capricornus	16.37	02.13	+5.7
Favourable				
Neptune	Capricornus	15.55	00.50	+7.9
Favourable				
Pluto	Ophiuchus	11.37	21.39	+13.9
Unfavourable				

PHENOMENA

Day	Hour	September
12th	13	Jupiter 0.5° S. of moon
15th	09	Venus 3° S of moon
18th	23	Mercury at greatest elongation E. 27°
19th	08	Mercury 7° S. of moon
25th	00	Mars 2° S. of moon
27th	00	Saturn at stationary point

October		
1st	19	Mercury at stationary point
7th	19	Saturn 0.5° S. of moon
10th	01	Jupiter 1° S. of moon
14th	02	Mercury in inferior conjunction
15th	05	Venus 4° S. of moon
16th	11	Mercury 6° S. of moon
18th	02	Neptune at stationary point
23rd	00	Mercury at stationary point

Minima of Algol

September 12th 03.54 15th 00.42 17th 21.30
October 5th 02.24 7th 23.12 10th 20.00 25th 04.00

Lunar Occultations

Times as at W.A.S. Observatory

Date	U.T.	Z.C.No	Mag	Phase
Sept	**h m s**			
12th	00.06.05	976	2.9	diss
12th	00.27.07	976	2.9	reapp
* 12th	13.14.00	Jupiter	-2.2	diss
* 12th	13.39.00	Jupiter	-2.2	reapp
13th	04.10.41.	1144	6.6	reapp
15th	04.32.07	1421	8.0	reapp
25th	21.10.58	2835	7.3	diss
25th	21.13.06	2834	5.0	diss
27th	22.16.53	3092	6.3	diss
28th	21.21.53	3214	6.8	diss
30th	21.46.16	3458	6.2	diss
Oct				
4th	21.38.01	368	6.2	reapp
5th	21.17.06	475	7.5	reapp
6th	02.01.26	494	8.2	reapp
7th	03.57.18	639	6.1	reapp
8th	05.53.59	792	5.0	reapp
9th	02.24.20	931	6.9	reapp
9th	03.01.38	942	6.5	reapp
10th	04.22.18	1100	8.2	reapp
10th	23.31.13	1215	6.8	reapp
11th	03.17.55	1240	8.8	reapp
14th	04.51.11	1622	8.2	reapp
21st	17.21.58	2610	6.9	diss
22nd	18.22.22	2771	5.6	diss
23rd	17.12.46	2907	6.2	diss

This is only about 15% of the predictions for the W.A.S. observatory.

* = Approximate time only

Z.C. No. 976 = mu Geminorum

Planetary Report

Mercury. Is at greatest eastern elongation on the 18th but due to the angle of its orbit is not favourably placed.

Venus. Morning object in the east passing 0.5° N. of Regulus at 23.00 on the 20th.

Mars. Evening object in the southwest moving quickly through Sagittarius.

Jupiter. Morning object in the east, did you see it's occultation on the 12th

Saturn. Morning object stopping its Easterly motion on the 27th and turning retrograde. The moon almost occults Saturn on October 7th 17h U.T. in preparation for November and December's occultation's.

Uranus & Neptune. Are both suitably placed for observation

Editors Note

Welcome back one and all!!!!
Trusting you all had a great Summer, and knowing what keen Astronomers you all are I'm convinced that you'll all now looking forward to the days drawing in, 18 hours of darkness and those frosty (but clear nights). All together now…..Hooray for Winter!!
Rob

Notices

From the Chairman…….

Brian Halls

I hope that everyone enjoyed their summer holidays and the return of fine weather – along with it, the chance to look at some clear skies.

Photograph Courtesy of Paul Carter

The new Society programme for the autumn and winter is now done and appears elsewhere in this newsletter – I hope there is something there for everyone. If you have any suggestions regarding speakers please let me know, as I would like to hear from you.

Committee

Next month (October) sees the start of the new Society year, with the Annual General Meeting. At this meeting the finances for the last year are declared and the voting of officers for the committee takes place. This may all sound sort of boring, however the Society is made very much of its members.

Over much of the last year, the Society has operated without a Secretary and this job has been shared by several of us on the committee. The Society constitution declares that no two posts on the Committee can be done by the same person, so therefore the Society needs a Secretary!

The **Secretary** is responsible for organising speakers for meetings, and organising the agenda of committee meetings, plus keeping minutes of committee and society meetings. Now, that may all sound a little *too* much to do however, the Committee has talked about how to spread some of this workload.

At the moment there is another post of **Assistant Secretary** and some of this work load could be shared between the two officers – in fact one suggestion toyed at a Committee meeting was that posts could be renamed or added – **Meeting Secretary** and **Business Secretary**. The former would arrange speakers for the Society meetings, while the latter would deal with correspondence and share the day to day running of the Society with the **Chairman**. A **Members Secretary** was also suggested – the position would deal with member and membership details.

Do **YOU** feel that you have what it takes to do one of these jobs? Again, please let me know as soon as possible.

All the present posts on the Executive Committee – **Chairman, Vice Chairman, Secretary, Assistant Secretary** and **Treasurer** are all up for re-election in October. The posts of Curator, Auditor and section directors, plus editor of WASNews and the Librarian are also open for re-election. If you feel that there is something that you would like to contribute to the Society, get yourself nominated!

Alert List

It has been a little over a year since the Alert List was updated, so if you would like your name added (or removed) from the list, please let me know. I would like to have a new list ready for the night of the AGM, so please advise as soon as possible.

Dates for your Diary

SAGAS Meeting – 20 October 2001

Brian Halls

At last I have received details about this meeting that will be held at the Sir Patrick Moore Building / South Downs Planetarium Trust.

Entrance is by ticket (£2.50 per person). I know that there is in the region of about 20 members of this Society that want to go, but ticket allocation is on a first come first serve basis to all SAGAS affiliated societies – so if you want to go to this meeting, please send a cheque for your ticket to the treasurer Michael Marshall (address on back of WASNews) **as soon as possible.**

To ensure as many of our members can attend this event I would suggest that all ticket money should be with Michael no later than **September 22**. This will allow us (hopefully) enough time to reserve as many seats for our members as possible and have details of the trip by the October monthly meeting.

Reports

Zimbabwe Eclipse report

Paul Carter

Wow!!! What an eclipse. By far and away the best one I've ever seen. Shadow bands at the start, a major prominence leaping into view seconds after 2nd contact, another 4-5 creeping into view just before 3rd contact and a magnificent diamond ring at the end which just seemed to go on and on and on. A magic event all round.

And just for a change, I haven't had to get up at midnight and travel for half a lifetime in a cramped minibus to see it. In fact we've travelled to our eclipse site (near the Mozambique border about 3 hours north of Harare) in a fleet (an armada) of a dozen luxury coaches, brought up specially from Jo'berg for the occasion, and complete with air-conditioning, on-board loos and coolboxes of beers. Most civilised! The first 2 hours or so are along metalled roads and aside from the occasional wrong turn and a few road blocks (which we sail through unhindered) the journey's fast and comfortable. The final 45 minutes or so are along well made dirt roads, past small kraals of huts, herds of goats and lots of smiling, waving children. Although I guess living next to the highway they're used to traffic, I keep wondering what they make of our convoy charging along their roads, kicking up great plumes of orangey-brown dust, and then haring off in the opposite direction again a few hours later like some mad-cap Benny Hill cartoon.

The eclipse site is along the bed of a small river, with plenty of room to spread out along the 400m or so of sandy beach and rocky outcrops (its only after we've all set up all our gear on the rocks that someone mentions snakes hiding underneath and sure enough one small snake is seen slithering from out under a bush and casually disappearing under another. A local says 'its harmless' and while I'm not one to disagree with expert opinion, I keep well clear of it anyway). At this stage the niggling little bits of cloud we'd seen on the journey up have all evaporated away and its a perfectly clear blue sky. The temperature is in the low 20s and quite comfortable. All the gear was set up about an hour before first contact and I spend some time just wandering up and down the beach, bumping into various people whose names I don't remember but whose faces are familiar from previous eclipses. I unexpectedly bump into Brian Halls not knowing he's on the trip - a sort of "Dr Livingstone I presume" meeting. He's having problems with his tripod so I lend him some elephant tape to repair it (I don't need it - I haven't come across any broken elephants yet). Hope the pictures come out OK Brian!

The atmosphere as we go through the partial phase is all very relaxed. Lots of the local children are wandering up and down trying to scrounge pens and eclipse viewers (I've already donated my box of pens, notepads and solar powered calculators to the local school in whose grounds we're based). Funnily enough, those with eclipse viewers are not making any attempt to look at the sun with them. In fact there seems to be a complete lack of interest in what's going on. A few of them do look through a couple of the telescopes but the language barrier prevents us from really communicating what's going on and there is no real sense of excitement building in them. As we approach the last 20 minutes before totality people stop wandering around and start to settle down by their equipment. The atmosphere becomes more expectant as the light levels start dropping. All the rocks and the river nearby are changing into an eerie metallic grey hue as the colour drains away. Ten minutes to go! Crickets are chirping away like mad. Change the batteries in the digital camera, check the focus on the main camera lens and make sure I know what I'm doing. Mentally rehearse what exposures I'm going to make... 2nd contact ... expose for diamond ring..., 2 seconds count down timer on the camera to prevent camera shake..., auto wind-on..., change the exposure from 1/500 to 1/250..., let the camera settle and take the next shot.., run through a series of 5 shots down to around 1/2 second, spend some time looking.... No problem! We've got over 3 minutes of totality and that's only taken 20 seconds so far. If only it was like that in reality!

With 2 minutes to go its getting fairly dark. Someone asks "can you see Mercury?". I say "don't bother" but involuntarily start looking anyway (I didn't find it). Last minute - think to plonk a white towel on the sand in case of shadow bands (I've never seen them before). Check the cameras again. This is it -less than a minute to go! Shadow bands!! Long wavy black lines about as thick as your thumb moving across the towel at a fast walking pace about 20-30cm apart - they make me think of that image of the sidewinder snake moving over the sands at the start of that BBC2 nature programme (Life on Earth?).

I'm so entranced by them I completely forget to look for the shadow and almost miss the shot of 2nd contact. I instinctively turn back to the camera and fire off the shutter just as the Sun is swallowed up and then .... Woooowwwee! A huge detached prominence at 2 o'clock leaps into view immediately with that beautiful pinkish colour so characteristic of eclipses. The corona is magnificent - all huge and round and spiky. What an eclipse. Polite cheers and applause from across the site - can't be any Americans nearby, its too quiet! Time to take some photos and then have a real good look through the binoculars. It doesn't help that I waste a few precious seconds holding them the wrong way round (what a small image!? Doh!) and then I can't find the Sun when they're the right way round, but it's finally worth it for the view of the corona and that prominence.

Details of the next 3 minutes are a bit hazy. A combination of wild, jump up and down excitement and calmly trying to remember to take a photo or 2 and looking at it with the naked eye and binoculars. I'm totally oblivious of my Psion, which is helpfully counting down totality and after what seems like only a minute, another 4 or 5 prominences come into view at 6 o'clock. Then, suddenly, its 3rd contact and the diamond ring slowly, almost politely, creeps into sight. Luckily it lasts long enough for me to simultaneously turn back to the camera for a quick shot and to check my watch, as that certainly wasn't anything like 3 minutes and 14 seconds.

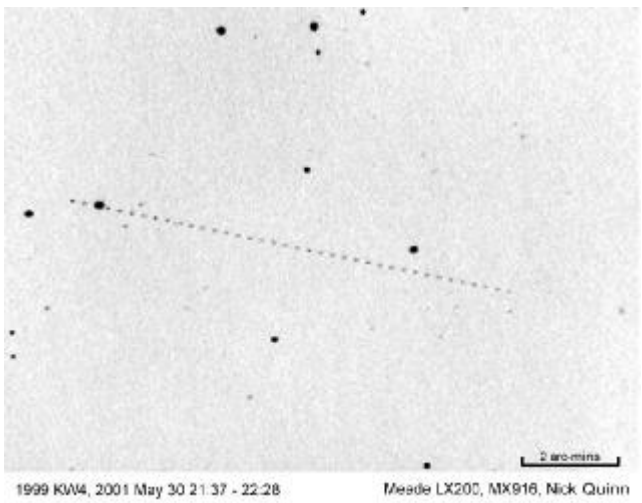
Unfortunately the sun and my watch both say it was and that's it over again for another eclipse. As always it been too short and, like at rugby matches, I want an instant replay. I'm far too overawed by it to even think about looking for the receding shadow (its on the other side of a large rock and I'm rooted to the spot anyway). The light comes back much more quickly than it disappeared it seems and soon we're back in bright sunshine and blue skies. Now its noisy as everyone excitedly compares notes of the events. "Wasn't that brilliant!", "What about those shadow bands", "Did you see that prominence?" (As if you could have missed it! I mean, it WAS HUGE).

A few die-hards stick by their equipment for partials while the rest of us congratulate each other, have a few beers and start to come back down to Earth. After 20 mins or so we reluctantly start to pack the gear away and file back up the hill to the buses taking us back to Harare. Its going to be a least 3 hours but who cares - the images will keep going round in the head for much longer than that.

Asteroid 1999KW4: A springtime visitor to Earth.

Nick Quinn

Earlier in the year, Sky And Telescope published a short article about asteroid 1999 KW4. This asteroid is a member of the 'Aten' class of asteroids and revolves around the Sun in 188 days; only Mercury has a shorter year (88 days). During late May its orbit would bring it only 4.8 million kilometres from the Earth; a fairly rare occurrence. At a previous flyby there was some evidence (from photometric data) that the asteroid was in fact double, a character that more and more asteroids seem to be revealing. A worldwide observing campaign was launched to try and gather some more data about this object. I planned to take a series of CCD images over several nights around the day of closest approach to see if I could detect any brightness changes due to both its rotation and suspected companion. Closest approach coincided with the long Spring Bank Holiday weekend, so several all-night observing sessions were possible. Taking a sequence of CCD images is very easy and one can potentially end up with hundreds of images after several hours of observing. To measure all the images I hoped to collect, required some help, and following a request in this 'august journal', Marilyn Harries and Graham Darlington volunteered their services. I would take the images and post them to a website, they would download and measure them. My imaging system consisted of a Starlight Xpress MX916 CCD camera attached to a 10 inch Meade LX200 telescope.



Well, how did we get on? Surprise, surprise, the weather over the weekend was poor and I was unable to get any images until the Monday night when there were a few breaks in the clouds. Not until Wednesday could I get any sort of decent observing run. By this time the asteroids position in the sky had changed so much, that my 'observing window' between twilight and when the asteroid disappeared behind a tree was very short! However, the images I did get were posted to Graham and Marilyn who made the brightness measurements and returned them to me. The graph shows some variation in brightness, some of this is due to 'scatter' in the observations (instrumental and atmospheric effects) and some is probably due to the rotation of the asteroid. But the time line is too short; we really needed two or three hours to start to get any sort of decent plot. Some lessons were learned: I needed to re-think the way I acquire CCD images, and pre-process them. Judging by the rapid rate the asteroid was moving several days after its closest approach (see image) I may have had trouble tracking it for the 15 - 30 second CCD integration times I had planned. I think we proved that a collaborative effort between observers and 'armchair astronomers', with the help of computers and the Internet is viable. Marilyn's article presents her view on the experiment and gives me encouragement to try this exercise again sometime. There are plenty of asteroids and variable stars out there to target in the future. Interestingly, results from a radar experiment in the week before closest approach confirmed that the asteroid is a 'double'. My thanks to Graham and Marilyn for their interest and help.

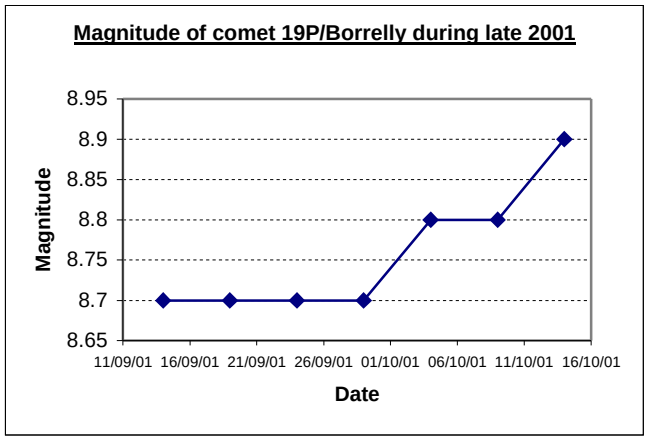
Comet 19P-Borrelly

Graham Boots

	Ra		Dec		
Date	hr	Min	Deg	arc-Min	Mag.
14.09.01	07	27.3	+18	58	8.7
19.09.01	07	44.2	+20	08	8.7
24.09.01	08	01.3	+21	14	8.7
29.09.01	08	18.4	+22	18	8.7
04.10.01	08	35.5	+23	19	8.8
09.10.01	08	52.7	+24	17	8.8
14.10.01	09	09.7	+25	13	8.9

The above coordinates are for Epoch 2000.0.

This comet has a period of 6.8 years and will traverse through Gemini during September, and then Cancer during October, and so it will be a morning object. I observed this comet at its last apparitions in 1987 and 1994.



Solar Section Report - July / August 2001

Brian Halls

Sunspot activity, which had been fairly quiet, began to increase a little during July.

Of interest were the high latitude sunspot groups in the southern solar hemisphere, the highest being a small Axx spot at $S49^0$. Spot groups were either H or C type class spots. The mean daily number of sunspot groups for much of the first week was 7.6 however; by July 6 there was a sudden decrease in the number of groups. By July 10 new regions were developing or rotating into view.

At about the same time the groups were becoming more magnetically complex which is often seen as a precursor of flare of activity from the particularly active groups. The groups however, remained quiet, but were interesting objects in the telescope as they daily changed their shapes and sizes.

My mid-month, active sunspots were primarily C and D class type groups. Sunspot group 9539 ($S18^0$ $L=164^0$) proved to be the exception. This loosely arranged straggle of small spots developed over a period of a couple of days into an E class group, and was magnetically complex. During this growth phase it was responsible for a small flare and there was hope for some potential activity to be seen in this group, however by July 17 this region had begun to decay.

By the latter part of the month the number of sunspots and groups was once more increasing, with 13 active areas being recorded on July 21 but, once again, activity took a down turn.

Another southern group during this time was quite active; region 9543 ($S23^0$ $L=075^0$ size 350; class Eki; July 25) took on a period of expansion, and though quiet it put on

a show in the telescope. However it too began to decay as sunspot activity once more declined at the latter part of the month. 9543 disappeared over the west solar limb on July 29.

Only four sunspot groups were visible on the last day of the month.

August however saw quite a jump in sunspot activity.

On several days in August, the surface of the Sun was very spotted with many small and short-lived spots being visible.

Activity peaked mid-month – Graham counting 16 active area (AA) on August 16.

There were also some large groups as well, mainly towards the end of the month.
I observed one interesting group on the morning of August 22, just as it was coming over the eastern solar limb. Situated at $S18^0$ $L=309^0$, this group was the re-emergence of a group that sailed out of view at the end of July – former active area/region 9557. Now renamed as 9591, it was sufficiently active to cause the Space Environment Centre (SEC) in Boulder Colorado to alert observers to keep a close watch on this group as the potential for it to produce a white light flare was considered a possibility.

A week previous to the appearance of this spot, SEC had generated a possible aurora alert due to a coronal mass ejection (CME) that had occurred on August 16. The source of the triggering flare for the CME was on the other side of the solar disk and away from view from both terrestrial and orbiting solar observatories. Region 9591 is a candidate for being the culprit.

It was still visible at the close of the month, however it was beginning to decay, but not before another large group, this time in the northern solar hemisphere began to rotate on to the visible solar disk on August 28 and which is visible to the naked-eye as I write this (September 1).

All in all, an interesting month for sunspots and other solar activity. Activity between the northern and southern hemispheres appears to have been even, though the southern solar hemisphere had more of the larger groups that the north.

Members observed the Sun on 27 days in July and 23 in August.

Articles

Filters for Celestial Objects

Graham L. Boots - Curator of the Observatory

BASIC PRINCIPLE OF FILTERS Block or allow through different wavelengths of the electromagnetic spectrum leading to enhancing parts by eliminating the interference of other parts.

SUN This section is for experienced observers only. If you are unsure please do not attempt observing the Sun directly, just use the projection method onto white card. Mylar is an inexpensive solar filter, which is made of thin plastic and coated on both sides with aluminium. It blocks 99.999% of the Sun's heat and light so you are just left with 1/1000 of one percent, even then it is still dazzling. It does give the Sun a bluish tinge. An orange filter will make the sunspots appear blacker and a neutral density filter will reduce the glare but DO NOT use these filters in isolation.

On one occasion recently I observed the sun under good conditions through a full aperture solar screen glass filter fitted to a Mead 20cms. Cassegrain-Schmidt telescope. This size of filter currently cost £125. The Sun had a dull yellowish colour, there was no glare or bluish tinge and the sun spot groups showed really well, both the umbra and penumbra but I could not see any faculae (hydrogen clouds).
Hydrogen Alpha filters belong to the specialist solar observer; they are expensive and fit a telescope specially adapted for solar observing. They reveal prominences at the solar limb which are also known as filaments when viewed against the solar disk back ground and appear as dark linear structures, also bright white flares can be seen.

MOON A pale blue filter reduces glare and sharpens the lunar features, again a neutral density filter also reduces the glare of a large bright Moon in a dark sky. Apart from the Sun and Moon filters are not much good on telescopes with apertures under 15 cms. due to the unavoidable loss of intensity. If you wish to purchase just one filter then I would suggest pale blue as it performs so well when observing the Moon and is sure to impress your friends.

MERCURY A pale green filter sharpens the image and still allows the image to appear bright also red and blue atmospheric effects due to the bending of light when the planet is low are reduced. An orange filter sharpens the image also.

VENUS A deep violet filter takes away the glare leaving a sharp image. Mercury and Venus can be observed in

daylight. Which in the case of Venus reduces the glare and if these planets are found high in the sky the atmospheric bending of light that occurs near the horizon hardly takes place. Beware not to get too near the Sun, which is never far away.

MARS Many colours of filters seem appropriate for Mars although I personally have never observer either of the two types of clouds found there. As there are so many I list them as follows along with what they maybe good for observing, depending on seeing conditions.

Green – Polar ice caps.
Red – Polar ice caps also.
Yellow – Reduces blue scattered light.
Orange – Does the same job as yellow but better.
Violet – White clouds.
Red or Yellow – Can enhance the visibility of dark markings and assist in the recognition of yellow clouds (dust storms).
Blue, Violet or Green – Suitable for white clouds and frost areas making them appear brighter.
It seems in the case of Mars experimentation by the individual is called for.

JUPITER A yellow filter reduces blue scattered light and an orange filter can do this better. A green filter can enhance the red and blue features. I find a green filter makes the gas belts darker and thus more prominent. The great red spot improves with the use of an 80A blue filter. Filters receive a numbering system from Kodak known as Wratten numbers, which enables reference to a specific filter, but for the most part I have chosen to ignore these in this general guidance leaflet.

SATURN A pale blue filter really sharpens the image like an icing cake. A yellow filter reduces blue scattered light, orange can do this better. Red and blue filters can indicate colour tints and belts. Also zones between the belts can be seen to be of varying widths.

URANUS, NEPTUNE & PLUTO All filters reduce the level of brightness and if an object is faint to begin with or if the telescope is too small filters will be of little or no value. Personally I have no experience or facilities for stacking filters i.e., looking through two or more at the same time.

COMETS I have already mentioned that yellow or an orange filter can reduce blue scatted light, this is especially useful when trying to observe a faint comet in a twilight sky as it may improve contrast. For the same reason a red filter is recommended for long exposure photography of comets in a twilight sky which are at their brightest when near the Sun and in such cases a red sensitive film should be used. Comets emit a lot of blue-green light between 490 and 520 nanometers) so a narrow band filter which allows just this area of the spectrum to pass can be useful and thus for photography a blue sensitive film should be used.

GALAXIES These objects do not benefit from the use of the ordinary filters mentioned here. Galaxies emit the wide and complete range of spectral emissions and filters are of no real value. The exception is the Light Pollution Rejection Filters also known as Nebular Filters. These types of filter block the primary emissions of streetlights which come from elements of sodium or mercury and allows a darkening of the sky background so faint objects can be seen. However there is a disadvantage. Around 30% of the object intensity can be lost in certain filters of this type. We have one at the Observatory, which was purchased many years ago for around £30 but is hardly ever used. When used on the Orion Nebula only the bright inner regions can be seen and all the delicate outer structure of gas is lost.

PLANETARY NEBULAE Here I can recommend the Lumicon Ultra High Contrast filter, without it I doubt if you will find M97 the Owl planetary nebula from an urban site. With it, on a good night you go straight to this object first time. The disadvantage is that currently the $1^1/_4$″ diameter size cost £95! Other planetary nebulae that can (depending of seeing conditions) benefit are M57 and M27 but I am sure there are many others. Other costly filters that can be considered by the advanced amateur astronomer are the Oxygen III and the Hydrogen Beta but I believe the latter is only suitable for four objects in the entire sky!

In addition to Lumicon other major firms that manufacture filters are Parks Optical, Thousand Oaks, Mead and Celestron all in the U.S.A. although it seems all the filters I come across are actually made in Japan but marketed by these firms.

REFLECTION NEBULAE Once again I suggest trying a Light Pollution Rejection filter (Nebular filter) providing the aperture of your telescope is at least moderate and the intensity of the object is sufficient to withstand the effects of the filter. I do not have any experience of modern day narrow or broadband Nebular filters but I do know they are very expensive. However, I expect they can be very useful for the serious amateur. One way of decreasing the effects of sky glow is to increase the magnification thus narrowing the field of view, which in turn reduces the amount of sky glow being observed. Some globular star clusters really benefit from this method, in particular M3 in Canes Venatici.

EMISSION NEBULAE As above a Light Pollution Rejection filter maybe useful. Often emission nebulae are ionised hydrogen and emit their radiation strongly in the red area of the visual part of the electromagnetic spectrum. When photographing these types of object a red filter and a red sensitive type of film such as the black and white Kodak Technical Pan 2415 work really well. Colour red sensitive films are many such as the Kodak Ektachrome series that is why the Orion Nebula comes out red on so many photographs rather than the blue/green/grey colour seen by the human eye. Recently at our society's observatory three members observed the Omega nebula M17 that is a cloud of ionised hydrogen gas (an HII region) on the borders of Serpens Cauda and Sagittarius. We were very pleased with the image we obtained through the 29cms. F5.6 Newtonian telescope without any filter but when we viewed it again using the Lumicon ultra high contrast filter we were amazed at the fantastic improvement, the filter darken the sky background and the nebula appeared so much more prominent. It appeared as if we had moved our observing sight to a mountaintop in an instant! This is a prime example of how a specialist type filter can over ride the loss of light penetration and remarkably improves the intensity of the object being viewed.

DOUBLE STARS A neutral density filter can be useful to see a close faint companion star which otherwise can be lost within the glare of the primary star. In such cases I would suggest observing the object on at least three nights so as to attempt to benefit when the atmosphere allows good seeing.

SIZES OF ASTRONOMICAL FILTERS

Filters normally screw into the field end of an $1^1/_4$″ diameter eyepiece. These currently cost about £15 for the coloured glass type although they are currently available from David Hinds Ltd., of Tring, Hertfordshire. There is also the costly 2″ diameter size for eyepieces of this size. At prime focus of Schmidt-Cassegrain telescopes such as those manufactured by Mead and Celestron which are so popular today there are filters that screw directly onto the rear cell. These can be used for visual observing or for photography with the T-Adapter or Off-Axis Guider. The clear aperture is 36mm. We have ten $1^1/_4$″ filters at the Observatory, some of which are available for short-term loan.

CARE & CLEANING OF FILTERS

Only clean filters if you have to and then only as far as is necessary. Sometimes you will have to accept that some specks or blemishes just cannot be removed.

I recommend that you wear non-powdered latex gloves available from Lakelands of Chichester. 50 pairs cost £10 and come in small, medium or large.

First of all use a camel hair puffer brush available from Jessops for around £4.50 to remove grit and dust.

Any marks left should then be approached using a clean white cotton handkerchief kept in a jar with a screw lid. Use only the lightest of pressure and if necessary breath on the glass to provide a little moisture or if you prefer use lens cleaning fluid again available from Jessops for about £2.50.

Store filters in a cool dry place away from sunlight in an airtight container, which can be the little plastic boxes they are sold in.

In regard to specialist type filters that are costly professional advice should be sought. Remember you are only cleaning the glass, not polishing it.

FURTHER READING

1. Norton's 2000.0 Star Atlas & Reference Handbook. 18th Edition. Edited by Ian Ridpath & published by Longman Scientific & Technical. Retailing currently around £23.
2. For the advanced astro-photographer Astrophotography for the Amateur second edition by Michael A. Covington published by Cambridge University Press, about £20.

From my own experience I cannot stress the value of filters for observing or recording celestial objects enough.

William Who?

Graham W. Birdsall

According to research undertaken by Dr. Ruth Farwell, dean of academic affairs at South Bank University in London, William Kingdon Clifford, a professor at University College London, understood the basics of a relationship between space, matter and gravity in a leap of scientific imagination that shocked almost all of his contemporaries in the 1870s and was not equalled until Einstein published his own work in 1915.

Describing him as a 'visionary Victorian', Dr. Farwell said that professor Clifford may even have been on the verge of proposing full scientific theories to describe his ideas and carve out his place in history, but his work was cut short when he died from tuberculosis, aged 33, on 3 March, 1879 - just 11 days before Einstein's birth.

'Clifford was way ahead of his time and was anticipating some major parts of Einstein's work,' said Dr. Farwell, who added that Clifford's great achievements have been

unfairly overlooked. Her claims came after she had studied previously unpublished personal documents and Clifford's scientific papers.

William Kingdon Clifford excelled at mathematics, philosophy, literature and gymnastics. At the age of 18 he entered Trinity College, Cambridge and eight years later took up the chair of mathematics and mechanics at University College London. His contemporaries treated Clifford's ideas with hostility, not least because they judged him to be an eccentric.

While Clifford did once climb a Cambridge church steeple, his pursuit of scientific discovery almost cost him his life when he found himself shipwrecked off the coast of Sicily while on an expedition to study a solar eclipse. However, a mathematical system he created, known as Clifford algebra, is the first indication that Clifford may indeed have been on the brink of greatness, for that system is still used today by scientists exploring quantum mechanics, one of the main strands of modern physics.

But Dr. Farwell believes Clifford's most significant contribution to science was his suggestion that the way matter was moved by gravity could be explained by treating the universe as if it had four dimensions of curved space instead of the conventional three.

'All of the ingredients of Einstein's concept of space-time were there - this was quite unlike anyone else's ideas at the time,' said Dr. Farwell. For two centuries, Sir Isaac Newton's picture of the universe had stood without serious challenge - until Clifford emerged on the scene.

Although Albert Einstein put the same concept at the heart of his theory of general relativity many years later, he achieved this quite independently of Clifford. Indeed, Einstein was probably oblivious of his earlier research. Nonetheless, Einstein went one step further of Clifford in explaining that the fourth dimension was time and used it to accurately predict the orbits of planets.

However, according to Denis Brian, author of 'Einstein: A Life', for all his brilliance, Clifford could not rival Einstein's combination of genius and stubbornness. 'These ideas were in the air at the time, but all the great scientists agree - only Einstein could have pulled them together.'

Had Clifford lived longer he would have been able to develop his ideas and carve out a formidable reputation, claims Howie Firth, director of the Orkney science festival and a long-time supporter of Clifford's cause.

'As it was, his ideas appear in a key way in two of the great pillars of modern physics - relativity and quantum mechanics,' said Firth. 'Just imagine what might have been achieved if the mature Clifford had met with the young Einstein...'

Epsilon Aurigae

Alex Vincent

The long-period eclipsing binary star *Epsilon Aurigae* has a period of 9,892 days (27.1 years). Its last minimum was in July 1983 and the next is due in August 2010. The duration of eclipse is 700 days, of which about 371 are total. The star is magnitude 2.9 at maximum and drops to 3.8 at minimum. The primary star is a luminous supergiant star that exhibits an F0 spectrum.

It is not known what the nature of the eclipsing component (the secondary) is, as no trace of it could be found visually or spectroscopically. There are a few ideas what it may be, such as a young star condensing, a flattened disc, a black hole (which would explain why it is not detectable), or a hot blue star surrounded by a huge shell of gas and dust. More may be known at the next minimum in 2010 when it again passes in front of the primary.

However, we may not have to wait for eclipses in order to discover what the secondary is. If the orbit is circular, the secondary minima will occur halfway between primary minima and the last one in February 1997. Halfway between primary and secondary minima are greatest elongations where both components are furthest apart. Could observations of some sort be made either on Earth or in space at elongations?

The next elongation takes place in November 2004. Perhaps observations could be made by large detectors using the appropriate instruments from prime observing sites, including the *Hubble* telescope, to gather enough data to establish the true nature of the secondary component of the *Epsilon Aurigae* system.

Armchair Astronomy

Marilyn Harries

An invitation in May's WAS News to collaborate in a data sorting exercise on a rare asteroid skimming past Earth was irresistible so I offered to help Nick Quinn when he called for Armchair Astronomers. I had the computer, some time, lots of patience and great admiration for this method of furthering scientific work., since it carries a huge potential for research.
Several programmes have already been set up globally, such as the Search for Extra Terrestrial Intelligence and

the Martian crater counting scheme, whereby ordinary mortals like you and me can contribute our on-line resources to help do the sort of measurements within months that might otherwise take a professional team years.

On the other hand, Nick is still waiting for my graph! And it took far longer than I would have thought possible for me to get to grips with, haha, a "simple little programme" called Astrometrica. But don't let this put anyone off. It certainly hasn't deterred me because I have learned so much, not least a little bit more about how to manipulate Windows and, let's face it, this is going to be a basic turn-of -millennium skill. Nick, of course, is way ahead here. How else could he post such shocking instructions on his website as "you need to be careful because Windows thinks cat. files are security files." As far as I am concerned Windows still thinks that and I don't know, even now, how I sneaked the star category file into the programme.

I am also having ongoing difficulty making sure that I have identified the asteroid (1999 KW04) correctly in the photographs supplied by Nick but trying to sort that out taught me how to turn website pix into negatives so that printing out doesn't use up so much ink. But I still can't e-mail them to the other Armchair Astronomer, Graham Darlington. Yup, there are just the two of us so far and if I'd known that I might have chickened out since there is safety, as well as science, in numbers. I hope this brief account might attract others. The programme really is fascinating and impressive but what I really love is that the dedicated astronomers who designed it put it on the world wide web for everyone to use free of charge so that absolutely anyone with web access can join an astronomical project. Don't give up on me, Nick! I'm still loading the images, smoothing them and choosing reference stars! Er ..... what next?????... better ring Graham again for another hour's confabulation.

WAS Corrects NASA Error

Graham L. Boots

In October 2000 I took a holiday on the Greek Island of Zakynthos in the Ionian Sea. After four previous failed attempts over the last two years I successfully photographed three geo-stationary satellites from my hotel balcony. Illumination of these satellites by the Sun is critical. For me at latitude 37.8° north the optimum date was the 7th October, which happened to have a very clear night sky.

Upon my return I asked Nick Quinn our Astronautics Section Director to try and identify the three geo-stationary satellites, not an easy task. He used a computer programme called Highfly and identified the satellites as Arabsat 1C, Gorizont 32 and Cosmos 2345. He felt he was 95% correct.

Some time later a visitor to the Observatory, Darren Wood spoke to member Colin Thomson about a web site of NASA (National Aeronautic & Space Administration) called J-Track, which gives information about every Earth orbiting satellite. The full address is http://liftoff.msfc.nasa.gov/RealTime/JTrack/Spacecraft.html Colin accessed this web site and I asked him to provide print outs of the three satellites. The parameters of Arabsat 1C and Gorizont 32 confirmed that they were indeed geo-stationary satellites but not Cosmos 2345, which had a highly elliptical orbit with an inclination of 63° to the equator.

I sent an email to Joe King NASA Official responsible for NSSDC Master Catalogue: Spacecraft at joseph.h.king@gsfc.nasa.gov along with attachments of the Highfly and their own print out of Cosmos 2345 which of course gave conflicting information. Within days I had a reply saying they would correct their error and fix the entry in their database.

After a week or two I accessed the J-Track web site again and found they had corrected their information for Cosmos 2345 to a geo-stationary satellite. I now have a revised, updated and corrected print out. Cosmos 2345 is now described as a Russian military geo-synchronous communications spacecraft.

I thank all those involved in this surprising end to an astro-photographic session from a hotel balcony.

What's on the Box

Friday 14th September

BBC TWO

01.00 ~ Final Frontier
Highlights of the current series of the astronomy programme.

BBC KNOWLEDGE

19.50 ~ Moments of Genius
(Discoveries from a muddy field) Presenter Brian Cox explores the history and technology of the Lovell Radio Telescope at Jodrell Bank.

Monday 17th September

BBC ONE

00.20 ~ The Sky at Night
(Evolving Universe – Beginnings) Patrick Moore and Chris Lintott examine current theories explaining the 13,000 million year evolution of the universe and asks whether the fate of the universe can be predicted by looking back to the Big Bang.

Wednesday 19th September

BBC KNOWLEDGE

19.00 & 23.10 ~ The Planets
(Atmosphere) Documentary series about the Solar System. This programme describes the investigation of weather systems found throughout the Solar System.

20.00 & 00.00 ~ Journeys in Time & Space
(The Big Bang) Series exploring the birth and growth of the Universe. Astronomer Chris Riley visits New York to see the 2-mile long machine that recreates the Big Bang. Dr Kathy Sykes meets Francisco Diego, who designs the world's largest telescopes.

Wednesday 19th September

BBC RADIO 4

18.30 ~ The Hitch-Hiker's Guide to the Galaxy
Douglas Adam's epic adventure in time and space.

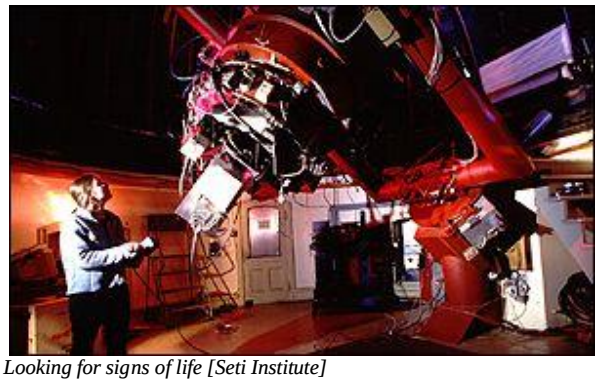
WAS News News

Alien hunters see the light

Frank Drake – BBC Online News

Looking for signs of life [Seti Institute]
Astronomers involved in the search for extraterrestrial intelligence (Seti) are broadening their hunt and looking for light signals directed at Earth. The optical Seti method has been tried before but previous experiments have been plagued by false alarms.

"This is perhaps the most sensitive optical Seti search yet undertaken," said Frank Drake, chairman of the board of the privately funded, non-profit Seti Institute in the US. Mr Drake, who in 1960 conducted the first modern hunt for evidence of extraterrestrial intelligence, is usually associated with radio Seti, an approach in which large antennas are connected to specialised, multi-million channel receivers.


Looking for signs of life [Seti Institute]

"This is different," he said. "We are looking for very brief but powerful pulses of laser light from other planetary systems, rather than the steady whine of a radio transmitter."
Technological boost The Californian team says that technological improvements have made optical Seti viable, though other Seti researchers say that human limitations have hindered progress in the past.

The subject was controversial for many years with both US and Soviet observers proposing projects and wrangling over their feasibility. Light detection has the disadvantage of only being able to detect a signal deliberately targeted at Earth, but it is less susceptible than radio Seti to terrestrial interference.

The new system uses a trio of light detectors and was designed and built by researchers at the University of California, Berkeley, and the University of California, Santa Cruz (UCSC).
Other systems have used fewer detectors and have consequently suffered from frequent false alarms.

Improved accuracy
The scientists hope that the new system, housed at the Lick Observatory at UCSC, will only suffer one false alarm a year. They have already examined about 300 individual star systems, as well as a few star clusters. They intend carrying on looking at least once a week for another year, they say.

Another optical Seti project, a collaboration between Princeton and Harvard Universities in the US, is also working on installing a light detector, while the optical Seti project at Columbus, Ohio, already operates a prototype system based on a 25.4-cm (10-inch) telescope.

Diary

September 12 ~ Africa Eclipse – members are encouraged to bring their pictures/ slides to show.

October 5 – 7 ~ BAA Variable Star Section Meeting – Alston Hall, Preston. Speakers include, Dr Allan Chapman, Prof Gordon Bromwich.

October 10 – *A.G.M* – and *The Maunder Minimum Mystery* by Brian Halls

October 20 ~ SAGAS Meeting – Planetarium, Chichester. Pre-booked only.

November 14 – *Comets Past and Present* by Alan Drummond (Crawley Astronomical Society)

December 12 - *Origins of Astronomical Knowledge* by Norman Walker

January 9 – *Society New Year Social*

February 13 – *The Moon* by Peter Gill (Eastbourne Astronomical Society)

March 13 - *The Aurora* by Neil Bone (South Downs Astronomical Society, Astronomy Now)

All Meetings **(bold)** are held on the second Wednesday of every month unless otherwise stated, at Heene Church Rooms, Worthing at 7.30 p.m. Meetings include the latest astronomical work, reports and, photographs by members. For further information please call 01903 521205, on the Internet at *www.was.org.uk* or
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Note to Contributors

Contributions & Correspondence for the **October** issue of WAS NEWS should be with the Editor by **October 1st**. All material for inclusion should be sent to the Editor.

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