

Janus



Ewell Astronomical Society Newsletter – Summer 2008

Serving skywatchers in SW London and north Surrey

Ewell AS homepage www.ewell-as.co.uk

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JANUS-ON-LINE-IN-COLOUR: For a full colour version of any recent Janus log-on to www.ewell-as.co.uk / Janus / Janus pdf file. Cut + paste web addresses [URLs] therein direct to your Internet Browser and save typing errors!

EAS Meeting dates for your 2008 diary – see www.ewell-as.co.uk

All held at Nonsuch HS for Girls – Ewell Road - Cheam [unless noted] and start at 8pm.
Ordinary Monthly Meetings [in bold] in Common Room start at 7.40pm. Headley Heath meetings *phone 01252 382940 from 7pm on evening to check observing is on'.
Door subscriptions £1 and £3 for visitors - Arriving at meetings with small change in your pocket and not tendering £10 and £20 notes is greatly appreciated. *Headley Heath meetings phone 01252 382940 from 7pm on evening to check observing is 'on'

Fri Jun 13 - Peter Meadows [BAA] *Solar Observing*

Wed Jun 18 @ 8pm – Users Group Meeting – NSHS Observatory Deck

Fri Jul 11 – Prof. Mike Merrifield [Nottingham Uni] *How to build a Galaxy*

August – no main meeting

Wed Aug 20 @ 8pm – Users Group Meeting – NSHS Observatory Deck

Fri Sept 12 – Prof. Monica Grady [OU] *The Earth - does it have a future?*

Sat Sept 13- Ewell AS Headley Heath Picnic & Star-Party

Mon-Thu Sep 22-25 @ 8pm Observing Session Headley Heath*

Fri Oct 10 – Dr Graziella Branduardi-Raymont [MSSL] *X-ray astronomy*

Wed Oct 15 @ 8pm – Users Group Meeting – NSHS Observatory Deck

Mon-Thu Oct 27-30 @ 8pm Observing Session Headley Heath*

Fri Nov 14 – Prof John Brown [ARFS-Glasgow Uni] *White Rabbits & Black Holes*

Mon-Thu Nov 24-27 @ 8pm Observing Session Headley Heath*

Fri Dec 12 – AGM + talks TBA

Mon-Thu Dec 16-19 @ 8pm Observing Session Headley Heath*

Wed Dec 17 @ 8pm – Users Group Meeting – NSHS Observatory Deck



Spider's nest! – globular cluster M5 in Serpens : pic May 19 @ WPO via Meade 30cm SCT+SX CCD; 3s exp

SOCIETY HEADLEY HEATH PICNIC & STAR-PARTY - Saturday Sept 13 Make a note in your diary - it's the day after our September meeting - and all are welcome. Bring along a picnic – telescopes provided.

THE USERS GROUP MEETING is held on Wednesdays from 8pm sharp on alternate months on dates noted on the EAS Diary in the School's Geography Room via Main School Entrance facing playing field -map www.ewell-as.co.uk

OBSERVING SESSIONS ON HEADLEY HEATH will be held monthly [Sept to May] on dates noted on the EAS Diary at the 'dark of the moon' at NT carpark adj cricket pitch. Phone 01252 382940 from 7pm to check meeting is on.

Report: OBSERVING SESSION at Headley Heath 2008 April 7 by Clive Cook

A very modest turn out of three eg Brian Taylor, myself and Valerie May who turned up a short while after with her binoculars. Observing Session Co-ordinator Mike Fantham could not attend on this occasion and I suspect everybody else were sitting indoors in the warm watching *The Sky at Night* on BBC2 ! It was a good clear night with a very striking young crescent moon with earthshine setting in the west.

I generally swept the sky picking out the odd Messier galaxy and showed Valerie the view through the 16" Dobsonian. Brian's set up his 10" Mead LX 90 coupled up to a webcam imager with which he concentrated on Saturn and its moons for a while. After Saturn he went visual and found Globular Cluster M13 in Hercules of which not at its best until later

Crescent moon + Mercury May 6 – Headley Heath>>>



in the year [although it's good after 2am in the morning when higher up!]. Brian also found M104 the *Sombrero Galaxy* in Virgo and I found 10th mag galaxy NGC 5005 in Canes Venatici.

We both found globular cluster M53 in Coma Berenices, near alpha, and the more impressive M3 globular cluster in Canes Venatici of which stars were nicely resolved in the 16" whilst Brian's image was a smudge! He realised that he was all dewed up! He said it was like looking through frosted glass! We stayed a little while longer, Valerie went home earlier. We had a good night and look forward to the next session [reported below].

Report: OBSERVING SESSION at Headley Heath 2008 May 6 by Maurice Gavin

Some four members - Jeff Heywood [80x20 bins], Clive Cook [16" Dob], Mike Fantham [8" Celestron SCT] and James Gordon [10" Newt] were already set-up when I arrived about 9.30pm and Valerie May arrived later. I immediately set-up my camera and tripod to record a rare conjunction of the moon and elusive planet Mercury [front cover] – Mercury was just visible to the eye in the late twilight a degree or so east of the crescent moon.. Moments later the duo set into birch trees on the heath. The various telescope competed for targets to view. James aligned his 10" on the aptly named *Ghost of Jupiter* – a planetary nebula NGC 4232 [Hubble pic below right] low down in Hydra on the meridian – so low in fact I had to grovel on the carpark cinders to view it! But very worthwhile it was – a circular glowing disk. James searched unsuccessfully for mag 8 Comet Boattini supposedly nearby but declared it AWOL!

Mike set his SCT on Mars – now well past opposition and receding and high in the SW near Castor and Pollux – Mars appeared a tiny bright orange disk with a hint of gibbous phase. Saturn was also on view in Leo in all the 'scopes - the ring system is now closing. Major moon Titan was very obvious then Rhea to the other-side of the planet. Between Titan and the disk where the fainter Dione and Tethys. Mike spotted moon Iapetus way off to one side of Saturn.

The light gathering power of Clive's 16" Dob exceeded that of all the remaining scopes here tonight and gave a very bright image well suited to deepsky objects. A large telescope takes a relatively long time to 'settledown' and for the main mirror to reach thermal equilibrium for the night and initially Clive used a cardboard disk across the top of his scope with a 6" off-axis aperture to view Mars and Saturn – the view being much improved in sharpness – a very useful 'trick' all observers could sometimes use. Later, with the disk removed, the full 16" aperture revealed a bright companion star to a brilliant Polaris! Directly overhead was the Whirlpool galaxy M51 – two bright nebulous blobs with a veiled glow surrounding the main galaxy – from darker sites then Headley the spiral form is apparent - Clive advised. It's awhile since I've attended an Observing Session but now I'll be back in the autumn and perhaps you will join us too.



BOOK REVIEW-First Light- the search for the edge of universe–by Richard Preston reviewed by Louis Barman

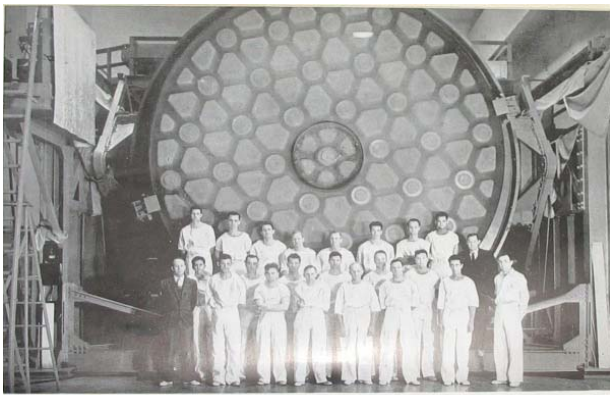
This is possibly one of my all time favourite books. It follows the author as he spent months living and breathing with the astronomers who were working with the giant Hale Telescope in Mount Palomar. This telescope is, in my opinion, one of mankind's greatest achievements considering that it was started at the height of the Depression in 1934. The mirror is an amazing 200 inches and it took 10 months just to let it gently cool down (so that the glass did not crack). This was followed by a further eight years of polishing much of it by hand. This telescope was completed in 1948 and then had four times the light collecting ability of anything that had gone before and it remained the world's largest quality telescope for an incredible 43 years.

This creaky old almost antique scientific instrument has now been upgraded many times to beyond the wildest dreams of the original designers, first through advances in photographic film and then with highly sensitive electronic cameras. So now virtually every photon of light that arrives at the giant mirror is now collected and imaged.

This book follows Professor James Gunn in his search for a particular rare and most distant type of quasar of which only a handful have been found so far despite years and years of searching. He was trying a radical new way of using the Telescope that has never been done before -- to turn off all the motors and just let all the galaxies sweep past the view, caused by the rotation of the earth. The clever bit was to electronically sweep the image out of the CCD camera at exactly the same speed as the galaxies swept past on the projected image. He had built a giant scanner, using the earth's rotation do the scanning. This meant that in one night they collected a vast amount of data all on one massively long electronic filmstrip.

All these electronics were built by hand on a shoestring by Professor James Gunn himself, even using parts he had collected from the local dump! As you can probably guess that it was not long before they found more of these rare quasars, by the bucket load. I can thoroughly recommend this book and I hope you will enjoy it as much as I did – it's available for loan our library.

<<< the men who spent eight years polishing the glass for the Hale Telescope.



THE TWENTY-ONE MEN IN WHITE

NIGHT SKY CONDITIONS 2007 at Ewell Court Observatory by Ron Johnson

2007 was generally a better than recent years in terms of night sky conditions. With 57 clear nights and 106 clear / cloudy nights making a total of 163 useable night for observation during the year.

A **clear night** is when there is no cloud in the sky.

A **clear / cloudy night** is when there is passing cloud but sufficient clear between to permit observations to be made.

A **cloudy night** is when there is complete cloud cover.

The following is a monthly break down of the year's figures:

Month	Clear	Clear/Cloudy	Cloudy
January*	2	14	15
February+	5	2	21
March	3	9	19
April**	8	15	7
May	6	8	17
June	3	7	20
July	3	9	19
August	6	7	18
September	7	6	17
October*	7	9	15
November	2	10	18
December*	5	10	16
Totals	57	106	202

2007 saw a small increase in the number of clear nights and a significant increase in the number of clear / cloudy nights. The best month for useable nights was April** with 23 and the worst February+ with only 7. January*, October* and December* also had a good number of useable nights.



X-RAY ASTRONOMY & CATAclysmic VARIABLES STARS

talk to Society by Dr Darren Baskill - Leicester Uni - on April 11th

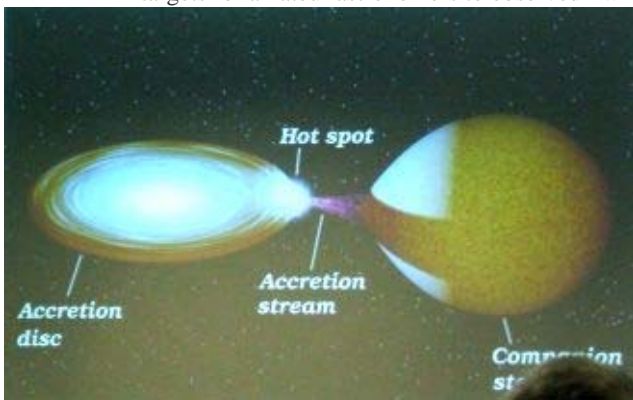
Cataclysmic variables stars are, as the name suggests, stars that vary in brightness cataclysmically! The first one to be discovered was the star U Geminorum over 150 years ago, found by J.R.Hind whilst looking for minor (and major) planets - a popular area of research at the time. While red variable stars were known about at that time, U Gem was unusual because it was very blue. Since then, amateurs have been monitoring this and other cataclysmic variable stars on a regular basis. The dwarf novae type of cataclysmic variable, of which U Gem is an example, can suddenly brighten once every few months.

But what are they? It took over 100 years of research to find out. Cataclysmic Variable stars are pairs of stars that are so close together - they orbit around each other in just hours - that matter is dragged away from a Sun-like star onto an extremely dense white dwarf star. If the white dwarf has a strong magnetic field the material falls directly onto the north or south magnetic poles - these stars are known as polars. However, if the magnetic field is sufficiently weak, the gas forms an accretion disk around the white dwarf star before impacting onto the white dwarf.

The visual light we see originates from gas falling through the disk, and the amount of gas falling through the disk varies... cataclysmically! Gas begins to build up in the outer disk, before falling rapidly through the disk (much like snow does on an avalanche-prone mountain). As the rate at which gas falls through the disk varies, so does its visual brightness (optically, the accretion disk outshines both stars put together). Cataclysmic variables can brighten by a factor of 100 in just 6 hours, before fading away over a week. These outbursts (avalanche) cycles can repeat over timescales of weeks to many years. This was how the objects were discovered in the first place, and why they have remained popular targets for amateur astronomers to observe - will they see an outburst tonight?! My research focuses on the X-rays

emitted from the region where the gas smashes into the surface of the white dwarf star. This region heats up to millions of degrees, hot enough to emit high-energy X-rays. To see the X-rays we use space-based telescopes. My work on the observations made by the Japanese X-ray observatory ASCA revealed two oddities - LS Peg & V426 Oph.

We took a closer look at both pairs using the latest generation of X-ray telescope, XMM-Newton. We were expecting both to be polars



containing magnetic white dwarfs, which would explain the high number of high energy X-rays we saw coming from these objects. Joe Patterson back in 1994 explained "The basic criterion for membership in this [magnetic] class is the presence of a highly coherent periodicity in a CV's light curve, typically at optical or X-ray wavelengths.". So the proof of these being polars would be to see a pulse of X-rays every-time the white dwarf rotated...But no pulses. Nothing. Everything else agreed with what we expect from a polar, just without the pulses, the fundamental thing we expect to see in a cataclysmic variable with a magnetic white dwarf.

However, there is one way to explain the lack of a modulation. If the white dwarf rotates almost exactly perpendicular to the disk, then the gas will flow symmetrically on to the poles, thus hiding any modulation. Maybe this is what is happening deep in the heart of LS Peg & V426 Oph?

GRAVITATIONAL WAVES: A NEW WINDOW ON THE UNIVERSE

talk to Society by Prof Malcolm MacCallum - Queen Mary's College – London on May 9th

Waves come in many types. We communicate mainly by sound waves, in which the air molecules move back and forth in the direction the wave travels in - these are called longitudinal. Light waves are more like the waves one can produce on a rope by waving one end: they are transverse, i.e. the motion of a piece of rope in the wave is perpendicular to the direction of the wave's travel, and there are two "polarizations", one from waving the rope up and down, the other from waving it from side to side. In general relativity, gravitational waves are like light waves in many ways: they move at the speed of light, and are transverse with two polarizations (albeit more complicated to describe than those of light). They have the effect of altering distances between points in spacetime, because in Einstein's theory the metric, which determines distances, is dynamical.

Light allows dipole waves, from a positive and negative charge pair oscillating, or from an accelerated charge, but gravity does not (because the equivalent of the dipole is the momentum, which cannot change): so the waves are quadrupole. This has two consequences, a more complicated directional pattern of radiation, and a formula for energy which shows that to get significant energy in gravitational waves one needs a large quadrupole, i.e. an astronomically sized object, changing fast. Hence the hope of using such waves to observe events we cannot hope to study otherwise.

The waves were first discussed by Einstein in 1916 but only in 1959 were they shown to be definitely predicted by the theory (and all the viable alternative theories). Theory can be wrong, so what about evidence? We have very good indirect evidence from the binary pulsar (for whose observation, from 1974 onwards, Hulse and Taylor won the 1993 Nobel Prize) and, since 2003, the double pulsar (whose orbital period is only 2.4 hours). The changes with time in these remarkable objects fit very well the energy loss and other predictions of the theory (see e.g. Kramer et al, Science Express, Sept. 2006). [Added note: we may in future have indirect evidence also from microwave background measurements.] We would like however, to be able to detect the waves themselves. This is pretty difficult: gravity is the weakest of the known forces of nature, and because they are generated by large objects moving collectively, the waves have long wavelengths. We expect there to be sources of waves which alter distances by a part in 10^{23} or so at wavelengths about 300m (or frequencies 1000Hz).

The first attempt to measure these was made by Weber, starting in the late 50s and 60s. He used large cylindrical aluminium bars at room temperature, with piezoelectric crystals bonded to it, and claimed a positive result in 1969 for coincident measurements between Maryland and Argonne (coincident detection at 2 sites is necessary to eliminate the many causes of instrument noise). His claims are no longer believed but he triggered off all the subsequent work. Modern bar detectors (of which I believe 4 are still operating) weigh about 2 tons, and are in vacuum chambers and cooled to within a degree or 2 of absolute zero. These and other improvements allow them to reach sensitivities down to parts in 10^{21} or better, but nothing definite is seen. To do better we use interferometers, in effect comparing the lengths of two arms at an angle by measuring light travel down each. Since each arm is a vacuum tube it can be long: the current experiments' sizes range from 300m to 4 Km. Even so we are measuring changes in distance by a tiny fraction of the size of an atomic nucleus. The tube can in effect be made much longer by bouncing the light many times, with very high quality mirrors, and there are other ways of improving the sensitivity. Thermal and seismic isolation, and careful control of noise sources, is essential.

Remarkably, the US LIGO instruments have now reached their original design sensitivity, which is around 2 parts in 10^{23} at the most favourable frequency, and their fifth science run, S5, has accumulated in total a year's worth of simultaneous observations (joined by GEO600, the UK/German machine, and VIRGO, the Franco/Italian one, for part of the time). The LIGO machines are now shut for upgrade to Enhanced LIGO, and after that has been used for a while, a further upgrade will be made to Advanced LIGO, which will improve sensitivity by using better suspension, seismic isolation and signal recycling (much of it pioneered by GEO) to around 1 part in 10^{24} . Advanced LIGO is

planned to open in about 2013. A satellite instrument, LISA, with much longer baselines and much lower frequencies is also planned for the 2010s.

Only one result of the S5 data analysis has so far been released, which is that the gamma-ray burst from GRB 070201, if it is in M31 as it appears to be, cannot be the result of a binary coalescing. All other results announced so far are from S4, or other instruments, and give only upper limits. These concern burst sources, like binaries coalescing, periodic sources such as pulsars, and cosmological backgrounds. The good news is that the best of these limits are only just above the highest predicted amounts from known objects like pulsars, X-ray sources etc. It would not be a surprise if Enhanced LIGO found something, and it would be a great surprise if Advanced LIGO found nothing. What would be the most interesting, of course, would be to find something unexpected!

ENJOYING MY NEW 8-INCH SCT by member Gary Walker

I took the plunge, and after having to make do with my old trusty 60mm refractor, from *Dixons*, I bought a Meade 8" SCT from last year's Astrofest. It has full GOTO facility, making it easy to find the more obscure objects. I observe all sorts of astronomical objects - planets, double stars, galaxies, planetary nebula, globular and open clusters. I thought I'd describe the appearance of some objects that I have seen in a year of observations, through the 8" SCT.

Planets - Venus - Phases seen easily, and it can be observed during daylight hours, which is a lot better than having to get up at dawn, in order to see it!

Mars- I have been observing the 2007/2008 apparition. With my telescope, I can pick out the dark markings on it, but little else. I thought I could glimpse them as early as August 26th 2007, when Mars was only 7.7" in size. The dark features of Syrtis Major, Mare Tyrehuim and Mare Serpentum appeared like a trident or bird's claw, when fully seen on the disk, around opposition. I usually use a Wratten 23A filter for this. With the Wratten 80A filter, I could see a bluish rim to the southern limb of Mars. I don't know if this represents limb haze, or not (eg on December 15-16 2007). With this filter, I could still see dark features on Mars. I don't know if this indicated a *Blue -Violet Clearing*, or not, as this filter should not normally show dark features? Now, of course, Mars is shrinking in size, and features becoming harder to see!

Jupiter - I could see up to 8 belts and zones with the 8"SCT, on September 12th 2007. From North to South these were:
1) Dark Zone at top (North) on Jupiter. 2) Bright Zone, fairly wide. 3) Main Dark Belt - most prominent feature upon Jupiter. 4) Bright zone between Nos 3 and 5 - criss-crossed by festoons or waves (which were seen with difficulty as they were faint). 5) Lower dark belt - much thinner than No. 3. 6) 1-2 thin, dark belts. 7) A brilliant, white band Zone, quite wide. 8) Dark zone at bottom (south) of Jupiter.

Saturn - I have occasionally seen the Cassini Division, in 2007, at high powers, on part of the rings. I can often pick out at least 4-5 satellites including Titan. The closer-in moons to Saturn appear like a swarm of gnats! The planet's glare is bright, though, making fainter moons hard or impossible to see. I can also see the Southern Equatorial Belt.

Uranus- This planet appears slightly bluish even with the lowest power (x66). At highest power (x333), it appears as a tiny blue-turquoise ball, quite beautiful to see. It resembles certain planetary nebula, such as NGC 2392.

Neptune- This appears dimmer than **Uranus**, but I could still see the bluish colour, even at x66. The disk became visible at x100, and as a tiny ball at x333.

Deep Sky Objects : M42- This appears rather like a bird, as two "wings" can be seen extending NE-SW. The central part of the nebula is the brightest, appearing as a "box", with a straight edge on it's Western side. The most impressive thing about this nebula, is that it clearly appears greenish in the 8" SCT, whereas in the 60mm refractor, it only appears as a grey, oval, fuzzy, patch!

Planetary Nebula: M97- Appears as a large fuzzy disk, I'm not sure if I could see the "eyes" or not. **M46** with **NGC 2438** - M46 appears as a beautiful spray of stars. **NGC 2438** could be seen 'within' it, but it showed up much clearer with an Oxygen III filter, and resembled a fainter version of M57. Without the filter, it just appeared as a fuzzy patch.

M57 - Appears clearly as a "smoke ring" or oval doughnut, even at low powers, and improves at higher powers. The ring and hollow is clearly seen in the 8" SCT, but with the 60mm refractor, **M57**, was only just visible.

M27- Appears as a bright clearly "hour glass" shaped grey object, that appears to "hang" in a rich field of stars, in the 8" SCT. Surprisingly enough, this was one object, that my 60mm refractor showed up better, than it appears in binoculars, appearing as a squarish patch, quite distinct!



NGC 6543, NGC 6392, "Ghost of Jupiter" (NGC 3242) and NGC 6572 - appear as small, bluish disks. NGC 7009- "Saturn Nebula" - Small grey disk at low powers- slightly elongated at high powers? M76- Clearly visible, appearing as smaller and dimmer version of M27, orientated E-W.

Galaxies: M81 - Appears as a bright fuzzy circular patch, with fainter surround. M82- Appears striking, as a band of light, mottling visible. M65 - appears as a circular fuzzy patch. NGC 3628 - This companion to M65 and M66 appears much dimmer than either, and is only just visible! M66 - Clearly orientated E-W. This, and M65 easily seen in same field of view at low powers.

M51- Appears as two fuzzy "stars", with a hint of haze, but no spiral structure seen. NGC 7331- Can be clearly seen orientated N-S, quite bright, and brighter in centre. M31- Oval fuzzy patch, bright centre, dim fuzz outside this. M110 - Dim, fuzzy patch, diffuse, apparently well separated from M31, (because the outer parts of M31 are not visible in my telescope but only on long exposure photographs). Similar to M33. M32- Appears as fuzzy "star", small and fairly condensed, appearing like an unresolved globular cluster, with bright centre. M33- Can only see the centre of this, as a large, dim, oval patch. It is better seen in binoculars as a large dim fuzzy patch.

Star Clusters: M11- A mass of delicate stars with one bright star on lower edge of it. Appears better at higher powers. Stars are in triangular or V shape. M13- Appears as ball of stars even at low powers. At high powers, stars (all rather dim) can be seen extending outwards from centre. **Perseus Double Cluster** – is glorious, two concentrations of stars.

The Sun: I bought an Orion glass solar filter to fit my 8" SCT at this year's Astrofest, but mostly the Sun has been frustratingly blank, appearing just as a circle of light! However, I did see a tiny sunspot on March 3rd 2008!
to be continued in next Janus...

MEETING REPORT: Friday April 11th Dr Darren Baskill -Leicester Uni spoke on X Rays & Cataclysmic Variables.

In 1855 J Rind discovered V Gemni while looking for planets. Unusually, it was a blue variable, when most variables are red, also it brightened very rapidly, in the manner of stars known as nova. However it began, and remained, blue in colour, retaining the brightness for some days, then faded. This sequence then repeated itself after a few months. This and other similar stars discovered later came to be called Cataclysmic Variables. CV stars suddenly become over 100 times brighter, six orders of magnitude, within a few hours and, having brightened in a few hours, the star remains bright for several days before fading. After some months, sometimes years, the star repeats the performance in a regular pattern.

For a long time astronomers were puzzled as to the cause of this brightening. Then it was noticed that many of these stars also became less bright at short intervals, a pattern typical of eclipsing variables, that is, two stars orbiting each other very closely with each eclipsing the other and reducing the overall brightness. This is the first means of identifying close binaries when the stars are too far away to be seen separately. Of course this can only happen when the stars plane of orbit is in the line of sight from Earth.

Another particular feature of CV stars is that they emit strong bursts of X-rays which become intense as they brighten several magnitudes. All these things give clues as to the nature these stars. Spectroscopic examination shows an interwoven pattern of a normal star and a white dwarf. Also the spectrum has broad emission and absorption lines indicating both red and blue shift, the mark of something rotating rapidly. It is now known that they are a binary pair, consisting of a normal star and one which, having reached the end of its Main Sequence life, has collapsed into a small but very dense body known as a white dwarf. White dwarfs are about the size of Earth but contain as much material as in the Sun. Typically the two stars orbit each other in less than ten hours.

The intense gravity of the white dwarf drags gas from the normal star and as the stream of gas circles around the dwarf it forms a fast spinning accretion disk, turning once every ten seconds, before falling on to the surface. In a variation, where the dwarf has a strong magnetic field, the gas spirals into its poles, much as particles from the solar wind are attracted to the Earth's poles, causing the aurora. At regular intervals the very fast moving gas, reaching speeds close to that of light, builds up in the disk, triggering atomic reactions which produce an enormous amount of radiation in a wide band of wave lengths including visible light and X-rays. This is the cause of the immense brightening of CV stars.

Dr Baskill then spoke about the European XMM Newton satellite which has two X-ray and one visible light telescopes. The satellite, successfully launched by the then still unproven Ariane rocket, looks at CVs from a polar orbit around the Earth. This enables the Earth's magnetic field to be recognised and deducted from any magnetic CV being studied. Over 500 CVs have been discovered to date. They include 55 Cyg. which lights up for six days once every 50 days and Z Cam. which brightens from magnitude 13.3 to 10.7. Amateurs play an important part in the discovery of CV objects, informing professionals of new finds, which can then be studied with high-tech equipment. *Alan Lane*



TESTING A NEW CCD CAMERA

by Maurice Gavin

My visit to Headley observing session in May brought home to me my advancing years and I found it uncomfortable viewing through finders

and eyepieces of Dobsonian and Newtonian telescopes members had brought along. The convenient downward view via the star-diagonal on the Schmidt Cassegrain Telescope [like mine at home] was a blessed relief! But initially aiming my own scope back home, via a conventional finder scope, still leaves much to be desired and it set me thinking.

Years back I temporarily piggybacked my CCD camera, coupled to a regular SLR camera lens, onto my Meade LX200 SCT for wide views of the sky – something like this needed resurrection as an *electronic finder* and I contacted Terry Platt of Starlight Xpress cameras. Terry kindly made available their latest camera – the *Lodestar* CCD camera [above]. The *Lodestar* is primarily designed for autoguiding a main telescope during deep-sky astrophotography but also works as an imager in its own right. It is of diminutive proportions and sized like a regular 1-1/4" eyepiece and weighs just a few grams. Unlike the remaining SX range of cameras it's their first un-cooled camera - being powered direct via a USB lead from a laptop like popular webcams – giving complete freedom a mains supply. Thereafter the similarities to a webcam evaporate - the *Lodestar's* CCD has an ultra sensitive monochrome chip of high 752 x 580 pixel resolution with camera exposure range from 1/1000sec [in daylight] to many minutes duration [for deep-sky objects]. The limiting factor for long exposures [in an un-cooled camera] is 'thermal noise' but the camera has routines to remove these 'noise' artefacts which can appear like false stars in the raw image.

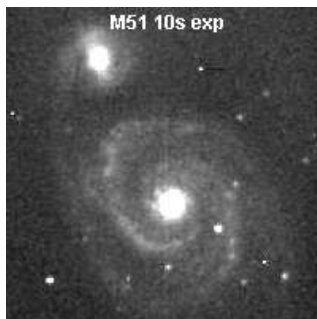
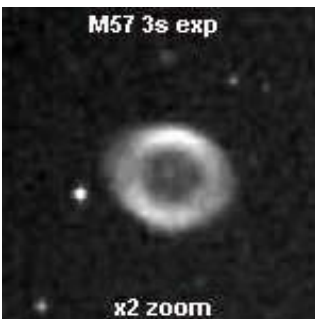
Finder use: To test the system I swapped my regular 8x50 [optical] finder on my telescope [right] for the *Lodestar* coupled to an old Zenith 58mm fl f/2 camera lens and set it into the finder bracket. The 6 x 4 degree field of view proved much larger than the optical finder and with exposures of just a second or so stars fainter than seen by eye alone where continuously displayed on the laptop screen! By increasing the camera exposure to nearly 60 seconds stars down to mag 11 were being displayed – and with a tweak of image contrast even the form of many deep-sky Messier objects like the *Whirlpool Galaxy* M51 [lower right] via 58mm fl f/2 camera lens in *finder* mode.

Alignment of the *electronic finder* with main 'scope proved straight-forward - sight a bright star, like *Arcturus*, through the main scope and carefully mark with [removable!] felt-tipped pen the bright star on laptop screen defined as Arcturus. Thereafter any star, as the telescope is slewed across the sky, that falls on the 'marker' will be visible through the main telescope. With the large sky field displayed precise centring and alignment with the main 'scope is unnecessary.

I tested a second option [above] – a minicam tv lens from the junk-box eg a 8mm fl *fast* f/1.3 'C' mount lens that screws direct into *Lodestar* front thread. The lens's tiny focal length gave a huge 43 x 30 degree field of view that encompassed several constellations in a single frame like a starchart! Stars to magnitude 7 [below naked eye limit] could be seen on the laptop screen. Due to the huge sky coverage the camera had to be fixed to the front of the telescope otherwise its view would be blocked by the telescope itself and [within my observatory] by the small shutter opening. The *Lodestar* camera was performing far better than I imagined and was probably too good to be hogged solely as an *electronic finder* - welcome that I would find it

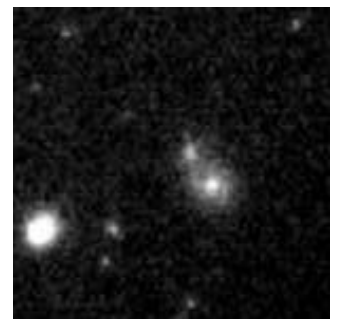
Live-View imaging: I've long been fascinated by views of the night sky presented in real-time on a tv monitor or laptop screen. This is not for everyone – the vast majority of amateur astronomers *must* look through an eyepiece and have real photons impinge onto the retina – something I was found equally essential early on. Beyond the brilliant moon and brighter planets telescopes can disappoint. However many friends, relatives and especially children are unaccustomed to peering through eyepieces and a video-screen presentation is commonplace nowadays and, of course, a whole audience can view at the same time and share the experience which becomes interactive.

The *Lodestar* camera didn't disappoint. To get the maximum *speed* out of my 30cm SCT I adjusted my Meade focal reducer to boost the effective telescope *speed* from f/10 to a blazingly fast f/2.6! This helps when recording faint diffuse objects like galaxies and keeps the camera exposures brief – essential for a *live-view* experience with rapid picture refresh. A dozen or so galaxy images were captured in an hour with each galaxy outline being visible on the laptop screen after a few seconds exposure and reveals the potential of this technique. Globular cluster M5 [front cover]; M57+ M51 [below] are via my Meade 30cm SCT in short exposures using the *Lodestar* camera. Normally a very large telescope on a very dark site is needed to satisfactorily view these faint deepsky objects by eye.



<<M57 central star in M57; 3s exposure
<<spiral galaxy M51; 10s exposure via 30cm SCT

Form of M51 via a tiny 58mm fl camera lens in finder mode>>



WOULD YOU LIKE A FREE TELESCOPE? An anonymous member has kindly donated some Meade starter telescopes complete with tripod, goto *Autostar* handbox [1000+ object memory], manual and instruction DVD/ software – each needs new batteries, additional eyepieces and maybe a finder etc. Preference given to beginners and junior members but they must go to good homes where they get used.



Members interested should contact/email Maurice Gavin - *Janus* Editor. If, on being offered a telescope, you would like to make a donation to the Society funds it would be appreciated but is not obligatory. Shown are the Meade DS-2114 reflector [left]; DS_2090 refractor [centre] and table-top ETX-70 [right - but no tripod]. Manuals at <http://www.meade.com/manuals/index.html>

Brief test : On collection of above I had a brief opportunity to test the DS-2090 refractor [centre] back home in simple manual [push 'n go] mode. With its larger 90mm f/9 coated objective the viewing experience proved superior to normal beginner's telescopes. Crisp diffraction rings were around brighter stars and close double stars, like the *Double-Double* in Lyra, were clearly resolved. Globular cluster M13 in Hercules was just resolved into faint stars with high power x200 eyepiece. Although no Cassini Division seen in Saturn's rings, the view was excellent. All this through a hazy and indifferent late twilight sky! Members will have seen in *Janus* over that last year some images I've obtained with an ETX-70 model [right] -each *Autostar* handbox will automatically point 'scope to loads of objects plus Moon & planets.

EWELL AS SUBSCRIPTIONS: The Society annual subscriptions are due on January 1st and some members are long overdue! Please forward your sub [member £15; family £18; junior £5 made payable to Ewell Astro Soc] to... EAS Treasurer - Valerie May, 41 The Green, Burgh Heath, Tadworth, Surrey KT205NP; phone: 01737361486

JANUS CONTRIBUTIONS – CAN YOU HELP? *Janus* always needs *your contribution for your newsletter!* If you have any astro observations, pictures, articles or notes please email it to mgavin@ntlworld.com or hand it to Maurice Gavin on a floppy disk or CD. Thanks.

SOCIETY INSURANCE - The Society's personal liability insurance is covered by the Nonsuch HS insurance but only for events on the school's premises. Outside visits, like observing sessions etc, are at the members/ visitors own risk.

ASTRONOMIA = NEW ASTRO SHOP IN TOWN – 246 High Street - Dorking - tel: 01306 640 714

SECRETARY'S POST & THE NIGHT SKY PRESENTATIONS FOR SOCIETY – appeal by our Chairman
As Chairman I am writing to appeal to you for volunteers in connection with the above duties for the Society. We are currently operating without a Secretary and we could do with more volunteers for the 'Night Sky' talks following the guest speaker's lectures, at our regular monthly meetings.

The Secretary: This is an interesting and varied post with contact through all mediums. As you are aware we have a Society Webb Page. Prospective members, guest speakers, other societies or in fact any individuals may contact the Secretary at anytime. Enquires range across the astronomical spectrum and can include: new memberships, meeting details, assistance from schools concerning telescopes etc. Ideally, you should enjoy meeting with people and be good at communication. As Secretary your input will be regular and you will need to attend the majority of meetings: (about 6 committee meetings a year and 11 regular monthly meetings). A final point, you are welcome to 'shadow' at our future committee meetings to see how we organise the running of the Society and the above referred to tasks.

If you are interested in taking on the Secretaryship even if only for a few months please contact either myself or anyone on the committee.

The Night Sky Presentations - As you know these typically cover the constellations visible over a given monthly period including objects of interest, i.e.: planetary positions, deep sky objects etc. We on committee would be happy to accommodate any members or visitors who wish to do a monthly presentation. Advance notice must be given though to me or anyone on committee because presentations are usually arranged a few months ahead. For example at the time of writing, meetings are booked for June, July and August.

You may use any medium preferably a visual one whether it be: desktop publishing with a lap top, overhead slides or flip charts etc. It is advisable however to arrange to test out your equipment/ presentation in advance of the meeting night.

If you are interested in presenting The Night Sky even if only for a one-off please contact either myself or anyone on the committee. David Cooper - Chairman - Ewell Astronomical Society Tel: 020 8393 9906 - April 2008