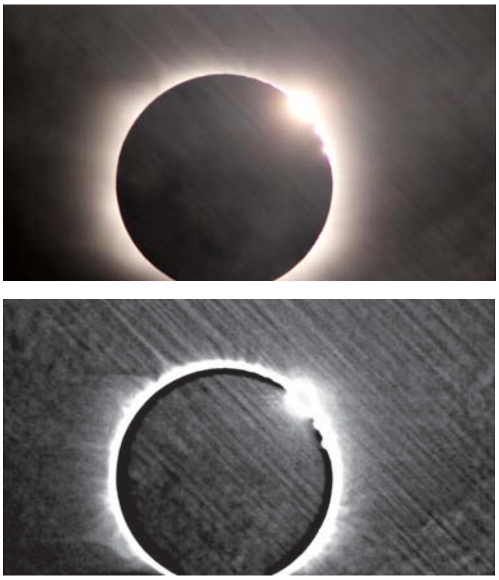
Flickering shadow bands – data buried in videos?

From Dr J. Eric Jones

I was interested to see the article by Nick James in the October *Journal* (*JBAA*, **120**(5), p.317) reporting imaging of shadow bands on thin cloud during the 2010 total solar eclipse.

For some years (as part of experiments to determine solar diameter variation) I have been videoing total eclipses and it occurred to me recently that a by-product may have been inadvertent recording of shadow band activity. If a video camera is pointed at the Sun using a fairly large magnification and the protective solar filter is removed a minute or so before totality, a very overexposed image occurs with 'rays' extending from the last bit of the Sun. These 'rays' reduce in size and disappear at the moment of totality and then reappear after third contact.



Shadow bands recorded on thin cloud at the total solar eclipse of 2010 July 11. *Nick James*.

Whilst doing my timing analysis of the 2006 eclipse tape, looking again and again at the image, it struck me that there is flickering within the 'rays' coming from the overexposed image of the last portion of the photosphere and that this flickering does seem to coincide with the shouts of 'shadow bands' when seen by observers nearby. Shadow bands were very intense in 2006 at our location in Southern Libya. If this flickering is due to shadow bands then perhaps spectral techniques or other methods applied to these images may provide some kind of scientific information about the bands.

To gather evidence for this possibility I have looked at my videos of the 2006, 1998, 2008 and 1991 eclipses when shadow bands were certainly seen. In each case flickering is definitely seen and the stronger the bands the more intense the flickering. In other eclipse videos taken on occasions when no shadow bands were seen (unfortunately this includes the 1994 eclipse observed at an altitude of 4,500m) very little or no flickering occurs.

In 1991 shadow bands were recorded by Eric Strach at San José del Cabo, Mexico. In our eclipse video taken at a location some 200 metres away we do see flickering in the 'rays' preceding totality. However what is interesting is that by great coincidence just a minute before totality an aircraft flew between us and the eclipsed Sun. This aircraft must have taken off from the nearby airport and was presumably not at a great distance above the ground; it certainly sounds close on the soundtrack. However the effect on the flickering of the rays on the video image was remarkable. There was a sudden intensification of the flickering which gradually subsided over the next 10 seconds or so, which suggests the possibility that we were seeing the effect of the turbulence trail left by the aircraft. This therefore suggests that the flickering we are seeing is not an artefact of the camera but is a real effect of processes in the atmosphere.

If this flickering is an actual measure of shadow band activity, then this infers that there are large amounts of data relevant to shadow band studies just lying around in thousands of video records of eclipses. It also suggests, if difficult to arrange, the use of aircraft to 'eclipse the eclipse' to see their effect on shadow bands.

J. Eric Jones *(Llandyrnog Astronomical Society)*

10 Maes Tyrnog, Llandyrnog, Denbigh, LL16 4EW. [j.jones317@btinternet.com]

A green flash and a green meteor

From Mr Tom Lloyd–Evans

Two items in the August *Journal*, both concerning green astronomical objects, caught my attention.

I long ago despaired of seeing a convincing example of the green flash, as it always seemed that the observation was dominated and rendered suspect by the afterimage of the red setting Sun. Then I read a suggestion by Rod Davies that it was preferable to look for it at sunrise, with the additional advantage of air which is clearer because the aerosols have partly settled out. I found this to be the complete solution and saw the flash almost every time I looked, from the South African Astronomical Observatory in the Karoo region of South Africa. The flash on the clearest mornings was not green, but a vivid blue.

The cover photograph and another on p.195, both of Perseid meteors, showed the meteor as green in the initial part of its path, changing to orange later on. The green hue is almost certainly real, and not a photographic effect, as the second trail, which lacks a terminal burst, does not return to green as it fades away. A plausible explanation of the green colour on the highest portion of the path is that the spectrum of the meteor is initially dominated by the green forbidden (auroral) line of oxygen. This line, [OI] (3F) at 557.7nm, is often seen in the early part of the spectra of meteors of high velocity. An example, of its appearance in the spectrum of a Perseid meteor observed by the writer in 1959, was published in the *Journal*, Vol **76**, p.231 (1966).

Tom Lloyd–Evans

Strath House, 5 Kinaldy Meadows, St Andrews, Fife, KY16 8NA [tomlene@hotmail.com]

Charles Lewis Brook (1855–1939)

From Dr Jeremy Shears

I am writing a paper for the *Journal* on the life and work of Charles Lewis Brook (1855–1939). Brook was the third Director of the BAA Variable Star Section (1910–1921), as well as being a director of the international textile and thread company of J & P Coats Ltd. He lived in Meltham, near Huddersfield. I am seeking a photograph of Brook and if anyone knows of the existence of such, I would be most interested to hear from them.

Jeremy Shears

'Pemberton', School Lane, Bunbury, Tarporley, Cheshire, CW6 9NR [bunburyobservatory@hotmail.com]

Letters

Dark spots on the Sun in H-alpha

From Mr Eric Strach

Observations by the author in hydrogen alpha light using a Celestron 8 and a Coronado Solar Max 60 with a ×2 Barlow, reveal that sometimes a dark spot is seen where no sunspot is present. It is also established that this was not dust on the CCD. The same features have been seen by professionals at Meudon Observatory, Pic du Midi Observatory etc.

Criteria for observing are:

– There must be no sunspot present (proved by professional observations);
– The dark spot must have been seen by professionals [in Hα] to exclude the possibility of its being dust on the CCD or optics;
– Ideally the time around sunspot minimum would be best though not necessarily so.

To meet the criteria listed, it is clear that such conditions will be very rare but just a few observations would prove the reality of the feature. Such a spot was seen on 2009 January 20. Professional findings confirm that there was no sunspot on this date, indicating that the spot was likely to be a filament seen in line of sight. An observation made on 2009 May 21 at 08:55 UT shows a normal filament with a small spot close by.

Correspondence with Alan Heath revealed that he too had seen such a feature, at a time when there were some sunspots but not where the dark spot was seen. The dates given by Heath are 2005 Aug 27, 07:40 UT; 2005 Sept 24, 07:35 UT and 2005 Oct 15, 10:45 UT. He also saw a group of three close spots on 2007 May 03, 12:15 UT.

A filament in line of sight is the most likely explanation and it is hoped that others will look for such a feature in the future, providing it is confirmed that an ordinary sunspot was not located in that position.

My thanks are extended to Alan Heath who assisted in the preparation of this letter.

Eric Strach

7 Tower Way, Woolton Park, Liverpool, L25 6EB

A 70mm diameter Crayford focuser

From Mr John Wall

Recently I was commissioned by the York Astronomical Society to design and build a very large Crayford focuser for their 300mm aperture reflector. As the mirror was made by Jim Hysom, it was imperative that I turn out a well finished high quality job. The focuser is unusual in that it had to carry a 70mm diameter focusing tube; at first the society tried to get one made by one of the commercial producers, but with not much luck.

The focuser is multi-purpose as various tubes carrying different pieces of apparatus had to be interchanged during observing sessions; there are no focusers in the commercial field which are capable of this facility, but my focusers are. I decided to use the Crayford Eyepiece Mount or CEM, the classical design, for this purpose.

The focuser was constructed from 2"×2"×¼" aluminium angle section for the main body, and 1½"×1½" aluminium angle for other parts. The focusing pinion is 6mm diameter, and made from precision ground high carbon steel; this runs in two sintered bronze oil-impregnated bushes, in the pinion bracket. The pinion bracket can be moved upward by releasing two compression finger nuts on the frame. The tube runs on four 16mm outside diameter ball races.

A 6:1 reduction fine focus gear was built into the coarse focusing knob, with a smaller fine focus knob placed just above it. The gear pinion which engages the coarse focus can be disengaged by pulling the fine focus knob sideways, and is pushed in to engage. The unit was assembled using M5 screws and bonding with epoxy glue. All parts were hand finished with No.600 carbon rubbing down paper and white spirit. All knobs were turned up on a lathe, the only machining that was carried out.

The coarse focusing action is very smooth under load, and fine focus achieved by tweaking the fine focus knob. The focuser is now in the hands of the YAS for assembly on their uprated flagship telescope.

John Wall

73 Ansty Road, Coventry, CV2 3FG.

The double star with the greatest colour contrast

From Mr Abdul Ahad

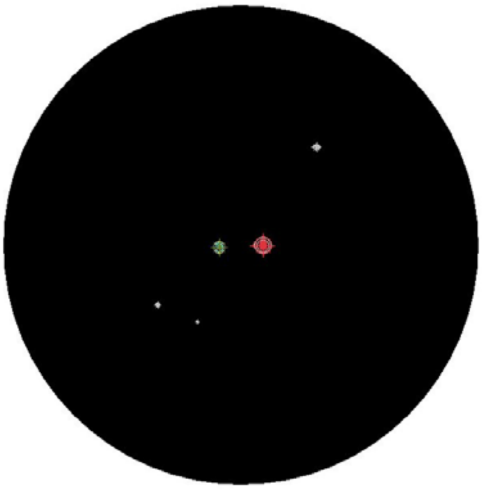
Appreciating the colours of double stars in the eyepiece surely has to be among the most pleasurable of all experiences in visual astronomy. This viewing pleasure becomes even more enhanced if the two components in the double system happen to be of contrasting colours. Since the first telescopes were turned to the sky a few centuries ago, a number of colourful pairs have emerged as clear favourites among double star enthusiasts that top the charts, time and time again. These 'classical doubles', as I would describe them, often consist of reddish primaries accompanied by bluish-green companions, of which Albireo (Beta Cygni), Almaach (Gamma Andromedae), Rasalgethi (Alpha Herculis) and 95 Herculis are prominent examples.

The colour contrast between the two individual components of a double star system becomes greatest when the stars each shine with a light that is at the opposite end of the visible part of the electromagnetic spectrum. That is to say, a red star sitting next to a blue star will produce a greater colour contrast effect in the eyepiece compared to, say, an orange star viewed next to a yellowish companion. This is one of the main reasons why the 'classical doubles' are so highly cherished by amateurs, especially among newcomers to this hobby.

Generally speaking though, descriptions of double star colours are quite subjective and have been known to vary markedly among individual observers. So is there any 'objective' method of determining double star colours? Fortunately there is! In my colour-ranking catalogue of the reddest stars, that I had originally compiled going back to the 1980s, stars are ranked according to their colour indices, B–V. This same technique can be applied to individual components of double stars to gauge their colours. The difference between the B–V values of each star in a pair will then yield a numerical value of the relative contrast between them. Using this method of 'colour differencing', it is thus possible to evaluate the colour contrasts for all visual double stars.

The reddest stars in the sky are of course the carbon stars, whose light is intrinsically reddened by chemical processes within their atmospheres, giving them highly positive B–V colour index values. Consequently, it follows that double star systems in which one component happens to be a deeply red-tinted carbon star and the other a star of non-carbon classification, will have higher than average colour contrasts.

Based on an analysis of 110 carbon stars dotted across the sky brighter than magnitude 8.5,[1] I have determined the double star



Drawing of the starfield around WZ Cas by Abdul Ahad

WZ Cassiopeiae (Otto Struve 254) to be the system with the greatest colour contrast, both visually as well as numerically, out of all double stars in the sky.

The primary in this pair is a deep red variable carbon star of 7th magnitude average brightness, with a colour index, B–V, of +3.08.[2] The secondary is an 8.3 mag A0-class main sequence dwarf of B–V 0.00. Thus the colour index difference between them is a high figure of 3.08.

It should be noted that, in my analysis, there were a couple of other close contenders to WZ Cas in this league, but they proved inferior for one reason or another as follows. U Antliae in the far southern skies is a deep red carbon star, varying around a central magnitude of 6.5. Like WZ Cas, it too has an A0-class colour contrasting companion, albeit much fainter at magnitude 8.7. However, the companion of U Ant (HD 91756) has a B–V of +0.4, with U Ant itself having a B–V of +3.28, giving a net difference of 2.88 between them in the pair as a whole, which is noticeably less than WZ Cas at 3.08.

The red variable star U Cygni in the far northern sky was found to be yet another beautiful object, paired with a (brighter) blue companion of mag 7.8 sitting only 65 arcseconds away. However, this pair did not rank as high as WZ Cas for the fact that the red star is actually a Mira-type variable, pulsating with a much greater amplitude than WZ Cas and fading to as faint as 12th magnitude at minimum. Also, the companion star (HD 193700) happens to be a yellow G0-class main sequence dwarf, having a colour index B–V of +0.8, compared to U Cyg's B–V of +3.08, giving a net difference of 2.28 magnitudes for the pair as a whole. This again is considerably less than the 3.08 of WZ Cas.

I have personally found WZ Cas to be two fine points of twinkling light of rose-red and greenish silver hues, set against the coal blackness of the sky. The colours were best seen through $\times$36 and $\times$100 Plössl eyepieces of my Skywatcher 8-inch Newtonian reflector. I hope readers of this column will take pleasure to observe this pair on the next clear night and see if they concur with my descriptions and ranking of WZ Cas as 'the most colour contrasted' of all double stars in the sky.

Abdul Ahad

100 Selbourne Road, Luton, Bedfordshire, LU4 8LR [aa_spaceagent@yahoo.co.uk]

1 List of carbon stars, **http://www.astrosurf.com/buil/us/peculiar2/carbon.htm**
2 *SIMBAD* database online

Asteroid (1036) Ganymed

From M. Jean Meeus

The BAA *Handbook* for 2011 gives, on page 47, a short ephemeris for asteroid 1036 Ganymed. Next year's will be a very favourable apparition of that object.

Ganymed (not to be confused with Jupiter's third satellite, Ganymede) was discovered by W. Baade at the Bergedorf Observatory, near Hamburg, Germany, on 1924 October 23. It has a revolution period of 4.35 years. Presently, its orbital inclination on the plane of the ecliptic is 26.7°, its orbital eccentricity is 0.534, perihelion distance 1.24 AU, and aphelion distance 4.09 AU. The diameter of Ganymed is 32 kilometers. The asteroid will be at high northern declination, +65°, during the last days of August 2011, then will pass only 6 arcminutes east of Gamma Cas on September 14 at 14h UT, and 1° west of Alpha Ari on October 21 at 11h.

Its least distance to the Earth will be 0.3591 AU, on October 13 at 0h, and this will be the shortest distance to us of the whole period 1900–2100. However, a still smaller approach, 0.3239 AU, took place on 1898 October 12, but at that time the asteroid was not yet discovered.

Jean Meeus

Leuvense Steenweg 312, Box 8, 3070 Kortenberg, Belgium [jmeeus@skynet.be]

'A cost-effective low power eyepiece'

From Mr David H. Frydman

Simon Dawes' letter in the October *Journal* (**120**(5), 322) regarding a low power eyepiece recalls a topic discussed before.

Members should be aware that there is a problem with using standard camera lenses from the 1950s to the 1970s as eyepieces, as many contain radioactive thorium. Although the eye relief is usually sufficient to avoid problems, some have almost nil eye relief.

Millions of thorium glass lenses were made from 1940 to 1978 and I would avoid using lenses from this period. Usually they have a yellow or brownish cast when viewing white paper. I would particularly avoid the Wray 50mm f/1.0.

See my short paper 'Radioactive lenses as eyepieces', in *JBAA* vol. **98**(6), p.309 (1988), and also my letter in vol. **97**(2), p.75 (1987).

David Frydman

6 Berkeley Court, Ravenscroft Avenue, London NW11 8BG

Observing Saturn

From Paul G. Abel & Alan W. Heath

We note the responses from David Arditti and from the Director of the Saturn Section to our letter in the June *Journal* (**120**(3), 184). We are pleased that the Director will continue to value the importance of visual observations in apparition reports.

We were not in any way casting doubts on the hard work and good contributions made by experienced imaging observers. Both visual and imaging observers should work together and not in opposition to obtain the best scientific results with their setups.

The point that we were trying to make is that some observers have been overprocessing their images very much, and without any visual backup such images lack scientific credibility. It is reassuring to know that care is taken when selecting from images submitted to the Section.

The debate of imaging *vs*. visual is largely a false one – the debate should be about observing skills and the adoption of the scientific ethic *vs*. the 'butterfly astronomer effect'. This is someone who spends little time learning how to observe in a scientific fashion and observes randomly, producing results which look pretty, but are scientifically worthless and may even be misleading.

It is surely the job of the BAA to preserve the principles of science and the scientific methodology which have always been the core of observational astronomy, both amateur and professional.

Paul G. Abel

Dept of Physics & Astronomy, University of Leicester, Leicester LE1 7RH [paul.abel@yahoo.co.uk]

Alan W. Heath

6 Harlaxton Drive, Long Eaton, Nottingham NG10 2ER

(This correspondence is now closed. – Ed.)