Letters

McClean star spectroscopes: the mystery solved

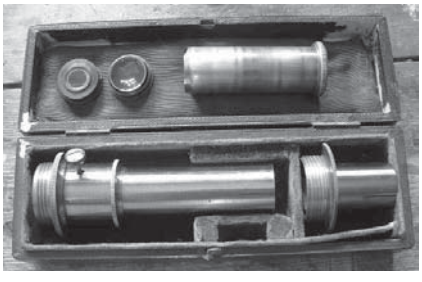
From Mr Brian Manning

Following my letter in the *Journal* in October 2005 [*JBAA*, **115**(5), 296 (2005)], I have had three responses. The first was from Dr O. Macnamara of Abberley, Worcs., who recounts an unsuccessful attempt with his brother in 1932 to see star spectra with a McClean spectroscope, but they did observe solar prominences and the Orion nebula using the positive lens.

Following this I had an email from Barry Clark of Australia who has done much spectroscopy from Melbourne Observatory. Barry drew my attention to the excellent paper by E. T. H. Teague in the April 2001 *Journal*, [*JBAA*, **111**(2), 102 (2001)] describing and illustrating his observations of star spectra with such an instrument. I then had an email from Ben Smith of Florida University, and this solved the problem.

Ben has long been interested in the work of John Browning, the instrument maker of the Strand, London, and sent me a copy of a page in Browning's 1885 book *How to work with the Spectroscope*. This describes how the McClean spectroscope is used, which should have been obvious to me. It is used like a Galilean negative ocular, in other words the spectroscope with the 'negative cylindrical lens is placed inside focus by a distance about equal to its focal length' (my wording in the quotes). Browning says 'roughly, the eyecap of the spectroscope should be placed at the solar focus'. It should be noted that the cylindrical lens is placed so that its refraction is in the direction of dispersion of the prisms, and not across it as inferred by Bell in his book *The Telescope*, (similarly for Sidgewick), thus the lens does not directly widen the spectrum. Instead it collimates the beam in the plane of the spectrum so that the eye can focus on the spectrum, in effect the star image. The widening is just the effect of the light in the other plane being out of focus due to the close proximity of the eye to the star image. This error is misleading and I plead was partly the cause of my not realising how the McClean is applied.

I have three spectroscopes: the Watson & Sons version of McClean, a John Browning version of McClean and an Adam Hilger one, which is very similar but not specifically a star spectroscope. It is of very similar dimensions to the other two, but has only a spherical positive lens fitted to it and I have to tape the Watson cylindrical lens to it in place of the other one. It normally slides into a tube fitted with an adjustable slit.



Brian Manning's McClean spectroscope.

Regretfully I have to say now why I could see so little with the Watson McClean. When tested with a slit on the solar spectrum it barely showed any lines, and an interference test on the outer faces of the prisms revealed that both are 1.5 fringes, convex instead of flat. This is surprising because Watson of course made fine microscopes. The Browning was good on a solar spectrum and the Hilger gave superb resolution despite lower dispersion. A further point is that due to the extreme prism angles on both McClean spectroscopes about half the incident light is refracted onto the prism base and of course lost, leaving a quite narrow beam about 2mm by 5mm. The Hilger with slightly taller prisms of less angle passes a 4.2 by 4.5mm beam .

I have made some star observations with the Browning and Hilger spectroscopes, but with limited time and opportunities due to the weather, not as well as I should have liked. I used my 10-inch f7 reflector and also rigged up an 85mm triple lens I made long ago for my spectrohelioscope. Sirius and Betelgeuse (being prominent at a reasonable hour) were the test stars and chosen from Teague's paper. On Sirius using the 85mm lens and the Hilger and Browning spectroscopes I could see H-beta and H-gamma clearly, but had to remove the eyecap on the Browning because it cut off H-gamma. I could not see H-alpha or H-delta. Using the 10-inch reflector, the same only brighter.

On Betelgeuse using both the 85mm lens and 10-inch reflector and the Hilger spectroscope, two thick lines in the yellow and red could be seen and two similar in the green-blue. Using the Browning and 10-inch reflector the extra dispersion revealed a third line in the blue-violet and two faint narrow ones in the green. This was similar to Teague's drawing, except that the green lines as I saw them were less prominent and he shows lines farther into the violet. I have tried unsuccessfully to get information on the Zeiss pocket spectroscope as used by Teague; I imagine it may be superior to the Browning one, and is not I think a McClean because Teague gives a range of magnification for its use. The McClean magnification is fixed by the cylindrical lens fitted to it, and I assume that the Zeiss is a Zollner spectroscope placed at the exit pupil of an eyepiece, with a positive cylindrical lens at the eye end.

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'Where have all the observers gone'

From Mrs Lorna McCalman

I am in total agreement with the sentiments expressed by Alan Heath in his letter published in June *Journal* [**116**(3), 149 (2006)], that the increasing use of digital technology is resulting in the visual observer fast becoming an endangered species.

For quite some time, many column inches have been devoted to technology and the practitioners who use these techniques with very impressive results. This has had the unfortunate effect of leaving the visual observer feeling second-rate; that visual observing is an outmoded method of operation which produces somewhat less convincing results than its shiny new digital counterpart. There is no doubt that technology has revolutionised all aspects of astronomy and is an invaluable resource, but the old adage of not throwing out the baby with the bath water is particularly relevant here.

A demonstration of my point can be made when as part of an outing with the Scottish Astronomy Group we went to visit the ancient Pictish stones at Aberlemno in Tayside. We all piled out of the bus to look at the carved stones and afterwards on the way back to Dundee, Ron Livesey, former Director of the BAA Aurora Section, asked me if I had seen the stones. I thought it rather an odd question as this had been the whole point of the outing. I answered in the affirmative, to which Ron observed that it was true that most people had taken photographs of the stones and made admiring noises, before returning to the bus. Ron then produced a beautiful sketch of the stones showing their detailed designs and I realised that I had not really seen the stones at all.

How many amateur astronomers have become celestial tourists, thinking they have *seen* an object when they have simply looked at it as an image to be processed on a computer screen? Another object 'in the bag'.

The instant gratification provided by GPS systems allowing rapid location of almost any celestial object has its benefits, but the satisfaction gained from finding and being able to find the object by one's own skill and effort is far more rewarding and is an aspect ▸

Planetary observing has never been healthier

From Mr M. P. Mobberley

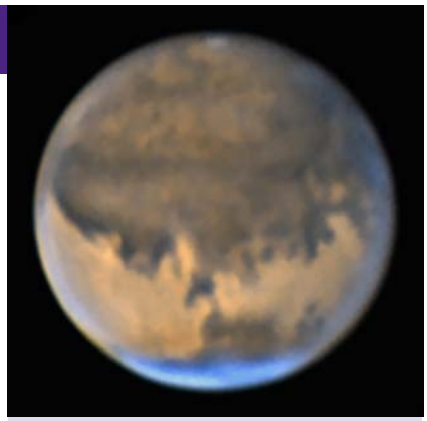
I would like to make a few comments regarding Alan Heath's letter in the June *Journal,* in which he describes planetary CCD imaging as 'push button' technology and 'fine if one just wishes to produce 'pretty pictures' '. I can sympathise with him to some extent: it must be very painful to have mastered the considerable skills necessary to observe fleeting details at the eyepiece, and transfer those observations accurately to paper, only to find that, in the last few years, a new technology has now surpassed 'eye and pencil' domination. But when one puts the pain aside it is obvious that CCD, or rather, *webcam* technology is a far more consistent, objective, reliable and high resolution way of obtaining scientific results. The *Cassini* and *Hubble* teams use enhanced CCD images and no-one queries the integrity of those digital pictures.

In fact, the differences between observers' results are far less controversial now than in the heyday of the visual observer. One only has to think of Lowell and his canals to realise just how easily the eye and brain can be fooled. If only Lowell had owned a webcam! In living memory there have been relatively few BAA observers who really could sketch precisely what they saw, without bias. In the cases of both George Alcock and Paul Doherty this led senior BAA members to cast doubt on what they could see with modest instruments and even to leave their fine drawings out of Section reports. The webcam has shown us that even small instruments can indeed reveal the fine details claimed by George and Paul, but not the illusory details 'seen' by many others.

In the early days of amateur digital imaging over-processing did occur, and artefacts did emerge. But in 2006 planetary imaging by amateurs is a mature technology and images are regularly scrutinised by dozens of peers worldwide within hours of their being taken. Often near-simultaneous images taken by multiple observers with different instruments allow objective analysis and a positional accuracy that is impossible with a sketch. The plotting of Jovian features drifting with time has reached professional levels within the BAA thanks to digital imaging and digital measurement by amateurs. Indeed, the webcam revolution has meant that planetary observing has never been so popular (surely a good thing) and it is no longer restricted to a tiny group of those with exceptional eyesight and drawing skills.

Personally, I find there are few things more fascinating and relaxing than observing the planets visually, when seeing is reasonable. But I know that if I want to faithfully record what I glimpsed, with maximum positional accuracy, I have to use the webcam. The next day I can tweak the contrast, gamma and colour balance to match what I saw visually, so there is still a visual role in the process.

It has taken me years to fully grasp this exciting new technology and change from being a planetary photographer. This is not a 'push-button' process at all; there is a huge input from the observer at the keyboard, as well as a nightly collimation ritual, rarely practised by all but the most dedicated visual observers. Each image takes many hours (or days) of work to complete and the concept of a 'push-button' approach is truly laughable – it is hard, but satisfying, work. I attach my favourite image from the recent 2005 Mars apparition. As far as I am concerned this accurately depicts the planet's appearance visually, through my Celestron 14, on the night of 2005 November 18. Just looking at this image gives me enormous satisfaction of 'a job well done' and great memories of the visual view that night.



Mars on 2005 Nov 18 at 22:30 UT. Image by Martin Mobberley with a Celestron 14 SCT at f/44, +Lumenera LU 075M CCD camera. The diameter of the planet was 18.8 arcsecs.

Finally, if there is one tradition the BAA should uphold it is that of moving with the times. We have always done so in the past and if we do not do it now the Association will definitely flounder and die in the 21st century.

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of amateur astronomy which should be actively encouraged and promoted.

I recently bought a 12" Dobsonian with absolutely no gizmos attached... no time-consuming fumbling around in the dark 'setting up', no adaptors, no wires to trip over, no batteries and electronics to malfunction in sub-zero temperatures. My most used instruments remain 15×80mm binoculars and a small 80mm refractor with which I make variable star brightness estimates and still find great pleasure in locating and actually *seeing* the object in the eyepiece. The immediacy of the object in the eyepiece is not something which can be replicated digitally or otherwise.

Three cheers for Mr Heath for standing up for the visual observer. There may be fewer of us around, but we have as valuable a contribution to make as any other.

Lorna McCalman

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The late Ronald Irving

From Mr J. C. Vetterlein

I should like to add a few words of appreciation to Christopher Lord's obituary of the late Ronald Irving of H. N. Irving and Son (*Journal* **116**(3), 146).

I first came to know Ron way back in 1956. I became a frequent visitor to his home and workshop. Both he and his wife, Joan, were of the kindliest disposition and always made me most welcome. I recall many an amusing lunch at table with the family and one of Ron's stalwart colleagues, Fred Penny, who was always rich in his vocabulary.

Later, when between jobs, I worked with Ron for about two years on a number of projects one of which was mentioned in the obituary. In 1963 the then owner of the Brightling Observatory, Commander Hugh Malleson, approached Ron with a view to refurbishing the lead-clad dome and providing a suitable telescope. Ron entrusted the design and most of the construction of a new dome to me. This was fully assembled in four sections, together with a double shutter, at the workshop. With the aid of Ron's brother, John, and Ron himself, we took the dome in parts to the site at Brightling where, in the course of eight hours, the old dome was removed and the new one put in place.

In 2001 I produced a monograph of the exercise (*The Brightling Observatory,* ISBN 1-902582-40-3). This was reissued this very month, June 2006. (Incidentally, the diameter of the dome was around 8 ft, not 14 ft as mentioned in the obituary notice – see photograph.)

I last spoke to Ron and Joan on the telephone about five years back. They sounded no different from when we last joked together (there are many opportunities for laughter in the engineering business) all those years ago at 258 Kingston Road. Rich memories indeed.

John C. Vetterlein

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Universal Time and UT1

From M. Jean Meeus

For about fifty years, the 'Universal Time' that is in use has actually been UT1. There is an official formula that gives the mean sidereal time at Greenwich as a function of UT1, but actually that formula *defines* UT1 as a function of the observed sidereal time.

The remarkable fact is that this 'new Universal Time' UT1 no longer refers to the Sun at all. On page 51 of the American *Explanatory Supplement to the Astronomical Almanac* (1992) we read that 'UT1 deviates secularly from solar time; however, the divergence is extremely small.' But the authors don't tell how large this divergence is. By the year 5000, will it be about 1 second, or 1 minute, or perhaps 1 hour?

Indeed, UT1 is bound to diverge from mean solar time, the 'true' UT that is locked to the mean Sun. But I don't think that many people realise that there is any divergence at all.

The difference between UT1 and the 'true' UT is approximately equal to 0.0027379 ΔT, where ΔT is the difference between the uniform Dynamical Time and Universal Time, and the numerical constant is equal to 1/365.242, the inverse of the length of the tropical year in days. For the year 2006, with ΔT= 65 seconds, this gives UT1–UT = 0.18 second. The quantity ΔT cannot be predicted accurately, but from estimated values it follows that in AD5000 the difference between UT1 and the 'true' UT will be about 89 seconds, a difference that is no longer negligible, though not catastrophic for current civil life. But by the year 10,000 the difference UT1–UT will have increased to about 10 minutes, and by the year 30,000 to an intolerable 2 hours.

Of course, the formula that connects the sidereal time to UT1 is not intended to remain in use for longer than a few millennia. Nevertheless, we might consider that the subject is a matter of principle, and we would have preferred to use the good old UT, that is connected to the actual mean Sun.

Jean Meeus

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'The Revd William Ludlam'

From Dr David Gavine

Two minor remarks on Martin Mobberley's excellent paper on the Cockfield Tower Observatory (*JBAA,* **116**(3), 119–126). The 'Scots' were not 'crushed at Culloden'; there were Scots on both sides. Indeed, most of the Lowland inhabitants, especially in Edinburgh and Glasgow, welcomed the defeat of the Highland rebellion which included only some of the clans.

Also, James Watt did not invent the steam engine. He improved its efficiency by introducing the separate condenser.

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From Mr John Farquharson

Apropos of Martin Mobberley's paper 'The Revd William Ludlam... and the Cockfield Tower Observatory', may I clarify the position regarding 'The Scots were crushed at the battle of Culloden in 1746.' This refers to Charles Edward Stuart (Bonnie Prince Charlie) and his Jacobite army which was defeated at Culloden by the British army led by the Duke of Cumberland. The battle was the suppression of a rebellion by the Jacobites who supported the claims of the House of Stuart to the throne.

A sad feature of Cumberland's victory was the atrocities committed by his soldiers on wounded Jacobites and the civil population, hence 'Culloden' does not appear on the battle honours of any regiment of the British Army.

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[We regret that this correspondence is now closed].