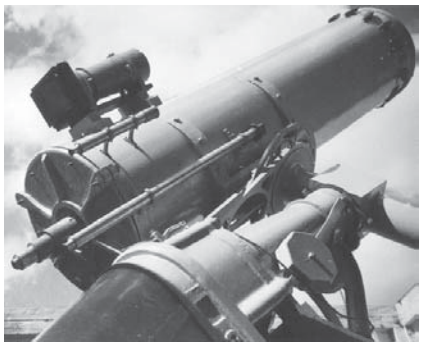
Letters

A forgotten Grubb telescope



From Mr Wayne Orchiston

By coincidence, I was about to lecture to the Sydney City Skywatchers (formerly the BAA New South Wales Branch) on a forgotten 20" (508mm) Grubb reflector, and just as I finished preparing my presentation the June BAA *Journal* arrived. The only image I was missing for my talk was a photograph of Henry Ellis – initial owner of the telescope – and there it was, accompanying Bob Marriott's interesting letter on page 177.

Grubb made the 20" reflector for Ellis during the 1890s, and in 1928, the year after he died, it moved to Sydney, Australia, through the actions of BAA NSW Branch President, Walter Gale. A prolific comet discoverer, Gale eventually sold the telescope, and it passed through a succession of local amateurs (most of whom were Branch stalwarts) before arriving at the observatory of Mr J. H. Catts.

Catts died in 1952 and the so-called 'Catts Telescope' was acquired by Mount Stromlo Observatory. Over the next seven years it was used by staff and graduate students for a variety of photometric projects.

By 1959, Mt Stromlo was interested in establishing a dark-sky outstation, and the Catts Telescope (Mark II) was fitted with a 26" mirror and set up at Mount Bingar in southwest New South Wales. Although there ostensibly for site-testing, in fact it was used extensively by the Director, Bart Bok, other staff, and five different graduate students for an ambitious range of astrophysics programs.

Siding Spring Mountain was chosen for the Stromlo outstation in 1963 and the Catts was surplus to requirements. It was then offered – but minus the mirror – to the University of Western Australia, and was installed at Perth Observatory in 1969. Fitted with a new 16" mirror, the Catts Telescope (Mark III) was used intermittently for variable star photometry through to 1998 when the dome was needed for other purposes. After a century of service to amateur and professional astronomy and three different incarnations, this venerable instrument was finally retired and placed in storage.

I am preparing a paper about this remarkable telescope, which was somehow missed by Ian Glass when he researched his book on Grubb telescopes.[1]

Wayne Orchiston

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1 Glass I. S., *Victorian Telescope Makers. The Lives and Letters of Thomas and Howard Grubb*, Institute of Physics, Bristol, 1997

Robert Burns and the aurora

From the Director of the Aurora Section

In the poem 'Tam O'Shanter', written by Robert Burns at his Ellisland Farm in 1790, the following lines appear:

Or, like the borealis race,
That flit ere you can point their place...

Obviously Burns had observed at least one active auroral display from Scotland comprising rapidly moving or pulsating forms. He lived from 1759 till 1796. A search through the records suggests that sunspot maxima took place around 1769, 1778 and 1788,[1,2] with the middle maximum the most active.

The catalogue of Hungarian aurora observations[3] lists only 12 sightings between 1761 and 1778, but 34 between 1779 and 1789 with a peak of 8 in 1787. Tromholt's graph[4] comparing sunspot activity with the frequency of aurorae in Norway shows an auroral maximum in 1785.

It would seem that Burns is likely to have seen substantial auroral apparitions in the years immediately prior to writing 'Tam O'Shanter'. As a farmer in Ayrshire and reaching the Moray Firth in his Scottish travels he would have had ample opportunity to observe in pollution-free skies.

R. J. Livesey

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1 Nicolson I., *The Sun*, London, 1982
2 Phillips K. J. H., *Guide to the Sun*, Cambridge University Press, 1995
3 Rethly A. & Berkes Z., *Nordlichtbeobachtungen in Ungarn*, Budapest, 1963
4 Tromholt S., Katalog der in Norwegen bis Juni, 1878, beobachteten Nordlichter, Kristiania (Oslo), 1902

The status of Pluto

From Mr James Abbott

The confirmed discovery of 2003 UB313, to date the largest trans-Neptunian body, adds more fuel to the debate about the status of Pluto as a planet.

There now appear to be two main strands to this debate. Firstly, it can be argued that if a body independently orbiting the Sun is larger than a specified threshold diameter, it is a planet. If this retains the status of Pluto, it would make 2003 UB313 a planet, which albedo range calculations have shown is almost certainly larger than Pluto.

But a number of the other trans-Neptunian bodies discovered since 1992 have estimated diameters exceeding 1,000km, such as Sedna. And what of the future – how many more of these substantial distant ice worlds are there? Their distances from the Sun dictate that their motion on the sky is slow and apparent brightness low. To add to the difficulty in finding these bodies, many may be in significantly inclined and eccentric orbits – as are Pluto and 2003 UB313. If it has taken until 2005 to confirm the first body larger than Pluto and it is only in the last decade or so that similar bodies slightly smaller have been confirmed, it suggests there could well be many more bodies rather smaller or larger than Pluto orbiting the frozen outer regions of our solar system.

This leads to a second way of approaching this problem. If there are large numbers of Pluto-like bodies, then that lends more weight to their classification as a group rather than as individual planets, particularly when their population range is compared to the sizes of the major planets. Pluto is smaller than a number of major planetary moons, including our own, and uniquely is effectively a double planet, locked in a synchronous relationship with its relatively massive moon Charon – another candidate body for a newly defined trans-Neptunian group. Then there is Triton, larger than Pluto and orbiting Neptune in retrograde fashion in an inclined orbit, and sharing a methane ice surface similar to both Pluto and 2003 UB313.

The solution in this debate is surely to bite the bullet and admit that the status of Pluto as a major planet is now very much in doubt. But the historical significance of Pluto can be retained as the 'founding member' of the new group by calling them Plutinos – a name already in circulation. To distinguish between Plutinos and the rest of the Edgworth–Kuiper belt, the threshold of 1,000km diameter could be employed.

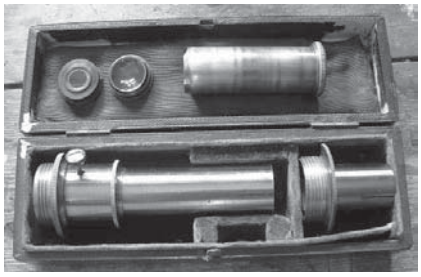
If such an approach is taken, there is no urgent need to downgrade Pluto and confirm the Plutino group in the formal sense, as the IAU would need to do. Indeed more years of work, as techniques for finding these bodies ▸

The McClean star spectroscope: a mystery

From Mr Brian Manning

Recently, I received a query from Guy Hurst from a lady in one of his astronomy classes as to whether it would be possible for them to actually see a star spectrum though a telescope. Guy had apparently projected an extended spectrum taken with a large telescope on the screen.

I immediately thought of an instrument I inherited from the late Mr J. H Hewitt of Edgbaston (see Figure). There are three components to this: a tube containing a small direct vision prism with an eye cap on one end;



a short tube into which it could slide, with a collar on it threaded 1.25" by 16TPI to screw into the old style eyepiece focusing mount; and a tube into which the prism tube could also slide, fitted with an adjustable slit. The maker was the well-known firm of W. Watson & Sons. In addition there are two lenses which are a push fit into the end of the prism tube remote from the eye cap. One lens is plano-convex about 1" (25mm) focal length, the other is cylindrical plano-concave.

The positive plano-convex lens was already fitted to the prism tube and with this inserted into the tube with the slit and focused on the slit line spectra can be seen when for example the slit is illuminated by light from a white card in sunlight. With the prism tube fitted to my 10-inch reflector that night I saw as expected a nice coloured line of light when focused on Arcturus. I then exchanged the convex lens for the cylindrical one. The result was a useless broad band of light, and I remembered that the cylindrical lens was plano-and of course could not be focused on the star image, neither is there any provision to couple both lenses together.

A friend, Colin Anderton, then pointed out that there is an illustration of this device in *The Telescope* by Louis Bell, the 'McClean DV star spectroscope'. I then placed my version behind a low power eyepiece previously focused on a star; this worked, but I do wonder how many have seen a decent star spectrum with this device. On Vega and Altair I could just detect two dark lines in the blue. Colin then pointed out that J. B. Sidgewick in the *Amateur Astronomer's Handbook* describes both McClean and Zollner star spectroscopes, the Zollner being used with an eyepiece as I did with the Watson McClean. Colin has a DV spectroscope tube exactly the same as my Watson one and engraved 'McClean'; this also needs to be used as a Zollner in the same way as my Watson version. In effect we both have Zollner DV star spectroscopes.

This is a bit of a mystery. Bell's description and illustration are wrong for the McClean, as is Sidgewick who also ignores the need for an imaging lens. I cannot really see how I can be mistaken, because usage proves the need for an eyepiece, or an additional positive lens to the cylindrical one. The illustration in Bell also shows the cylindrical lens incorrectly; it should be rotated 90°, but this may have been due to the problem of depicting it if so positioned.

Of course this equipment is just historical and of little value now. One can only admire the efforts of William Huggins and other early workers. I would be interested to hear if anyone has information on this, perhaps knowledge of McClean's original description, and if any BAA members have used one.

Brian Manning

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▸ improve, will allow time to settle the debate. But if, as seems likely, there are more of these substantial ice worlds beyond Neptune waiting to be discovered, then confirmation of a Plutino group as a Solar System class, and the 'demotion' of Pluto as a major planet would seem a logical step to take.

James Abbott

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Modelling the transit of Venus at Horsham

From Mr Tom Patrick

David Thomas' letter describing the observations at the Otford solar system model [*JBAA* vol.**115**(4), p.193] prompts me to report the simultaneous activities on 2004 June 8 at Christ's Hospital school, Horsham. The Horsham Astronomy Group holds its meetings at the school where its chairman, Alan Smith, is head of the mathematics department.

One of us, having seen the Otford model, proposed that students' interest in viewing the transit through club telescopes could be enhanced with a solar system scale model set up for the day. A scale of 12m/AU, i.e. 1/2.7 billionth was chosen; this was only one third Otford's size, and allowed all planet positions out to Pluto to be represented within the school's extensive playing fields. Orbits of Venus and Earth were marked with orange and white tapes pegged onto a convenient cricket pitch. Scale planets would have been 0.9 and 1.0mm diameter, too tiny to find; student markers, wearing distinctive coloured clothing, were assigned to the appropriate nine locations. 'Pluto', at the boundary hedge, was 470m from 'Saturn', only 9mm dia. at the other extreme of the layout. All involved gained a fresh appreciation of the vast spaces of the Solar System we were modelling.

The event was well supported by Horsham club members who provided a dozen telescopes with a variety of solar filter and projection devices, ready to show the transit in progress when the first of a score of student groups came over after breakfast. The Sussex weather could not have been better. Over 200 students each saw some part of the transit. Television crews added some excitement. For each group, a Grand Tour of the 'planets' followed, a walk of over a mile including a return past 'Earth', 'Venus', 'Sun', and 'Saturn' to school. Along the way, different multiple choice quiz sheets were available to focus interest and give instruction on planetary astronomy. These may have been a profitable diversion in a week in which many were preoccupied with exams.

After fourth contact broke, we went in to lunch to the rousing strains of the school's marching band playing J. P. Sousa's *Transit of Venus March, 1882*.

Tom Patrick

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Venus transit CD-ROM

The special CD-ROM containing all observations and reports received of the 2004 June 8 Venus transit is still available from the BAA office. Order online at **www.britastro.org/sales** or telephone Jean Felles at 020 7734 4145.

How bright is the sky beyond our Solar System?

From Mr Abdul Ahad

On an imaginary journey outward from our Solar System, one eventually reaches a point where the Sun's apparent light output is no more prominent than that of the surrounding cosmic night sky, filled with a mixture of nearby stars and the surrounding diffuse glow of the Milky Way galaxy. I have attempted to calculate the distance of this point by quantifying the total brightness of the interstellar night sky in visual magnitude terms, as seen from such a remote location.

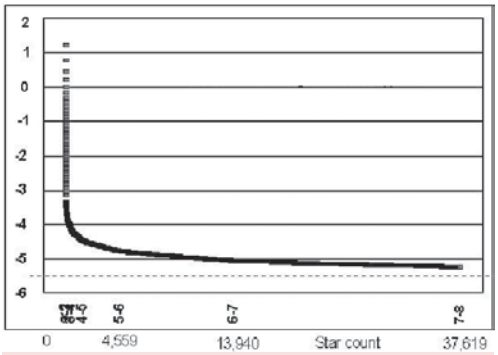

Figure 1. The cumulative magnitude curve appears to be tending to a net integrated magnitude of –5.5 at infinity.

To an observer located half-way between the Sun and Alpha Centauri (a distance of 2.2 light years from the Solar System) our Sun will shine at a magnitude of around –1.2 in one part of the sky, and Alpha Centauri will be shining a touch brighter at magnitude –1.7 in the opposite direction, both objects appearing to the naked eye as star-like points of light. The Milky Way will be seen as a band all around the sky.

To determine the contribution from stars, I have integrated the apparent visual magnitude data for stars in the Hipparcos/Tycho catalogue. I first integrated the magnitudes for the 4,000 stars visible to the naked eye across the entire sky down to magnitude 6; the resulting integrated magnitude is approximately –5.5. One problem with this approach is whether the integrated magnitude was actually converging to a reasonable value. This appears to be the case with my integration (see Figure 1) but some caution should be exercised.

Estimating the net brightness of the Milky Way is quite complex. A realistic estimate of its total magnitude might be around –5. I have formulated an analytical method which works backwards from the Milky Way's given absolute magnitude of –20.5. Since this absolute magnitude is for the whole of the Milky Way galaxy, when seen face-on from a standard distance of 10 parsecs, by making an allowance for the fact that we are based within the spiral arms, some 8,200 parsecs from the core and only see about half of the galaxy from our vantage point (Figure 2), it is possible to deduce an estimate. That method confirms a net brightness of –5.0 magnitudes.

Thus the entire night sky would have a brightness which equates to a net figure of approximately –6.0 magnitudes. Comparing this with the magnitude of a Full Moon (–12.7) we have a magnitude difference of 6.7 and so the net illumination of interstellar space two light-years beyond our Solar System is roughly 1/500 of that of the Full Moon.

The level of darkness reported here would be encountered on every journey in all directions into deep space within a sphere hundreds of light years in radius centred on our Sun, since the average spacing between star systems is roughly five light years. The heliocentric distance at which the Sun's apparent magnitude equates to –6.0 is approximately 14,000 astronomical units, which marks out the radius of a sphere beyond which the Sun will become a secondary source of overall light illumination to an interstellar traveller.

I would like to thank Brian Tung, Tony Flanders, Ernie Wright and others in a *Usenet* article where I first discussed the line of inquiry in this letter back in March 2004.

Abdul Ahad

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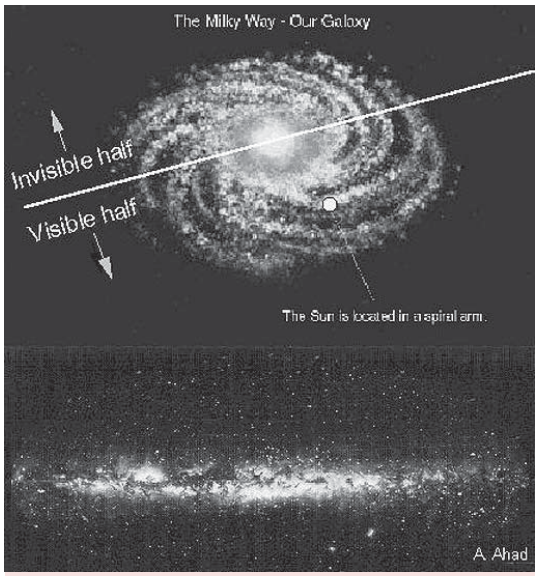

Figure 2. Schematic of the Milky Way galaxy as seen from Earth.

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