Letters

Eudoxus revisited: a comparison of lunar images

From Nigel Longshaw

My paper concerning the little known observation by E. L. Trouvelot of the lunar crater Eudoxus in 1877 was published in the 2007 August *Journal*. I hope in time this tiny extract from the vast archive of lunar observations might promote a little more interest in our nearest neighbour. Trouvelot's depiction of the crater, a vignette of the lunar surface captured at an unusual phase of illumination, demonstrates that there is still much to be investigated in the visual records of the past. However it is important that these records are viewed with an open mind; observations should not simply be dismissed as being inaccurate or fanciful until a complete examination of their individual circumstances has been made. In light of the close range imagery which has taken place in the interim period it is difficult to reconcile Trouvelot's observation of a wall-like feature in Eudoxus, yet we can perhaps approach the issue on the basis that he did record something unusual in his telescope on that night in February 1877.

When making further investigations into anomalous observations the most satisfactory recourse is to make repeat observations at the eyepiece under comparable conditions to the original observation. The UK weather is seldom cooperative and such opportunities can be few and far between. In this regard recourse to photographic evidence can be one way of making progress until such time as visual work can be resumed.

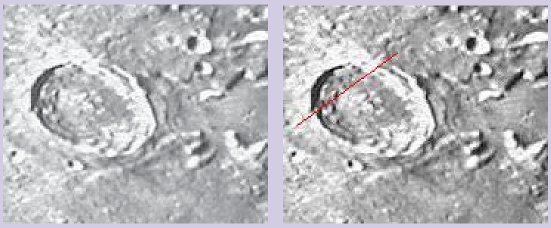


Figure 1 (A & B). Extracts from the *Consolidated Lunar Atlas*, see text.

A recent examination of images from the *Consolidated Lunar Atlas*,[1] actually made under a different line of enquiry, has led to a possible comparison with Trouvelot's drawing which might offer an explanation, at least in part, for what he recorded.

Figure 1 shows extracts from *Consolidated Lunar Atlas* image reference B12, with Trouvelot's drawing shown as Figure 2. Trouvelot's drawing compares well with the low resolution photographic image in terms of the location of the main features, testifying to Trouvelot's accuracy at the eyepiece. Displaying the two depictions in this manner it is possible to notice in Figure 1 an alignment of features between the 'notch' in the northeast crater wall and the ridge/cleft Trouvelot depicts outside the crater wall to the south. This 'alignment' of features (Figure 1b) appears to comprise broken terrain, peaks, and crater wall terracing, and it is conceivable that the tops of these individual peaks and intervening features, when first illuminated by the rising Sun flooding over the east wall, could merge and give the appearance of a continuous bright line, especially if viewed in less than perfect seeing. Perhaps under such conditions it would be reasonable to conclude that this 'illuminated thread' emanated from the obvious 'notch' in the northeast crater wall, when in fact the

Figure 2. Trouvelot's drawing of his 'mur enigmatique' in Eudoxus.

An astronomer's church

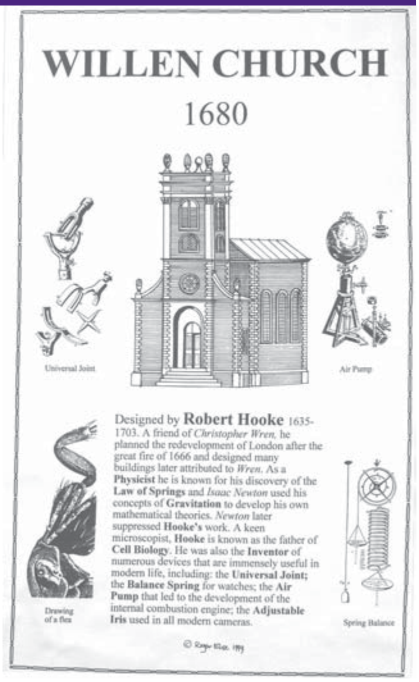
From Sheridan Williams

The church in Willen, now part of Milton Keynes, was designed and built by Robert Hooke (1635–1703) in his first bit of free time after the huge task of organising and overseeing every detail of the rebuilding of central London following the Great Fire of 1666. Hooke was given the London rebuilding job because there was simply no-one else with his range of technical ability and vision. But his life was devoted to science. He was the most active of the group of scientists (of whom Newton was just one member) who created a 17th century scientific revolution in this country.

Hooke's greatest interests, and biggest advances, were in astronomy and what is now called geophysics. Perhaps his most fundamental result was his failure to measure the parallax of a star. The lower limit which this gave was the first solid direct evidence that stellar distances were very great. He tried to increase precision by using longer and longer telescopes, including the zenithal 200-foot instrument he built into the Monument in London to the Great Fire, but the first measurement eventually came nearly two hundred years later with a totally different instrument, the split lens Konigsberg heliometer, in the hands of Friedrich Bessel.

Robert Hooke's papers have recently been placed online by the Royal Society - see **http://www.royalsoc.ac.uk/library/HookeTTP/hooke_broadband.htm**.

After 300 years the church at Willen is now the only complete example of Hooke's architectural work, but needs some re-roofing and work to the north vestry. One of the ways of raising the money is the sale of this very attractive tea towel, which will remind you and your guests of stellar parallax and quadrants every time you use it – perfect for Christmas! The price is a mere £5 per towel inc p&p – send a cheque to Rev Paul Smith, 2 Hooper Gate, Willen, Milton Keynes, MK15 9JR.



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circumstance of a chance alignment of individually illuminated features might offer a plausible alternative explanation.

Eudoxus is illuminated to a greater extent in Figure 1 than when Trouvelot observed the crater, and it is therefore difficult to obtain a direct comparison of the shadows; however the morphology of these shadows, which Trouvelot found difficult to reconcile with his observation of a 'wall', could in part be due to the terraced nature of the inner slopes of Eudoxus being situated at differing levels.

Such investigations should be treated as a 'work in progress', and it would be interesting to publish further observations or images which might lead to a better understanding of why Trouvelot concluded he had observed a 'mur enigmatique' in Eudoxus.

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1 Gerald P. Kuiper *et al.*, *Consolidated Lunar Atlas*, Lunar and Planetary Laboratory, University of Arizona (1967). Digital renditions available on the NASA website **http://www.lpi.usra.edu/resources/cla/** created and edited by Eric J. Douglass.

Lunar eclipse facts

From Dr Darren Beard

I am writing concerning the article 'The total solar eclipse of 2008 August 1' which appeared in the 2007 October *Journal*.

The article states that 'the maximum number of lunar eclipses in any one year is 4 and the minimum is 2.' This is in fact wrong. The maximum number of lunar eclipses is any one year is five. Five lunar eclipses occurred in 1749 and 1879 and will do so again in 2132 and 2262. Usually when there are five lunar eclipses in a year, four will be penumbral and only one will be umbral.

More rarely, two of the five eclipses are umbral. This last occurred in 1749, with eclipses of 1749 Jun 30 and 1749 Dec 23 being partial in the umbra. Two lunar eclipses out of five in a year will not be umbral again until the year 10946.

There can never be more than three umbral lunar eclipses in a year, so any year with four or five lunar eclipses must include penumbral eclipses.

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'GoTo' telescopes and locating objects in daylight

From John C.Vetterlein

I apologise to Chris Hooker if I misread his method for locating Mercury (*JBAA* **117**(4), 2007, p.202 *et seq*.). The second procedure Chris describes in his most recent letter is the one I adopted as a schoolboy way back in 1950.

On the issue of GoTo, I found the *SynScan* (version 3.01) software supplied with the *Sky-Watcher EQ* series mounts leaves much to be desired for Mercury and Venus. In the case of Venus the coordinate error can be as much as 6.8 minutes in RA and 45' in declination. There are similar problems with the Moon and, to a lesser extent, Mars. I have discussed the matter with *Sky-Watcher* and they have undertaken to rectify the problem.

From my location in Orkney, I find the three stars Arcturus, Capella and Vega the most satisfactory for setting up the mounting in daytime. All three are bright and readily visible in good, clear skies with apertures of 80mm or more. A 40mm eyepiece should offer a wide enough field to locate these stars. The two latter are circumpolar so that the two-star method may be employed most times of the day or year. In most cases (including locating Mercury and Venus in daylight) the two-star method may be used provided the first star can be centred in the field. If for some reason – cloud, low altitude – the second star cannot be seen, one may make the assumption that it is in the field and complete the setting accordingly. [The single-star method makes it more difficult to input coordinates for user-defined objects.]

It is essential to have good polar alignment. To ensure replication, I position the tripod onto three 15mm holes drilled into a large sandstone slab. (See photograph.) It took about forty minutes one night making the initial polar alignment to an accuracy suitable for most purposes. [Incidentally, the suppliers had to make up a locking bolt for polar altitude for the latitude of Orkney.] Transporting the telescope to site – five metres from where it is stored – can be done in three stages. The heaviest component is the tripod/mounting assembly, which has to be kept bolted together. Single-handed, the telescope can be ready for use within the space of five minutes.

As may be seen from the photograph, I have mounted the 100mm and 120mm tubes in parallel. Both have the same focal length of 900mm and so in effect this is a mini-astrographic telescope. The EQ6 mount is quite capable of accommodating

this arrangement, together with other photographic equipment. When photographing at the prime-focus of the 120mm, the 100mm, in combination with Barlow lens and illuminated graticule, may be used to make any necessary corrections during long exposures.

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Sunspot observations by Theophrastus revisited

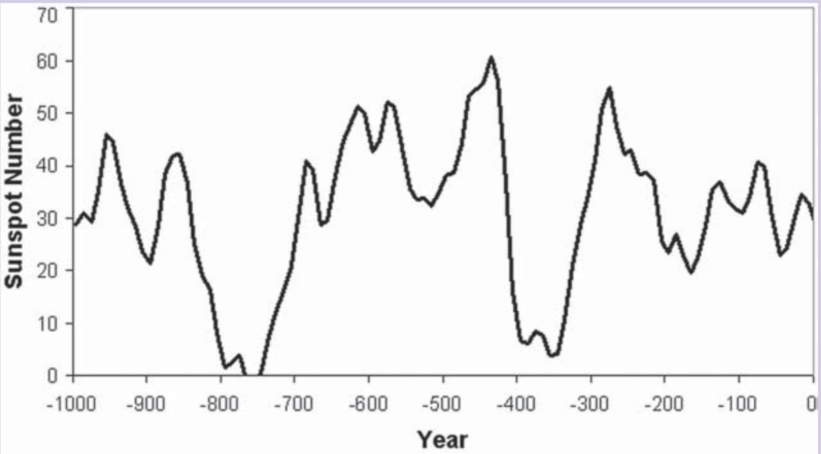

Figure 1. Reconstructed sunspot numbers during the first millennium BC. *Data provided by I.G. Usoskin.*

From José M. Vaquero

More than fifteen years ago, Jacqueline Mitton[1] asked members of the BAA for information about possible sunspot observations by Theophrastus in the 4th century BC. The response of Ronald Hardy[2] was very complete and stimulating. He confirmed that Theophrastus recorded the observation of possible sunspot activity (though not necessarily done by him) in the surviving fragments of his treatise *De Signis Tespestatum* ('On weather signs').[3] For example, we can read in this work: '*If the Sun when it rises has a black mark, or if it rises out of clouds it is a sign of rain*'.

Modern studies on long-term solar activity have showed great maxima and minima in the Sun's history.[4–6] Figure 1 shows the sunspot number during the first millennium BC reconstructed and smoothed by Solanki *et al.*[4] (Note that the 11-year solar cycle cannot be recognised because the sunspot number is smoothed.) During the 4th century BC (Theophrastus' epoch) solar activity was very low and the probability of observing a naked-eye sunspot by Theophrastus would be very low. However, solar activity was high during the 5th century BC and the probability of observing a sunspot by ancient Greeks was high. In fact, Bicknell[7] has proposed that Anaxagoras observed a naked-eye sunspot in 467 BC. Thus, it is probable that Theophrastus' references to sunspots were observations made by early Greek astronomers, as Hardy[2] suggested in his letter.

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1 Mitton J., 'Who discovered sunspots?', *J. Br. Astron. Assoc.*, **101**(3), 144 (1991)
2 Hardy R., 'Theophrastus' observation of sunspots', *J. Br. Astron. Assoc.*, **101**(5), 261 (1991)
3 Theophrastus, *Theophrastus's enquiry into Plants and minor works on Odorus and Weather Signs*, translated by A. Hort, London, 1916
4 Solanki S. K., Usoskin I. G. *et al.*, 'An unusually active Sun during recent decades compared to the previous 11,000 years', *Nature* **431**, 1084–1087 (2004)
5 Usoskin I. G., Solanki S. K., & Kovaltsov G. A., 'Grand minima and maxima of solar activity: new observational constraints', *A&A* 471, 301–309 (2007)
6 Vaquero J. M., 'Historical sunspot observations: A review', *Adv. Space Res.*, doi:10.1016/ j.asr.2007.01.087 (2007)
7 Bicknell P. J., 'Did Anaxagoras observe a sunspot in 467BC? *Isis* **59**, 87–90 (1968)

Observations of Venus in 2004

From Christopher Taylor

I would like to thank Dr McKim for his gracious remarks[1] on my description[2] of the cusp-extensions of Venus in June 2004. In truth, this particular brief and purely recreational sighting scarcely deserves the title of 'observation', but a photograph can be found on the Hanwell website (ref. below) and I do feel that a systematic campaign to monitor Venusian cusp-extensions near inferior conjunction would be one of the most interesting scientific programmes still possible with small telescopes in the present state of studies of the planet. A single such observation immediately teaches a basic lesson in planetary science: the striking contrast between the cusp *extensions* of a thin crescent Venus and the equally noticeable cusp *contractions* of the Moon when at a similar phase instantly demonstrates that the former has a dense atmosphere, while the latter has none – the optical properties of thick cloud and those of solid surfaces are exactly contrary in this respect. By extension, I would suggest that a systematic watch of the variations of this phenomenon might well reveal facts about the planet's atmosphere and events in it, its dynamic processes, etc., not easily accessible to other methods of observation. If it is not already being done, this might make a worthwhile programme for some enterprising Venus observer.

Turning to the subject of hydrogen-alpha observations of transits, I do not doubt for a moment that Dr McKim chose his words very deliberately and, having reread the passage in question, entirely accept that, in a strictly literal sense, there was no historical inaccuracy in his original statement. I still feel, however, that such statements could easily be misconstrued by the historically less-informed members of the astronomical community as supporting the wholly unfounded claims which certainly were being made in 2004 that that summer's transit of Venus was the first ever to be observable in Hα; as it is, I fear we will not have heard the last of that particular error. It is also, surely, axiomatic that the scientific point of such Hα observations, and even their main purely visual appeal, is to see Venus *off* the Sun's disk – as was done in 1874 – not on it, where the planet can be seen just as well in white light. For more on this issue, as well as the photo mentioned above, see the Transit 2004 page on the Hanwell Community Observatory website, **www.hanwellobservatory.org.uk**

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1 McKim R. J., *J. Brit. Astron. Assoc.*, **117**(5), 277 (2007)
2 Taylor C., *ibid.*, **117**(4), 203 (2007)