



The speed of the lunar shadow on Earth during solar eclipses

From Mr Peter Macdonald

I read with interest the paper by Wilhelm Carton in the April *Journal* regarding the speed of the lunar shadow on Earth during a solar eclipse.

To calculate this quantity I employ a routine developed from the *Explanatory Supplement to the Astronomical Ephemeris* and the *Canon of Solar Eclipses* (references 3 and 4 respectively in Wilhelm's paper) which, considering its simplicity, compares very favourably with this new algorithm.

On page 223 of the *Supplement*, the semi-duration of the total or annular phase is given

Calculated speed of the umbra during two total solar eclipses

2009 July 22		2010 July 11	
UT	Speed	UT	Speed
h m	km/s	h m	km/s
00 55	4.682	18.20	3.177
01 15	1.268	18.40	0.982
01 35	0.881	19 00	0.688
01 55	0.728	19.20	0.602
02 15	0.662	19 40	0.614
02 35	0.646	20 00	0.708
02 55	0.670	20 20	0.941
03 15	0.739	20 40	1.764
03 25	0.798	20 50	55.512
04 05	1.734		
04 15	4.050		

as L_2/n , where L_2 is the radius of the umbra (which term applies to both total and annular eclipses) at a height ζ above the fundamental plane, and n is the **speed of the shadow** (my emphasis), both reckoned in units of the Earth's equatorial radius. (Time=distance/speed). But n is the speed of the umbra parallel to the fundamental plane; as the curvature of the Earth elongates the outline of the shadow, so its speed relative to an observer increases by the ratio of its semi-major axis ($L_2/\sin h$) to the semi-width of the path (L_2/K), the derivation of the formulae being explained on p.22 and p.20 respectively of the *Canon*.

Multiplication by 6378, being the equatorial radius of the Earth in km, followed (if hourly variations are used for the derivatives) by division by 3600, the number of seconds in one hour, gives the result in km per second. So the expression becomes:

$$\text{Speed} = 1.7717n [(L_2/\sin h) / (L_2/K)] \text{ km/s}$$

For comparison, the Table gives the speed of the shadow at the instants tabulated in the original paper, calculated by the method just described from the Besselian elements presented in the relevant NASA Solar Eclipse Bulletins.

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Light pollution: plus ça change?

From Dr Jeremy Shears

The French critic, journalist and novelist Jean-Baptiste Alphonse Karr (1808–1890) had a famous epigram: 'plus ça change, plus ç'est la même chose', or 'the more things change, the more they stay the same.' Whilst astronomers are becoming increasingly affected by light pollution, complaints about this phenomenon are not new.

In fact Col. E. E. Markwick (1853–1925), BAA President from 1912 to 1914 and Variable Star Section Director 1899 and 1909, wrote of his frustrations about increasing light pollution in his home town of Bournemouth more than 100 years ago. I thought readers might be interested to see part of the letter he wrote to the *English Mechanic* in July 1910. It struck me that, apart from the phraseology and reference to gas lights, it could have been penned yesterday.

'...We are beginning to find out what an important part nature study in its manifold directions holds in our social life; and the more so, seeing that modern 'civilisation' is hostile to many forms of life not immediately bound up with that of the genus *homo*. But among the facilities for nature-study which are now becoming recognised as necessities of modern life, I have not yet noted any formal recognition of reserving places or areas where one may study the sky by night, under the same, or nearly the same, conditions as prevail in open country districts far removed from sources of glaring artificial light, and from factory chimneys, or large masses of domestic houses, pouring out their streams and clouds of smoke into the air.

It seems to me that the time has come when in town-planning provision should be made for the study of astronomy as it was practised by the ancients. What are our requirements in this respect, and how can we meet them? What we want is a sufficiently large, level space of ground, to give us a practically open horizon in all directions... And then (which is the great difficulty nowadays) we want this ground to be dark – that is, the air above it not to be illuminated by gas or electric lights. I fear that in the existing state of things we can never hope to attain the purity of sky which holds in country districts, or the desert. But very much might be done to create an ideal 'observing park', by screening any lights absolutely necessary in the roads approaching or surrounding it, while any factory chimneys near must be strictly taboo...

The great difficulty is that municipal authorities and the police do not like dark

places in our towns, which is quite natural to understand. My point is that in planning a town, provision should be made to meet as far as possible the requirements of those who 'consider the heavens,' ... where they can go of an evening to study the planets in season, the moon, a comet visible, meteors, the Zodiacal Light, and, grandest of all, the universe of stars, with the Milky Way, forming the grandest canopy above us that can be conceived...

But some will probably rejoin, Have you not now large parks and open spaces in all towns – are they not sufficient? I reply, Are they open from 6 to 12 p.m.? Are they free from the glare of town or public lights? Doubtless there are many coigns of vantage from which splendid views of the sky can be had, subject to limitations of some sort. For example, the view from the Spaniards-road at Hampstead Heath. I also call to mind the view of the southern heavens obtainable from the East Cliff, Bourne-

mouth. Here you have a grand sweep of the southern horizon, looking over the Channel, with no lights at all on the road. To the north there is town glare. How long will this state of things continue?

I have no doubt that when the Undercliff drive to Boscombe is completed, the upper road will then be fully lighted, and those who used to repair thither to learn or to teach simple open-air astronomy will in time find their sky views marred by the glare of lights...

I don't know what Col. Markwick would make of the skies over Bournemouth today! But hopefully, supported by the great work being done by the Campaign for Dark Skies, things will change for the better for all of us who like to see the stars.

Jeremy Shears

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'Five spiders in a Newtonian'

From Dr Jeremy Tatum

The photograph by R. A. Marriott in the April *Journal*¹ of some spiders enjoying the hospitality of his telescope tube reminds me that some time ago Neil Honkanen, Ernie Ackroyd and I published an article in the *Journal*² on the construction of a movable eyepiece cross-hair designed for following the motion of a comet during a long exposure photograph. In the Acknowledgments section at the end of the article, we thanked 'Araneus diadematus for... improvements to the filar micrometer', an acknowledgment that drew no comment (nor need it have done) from referee or editor.



On reflection, however, we feel that her contribution was so crucial (she was in fact responsible for the actual manufacture of the crosshair, which was exceedingly fine, strong and straight, and lasted for several years) that she should have been included as a co-author rather than being relegated to a mere mention in the closing paragraph of the article.

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- 1 *J. Brit. Astron. Assoc.*, **121**(2), 119 (2011)
- 2 *J. Brit. Astron. Assoc.*, **97**, 90 (1987)

[Photo of *Araneus diadematus* courtesy www.gardensafari.net]

Reporting the aurora

From Mr R. J. Livesey

It was the great Lord Kelvin who said that one did not understand something unless one had made measurements of it.

With modern photographic technology there is a proliferation of coloured images of the aurora and noctilucent clouds in magazines and journals and on the Internet. Not least, many pictures of these phenomena are sent to the Aurora Section. However, often such pictures are not provided with accurate information as to their origin, which is necessary for scientific evaluation.

The accurate location of the observer is necessary, as is the direction in which the camera pointed relative to true north, and the estimated angular elevation of the centre of the photograph. The day, month and year should be logged, preferably giving the double date of the evening and morning of the event-night. The time the photo was taken should be logged in Universal Time (UT). If British Summer Time (BST) is quoted that should be clearly stated, especially for noctilucent cloud observations.

Overseas, if time is given in local time, the time zone and whether or not daylight saving is in operation needs to be clearly identified if conversion to UT is not made.¹



Aurora on 2005 May 20 photographed at Glen Ullin, N. Dakota, USA by Jay Brausch.

The collection of accurate observations, particularly of noctilucent clouds, for use by researchers continues to be an important function of the Aurora Section. Correlations of the frequency and latitude of noctilucent clouds with the years and with the sunspot cycle have been of great value. Ken Kennedy, the new Aurora Section Director, will be glad to receive observations and photographs of the aurora and noctilucent clouds, including the required information as given above.

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- 1 D. M. Gavine, 'Observing the aurora', *J. Brit. Astron. Assoc.*, **114**(5), 293 (2004)
- Also see the Aurora Section website, <http://www.britastro.org/aurora>

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