Ordinary Meeting, 2007 October 21
held at New Hunts House, Guys Hospital, London Bridge, London SE1

Roger Pickard, President

Ron Johnson, Hazel Collett and Nick James, Secretaries

Taking the chair from Dr Richard Miles, the new President opened the first meeting of the 118th Session and expressed his honour at having been elected to the post. Mrs Hazel Collett, Meetings Secretary, was invited to read the minutes of the final meeting of the previous Session, which were approved by the audience and duly signed. The President announced that 60 new members were proposed for election, and, in keeping with tradition, announced that their names would be displayed in the Association's Office. He noted, however, that the Office was currently closed for the duration of its move back into Burlington House. The election of the 82 new members who had been proposed at the previous meeting was put to members, and they were approved and declared duly elected. The President invited any new members present to introduce themselves at the end of the evening.

Mr Nick James, Papers Secretary, reported that three papers had been approved for publication in the *Journal*:

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The President announced that the next Ordinary Meeting would be held on Saturday November 24 at 2.30pm at the Mermaid Centre in Blackfriars, London. Before then, a meeting of the Instruments and Imaging Section would be taking place in Northampton on November 17.

The President then invited Mr Sheridan Williams to present the evening's first talk.

Where To Go for the 2008 Solar Eclipse

Mr Williams explained that, of the total solar eclipses which would be taking place over the next few years, the one which he would most readily recommend members to travel to see was that of 2008 August 1, despite its comparatively short duration of only 2m27s. The principal reason for this recommendation was that the statistical chances of getting clear skies along its track were significantly higher than for any other eclipse in the coming decade.

The eclipse would begin in northern Canada, track northwards into the Arctic, pass over the North Pole, head south into Russia, and skirt along the border between Mongolia and China before terminating in China. In the NASA 2008 *Eclipse Bulletin*[1], Espenak and Anderson had calculated the statistical probability of cloud cover for each location along this line in August. The prospects in Canada and the Arctic were not good: Cambridge Bay, at the start of the eclipse track, had a 65 per cent chance of cloud. This rose to 75-85 per cent at more northerly latitudes. However, the prospects in Russia and China were better: the chance of cloud cover reached a minimum of 30-35 per cent around Hami in the Gobi Desert in China.

With this in mind, the speaker had set out on an expedition in 2007 August, exactly one year before the eclipse, to explore possible observing sights in this vicinity. His findings had been presented in a recent *Journal* paper[2]. In summary, of three sites surveyed – Novosibirsk in Russia, the Gobi Desert in China, and the Altai Mountains in Mongolia – the Gobi Desert seemed the best choice, offering both good weather prospects and some dramatic scenery.

Mr Williams went on to compare these prospects with those for the eclipse of 2009 July 22, which had a much longer duration of 6m39s, but which would be taking place over cloudier parts of the globe. This eclipse's path would start in India, cross Nepal, Bangladesh, Bhutan and China, and then move into the East China Sea before terminating in the Pacific Ocean. The first portion of this track had a 65-85 per cent chance of cloud cover; the eclipse would be taking place during the summer monsoon season. Even in China and on small islands to the south of Japan, the chance of cloud cover would never be below 50 per cent. The best chances of seeing this eclipse would come to those on Pacific cruises, who could sail to find breaks in the cloud.

The next total solar eclipse after this would take place on 2010 July 11, and would have a duration of 5m20s. Its path would be almost entirely over the Pacific Ocean, however; apart from a few islands, its only landfall would be a brief touch upon Chile and western Argentina at its termination. The best land-based observing location would be Easter Island, but even here there was a 50 per cent chance of cloud. The prospects were little better for the 4m02s eclipse of 2012 November 13, whose track would also be over the Pacific Ocean for most of its length; it would be observable from north-eastern Australia, but there was a 40-50 per cent chance of cloud cover there.

Looking further ahead, however, the speaker could strongly recommend the eclipse of 2027 August 21 to those

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who liked to plan ahead. It would have a maximum duration of 6m23s, and its track would pass through northern Africa, where the chance of cloud cover reached a minimum of only a few per cent in Luxor in Egypt.

Following the applause, the President welcomed Mr Nick James to present Sky Notes.

The Appearance of Comet 17P/Holmes

Mr James explained that his Sky Notes would be dominated by one object, Comet 17P/Holmes, which had unexpectedly and dramatically appeared as a naked-eye comet a week previously. He apologised to those members whose fine images of other objects he would not have time to show as a result; all astronomical news stories appeared to have been overshadowed by this one remarkable object.

As its name implied, Comet 17P/Holmes was historically the 17th comet to have been shown to be periodic. Its discoverer, Edwin Holmes, had been a founder member of the BAA; the comet's discovery had come two years after the Association's foundation, on 1892 November 6. The comet's nucleus was now known to measure around 4 km across and to be in an orbit lying entirely between that of Mars and Jupiter; its perihelion and aphelion distances were 2.1 and 5.2 AU respectively, and its period was 6.9 years. At perihelion, it typically brightened no further than to mag 16, and so under normal conditions, it posed a serious challenge to even the most dedicated members of the Comet Section. It had passed its latest perihelion five months ago, on 2007 May 4. An image from the Nazaret Observatory on 2007 October 23 00h25 UT revealed its appearance to be much as would be expected at such a point in its orbit: the speaker described its appearance at mag 17 as 'resplendent in its cometary nothingness'.

However, only 24 hours after this image had been taken, on October 24 at midnight UT, Juan Antonio Henriquez Santana – a Spanish amateur – had observed it to have brightened to mag 10. A few hours later, on October 24 at 13h UT, Seiichi Yoshida had reported it to have brightened still further, to mag 3; he had described it as stellar in appearance. This brightening, all the way from mag 17 to mag 3 in under 48 hours, represented a one-million-fold increase in the comet's luminosity. Very few astronomical objects exhibited such rapid changes: this was akin to the behaviour of supernovae and gamma ray bursters (GRBs). It was unprecedented to see such a rapid rise in the brightness of a solar system object.

There had, however, been some prior indication that this comet was prone to dramatic outbursts. Edwin Holmes' discovery of the comet had come five months after its perihelion of 1892 June 13, and as soon as its orbit had been determined, it had been apparent in 1892 that, given its conspicuous location – close to M31 – and brightness – mag 6 – it would not have gone unnoticed prior to Holmes' observations unless it had brightened very rapidly immediately beforehand. An *Astrophysical Journal* paper[3] by Edward Barnard from 1896 summarised its behaviour at that apparition, and the speaker recommended members to download this from the NASA *Astrophysics Data Service* (ADS); this piece of history provided a fair guess at how the comet might behave in its present outburst.

Presently, the comet was in Perseus, placed very conveniently for UK observers; it passed close to the zenith at around 01h30 UT. Its proper motion was small on account of its distance from the Sun; it moved by only around 10 arcminutes per day and would remain in Perseus throughout the winter. The speaker thought that it would be readily visible from the street outside Burlington House after the meeting.

Following its dramatic brightening over October 23–24, it had appeared as a stellar object at around mag 2.5. It had looked rather like a new nova, and so the Variable Star Section had published a note to forestall any members who might mistake it as such. Already on 24th, however, a slight coma had begun to be apparent. On account of this, it was thought that the comet's sudden brightening could be ascribed to a massive ejection of dust from its surface. This dust was now spreading out at high speed into a spherical volume around the nucleus, giving rise to the perfectly circular observed coma. The principal source of luminosity in such a dust cloud would be the scattering of sunlight off dust particles, and this meant that its spectrum would be expected to mirror that of the Sun. Observations indeed showed that the comet's spectrum was essentially solar. What was not understood was what had triggered this cloud of dust to be released. Its expansion velocity was around 500 m/s, which implied that it must have been released with explosive force.

Mr James then turned to show a selection of members' images of the comet. He was impressed by the amount of structure which David Arditti's images revealed in its coma. To put this in context, he explained that whilst the eye was quite good at handling objects with large dynamic ranges, film photography had historically been quite restrictive: in the case of this comet, photographers would have had to exposure for either the bright stellar nucleus, or for the coma. The other would have been washed out. With the advent of CCDs, it had become possible to produce much better images of such objects. The standard way of doing this was to stack a large number of short exposures, and to apply a logarithmic stretch to the brightness profile of the resulting image. In expert hands, this method had the potential to mimic the ability of visual observers to pick out high-contrast structures.

The speaker had tried analysing several of these images by plotting the brightness of the comet's coma against

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radius. Such analysis of images taken by Denis Buczynski on October 24 revealed the coma to have faded into the sky background at a radius of around 30" at that time. The speaker's own images from October 27 03h29 and 04h42 UT showed that by then, the comet had expanded to a radius of 120". Its expansion was even evident within the one-hour interval between these images. By calculating the projected size of these images at the comet's distance, Mr James had been able to calculate the expansion speed of the coma, confirming the widely-published speed of 500 m/s. Extrapolating the comet's expansion backwards, the speaker calculated that it would have had a size of zero on October 23.

Maurice Gavin had used another method to show the coma's expansion. He had subtracted an image that he had taken on October 29 from one taken on October 28. The resulting difference image showed a bright positive ring where the coma had grown.

Many observers had reported seeing some short ray-like features emerging from one side of the comet. The speaker explained that these probably formed the comet's tail. Because the comet was so distant – it lay outside the orbit of Mars – an observer standing on the comet would see the Sun and the Earth separated by a mere 15°. Consequently, from the Earth, the comet's tail was directed into sky; it was concealed behind it. These ray-like features were likely to be a severely foreshortened tail.

Long exposures appeared to reveal a faint outer coma of about twice the diameter of the inner coma. Most observers who had tried taking colour images of this were agreed that it was of a noticeably different colour from the inner coma, suggesting that it might be more gaseous than the inner dusty coma. Pete Lawrence's CCD images and Stewart Moore's visual observations both implied that this outer coma had a bright ring around its outer edge. The speaker questioned whether this was real or an optical illusion / processing artefact, but was inclined to think it real.

Looking to the future, the speaker turned to Barnard's paper[3] as an indication of what the comet might do next. In 1892, it had faded away over a period of 6-8 weeks. However, two months later, it had undergone a second outburst, re-appearing for another few weeks. The only way to find out whether it would do the same in its present apparition was to keep observing it. Mr James urged members to send their observations to the Comet Section; Jonathan Shanklin had only received 3,000 images so far, and his inbox could do with some more.

Following the applause, the President adjourned the meeting until Saturday November 24.

Dominic Ford

References

[1] Espenak, F. & Anderson, J., NASA 2008 *Eclipse Bulletin*, NASA/TP-2007-214149, available for download from http://eclipse.gsfc.nasa.gov/SEpubs/20080801/rp.html (2007)
[2] Williams, S., *J. Brit. Astron. Assoc.*, **117**(5), 231 (2007)
[3] Barnard, E.E., *ApJ*, **3**, 41 (1896)

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