

Ordinary Meeting, 2009 March 25

held at the Royal Astronomical Society, Burlington House, Piccadilly,
London SE1

Roger Pickard, President

Ron Johnson, Hazel Collett and Nick James, Secretaries

The President opened the fifth meeting of the 119th Session and announced that Council had decided earlier in the day that the reading of minutes at Ordinary Meetings was a redundant practice which should be ceased forthwith. He added that the minutes of Ordinary Meetings would continue to be made available to any members who wished to consult or comment upon them. The President then proceeded with the other business announcements, announcing that 146 new members were proposed for election. Those 25 new members who had been proposed at the previous meeting were approved by the audience and declared duly elected. Mr Nick James, Papers Secretary, reported that four papers had been approved for publication in the *Journal*:

[check these]

The Comets of 2000, by Jonathan Shanklin

GSC2.3 N152008120 – a new SU UMa-type dwarf nova in Draco, by David Boyd *et al.*

Condensation in Observatory Domes, by Brian Mitchell

VSX J074727.6+065050: a new WZ Sagittae star in Canis Minor, by Jeremy Shears *et al.*

The President announced that the next Ordinary Meeting would be held on Wednesday May 27 at the present venue. Before then, the Association would be holding an *Out-of-London* meeting at the Rutherford Appleton Laboratory in Didcot, Oxfordshire, on April 25, and the Association's *Winchester Weekend* would be taking place over the weekend of April 3-5 at Sparsholt College, Winchester. The President then introduced the evening's first speaker, Dr Richard Miles, Director of the Association's Asteroids and Remote Planets Section.

Comet 17P/Holmes

Dr Miles opened by summarising the physical characteristics of comet 17P/Holmes, explaining that it was a short-period comet of the Jupiter family. At present, its orbital period was 6.9 years and its perihelion and aphelion distances from the Sun were 2.05 AU and 5.18 AU respectively; this meant that it usually lay between the orbits of Mars and Jupiter, never passing inside Mars' orbit but briefly passing outside Jupiter's orbit at each aphelion. However, its orbit had not been constant over the 117 years since its discovery in 1892. From time to time it passed sufficiently close to Jupiter at aphelion that its orbit could be substantially perturbed by Jupiter's gravitational influence, and this had happened three times since its discovery, in 1908, 1968 and 2004. In the course of these interactions, it had passed through a range of orbits with periods ranging between 6.9 years and 7.33 years.

The speaker went on to explain that the comet had been discovered by BAA member Edwin Holmes on 1892 November 6, a year after the Association's foundation. It had rapidly attracted considerable interest since its conspicuous brightness – visible to the naked eye at around mag. 6 – and position – close to M31 – meant that it could not have lain unnoticed in that state for more than a day or two, and it seemed certain that it must have undergone an exceptionally rapid outburst. Its evolution had been very well recorded over subsequent days and weeks; a series of photographs taken by Edward Barnard at the Lick Observatory showed a growing circular patch of nebulosity.¹ The comet had faded rapidly over the following two months, but just as it had verged upon becoming lost, Barnard had recorded it in outburst once again on 1893 January 16, this time brightening to a more modest mag 8 and for only a short time. Shortly thereafter, it had faded beyond the reach of the telescopes of the time, and had only been rediscovered as a modest mag 16-17 object in the 1960s.

The comet had regained attention on 2009 October 24 following a report at 01:33 UT from Spanish amateur astronomer Juan Antonio Henriquez Santana, of the *Observadores Cometas* observing group, that it had been observed at tenth magnitude, whereas it had been no brighter than sixteenth magnitude in previous days. In subsequent hours, events had unfolded rapidly.² The comet's outburst had been confirmed by Ramón Naves at 02:15 UT, and within 24 hours, the comet had become an easy naked-eye object at almost mag 2. The first recorded UK-based observations of the comet had been made by Denis Buczynski at 18:35 UT. At the time of the 2007 October meeting of the Association, on October 31, it had remained sufficiently bright that a number of members had had no difficulty in observing it without any optical aid from the pavement of Piccadilly in Central London.

Dr Miles then went on to describe the comet's observed morphology, explaining that aside from its nucleus, three distinct components were visible in the best images. Closest to the centre, a yellowish and almost circular inner halo was attributed to dust. Around this, a more widespread greenish-blue glow was apparent, with similarly

circular shape, but less well-defined outer edge; this was attributed to water vapour. Finally, an ion tail could be seen extending from the coma in the anti-solar direction. By combining measurements of the observed rate of expansion of the comet's coma with the known distance of the comet, it was possible to infer that it was growing outwards at a speed of 500 m/s. This was suggestive that the coma was made up of material which had been thrown off the comet's nucleus with explosive violence.

A few days after the initial outburst, it had become apparent that there was not just one central brightness maximum within the comet's inner coma, which might be associated with the comet's nucleus, but also a second. Over subsequent days it had become further apparent that this second brightness maximum was moving relative to the centre of the coma at an estimated speed of 135 m/s.³ Subsequently, a larger number of small point-sources had been recorded within the comet's inner coma, travelling at a range of speeds and in a range of directions, but appearing to have emanated from a common source at around the time of the observed outburst; the speaker informally dubbed these *mini-comets*.

The *Observadores Cometas* observing group of which Juan Antonio Henriquez Santana was a member had gone on to monitor the comet's lightcurve for several months, seeing principally a steady decline in its brightness which was compatible with the expansion of a spherical shell of material. However, regular small outbursts, each by a little less than a magnitude, were also observed every 45 days. If this period was to be interpreted as being associated with the comet's rotation period, then 17P/Holmes was an unusually slow rotator: comets normally had rotation periods which were only a few hours. The speaker conjectured that the slow rotation of 17P/Holmes might have played a part in its outburst, perhaps because it would lead to exceptionally large temperature differences between its day and night sides.

The speaker concluded his talk by discussing observations which he had made of the comet over recent months using the Faulkes Telescopes, going on to discuss possible physical mechanisms for the apparent explosion which had triggered its outburst. He explained that a popular theory in the professional literature was that a large mass of amorphous ice beneath the comet's surface had undergone a phase transition to form crystalline ice. However, he argued that this theory seemed unable to provide sufficient energy. He then argued that liquid water might exist beneath the surface of the comet, and that this might have become gradually converted to hydrogen peroxide as a result of interactions with cosmic rays. This hydrogen peroxide could then react explosively if brought into contact with metal-rich parts of the comet, producing large quantities of heat and oxygen gas, the latter perhaps being sufficient to blast the surface off the comet. These ideas will be written up more fully in a future Journal paper.

Following the applause, the President introduced the evening's second speaker, Mr Tom Boles, the Association's most prolific discoverer of supernovae, a former president of the Association, and one of its current Vice Presidents.

Cosmology and the Expanding Universe

Mr Boles presented a pictorial overview of the development of cosmology in the twentieth century, beginning with the first observations, made in the 1920s, which had produced truly compelling evidence that the 'spiral nebulae' discovered by the Herschels were in fact vast systems of stars which lay outside the Milky Way, known today as galaxies. He went on to outline the experiments performed by Vesto Slipher in 1921 to measure the rotation speeds of these nebulae, explaining that Slipher's measurements had revealed that these objects rotated at phenomenally fast speeds – moving hundreds of kilometres each second – implying that they must also be startlingly large and distant in order to have nonetheless appeared static throughout the ages. Mr Boles then followed the story through Edwin Hubble's discovery in the 1930s of the apparent expansion of the Universe, to the discovery of the cosmic microwave background by Arno Penzias and Robert Wilson in 1964. He discussed the earliest evidence for the existence of dark matter, which had arisen from observations of the rotation velocities of galaxies made in the mid-1970s, and described how modern observations of gravitational lenses and the X-ray emission of galaxy clusters had corroborated the early evidence.

To close, Mr Boles described in detail how recent observations of the cosmic microwave background, made by a wide range of instruments including most notably the *WMAP* satellite, had allowed many of the parameters in modern cosmological models to be determined with remarkable precision.

Following the applause, the President apologised for the late running of the meeting, and invited Mr Nick James to present his Sky Notes.

The March Sky

Mr James opened with a review of the current circumstances of the planets and other solar system bodies. He reported that the Sun was continuing to show little sunspot activity, and that despite the sporadic appearance of a few small sunspots from time to time, there were no signs as yet of the start of a new sunspot cycle. The Moon was not currently visible – it would pass New Moon on the following day, March 26 – but the coming week would provide an unusually good opportunity to observe its waxing phases. The speaker explained that at this time of

year the ecliptic was highly inclined to the horizon at dusk, and this would place the Moon at an unusually high altitude in the early evening sky as it approached setting during its first few days; he predicted that the young crescent would be readily observable at nightfall within a couple of days. He added that the Society for Popular Astronomy would be organising a *Spring Moonwatch* between March 28 and April 5 in recognition of these favourable observing conditions, encouraging novice and experienced astronomers alike to look at the Moon in celebration of the International Year of Astronomy.

Turning to the planets, Mr James explained that Mercury would be coming up to superior conjunction on March 31, but would reappear in the evening sky in late April. He added that on the date of its maximum eastern elongation, April 26, it would appear within 3.5° of the Moon and the Pleiades; the triplet would appear at 10° altitude in twilight at 20h00 UT.

Venus was also close to the Sun at present, and would reach inferior conjunction on March 28; it would re-emerge in the morning sky over the next few weeks, reaching maximum western elongation on June 5. The speaker added that it was still just about visible in the evening sky, at a distance of 8.5° from the Sun, but emphasised that **extreme caution** needed to be exercised when observing an object so close to the Sun. It was **essential** that reliable setting circles be used to locate the planet and that observers did not attempt to navigate by eye. The reward, however, was a beautifully thin crescent. The speaker added that when Venus was in this phase, it was possible to use long-wavelength near-infrared CCDs to image thermal emission from the night-side of the planet, and that under the right conditions, such images appeared able to penetrate the planet's thick atmosphere to capture detail associated with features on its elusive surface.

The speaker added that he was personally hoping to follow Venus all the way through its current conjunction, and recalled how another member of the Association had once pursued a similar observing project using an 18-inch reflector, tracking Venus as it had passed, on that occasion, within 2° of the Sun. That member had reported seeing a complete ring of light being deflected around Venus' atmosphere at inferior conjunction, but had also reported seeing a remarkably intense image of the solar disk reflected onto the roof of his observatory. **Members were not recommended to try this at home.**

Mars had passed solar conjunction in 2008 December, but would not reach opposition until 2010 January 29. It would be visible in the morning sky later in the year, but would remain a difficult object for the immediate future. Jupiter had likewise recently passed conjunction, but would reach opposition rather sooner, in August. Currently, it was only just beginning to become visible in the morning sky. Unfortunately, it would remain at rather southerly declinations throughout this year's apparition, and would not be well placed for UK observers.

Saturn was undoubtedly the best-placed planet at the moment. It had passed opposition in February, but would remain visible in the evening sky until late in the summer. The speaker mentioned briefly that, as had been discussed in several recent Sky Notes presentations, its rings were presented in an almost edge-on orientation at present: at the time of the meeting they were inclined at around 3° to our line of sight.

Mr James went on to report that an asteroid by the name of 2009 DO111, discovered by the Stewart Observatory on Kitt Peak on February 22, had generated some news headlines within the last few days on account of its having passed within a mere 1.22 lunar distances of the Earth on March 20 at 04h00 UT. This was a relatively large object by near-Earth-asteroid standards – around 100 m across – and had reached a peak magnitude of around 13. Peter Birtwhistle had obtained some excellent photometry of the object over the night of March 15/16, determining its rotation period to be 351.9 ± 0.5 seconds.

Continuing on a theme of asteroids, Mr James reported that the Director of the Association's Meteor Section, Neil Bone, had recently been honoured by the International Astronomical Union (IAU), who had given an asteroid the name (7102) Neilbone. Mr Bone's citation for the honour had commended him for his contributions to amateur astronomy made through the Association, the Society for Popular Astronomy, and *Astronomy Now* magazine. The speaker warmly echoed this commendation and offered Mr Bone his personal congratulations. He added that the object itself was currently well placed for UK observation in Perseus, but would be a very challenging target at mag 18.3. Nonetheless, Dr Richard Miles had recently had little trouble obtaining images of it using the two-metre Faulkes Telescope North.

Turning to comets, Mr James reported that 2007 N3 (Lulin) had been the most exciting object of late; it had been an easy fifth-magnitude binocular target in the UK sky in February. He added that it had passed perihelion on January 10 and had made its closest approach to the Earth on February 21, reaching maximum brightness at around that time. It remained visible in the UK sky in Gemini, but was now fading fast. Whilst it was still possible to see it through binoculars, the speaker predicted that it would fade to telescopic magnitudes within 1-2 weeks.

Mr James closed by remarking that the best meteor shower of the next couple of months would be the Lyrids, which might reach a modest rate of around 10 meteors per hour on April 21/22. The waning Moon would present minimal interference, having only three days remaining until the New Moon of April 25.

Following the applause, the President adjourned the meeting until Wednesday May 27 at the present venue.

Dominic Ford

References

¹ Barnard, E.E., ApJ, **41**, 3 (1896)

² IAU Circular 8886 (2007)

³ Montalto, M., *et al.*, A&A, **479**, L45 (2008)