

Ordinary Meeting and Exhibition Meeting, 2004 June 26

held at The Cavendish Laboratory, Madingley Road, Cambridge

Tom Boles, President
Ron Johnson, Nick Hewitt and Nick James, Secretaries

The President welcomed members and guests to the annual Exhibition Meeting, and formally opened the seventh Ordinary Meeting of the 114th session. He invited Dr Nick Hewitt to read the minutes of the previous meeting, which were approved. There having been no meeting of Council since the previous meeting, the President said that there were no new members or papers to announce. However, any new members present were invited to introduce themselves to him after the meeting. Mr Boles said the next meeting would be the Out of London Meeting, held this year in Douglas, on the Isle of Man, on September 10–12. Anyone planning to attend should let the Association know within the next few days whether they required accommodation.

Mr Boles then explained that it was his most pleasant duty to present the Association's Awards and Medals for 2004.

The Steavenson Award: John Toone

Mr Boles was delighted to present the Steavenson Award, given for an outstanding contribution to observational astronomy, to John Toone. Mr Toone had been an active member of the Variable Star Section for over twenty years, and had submitted in excess



John Toone

of 100,000 observations since his first in 1975. He had served this Section in recent years in the arduous capacity of Chart Secretary, and was particularly noted as one of the rare breed of early morning observers. He had also made the observation of active galactic nuclei his speciality. There was prolonged applause. In accepting the award, Mr Toone wished to thank his parents first of all – who, though never into astronomy themselves, had bought him his first refractor. In addition, he had always thought of Colin Henshaw as a mentor in his early years. Mr Toone also thanked all of the VSS Directors and officers, who had helped him a great deal over the years. Fi-

nally, he thanked the Association itself, whose combination of 19th-century standards and 21st-century observing techniques he felt made it the active institution it was.

Following further applause, the President said that the Merlin Medal and Gift, given in recognition of a notable contribution to the advancement of astronomy, was this year awarded to Mr Neil Bone.

The Merlin Medal and Gift: Neil Bone

Mr Bone's name would surely be familiar to all as that of a tireless promoter of the cause of amateur astronomy. As well as travelling widely to give talks, he was also the author of a great number of books, and wrote the regular *Sky Notes* column for the Association's *Journal*. Mr Bone had served the BAA as Director of the Meteor Section for twelve years to date, and had published many *Journal* papers in that capacity.

After lengthy applause, Mr Bone expressed his great honour at receiving this award. Casting back to his childhood he remembered the individuals who had inspired him into astronomy and sustained his enthusiasm in the early years, expressing his thanks to Howard Miles for replying to his letters, Ian Ridpath, Melvyn Taylor, Robin Scagell and Michael Gainsford, though there were many others. From these individuals, he had learnt the importance of replying to queries and providing encouragement to newcomers, and as Section Director he endeavoured to be as welcoming as they had been. Finally, Mr Bone expressed his gratitude to David Gavine and to his wife and family, who were present in the audience.

When the applause died down, Mr Boles introduced the first speaker, Mr David Graham, Director of the Saturn Section, and invited him to deliver the first talk of the afternoon.

Observing Saturn in the age of Cassini

The title of the talk, Mr Graham began, referred of course to the spacecraft bearing the name *Cassini*, now returning superb images of Saturn as it neared the date of the orbital insertion manoeuvre. Over the forthcoming four-year mission, extensive observation of



Neil Bone (left) receives the Merlin Medal from Tom Boles. (Photos by Hazel McGee)

the planet and its moons would be undertaken, and some very fine images were sure to be seen in that time. *Cassini*, the probe, was of course named after the man, Giovanni Domenico Cassini (1625–1712), onetime head of the Paris Observatory, whose pioneering observations of the planet were also commemorated by the naming of the prominent 'Cassini Division' in the ring system. The subject of Cassini the man would, however, have to be left for another day.

Visual observations by Dr William Sheehan from 2003 September, during the previous apparition, opened the talk. Dr Sheehan had been working at the 36-inch (910mm) refractor at the Lick Observatory on Mount Hamilton, primarily to observe the perihelic opposition of Mars, but he had also found time to make some superb sketches of Saturn. In the same month, high-resolution CCD images from Christophe Pellier had revealed a vague feature in the South Tropical Zone (STrZ) which appeared to be a faint white spot. This was one of several similar features which had been noted by various observers during the apparition.

In the speaker's experience, astronomy books were frequently found to say that white spots erupted in the North Equatorial Zone around every 30 years, lasting only for a few months. However, it would now seem that high-resolution images such as those by Pellier, Peach and others, were revealing that similar, but much smaller, features frequently erupted in the South Equatorial Zone between the large events which had been noted previously. Both phenomena appeared to be season-dependent, occurring only in the summer of the respective hemisphere. It was perhaps counterintuitive that the smaller erup-



tions should be found in the southern hemisphere, the summer of which lay closer to the perihelion of the planet, and thus where the solar flux was stronger. However, the speaker pointed out that whilst the solar flux was indeed stronger at perihelion, the rate of orbital rotation was slower at aphelion, and so northern summer was a little longer than southern summer. In the case of spot formation, this effect appeared to dominate the closer proximity of the planet to the Sun.

Around November 30 last year, several observers had noted an outbreak of white spots in the STrZ. This activity seemed to mirror what had been seen during the 2002 apparition. A type of observation that the speaker wished particularly to recommend was the construction of photometric profiles of the rings. Presently, Damian Peach was apparently the only observer making such measurements. Once measurements had been amassed over several apparitions, it would be interesting to monitor the time-variation of the ring-components. Showing Peach's results, the speaker pointed out the clear dip in the profile which was the Cassini division, and a smaller dip which was the Encke division. It was hoped that these observations might prove scientifically interesting in due course.

The speaker noted that on one occasion in the previous apparition, a dark spot had been detected in Hubble Space Telescope (HST) images from the International Outer Planets Watch, and confirmation had come ten days later from Damian Peach. It was amazing that amateur planetary imagers could now record features which were previously exclusive to the HST. It seemed that these dark spots were most prominent when viewed in red light, whilst bright spots were most conspicuous in blue light because they were known to exhibit methane emission.

In the second part of his talk, Mr Graham moved onto the progress of the *Cassini* mission itself. He was pleased to see another probe observing the Saturn system, as Mars seemed to have got more than its fair share of attention in recent years. The probe had already started to return superb images, although it was still heading through the solar system on its way to the planet, and would not enter a bound gravitational orbit of it until an orbital insertion manoeuvre on July 1. All the images were available on the *Cassini* website, and the speaker recommended all to have a look through them. Over the next four years – the estimated lifetime of the mission – it was evident that a rich array of images of the planet and its moons would be on offer.

The speaker first showed one of *Cassini*'s images from February 9, when it had still been many millions of miles distant from the planet, but which was one of the first to show it in an orientation distinctly different from the view seen from Earth. Whereas the Earth's relative proximity to the Sun meant that terrestrial observers saw no visible phase to Saturn's

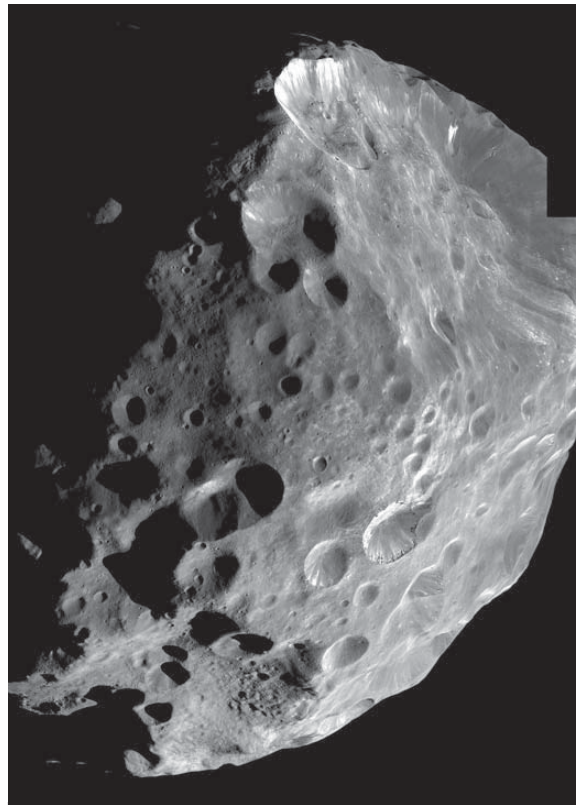
disk, and any shadow cast by it onto the ring system lay hidden behind it, *Cassini*'s approach trajectory now gave it a superb view of the day/night terminator, and the shadow of the ball cast onto the rings.

Recent amateur images by Richard McKim and Christophe Pellier had been suggestive of the presence of indentation-like features on the northern edge of the South Equatorial Belt. Close inspection of some of *Cassini*'s first images appeared to hint at a similar conclusion. The speaker was confident that the features seen by *Cassini* would turn out to correspond to those which amateur observers had seen previously.

Zooming in on the shadow cast by the ball onto the rings revealed a view reminiscent of that seen during the *Voyager I* flyby, and which had not been seen since. However, the *Cassini* images had so far revealed no hint of the spoke-like features which had been apparent in the images returned by this earlier mission. It would be interesting to see whether they would make an appearance at some point during the four-year mission.

Perhaps the most striking image of all those returned thus far was from the probe's close encounter with Saturn's distant moon Phoebe on June 11. Orbiting at a distance of eight million miles, and a mere 100 miles across, this moon was unusual in a number of respects. Its orbit was retrograde as compared to that of the other moons, and the plane much closer to the ecliptic than that of the rest of the Saturn system. Furthermore, its albedo was very low, suggestive of an unusual composition. Six years after its discovery in 1898 by William H. Pickering, Dr A. C. D. Crommelin, then BAA President, proposed that Phoebe might have had its origins outside the Saturn system, and have become gravitationally captured. This was now widely believed to be the case, though it remained without decisive confirmation, and would be investigated further by *Cassini*.

Finally, the speaker once again urged members to download *Cassini*'s images for home viewing – at half a megabyte the download time would be reasonable on even a dialup connection, yet the amount of detail was phenomenal, and could not be done proper justice on a projection screen. He noted in particular that the image of Phoebe was 2,000



A mosaic of high-resolution images of Saturn's satellite Phoebe returned by the *Cassini* spacecraft at its close flyby on 2004 June 11. The image scale is 74 metres per pixel. NASA/JPL/Space Science Institute, Colorado

pixels square, but despite being a mosaic of several smaller images, the stacking was so good that it was not possible to make out the edges of the individual frames.

Following the applause for Mr Graham's presentation, the President invited Mr Martin Moberley to present his regular Sky Notes.

The summer sky

Opening with the supernova scene, Mr Moberley explained that preparing this month's Sky Notes had been a somewhat frustrating business, as every time he thought he had finished, another discovery would come in. Since the previous meeting, Mark Armstrong had contributed four discoveries, his latest confirmed on the evening before the meeting. One further discovery by Tom Boles landed the two rivals neck and neck with 66 discoveries apiece. Having surpassed the record of 100 UK supernova discoveries last year, it now seemed very likely that both the Association's leading hunters would have 100 each by early next year.

The speaker then showed the latest images of comet C/2001 Q4 (NEAT), including a mosaic of eight two-minute exposures taken on May 16, close to perihelion, by Mike Holloway in Van Buren, Arkansas. Mr Mob-



Callum Potter (left), Nick Hewitt and Dave Gavine at the Exhibition Meeting. (Photos by Hazel McGee)

berley went on to show one of his own mosaics from a week later. Throughout July and August, C/2001 Q4 would be passing through Ursa Major at mag 7-8, skirting close by a series of galaxies in the first half of August: NGCs 3613, 3610, 3642, 3945 and 4036. Most of these close approaches would be within around 30 arcseconds, and so they would be fine photographic opportunities. In September the comet would cut across Draconis, heading on into Ursa Minor in October, fading to around mag 10 by November.

Comet C/2004 F4 (Bradfield) was now passing through Cassiopeia, and fading from mag 10 at the start of June to mag 12 by the end of July. An intrinsically compact comet, a CCD would soon be required to observe it, though it would remain a northern object in coming months. Similarly, Comet Tabur was fading at around mag 11, and passing through Auriga and Lynx in July and August respectively. This too was essentially now confined to the realm of CCD observation.



David Boyd (left), Gary Poyner and Janet Simpson of the Variable Star Section.

The most easily observable planets – Mars, Jupiter and Saturn – would be absent from the night sky over the summer, but Mr Moberley urged members to take advantage of the summer oppositions of Uranus and Neptune on August 27 at mag 5.7, and on August 6 at mag 7.8 respectively. He wondered, given the ever-increasing level of detail that amateurs were able to resolve on the nearer planets, whether it might soon be possible to resolve detail on the disks of these also, having diameters of 3.9 and 2.5 arcseconds respectively.

The speaker also noted that the Association's own asteroid, 4522 *Britastra*, would pass within 6 minutes of Neptune on August 1 in Capricornus at mag 14.5.

Mr Moberley briefly reviewed the progress of the *Cassini* mission to Saturn, already discussed by the preceding speaker. One of his favourite images thus far was of the ring system, taken on May 10. The filamentary shadows of each ring on the surface of the planet could be seen through the inter-ring spaces, having an appearance similar to a spider's web. Though these images had been taken while the probe was still a considerable distance from Saturn, the speaker noted that each pixel represented a distance of only 100 miles on the surface. On May 23, *Cassini* had turned its cameras upon Titan for the first time, one of the most curious moons in the system, and to be the ultimate destination of the European *Huygens* probe, scheduled to be released from mothership *Cassini* on Christmas Day, and to descend into the moon's atmosphere on 2005 January 14. Perhaps the most stunning images of all were those from the close fly-by of Phoebe on June 11, already mentioned by Mr Graham.

The speaker went on to discuss *Cassini*'s orbital insertion process that would take place on July 1. The beginning of the manoeuvre would be marked at 00h47 UT, when the probe would ascend through the plane of the rings, passing between the F-ring and the G-ring at an altitude of

60,000 miles above the planet's cloud tops. Though the probe was likely to encounter some small particles of debris between the rings, the risk posed by them was minimal. The insertion burn itself would take place over a 96-minute period between 01h12 and 02h48, during which time *Cassini* would dip to a minimum altitude of 11,000 miles above the cloud tops. The speaker noted that this was the lowest altitude that *Cassini* would attain at any point during its forthcoming four-year mission. At 04h34, all going to plan, the probe would descend back through the ring plane, once again passing between the F-ring and the G-ring. This would mark the end of



Dr Richard McKim (at computer) with the exhibit by the Mars Section.

the critical orbital-insertion period. However, the light travel time between Saturn and Earth being 85 minutes, mission controllers would only be sure of the success of each step after a considerable delay.

Mr Moberley drew members' attention to some of the most exciting highlights of the mission which would be coming up in the autumn, including the first close fly-by of Titan on July 2. A second close pass would follow on October 26, at an altitude of a mere 750-miles from Titan's cloud tops. A third flypast of Titan would come on December 13, at a distance of 1,400 miles, to be followed by the separation of the *Huygens* probe on December 25. In the meantime, high-resolution imaging of several other moons would also be undertaken, including Enceladus, Mimas, Phoebe and Iapetus.

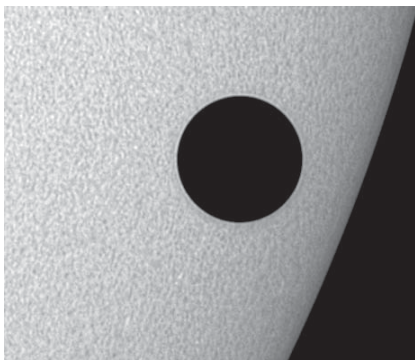
Closer to home, meteor spotters were reminded of the Boötid Pons-Winneckeds storm, which might return on that very evening. Rates of 50–100 ZHR had been reported in 1998 after a 70-year dormant period, and a return this year was possible, though the speaker noted that this was likely to be hampered by a ten-day-old Moon, evening twilight, and the forecast of rain across the UK. A better-known summer meteor shower would come in the form of the Perseids, spread between July 23 and August 20, peaking on August 12 with a likely ZHR of 80, four-days prior to New Moon.



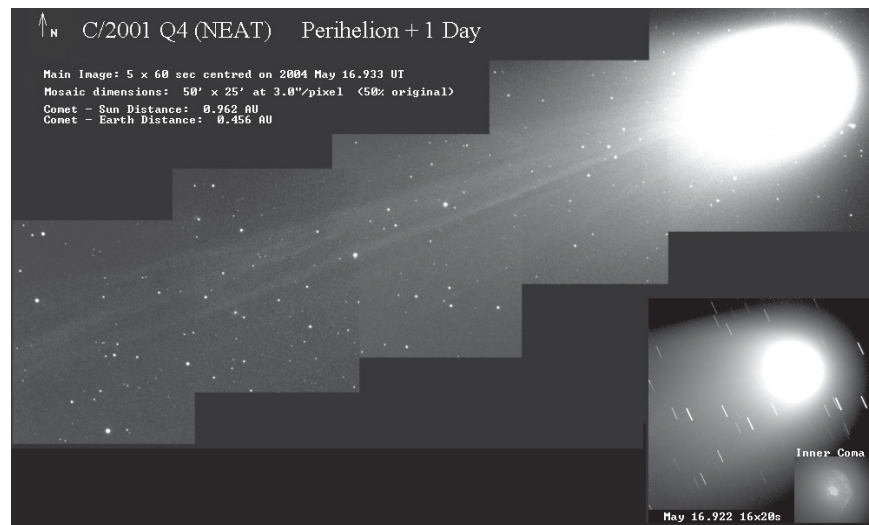
On September 29, asteroid Toutatis would pass within 1.5 million km of the Earth. Though this did not pose a threat, the speaker noted that no larger asteroid had passed closer to the Earth for 250 years, and in the long-term, Toutatis was deemed the most hazardous such rock yet discovered. It was believed to be several kilometres across. Mr Mobberley showed images from a previous close approach, at a distance of 5.3 million km, in 1996. Radar ranging had been used in an attempt to map the surface on that occasion, revealing it to have an unusual topography, apparently formed of two large bulges connected by a narrow neck. It remained possible that these were in fact two disconnected components. Though at a bright mag 9, the forthcoming approach would not be readily observable, taking place at declinations inaccessible to northern observers, and where even southern observers would be hampered by the Sun. Toutatis would travel towards perihelion after passing the Earth, fading dramatically immediately after its close approach due to the sudden change in its apparent phase.

Having come to the end of his Sky Notes, Mr Mobberley explained that he had been asked to summarise the observations of the June 8 transit of Venus which were made from Sir Patrick Moore's garden in Selsey, on the southern-most tip of the Sussex coast. To celebrate the historic occasion, a great many astronomers had descended to join Sir Patrick, including Brian May, former guitarist from the band *Queen*, planetary imager Damian Peach, the production team of the BBC's *Sky at Night*, as well as the speaker himself and many others. During the course of the morning, Sir Patrick had made a number of appearances on breakfast television to report the progress of Venus across the face of the Sun.

As observers began to arrive, an ever-larger collection of telescopes had filled Sir Patrick's house. The speaker particularly mentioned a Dobsonian reflector brought by Brian May, which had been his childhood instrument, and to which an eyepiece projection unit had been added for transit observation. The speaker



Venus in transit, 2004 June 8, imaged by Paolo Lazzarotti (Italy) at 10:54 UT. Note the solar granulation refracted around the disk by Venus' atmosphere. P. Lazzarotti.



Comet 2001 Q4 (NEAT) imaged by Martin Mobberley with a Celestron 14 SCT on Paramount ME mount with ST9XE CCD. M. P. Mobberley.

joked that perhaps some would have preferred him to have brought his guitar along instead!

As the Sun rose on transit day, the weather forecast was to prove good, the south-east of the country enjoying bright sunshine, though the skies of northern Britain were rather more overcast. The observers at Selsey, at least, were promised a good view. As the time of ingress drew near, the assembled gathering congregated in the only small corner of the garden from which the early-morning Sun was visible, peeping a little over 10° above the horizon. The seeing was good, and Sir Patrick was soon able to report to BBC1 audiences that ingress had been observed. The speaker showed animations of some of his own observations, followed by superb high-resolution images by Damian Peach and Dave Tyler.

Mr Mobberley also took the opportunity of showing an image of egress taken by Paolo Lazzarotti from his Italian observatory. Stacking 1/100 second frames over a 15 second period, Lazzarotti had achieved such high resolution that the solar granulation could clearly be seen, as could the refractive effect of Venus' atmosphere on this granulation around the sharp edge of the disk of the planet. Finally, the speaker wished to dispel one popular myth: there would in fact be another chance to observe a transit of Venus from the UK in 2012. On 2012 June 6, the Sun would rise at 03h36 UT, at which time the transit would be approaching egress, which would occur an hour later at 04h37 UT. So dedicated observers with flat horizons would be sure to make some observations in eight years time.

Following the applause for another lively instalment from Mr Mobberley, the President explained that the rest of the meeting would consist of a number of members presenting their observations of the transit from other observing sites. Mr Nick James was invited to chair the discussion.

Members' observations of the transit of Venus, 2004 June 8

Mr James began by describing his own observations from Sharm el-Sheikh in Egypt, where he had been accompanied by several BAA members including Hazel and Brian McGee, John Mason, Nigel Evans and Nick Hewitt. Having selected Cornwall as his observing site for the 1999 solar eclipse, he chose this site for the transit on the grounds that it had not seen a cloud in years, and rain perhaps only twice in the past decade. Whilst the heat of the Egyptian climate was quite formidable, and the seeing consequently rather poor, some observations were assured. In addition, accommodation was reasonably priced, Sharm el-Sheikh being a prominent diving resort.

Before showing his own images, the speaker showed a selection of his favourite observations from around the world – perhaps greatest of all a series of drawings by Mario Frassati, at that time Director of the Mercury and Venus Section, showing what he saw at his eyepiece. Most notable were those of the appearance of egress, during which he saw light refracted by the atmosphere of Venus shortly after interior egress, generating a momentary bright outline to the dark limb of the disk of the planet.

Another fine image was that by Tomas Maruska in Slovakia, who had been observing within a narrow track of locations which would see the International Space Station (ISS) transit the Sun while Venus was in transit. The speaker explained that the ISS, whilst visible only infrequently in any one location, was always visible somewhere on Earth. Thus the transit of the Sun by the ISS was not in itself rare, but merely required the observer to be in a very precise geographic location. The ISS



Some of the BBC's equipment on the roof of the hotel at Sharm el-Sheikh. Hazel McGee

took a mere 0.6 seconds to cross the solar disk, however, so high-speed photography was essential if this was to be caught on camera. At his own observing site in the Sinai, Mr James was 70 miles to the south of the track where this phenomenon could be seen.

The speaker's own observations included a gripping six-hour video of the whole event, available on request on DVD. Owing to the time constraints of the meeting, however, there was sadly only time to show a time-lapse version of this video, compressed down to 45 seconds. It was noted that during the course of the transit, an unidentified object had briefly passed across the Sun. It did not appear to be any known satellite, and he invited members to get in touch if they thought they could identify it. The speaker also remarked that during the transit, he had taken his BAA solar viewer, as provided with the *June Journal*, into the swimming pool, but it had disintegrated in the water. It was noted with some humour that the meticulous safety instructions provided by the Public Relations Officer before the event had failed to warn observers of this hazard.

Sharm el-Sheikh was also chosen by the BBC as an observing location, and professional observers were sent to provide footage to accompany that from Selsey. Mr James showed images of the setup they had used, which included Coronado solar telescopes fitted with cameras. Around a tonne of satellite uplink hardware was used to relay footage to London. However, he noted that the equipment was operated not by astronomers, but by experts in the filming of scientific events, without specialist astronomical expertise. As a possible result of this, they appeared to have missed first contact after initially training their cameras on the wrong limb of the Sun.

Mr James then invited a series of members to present their own observations.

Nigel Evans had also observed from Sharm el-Sheikh, and showed a mosaic he had generated from a series of images taken with a webcam at intervals throughout the transit. As an intermission, he also showed images of

the Milky Way he had taken in the desert, taking advantage of the dark skies. Using a Canon digital SLR f/4 camera, and stacking six five-minute exposures, he had obtained a fine image (used on the cover of the 2004 *October Journal*). There was often debate as to how long film would remain useful to astronomers, and it seemed on the grounds of these images that it would soon be obsolete. He compared this CCD image with one of higher magnification taken on film, zooming in on Scutum. A little more detail was

apparent, and so at present it seemed that film was marginally superior, but the difference was so small that it seemed unlikely to remain that way for long.

Mike Foulkes presented the results of his own observing trip to Egypt, on which he had been accompanied by Derek Hatch. He had sought to obtain high-resolution images of the black drop effect, but on the day, the seeing had been too poor to allow this. Though he had anticipated that it would be poor, it was to prove even worse than expected. At second contact, he noted that he could clearly see an arc of light around the dark limb of Venus, where sunlight was diffracting around its atmosphere. The black drop effect could be seen standing back, but was not apparent in the highest resolution images, suggesting it to be a seeing-related effect. In summary, he reported that his visual observations had been good, but his imaging less successful. Seeing had deteriorated during the transit, and become very poor by third and fourth contact.

Richard McKim reported on his observations from Northamptonshire, showing three still frames from an AVI video he had made. He had used an H-alpha filter. He remarked that his 14-month-old daughter's first reaction to being shown the projected transit was to try to rub out the blemish on the Sun's disk with her finger.

Neil Bone reported on his observations from Chichester, West Sussex, where he had used an unstopped 60mm aperture for solar projection. He had always previously been of the view that dictaphones were a good way to lose observations, but on this occasion had used one with great success to time ingress. At second contact he was unsure whether there had been a black-drop effect – if so it had been minimal. He recalled that a few years ago he had dreamt of observing three events: the Leonids of 1999, the total solar eclipse of 1999, and the transit of Venus of 2004. He was glad that clouds had spared him one of the three.

Stewart Moore had observed from East Anglia. He had found the weather so favourable, that not only had the seeing been superb through-

out the transit, but it had also allowed for a full practice the previous morning. He had used an 8¼" aperture stopped down to 6", and noted that the seeing had been crystal clear at 6am. Rather than displaying more images, he wished to make three summary remarks: firstly how beautiful it had appeared through the eyepiece, secondly how huge Venus had appeared, and thirdly the lack of black drop effect. With reference to the latter, he had perhaps been able to discern a fuzzy hair-like connection at second contact, rather like a meniscus effect. However, it had been much lighter than the dark disk of Venus, and did not interfere at all with his timing. He anticipated there would be much debate in coming months as to the origin of the effect which had so dogged historical observations.

Noting how fine the seeing had been, Mr Moore wondered whether amateurs ought perhaps to try solar observing at 6am more often. Finally, he reported that he had seen an effect similar to Baily's Beads around the disk of Venus during the transit. This did not seem to have been seen by any of the other observers presenting reports, but he was curious to hear from anyone else who had seen a similar phenomenon.

Mr James concluded the presentation by showing images by a number of other UK observers, including Maurice Gavin, Lyn Smith, Martin Taylor, David Strange and Damian Peach. In Martin Taylor's images, it was noted that the black drop effect was seen in some of the webcam images. Normally only those images with good seeing were selected, and when this was done, the black drop disappeared. But when the opposite was done, and only the images with the poorest seeing selected, the black drop effect was clear. Mr James thought from this that the black drop effect was very likely to be a seeing-related phenomenon.

The President concluded the proceedings by thanking the afternoon's speakers. He also expressed his gratitude to Nick Hewitt and Jonathan Shanklin for organising the meeting, and to Geoffrey Johnstone and Peter Hudson for providing assistance. Thanks also went to those members of the Cavendish staff who had been present: Harry Druiff, Bill Badcock and David Woosey, also to those who had helped in preparing the lunches. The meeting was then adjourned until the Out of London Meeting on Saturday September 10 in Douglas, on the Isle of Man.

Dominic Ford

Journal special issue – the 2004 transit of Venus

The next (June) issue of the *Journal* will contain members' observations and reports of the Venus transit. If you have not yet sent in your contribution, please do so **immediately** to Nick James, e-mail ndj@blueyonder.co.uk.