Ordinary Meeting, 2003 March 19
held at The Geological Society, Burlington House, Piccadilly, London W1

Guy Hurst, President

Ron Johnson, Nick Hewitt and Nick James, Secretaries

The President opened the fourth Ordinary Meeting of the 113th session. Dr Nick Hewitt was invited to read the minutes of the previous meeting, which had been held at the first Observing Workshop in February, and these were approved by members. Mr Johnson announced that one present had been donated since the previous meeting: a copy of Nick James' latest book [?], donated by Explorer's Tours [?]. Following the recent membership drive, the President was pleased to announce that there were 236 new members proposed for election. The six proposed new members from the previous meeting were approved by members. The President was keen to meet any of these new members after the meeting. Mr James announced that Council had approved two papers for the Journal:

Radio Emission from the Active Sun, by J.C.D. Marsh
Scale Model of the Solar System, by Barry Keenan

Mr Hurst announced that free NASA bulletins, detailing the local circumstances of all total and annular solar eclipses during 2003, were available at the meeting. The Association's next meeting would be held at King Alfred College in Winchester on April 25-27, and would include the second in the series of Observing Workshops. The President was delighted by the amount of positive feedback which he had received in response to the first Workshop, and hoped that the second would be equally successful. The Winchester weekend would be followed on May 10 by the annual ProAm meeting, hosted this year by the Open University, and including the inaugural George Alcock memorial talk by Dr Brian Marsden. The next Ordinary Meeting was to be held on May 21.

Finally, the President encouraged members to pass on their opinions of the suitability of the lecture theatre, which was being used for the first time. Mr Martin Mobberley was then invited to present Sky Notes.

The March Sky

The speaker opened with the planetary scene, showing some of the superb results obtained by Eric Ng in Hong Kong, directing a Philips ToUcam webcam CCD at Jupiter. Ng had imaged a white oval passing the Great Red Spot on February 17 – an event also sketched by Dr Richard McKim – as well as the transit of Io on March 13, with the planet's shadow well-resolved. Many of those amateurs with sufficient resolution had watched with interest on January 28 as white spot Z, nicknamed "barge killer", had approached barge B1. Images of the event by Damian Peach featured a number of smudges within the North Temperate Belt – past victims of Z. In this instance, however, B1 was to receive light treatment.

Closer to home, Mars already subtended 7" at the time of the meeting, and would peak at 28" at opposition on August 28. The most favourable declination would be -13° in mid-July. Syrtis Major was recommended as one of the most distinctive surface features to watch out for.

In the comet scene, C/2002 V1 (NEAT) had passed within 0.1 AU of the Sun at perihelion on February 18. This was sufficiently close that there had been a significant risk of it becoming engulfed by a solar flare. Whilst the comet had clearly not been observable by amateurs, the Soho solar coronograph had provided a superb view, and the speaker predicted it would have appeared at mag 2 at perihelion. Meanwhile, Juels Holvorcem was presently passing through Andromeda at mag 7, but would plunge into twilight in early April. C/2001 HT-50 (LINEAR-NEAT) was in Orion at around mag 11-12. Mr Mobberley suggested that CCD observers might like to take advantage of an excellent test of the dynamic range of their equipment on March 21, when it would pass within 8' of Betelgeuse. C/2002 X5 Kudo-Fujikawa was back, low in the southwestern twilight of Orion at mag 9. On March 9 it would skirt past Rigel, before a close encounter with the Orion Nebula (M42) on April 10.

Tom Boles had had an illustrious month, discovering 11 supernova events since the previous meeting. As at February 13, Boles had had 38 supernovae to his name, as compared to Armstrong's 40. But, Boles had since added three further events to his total, making him the UK's undisputed leader in supernova discovery. The UK amateur total was now 90, and it seemed highly probable that the 100th event would come before the close of 2003. Mr Mobberley reflected upon how inconceivable such a suggestion would have been only five years ago. For minor planet observers, asteroid Vesta would be passing through a dense cluster of galaxies in Virgo until mid-July, maintaining a brightness around mag 6-8.

Mr Mobberley reminded members of the ongoing series of Multiple Galilean Events of the Jovian moons. January 17/18 had seen five simultaneous transit events on Jupiter's surface, and whilst the weather had been a mixed bag, observers in East Anglia had fared best. Damian Peach had sent characteristically clear images of the transits from Tenerife. Favourable events in the near future included March 20, when Io would occult Europa between 23:51 and 23:54UT to a maximum of 59%; March 24, when Io would eclipse Ganymede between 21:59 and 22:05UT to

a maximum of 9%; and March 25, when Europa would occult Ganymede between 20:45 and 20:52UT to a maximum of 28%.

May 7 would see the first solar transit of Mercury since 1999, with greatest transit at 7:52UT. Each century sees an average of 14 such events, mostly in November (perihelic), but occasionally in May (aphelic). A second transit of Mercury would take place on 2006 November 8-9, with rarer transits of Venus on 2004 June 8 and 2012 June 5-6.

There would be a total lunar eclipse on May 16, visible from the UK at moonset with an altitude of only 10° above the SSW sky. Members able to observe at such altitudes were advised to watch out for the spectacular red colouring of the eclipsed Moon. An annular solar eclipse would be visible from Scotland on May 31, with the remainder of the UK witnessing a partial event. This was the UK's first annular eclipse since 1921, and the last until 2093. Mr Mobberley explained that annular events were possible because whilst the Sun only varies in angular size between 31'31" and 32'25", the Moon varies between 29'22" and 33'31". Thus, there are times when the Moon is not sufficiently large as to be able to entirely eclipse the Sun, and a ring of sunlight is left around its silhouette. On the occasion of May 31, both objects would be close to their smallest possible sizes.

Following the applause for Mr Mobberley's well-illustrated presentation, the President invited Dr John Mason to introduce a series of eclipse reports from members who had viewed the total solar eclipse of 2002 December 4 in southern Africa and Australia.

The Total Solar Eclipse of 2002 December 4

This had been the second total solar eclipse of the 21st century, with a maximum length of totality of 2 minutes 4 seconds over the southern Pacific Ocean. The path of totality was a mere 85km wide, lying primarily over ocean, with land-based observation possible only at either end of the path: from southern Africa or southern Australia. In the former case, however, the chances of good weather were slim as the African rain season was at its height. No successful observations had been reported from the east African coast, although observers had enjoyed some success in Botswana and Zimbabwe, with a 1 minute 15 second totality at 30° altitude. Along most of the track, cloud cover had exceeded 50%, and rough seas precluded any stable camera mount.

The greatest success had come from Australia, where the altitude of totality was 9° and cloudiness 25-30%. Observing parties had favoured three sites in particular: Ceduna, at the western coastal extreme of totality's path; the Woomera Prohibited Area; and Lyndhurst, towards the northeastern extreme of the totality path. Lingering cloud at Ceduna had led many to journey along the path of totality towards Lyndhurst, however.

Four substantial sunspot groups had been visible four days before the eclipse, raising hopes for coronal flares during totality. In the event, prominences were visible all around the solar disc. At the end of totality, the diamond ring grew over a broad front, rather than emerging from a single point. Dr Mason then proceeded to invite a number of Association members to present their observations.

Mr Mike Maunder reported that he had observed from Ceduna, on the southwestern Australian coast, attempting to film totality with a reflection across the sea. Whilst much of the partial phase had been clearly visible, the 33 seconds of totality were unfortunately partly obscured by cloud. He had hoped that his footage would be reported by the BBC on the Sky at Night, but sadly it was dropped from the schedule at a late stage.

Mr Nick James had stayed with a large number of Explorers' Tours observers at Woomera, central Australia. The group had been greeted by kind weather. The eclipse path had not passed through the main settlement at Woomera, and so the chosen observing site had been the Woomera Prohibited Area – a former British rocketry and nuclear test site. The area was incredibly isolated, but the flat horizon was ideally suited for observation of the low altitude totality phase. To assist in this aim, observers had formed a long line to avoid obstructing one another's views. Besides his eclipse observing, Mr James had also taken a keen interest in the surroundings at Woomera, which included the launch pads for both military and space rocketry. Following the 100% failure rate of the European multistage satellite launcher, the site had fallen into disuse in the 1970s.

Mr Nigel Evans presented a second report from the same observing site. He had optimised his use of the 27 seconds of totality by wiring five cameras to his Psion PDA. This fully-automated setup allowed him to effortlessly take a range of photographs, including strings of images at different exposure settings. His results included Hα and He ionisation maps, revealing strong prominences in the corona. He reported that high winds had limited his seeing to an arcminute, and that he had also overestimated aperture settings, but his results were of superb quality nonetheless. Most notable of all was video footage of the Sun setting during the partial phase, with a "continuous green flash" caught on camera, as the crescent – shaped much like a dolphin fin – passed out of sight.

Finally, Mike Foulkes and Derek Hatch reported that they had been based at Lyndhurst, a small settlement comprising of no more than a couple of buildings surrounded by dry, flat, desert. They had used a digital SLR camera with a wide-angle lens on an equatorial mount, and recorded a straightforward second contact, clear images of Bailey's beads, and a double diamond ring at the close of totality.

Following the applause for the superb results presented in the reports, the President invited Dr Jon Loveday, of the University of Sussex, to present the afternoon's main talk.

The Sloan Digital Sky Survey (SDSS)

Dr Loveday set out the aims of the survey: it was to make a definitive map of the local universe over one quarter of the celestial sphere, concentrated primarily around the northern galactic pole. Five spectral bands were to be covered: three optical, one near IR, and one near UV. It would catalogue 50 million galaxies down to mag 22, obtaining spectra for a million of them. The collaboration included 150 scientists from Japanese, American and European institutions. The observing site had been selected as the Apache Point Observatory in New Mexico, with the primary instrument a wide-angle reflector with 2.5m primary mirror with 3° field, on an alt-azimuth mount with roll-off enclosure. Two spectrographs would be used to undertake the spectral component of the survey.

The sky was to be surveyed in narrow longitudinal strips. By surveying along these strips at the same rate as the Earth's rotation, it was possible to minimise movement of the instrumentation, and thus measure continuously, making maximal use of the available observing time. The integration of each plate lasted 55 seconds, with cameras tuned to each spectral band staggered in east-west orientation in the image plane, such that, as the Earth rotated, and the right-ascension of observation increased, objects proceeded from one camera to the next. All of the electronics worked simultaneously, with different areas of sky being measured in each colour. The cameras consisted of four-million-pixel 2-inch square CCD arrays cooled by liquid nitrogen to -80°C. The totality of the proposed survey area was 45 such strips, each taking roughly two nights. Thus the project would take place over 90 perfectly clear nights, which at the Apache Point Observatory are around 50% of all nights.

The spectroscopic component of the SDSS was achieved using a metal plate filter in the image plane of the telescope, with holes drilled at the positions of sources, and fibre-optics used to pipe light to a spectrograph. The fibres had to be placed by hand, and with up to 640 fibres connected to any one such filter, the average turnaround time to set up each plate was around 15 minutes. The spectrometers covered the range 3900-9100Å with light throughput efficiency 20-25%.

The sample of objects for spectroscopic examination included the brightest 900,000 galaxies in the survey, those down to mag 17.77, and around 100,000 luminous red galaxies, down to mag 19.5. These objects correspond to those out to around redshift 0.4. As of 2003 March, 60% of the survey area had been charted, with 370,000 spectra recorded.

The first public data release, "Data Release 1", would include 2067 square degrees of survey (25%) and 186,240 spectra. Publication had been scheduled for January, but had been postponed after a bug was found in the magnitude calibration. It was presently on schedule for a March 31 release. The available data products were to include survey images in FITS and JPEG format, spectra in FITS and GIF format, raw object lists, and finding charts.

Dr Loveday demonstrated how the survey data could be plotted onto pie diagrams with the Earth at the centre, and galaxies at increasing redshifts plotted at increasing distances from the centre, with redshift 0.1 on the edge of the plot. This revealed a frothy distribution of galaxies with voids and great-wall-type features bounding them. A decrease in the density of galaxies at increasing redshift was accounted for because the limiting absolute magnitude of observation deteriorated with distance. Such information about galactic distributions was useful in constraining our modelling of galactic evolution, as well as the values of cosmological parameters. In theory, the distribution of galaxies is the result of the gravitational interaction of luminous matter with dark matter – an interaction of which the details remain highly speculative at the present time. However, by modelling the kinds of distribution we would expect from different kinds of interaction, Dr Loveday explained how we could use the SDSS to select the most favoured interaction models.

Scientific highlights of the data included the identification of several luminous quasars beyond redshift 5. Furthermore, a surprising feature of the overall distribution of galaxies was a trend of brightening average absolute magnitude and decreasing density at higher redshifts, which remained after account had been taken for line-of-sight effects. A possible explanation was a local underdensity extending out to redshift 0.3. If real, the presence of structure on such large scales would be a result of profound cosmological consequence. However, there was close correspondence between the density/redshift relationship observed in north and south hemispheres, placing us very close to the centre of the proposed underdensity. This seemed remarkably coincidental, and a more attractive explanation was therefore a significant time-evolution of the galactic distribution between redshift 0.1 and the present day. This in itself was equally profound: galactic formation models suggest such structures to develop well before redshift 1, and hence we would not necessarily have expected to observe a great deal of change since redshift 0.1.

Following prolonged applause for Dr Loveday's comprehensive and clear account of the SDSS, the President adjourned the meeting until May 21 at the same venue.

Dominic Ford