Deep Sky Section

Brightening of Hind's Variable Nebula

In December 2004 reports from visual observers in the USA on the amastro web site **(http://groups.yahoo.com/group/amastro/)** indicated that Hind's Variable Nebula, NGC1555, had brightened. An alert was issued on BAA electronic circular no.00169 and paper circular no.798. There are five recognised variable nebulae – Hubble's, Hind's, Gyulbudaghian's, NGC 6729 and, since Jan 2004, McNeil's. Of these, Hubble's nebula in Monoceros and NGC6729 in Corona Australis are usually bright and easy to observe, while the others are challenging objects, particularly visually, requiring telescopes in the 50 to 75cm range with very good skies.

NGC1555 is located in Taurus at RA 4h 21.8m and Dec +19° 32′ (2000.0). It was discovered by John Russell Hind in 1852, using a 7-inch (178mm) refractor from London. He also discovered the variable star, T Tauri, associated waith the nebula, although variations in the brightness of T Tauri do not seem to directly correlate with variations in the nebula's brightness. Hind's variable nebula is a small 30 arcsec comet-shaped area of faint nebulosity lying just to the west of T Tauri. It is predominately a reflection nebula and therefore nebula filters are of little use. Variations in brightness are usually associated with subtle changes in shape or size of the nebula, or in the brightness distribution over its surface.

There appears to be some confusion in the literature, and in some software, between NGC1555 and nearby NGC1554. The *Night Sky Observers Guide* (Willmann–Bell, 1998) regards them as the same object, with the different NGC numbers referring to different parts of the same nebula. *MegaStar v4.0* lists them correctly as NGC1554 (Struve's Lost Nebula) and NGC1555 (Hind's Variable Nebula) in its Non Stellar Objects database, but then plots them both as NGC1554. *Uranometria*, both old and new editions, also regards them as the same. For the correct positions of the two objects, along with images, see the NGC/IC Project web page **http://www.ngcic.org**.

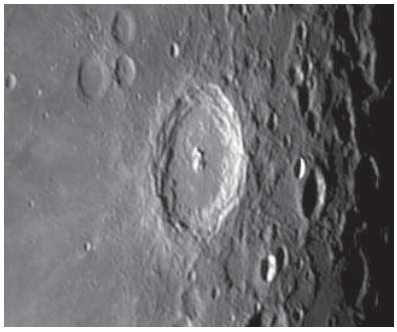
Left: NGC1555 before recent brightening, taken by David Strange. 50cm Newtonian, SX CCD. ***Right:*** NGC1555 after brightening by Martin Mobberley, 35cm Celestron C14 @ f7.7 on Paramount ME, ST9XE CCD, 120s, 2004 Dec 16.873 UT.

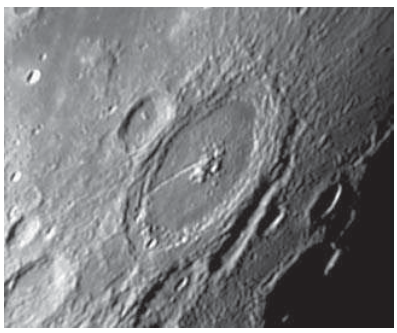
Following the email alert, reports of brightening were received from several members. The Director tried for it visually in his 35cm Dobsonian under reasonable skies in mid-December but could not detect it. However both Gary Poyner (35cm SCT) and Alan Snook (31cm Newt.) observed it and CCD images were received from Cliff Meredith, Martin Mobberley, Grant Privett and Gordon Rogers. Images reproduced here show the nebula before and after brightening.

The behaviour of Hind's Variable Nebula is not well understood and this is an ideal opportunity to monitor a normally difficult and greatly under observed object. Please monitor on a regular basis and send all observations to the Director, along with full details of instrumentation and observing conditions.

Stewart Moore, *Director*

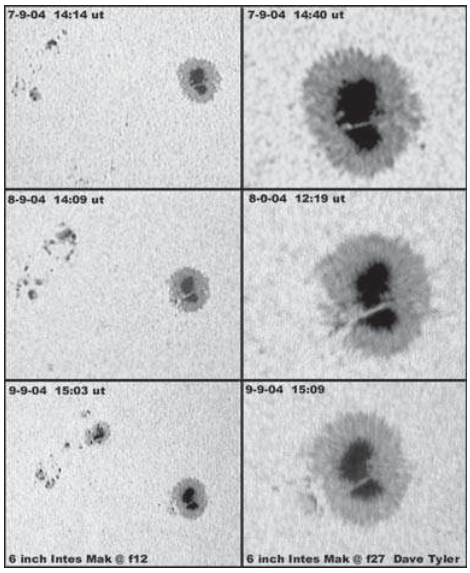
Imaging the Moon and the Sun





Left: Lunar craters imaged on 2004 September 1 with a Vixen 80mm apochromat refractor. Top: Langrenus; below, Petavius. *Damian Peach.*

Right: Development of a solar active area over three days last September. 150mm Intes MK-67 Maksutov with Toucam 840 webcam and Baader film filter. *Dave Tyler.*



An eclipse and an aurora captured in the autumn sky

Above, a surging/rayed aurora photographed from Glen Ullin, North Dakota, USA by Jay Brausch, 2004 November 10/11, 04.45 UT.

Left, the lunar eclipse of 2004 October 28 photographed high in the sky from Connecticut by Charles L. Calia. Stellarvue 80mm f/6 refractor, Kodak 400 ISO film. Top, 01.52 UT; below, 02.19 UT.

Meetings

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 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. Finally, 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.

John Toone

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 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.

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

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.

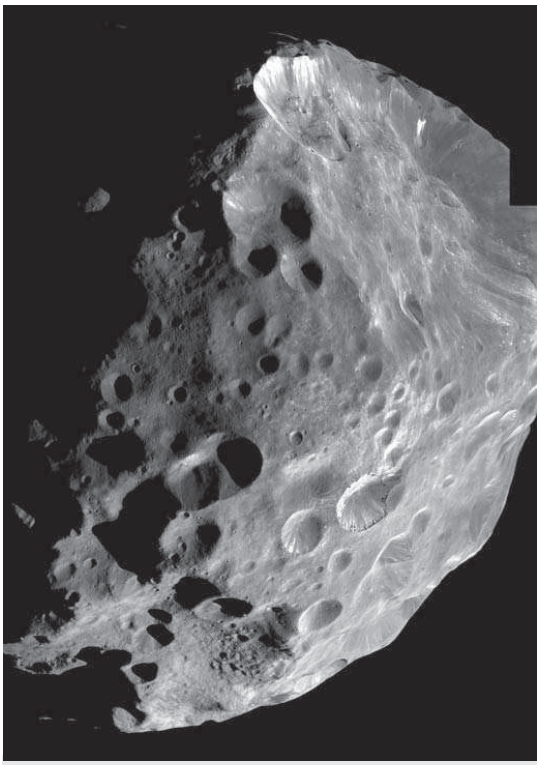
The speaker noted that on one occasion in the previous apparition, a dark spot had been detected in Hubble Space Telescope (HST) images from the International Outer Planets Watch, and confirmation had come ten days later from Damian Peach. It was amazing that amateur planetary imagers could now record 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.



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*

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 to 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 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 Mobberley to present his regular Sky Notes.

The summer sky

Opening with the supernova scene, Mr Mobberley 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 Mobberley 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 Mobberley 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 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.

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

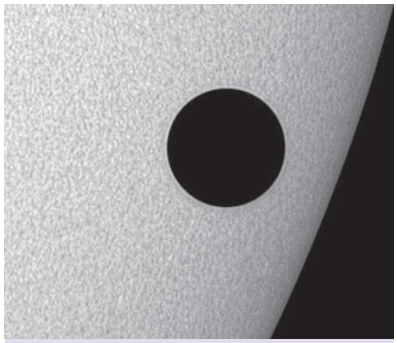
Mr Mobberley drew members' attention to some of the most exciting highlights of the mission which would be coming up in the autumn, including the first close fly-by of Titan on July 2. A second close pass would follow on October 26, at an altitude of a mere 750-miles from Titan's cloud tops. A third 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.

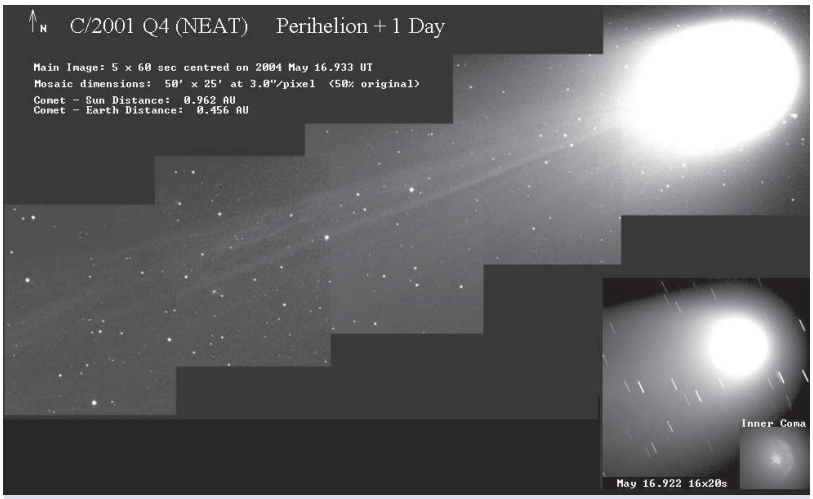
On September 29, asteroid Toutatis would pass within 1.5 million km of the Earth. Though this did not pose a threat, the speaker noted that no larger asteroid had passed closer to the Earth for 250 years, and in the long-term, Toutatis was deemed the most hazardous such rock yet discovered. It was believed 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 joked that perhaps some would have preferred him to have brought his guitar along instead!



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.*

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 Lazzaroti 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 throughout 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.

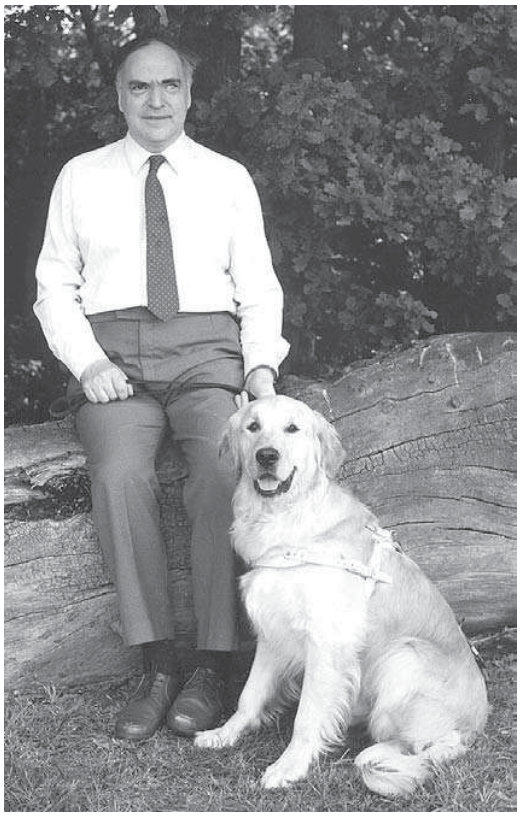
BAA Update

Obituary

Angus McKenzie, 1933–2005

It is with great sadness that we record the death of Angus McKenzie MBE at the age of 71 after an illness lasting for several months.

Angus was a well respected and long standing member of the Hampstead Scientific Society and the BAA, having joinedthe HSS at the age of 14 in 1947. He was interested in all aspects of science, in particular, chemistry, radio and above all else, astronomy. As a youthful enthusiast, he was greatly encouraged during the 1950s by the HSS' late astronomy secretary and BAA Curator of Instruments, Henry Wildey.



Courtesy Kirsty McKenzie

Angus was born in September 1933 and was educated at St Paul's School, Hammersmith. He went on to study for City and Guilds in electronic engineering and acoustics, but failing eyesight caused him to abandon the course at the end of the second year. It was typical of Angus, that even the total loss of his eyesight in 1959 did not prevent him from remaining passionately interested in astronomy for the rest of his life. Having joined the British Astronomical Association in his teens, he remained a member until his death and would frequently attend meetings accompanied by his faithful guide dogs Simon and latterly, Ward.

It is often said that the loss of a sense, such as eyesight, leads to the development of other senses to compensate. In Angus' case this was clearly demonstrated. He built a career in audio and radio, at first running a recording studio and later becoming an audio and radio consultant. He engineered and produced numerous recordings of classical music and carried out much research into stereo, binaural and quadraphonic sound. He wrote many technical papers and gave many lectures on topics as diverse as radio and hi-fi, amateur radio, classical music, astronomy and the London underground railway. He broadcast on both radio and television and was the author of many books on the subjects of hi-fi and amateur radio.

His great passion for the London Underground, on which he travelled frequently, led him to produce an auditory guide to the system in 1994 which was available free of charge to blind persons. This innovative guide, a kind of 'sound map', led the user from station to station providing clues as to their location from the pitch of track noises and the different sounds emitted by tube train brakes. I well remember the lecture he gave to the HSS in which he vocalised the different noises made by different makes of tube train and the sounds which they emitted when accelerating, braking and passing over points.

Angus was also a regular speaker and fund raiser for the Guide Dogs for the Blind Association and in recognition for this work he was awarded the MBE in 1997. He was the first blind member of Mensa and was a fellow of the Institute of Electrical Engineers and the Audio Engineers Society.

For many years Angus lived in Finchley in a house crowded with electronic equipment with shelf upon shelf of records and CDs, each labelled meticulously in Braille. I always marvelled that he could find a particular recording instantly. He had a talking computer and the house was equipped with a gigantic rotating radio aerial which could be seen from miles away and was used by him to communicate with fellow radio 'hams' throughout the world.

Angus leaves two daughters, a son and two granddaughters and a multitude of friends, who will mourn the passing of a man who never let a physical disability get the better of him.

Doug Daniels
(Astronomical Secretary, Hampstead Scientific Society)

Erratum – February *Journal*

We regret an error which occurred in the report of the Ordinary Meeting of 2004 May 26 in the February *Journal*, page 48, where it is incorrectly stated that the speaker said that the currently accepted rotation period of Mercury is 4.4 days. 4.0 (3.995) days is the period of the rotation of the atmosphere of Venus, not Mercury. Our thanks to Dr Roger Griffin for pointing out this error.

New members

The British Astronomical Association cordially welcomes the following new members:

Elected 2004 May 26

Blackwell Alan, Nottingham
Brownridge Carl Richard, Exeter, Devon
Colquhoun Hugh, Clydebank, West Dunbartonshire
Eziefula Obiako, London NW9
Gawthrope Gary James, Swinton, South Yorkshire
Gibbons Ralph, Chesterfield, Derbyshire
Gibson Nicholas Martin, Spilsby, Lincs.
Haddock David John, Worcester
Hendry John David Robert, Felton, Northumberland
Jones William, Sheffield, Yorkshire
Knowles James, Chesterfield, Derbyshire
Leiper Fiona, Lentran, Inverness
Loran Michael, London N6
Moffatt Terrence, Lockerbie, Dumfriesshire
Parks Julian, New York, USA
Sinfield Aston, London SW12
Waller Graham, Loughborough, Leics.

Elected 2004 June 26

Beesley David Edward, Belfast
Belfield Mark Jonathan, Weybridge, Surrey

Cousens Alan Kenneth, London N6
Edmonds Robert, Salisbury, Wiltshire
Jedicke Peter, London, Ontario, Canada
Jones Alan, Redruth, Cornwall
Kalve Peter, Moulton, Northamptonshire
Kentfield Sally, Guildford, Surrey
Lauritson Stephen, Kingswood, Bristol
Lind William, Market Weighton, York
Lucas Robert John, Kenilworth, Warwicks.
Matthews John Alfred, London SW20
McArthur Maggie, Reepham, Norfolk
McArthur Ronald, Reepham, Norfolk
Moxham Rodney, South Ockendon, Essex
Penny David, Kingston, Surrey
Price Gerwyn, St Albans, Hertfordshire
Woodley Ian, Guildford, Surrey
Woosnam Brian, Colwyn Bay, Conwy
Wright Robert, Ormskirk, Lancashire

Society elected 2004 June 26

Callington Space Centre, Callington Community College, Launceston Road, Callington, Cornwall PL17 7DR

Elected 2004 September 11

Duffy Maria Kate, Middleton, Manchester
Flin Andrew, Stony Stratford, Milton Keynes
Gardiner Robert, Kirbymoorside, Yorks.
Hall Kenneth, Preston, Lancashire
Hardy Dean, Eastbourne, East Sussex
Hardy David, Eastbourne, East Sussex
Ruocco Leon, Southgate, London N14
Wones Paul, Chatham, Kent

Elected 2004 October 27

Acheson Alastair Donald, Romsey, Hants.
Ahad Abdul, Luton, Bedfordshire
Barron Robert, Kfar Saba, Israel
Best Richard, Ringmer, East Sussex
Bowden Paul, Andover, Hampshire
Burdis Graeme Edwin John, Haywards Heath, West Sussex
Cadman Mark, Epping, Essex
Caffrey Brian, Shaftesbury, Dorset
Curtin David Paul, London NW3
Dowdall Vincent Arthur, Machen, Caerphilly
Easton Geoffrey William, Chelmsford, Essex
Flynn Michael, Los Gatos, California, USA
Fortuna Marcelo Rafael, London SW16
Freaney John, Liverpool, Merseyside
Greef Robert, Wymondham, Norfolk
Green Alec, Burstwick, East Yorkshire
Hanna Sorina, Norwood, Sheffield
Hauler Thorsten Erik, London E17
Hayler Neil, Pulborough, West Sussex
Hill Trevor John, Taunton, Somerset
Hudson Michael David, Wingham, Kent
Lea Ruth Jane, London N3
Leventhal Monty, Maroubra, NSW, Australia
Lewis David Edgar, Leckwith Village, Glam.
Macdonald Lesley, Chandlers Ford, Hants.
McGee Brian, West Clandon, Surrey
Milgate Kelvin, Broadstairs, Kent
Mitra Paramita, Kettering, Northants.
Montgomery Bronwen Elizabeth Margaret, Stoke-on-Trent, Staffordshire
Moore David Ernest, Coventry
Morris Rebecca Lea, Deal, Kent
Murphy Richard Noel, Bray, Wicklow, Ireland
Naughter P. J., Gorey, Wexford, Ireland
Ness Vicki Sian, Manchester
Pavlika Vasos, Waltham Abbey, Essex
Penfold Lynn Elizabeth, Basingstoke, Hants.
Penfold Steven Charles, Basingstoke, Hants.
Platten Jon, Sherburn, Durham
Poort Lars Oksen, Ummannaq, Greenland
Redden R. Allen, Bowling Green, Kentucky, USA
Ringland Stephen, Stockport, Cheshire
Robinson Matthew, Romsey, Hampshire
Schwencke Anthony, Sidcup, Kent
Spence Martin, Frascati (RM), Italy
Stevenson–Davies Bryn, Market Drayton, Shropshire
Summerly Jeremy, London W14
Sutherland Alistair, St Monans, Fife
Trantham Colin Gary, Bury St Edmonds, Suffolk
Turnbaugh Matthew, Brandon, Suffolk
Ursell Brian George, Kirton Fen, Lincs.
Waites Charles, Peterlee, Co. Durham
Ward Leslie James, Scarborough, North Yorks.
Warrick Peter Charles, Barnehurst, Kent
Watson James, Warrington, Cheshire
Wilkinson David Henry, Bury, Lancashire
Wilson Colin, Hemel Hempstead, Herts.
Wright Adam, Barnet, Hertfordshire

Society elected 2004 October 27

La Societé Guernesiaise Astro Section, c/o Keanda, Les Sauvagées, St Sampsons, Guernsey GY2 4XT

Elected 2004 November 27

Ali Zeeshan, London SE14
Amos Stuart, Southampton, Hants.
Anderson David Wayne, Margate, Kent
Arditti David Louis, Edgeware, Middlesex
Barber Robert William, Manchester
Biffin Anne, Fleet, Hampshire
Biffin Tom, Fleet, Hampshire
Bonner David, Thames Ditton, Surrey
Brankin Derek, Dundee, Tayside
Burton Steven, Birmingham
Charvanathan Arabi, London E6
Coates Roger John, St Neots, Cambs.
Cochrane Michael, Symington, Ayrshire
Cooper Nicholas, Haywards Heath, W. Sussex
Dower Christopher James, Skegness, Lincs.
Duck Stephen, Herne Bay, Kent
Edwards Veronica Ann, Sevenoaks, Kent
Evans Benjamin, Bridgwater, Somerset
Gomez Roanne Marie, London NW10
Guile M. J., Urmston, Manchester
Hagon Alan, Maidenhead, Berkshire
Hagon Christine, Maidenhead, Berkshire
Harding Paul, Tadley, Hampshire
Harris Gary, Bearsted, Kent
Heath John, Oakwood, Derby
Herron David, Maidenhead, Berkshire
Hoskins James, Harefields, Oxford
Howie Andrew, Paisley, Renfrewshire
Huskisson Niall, Middleton, Warwickshire
Iftikhar Javid, London TW3
Inglis Michael, Patchogue, New York, USA
Jelley Neil, London SW1
Johnson David, Newport, East Yorkshire
Kessler Helmut, Onchan, Isle of Man
Kessler Jeanette, Onchan, Isle of Man
Leigh Christopher, Underriver, Kent
Lockett William John, Acomb, York
Lyne William George, Solihull, W. Midlands
McCarthy Huw, Brighton, East Sussex
McDowell Ian, London SE10
McWalter Ian T., Broughty Ferry, Dundee
Mealor Andrew, Lincoln
Middleton John Roy, Folkestone, Kent
Nieman Adam, Bristol BS8
Nye Frederick John, Crosby, Liverpool
Paton Angus, Greenock, Inverclyde
Pinnick Simon, Solihull, West Midlands
Pinter–Krainer Marc, High Wycombe, Bucks.
Piper Ian, Sandhurst, Berks.
Porter Simon John, Allentown, PA, USA
Prieto Gallego Jose, Madrid, Spain
Raftery Brian Stuart, Leverkusen, Germany
Saraiva Artur, London SE4
Smith Cedric Norman, London N7
Smith Philip Norman, London N7
Tandon Anamika, London SE26
Tempest Mark, Wardley, Tyne & Wear
Uttley Ian, London SE3
Vincent Martin, Henfield, West Sussex
Wade Anthony, Scarborough, N. Yorkshire
Waite James, Halesowen, West Midlands
Walker Simon, Dunbar, East Lothian
Walley John Charles, Marlborough, Wilts.
Waters Colin, Capel St Mary, Suffolk
Williams Brian, Dover, Kent

Letters

Gamma Virginis – an important observing opportunity in May

From Mr Christopher Taylor

Observers may be in danger of missing by far the most spectacular binary star event of the century: the now-imminent periastron passage of γ Virginis (Porrima). For over 160 of its 169-year period this pair of identical 3rd magnitude stars is very easily resolved at moderate power in a small telescope, but thanks to its extreme orbital eccentricity (about 0.9), Gamma closes for two or three months around minimum to no more than 1/3 arcsecond, a dramatic climax last seen in the winter of 1835–6 by John Herschel, W. R. Dawes and Admiral Smyth. This is not something only detectable by micrometric measurement but a progressive change in the visual appearance of the pair, plainly obvious at the eyepiece over an astonishingly short time.

We are about to witness the only instance visible from northern latitudes of a bright star pair visibly and obviously moving, as seen in a 150mm (6-inch) telescope, within a two-year period. Gamma Vir has changed its gross appearance completely even in a 102mm (4-inch) OG in each of the 12 months from spring 2001 ('disks tangent' – they were well separated a year earlier), 2002 ('disks heavily overlapping'), 2003 (a single elongated disk, 'olive') and 2004 ('round'), each of these changes being instantly obvious 'by eye'.

A careful analysis of the impressively consistent historical measures from the 1830s has yielded the following results. Firstly, the mutual symmetry of the distance measures on the arcs 1831–35 and 1837–40 implies that minimum separation was reached somewhere about 1836.32, a date within about two months of that given independently by the observations of the event itself by Smyth, Herschel and Dawes; on the basis of this concordance of evidence we can conclude with a high level of confidence that the apparent appulse occurred on 1836.15 ± 0.07, and that Gamma was definitely opening out again by 1836.25–.30. Secondly, the maximum rate of revolution of the system in position-angle, attained in the spring of 1836, was at least 120° per year and may have been substantially larger; this is a considerably higher figure than that usually quoted and has radical implications for the likely minimum separation of the two stars (see below). Thirdly, by 'matching' the Hanwell measures of p.a. taken with the 318mm reflector in the years 1998–2004 onto those of 1829–1835, it appears that this 'magnificent phenomenon', as John Herschel called it, will fall next in, or about, mid-May this year, i.e. 2005.37 ± 0.07.

The purpose of this note is therefore to alert observers to the imminence of this unique event which, in default, they may miss entirely if relying on older and now-superseded orbital predictions. In particular, the commonly-quoted periastron date of 2007–8 (still given in many current books, sky-mapping programs and even on some active websites) is based on Strand's orbit of 1937, which in reality has been defunct now for a decade or more: by spring 2001 its errors were so gross as to be obvious at a glance in a 4-inch telescope, Strand predicting a distance which would have made the two stars easily separated in that aperture, contra the 'disks tangent' actually seen. Anyone still relying on that erroneous ephemeris will therefore miss the action entirely, as by late 2007 Gamma will have opened out again to nearly 1 arcsec. and have slowed once more to a mere 20° per year in revolution. Meanwhile, in fact, the pace has really been hotting up over the last year or so. The morning measure of Gamma with the 318mm on 2004 December 27 showed the pair at about 0.4 arcsec. in p.a. 177° (approx.), a closing up of some 40%, and a revolution of no less than 42°, since the corresponding dawn observation of just 12 months earlier.

Evidently, to follow the events of the next few months will be a real challenge, good optics and high magnifications (at least ×60 per inch of aperture) being absolute essentials. While the star will certainly appear single in a 150mm telescope at minimum, it will be completely resolved again in that aperture within two years, and an acute observer will begin to see the two components opening out and rapidly revolving well before that. In 1836, Smyth with a 150mm OG and Dawes, with only 96mm, managed this convincingly only two months after closest approach! Here, then, is a challenge to today's observers - can you match the Smyth–Dawes record?

A further incentive to observe this remarkable event is that, despite all the many efforts of the orbit computers, we still have very little idea what to expect at apparent periastron. Despite persistent astronomical folklore to the contrary, the least separation of Gamma was not determined, or even estimated, in 1836; all we can say on the basis of those observations (Smyth, Dawes and subsequently Struve, who missed the appulse itself) is that minimum distance was almost certainly less than 0.3 arcsec. and probably less than 0.25. This, again, is independently verified by apply-

The Star of Bethlehem

From Mr Terence Moseley

I read with great interest the article in the 2004 December *Journal* on the Star of Bethlehem by R. M. Jenkins. The following may lend some weight to his theory.

There is a certain folk history in parts of the west of Ireland (Clare & Galway) that there was a total, or almost total, eclipse of the Sun in that region just before the great potato famine in the mid-1840s, with the implication that it might in some way have contributed to the potato blight, which ruined the crop and led to the famine. The famine started in 1845 but was at its worst in 1846, and ended in 1847. Well over a million people died, or had to emigrate, so it was a seminal event in Irish history.

In fact there were two relatively small partial eclipses just before the famine was at its worst. There was a partial eclipse on 1845 May 6, magnitude about 48% in that area. Another smaller one, magnitude about 27%, occurred in that area on 1846 April 25. There was also one of around 69% on 1842 July 8, but that occurred just after sunrise, when very few people would have seen it.

However, there was an eclipse on 1836 May 15, which was total in the northern quarter of Ireland, including some areas later badly affected by the famine. It was about 93–95% in the relevant area, and it occurred at around midday. There was also an annular eclipse visible in the southern third of Ireland on 1847 Oct 9, again occurring just after sunrise. It also reached a magnitude of about 90%+ in that area.

So what seems to have happened is that the collective folk memory merged the smaller eclipses occurring before/during the famine with the total/almost total eclipse of a decade earlier, and the one which happened as the famine ended, giving the story of the total eclipse occurring just before the famine.

Something similar may have occurred with the 'folk memory' or 'tradition', of the visibility of the two returns of the comet before, and some years after the birth of Christ, to give an impression of the 'Star' as it was recounted in St Matthew very many years later.

Terry Moseley

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ing Kepler's law of areas to the apparent motion, using the maximum angular velocity quoted earlier, which implies an upper limit of 0.29 arcsec. at closest approach. The computed orbits, on the other hand, right down to the most recent (Soderhjelm 1999) at 0.35 arcsec., have consistently overestimated this parameter.

Gamma has yet another unresolved conundrum for us, however, in that its motion in 1836 appears to have violated Kepler's law. The observations show that the rate of revolution peaked some months after closest approach, a violation of Kepler II perhaps most easily explained by the presence of an unseen third body. If this should, indeed, prove to be the case, any predictions based on simple periodicity of the motion - including that made here, and all 2-body orbit computations - may turn out to be inaccurate: 2005 may not be an exact re-run of 1836. So even here, in one of the most famous of all binaries, the unknown confronts us and surprises may lie in wait. All of this surely makes for a fascinating observing challenge.

Christopher Taylor

Hanwell Community Observatory, c/o 25 Lincoln Road, Oxford OX1 4TB

[A full account of the work on which this note is based will be put up shortly on the double star section of the Hanwell website **www.hanwellobservatory.org.uk**. For an interesting retelling of the full story of Porrima see Bob Argyle's article 'Porrima: a close approach' in Patrick Moore's *2005 Yearbook of Astronomy* (Macmillan, 2004).]

Seeing for oneself

From the Director of the Aurora Section

I concur with Jeffrey Barham's article in the 2004 November issue of *Astronomy Now*. In spite of modern technology, Hubble Telescope images, CCTV and photography attached to telescopes, it is much better, particularly for beginners, to see for oneself. Visual amateur astronomy is luckily not yet dead.

Some years ago, my water supply survey party and myself were billeted in a Nigerian construction camp operated by a British contractor. In the mess the lorry, bulldozer and crane drivers together with other technicians looked upon us as a race of bushmen dressed in old army-surplus kit from Millets.

One evening there was a beautiful half-Moon so I borrowed our theodolite and set it up in the recreation area to have a look. One of the (well-upholstered) crane drivers saw me from the window of the camp bar, and to satisfy his curiosity he left his beer and strolled down to find out what I was up to. I told him to have a look into the theodolite.

It took but a few seconds for him to become very excited as he saw for the first time with his own eyes the craters, mountains and maria on the Moon. Letting out a string of expletives (religious, explicit and otherwise) as only a British construction worker can, my companion dashed for the bar. Within half a minute this emptied and I had a queue of new recruits to lunar observing, and a lot of satisfied customers who were venting their appreciation in unprintable form. It takes a good deal to persuade a portly British plant operator to part from his pint of beer.

As I once said to a class of civil engineering students, to the annoyance of their professor, if you are standing up to your oxters in thorn bushes throwing stones at the crocodiles, a computer is not much use to you. As in civil engineering so in amateur astronomy, there is nothing quite like seeing for oneself.

Ron Livesey

Flat 1/2, East Parkside, Edinburgh, EH16 5XJ

Some thoughts on 'doomsday asteroids'

From the Director of the Asteroids & Remote Planets Section

Much observing time is now spent identifying asteroids that may have a close encounter with the Earth, and there is a fear that eventually one will be found that will hit. There are currently no Near Earth Objects known which are on a collision course with us, but can we be sure this situation will last? The Moon bears witness to many past impacts in its crater record and we know of several such sites on Earth, such as Meteor Crater in Arizona and the legacy of the airburst of the Tunguska event in Siberia in 1908. It is known that we sweep up much debris every year during our annual orbital journey around the Sun, most of which is no larger than a grain of sand.

The American programme to identify Near Earth Asteroids is intended, by 2008, to identify all bodies larger than 1 km that are in orbits that can cross that of Earth. Inevitably this project has also found many smaller objects including 2004 FH, which passed by in March 2004 and was estimated to be in the 20m to 30m size range. What is true is that despite much speculation, we have no way, with the current state of our technology, to change an orbit to ensure it will no longer cross that of Earth.

If there is a risk of impact there have been many ideas proposed to mitigate this. Some have suggested blowing up the projectile as a solution, such as proposed by Hollywood in films such as 'Meteor', 'Deep Impact' and 'Armageddon'. This would produce debris that could cause widespread damage possibly as severe as that by the original body. Other ideas have included deflecting the object away. The concern with this is that any attempt to disperse with a loosely bound pile of rocks by explosive means may prove futile; it would merely absorb the force by a slight adjustment to its shape. If it did work however there would still be an intersection some time in the future so this solution would only postpone the inevitable. My own belief is that a second explosion when away from Earth would be required to cause another orbit adjustment to ensure it could not return.

The majority of objects flying by are in relatively eccentric orbits round the Sun so that the encounter is at a high velocity and, when near, they appear to rush across the sky moving several degrees an hour at closest. Those in Earth-like orbits have lower velocities relative to the Earth and so move much slower – however they still move quite rapidly relative to the stellar background compared to the planets for example. They quickly brighten when closing in on us and fade equally rapidly as they depart.

There will come a day when one will be seen that does not move relative to the stellar background. It will brighten as it nears. If it will miss us then eventually a small lateral motion will be detected which will increase as it nears. If it remains stationary against the stellar background then Earth is the target and it will hit. What effect it will have on the Earth depends on a number of factors, of which the most important are size, composition and configuration.

As a basic rule the bigger it is, the more damage it will do. The way I look at this is that a 10km diameter body is a planet killer, 3km is a country killer whilst a smaller one would be a city or district destroyer. I realise that this is a simplistic view, especially as the effect on the Earth as a planetary body would be minimal in the long term, but it is valid as a way of getting a handle on things. There has been much speculation about the consequences and there are many websites that discuss this, including at least one site where you can input data and get an idea of the resulting effect of an impact.

Composition of the impactor is important. A solid metallic body is more likely to make it through the atmosphere in one piece than an icy one that may boil away. A stony body is an intermediate case: it will ablate and may even airburst into fragments before it lands.

The configuration is also significant, and the risk here is really similar to composition as a solid body will be stronger than a 'rubble-pile' which will tend to fragment as it heats in the atmosphere. The difference in the resulting surface damage would be similar to that resulting from firing either a cannon ball or grapeshot.

None of these would cause major problems to the Earth itself; the main problem would be the effect on the biosphere. There has been much speculation since the discovery of the iridium layer by the Alvarez' in the 60s that impacts have been the cause of mass extinctions of species in the past. Others have put this down to volcanic activity or climate change. As so often is found, the truth is not provable but is probably a combination of all these. Perhaps such strikes brought about volcanic activity and the dust from this caused a 'nuclear winter'; it will be hard to be precise unless it happens again and we observe it.

The crater formed 65 million years ago was identified at Chicxulub in the Yucatan peninsula and this coincides with the dinosaur extinction. Recently the Bedout crater has been identified off the north west coast of Australia, which is 250 million years old and this coincides with the major extinction event popularly known as 'the great dying' when the majority of species alive at that time rapidly went extinct. If these cycles are periodic (unlikely?) then we have a while to go before the next is due.

For the last two or three years there has been much discussion about the possibility that many of the odd events described in older documents, such as the Old Testament, the Sagas, Gilgamesh and the like, may recount as fables a record of minor impacts. Many instances can be found of city states that rose to become dominant in an area but then disappeared almost overnight, sometimes with a story of associated supernatural events. Whilst the collapse of the Minoan civilisation is probably connected to the eruption of volcanic Thera (modern Santorini), some stories hold the prospect of being the aftermath of an impact since the descriptions seem to fit. We are unlikely ever to be able to prove this one way or the other but there are a sufficient number that it seems likely one or two could just be so.

Suffice it to say you will suffer if directly under the impact – if not then its effect will depend just how big the object is and how close it lands. It will be quite bright before it enters the atmosphere (small 2004 FH was mag 11 at its brightest when it was at three Earth diameters distance). So it will be detectable before it enters the atmosphere, and you could be the one to follow it in and possibly to chart the end of mankind.

Andrew J. Hollis

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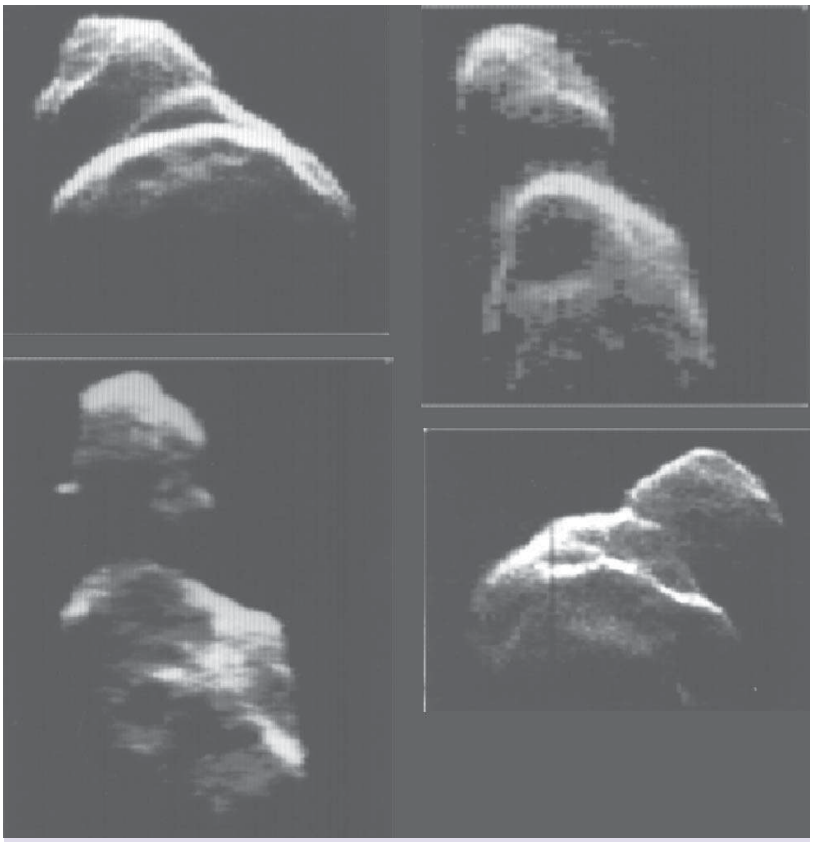

Earth-based radar images of near-Earth asteroid (4179) Toutatis, made using the NASA Goldstone DSN antennae on 1992 December 8, 9, 10, and 13, when Toutatis made a close approach (approx. 4 million km) to Earth. The radar illumination is from the top in each image, and each shows the asteroid in a different orientation. Toutatis is an irregularly shaped object of roughly 4.6×2.4×1.9 km, which appears to consist of two bodies in close contact. *NASA*

An annular–total solar eclipse

From Mr Alex Vincent

On 2005 April 8 there will be an annular–total eclipse of the Sun, visible from Panama and Colombia. In this type of eclipse (called a hybrid) it is annular in the morning, total at local apparent noon and annular in the evening. The duration of annularity and totality are quite short and the ring of Sun around the Moon's limb is very thin. The total section is in the centre of the eclipse track because the Moon is 6000km closer to the Earth and therefore its umbra just touches the surface.

The last annular–total eclipse visible from Britain took place on 1858 March 15 and the next will be on 2545 April 12. The eclipse of AD 143 May 2 entered Wales as total, but was annular by the time it reached England. In the 1858 event, only the annular phase was visible from Britain, but in the case of the 2545 event totality will be seen across these islands.

If an annular–total eclipse is observed on the centre line just outside totality, then a complete ring of Baily's Beads known as a 'pearling eclipse' is seen, which must be a magnificent sight. Also it is possible to see more than one diamond ring effect at the same time in the right place, which would also be a grand sight.

An idea would be to travel under the Moon's shadow to record the event from start to finish, to see the eclipse go from annular to total and then back to annular. This would have to be done from a height of 30,000 feet or more and would mean that there would be more totality as one is nearer the umbra. Preparation could be made for the next annular–total eclipses on 2013 November 3, 2023 April 20, 2031 Nov 14, 2049 Nov 25 or 2050 May 20.

Alex Vincent

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Sky notes

2005 April & May

by Neil Bone

Sun and Moon

The Sun's apparent motion eastwards along the ecliptic carries it north through Pisces and Aries and on to the heights of Taurus by the end of May. Consequently, for observers at the latitudes of the UK, the Sun rises earlier and sets later with each passing day, and the hours of darkness for nighttime observing steadily diminish. By late May, the Sun's high northerly declination is such that even at local midnight it is no more than 17° below the horizon from London northwards, and astronomical twilight persists throughout the short night. This situation continues until late July.

Sunspot cycle 23 is expected to reach minimum in the next 18 months, but refuses to lie down! Yet another unexpectedly large and active spotgroup (AR 720) grew to naked eye proportions as recently as January, and continued observation by the recommended safe method of projection using a small refractor should prove rewarding on most days. Records of those days – increasingly likely at this stage of the cycle – when no spots are visible are also of value, of course.

The Moon is new on April 8 and May 8, placing the darkest skies in the opening half of each month. Full Moon occurs on April 24 and May 23.

At April's New Moon, an annular-total solar eclipse will be visible along a track mainly over the Pacific Ocean, making landfall near its end in northern South America. Observers in the southern United States will enjoy a substantial partial eclipse, but no part of the event is visible from the UK. Solar eclipses are usually preceded or followed by a lunar eclipse at Full Moon. In this case, the April 24 Full Moon skirts through the penumbra of Earth's shadow after UK moonset; such events are barely noticeable, and certainly nowhere nearly so impressive as when the Moon enters the deep umbral shadow.

The planets

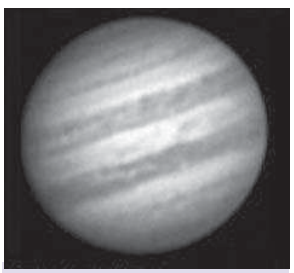
Mercury is technically a morning object, at greatest elongation 27° west of the Sun on April 26. Rising less than 30 minutes before sunrise, however, Mercury will not be visible from the British Isles during this interval.

Having passed superior conjunction on the far side of the Sun in late March, Venus emerges slowly into the evening sky during April and May. By late May, Venus' elongation east of the Sun is 16°, and it is setting barely an hour after sunset. Even at magnitude –4, the planet is an elusive target in these circumstances, and its visibility doesn't improve significantly until much later in the year.

One planet which is becoming better-placed is Mars. Throughout the past several months, the Red Planet has been a dim 'spark', rising a couple of hours ahead of the Sun. During April and May, however, it begins to brighten and pull out westwards from the Sun, as Earth begins to catch up to it on the approach to this autumn's favourable opposition. By late May, Mars has brightened to magnitude +0.3, and is prominent against the stars of Aquarius, east of the 'Water Jar' asterism, rising around 01h UT (Universal Time, equivalent to GMT; during these months, observers should remember to subtract 1 hour from BST for astronomical recording). As the distance between Earth and Mars decreases, the apparent angular diameter of the latter increases, to almost 8 arcseconds in late May: observers with larger telescopes (in the 200mm aperture upwards bracket) should now be able to make out some of the planet's albedo features, especially if seeing conditions are steady late in the night.

Jupiter reaches opposition (180° from the Sun in Earth's sky, and at its closest and apparently largest for the year) on April 3, close in the sky to the third-magnitude star Gamma Virginis, just south of Virgo's 'Bowl'. At magnitude –2.4, Jupiter will be the brightest object in the midnight sky at this time.

Telescopically, Jupiter presents a large, oblate disk, somewhat flattened by its rapid (less than 10 hours) rotation. Its equatorial diameter is in excess of 40 arcseconds, and even small telescopes in the 60–80mm aperture class will show at least a couple of the principal dark belts and lighter zones. Sketching these, and the occasional lighter spots or dark 'festoons' of material extending from the belts' edges, has always been a popular occupation for visual observers.



Jupiter on 2005 February 04, imaged by Dave Tyler

The four bright Galilean satellites – Io, Europa, Ganymede and Callisto – can be seen in binoculars.

Saturn, south of Castor and Pollux in Gemini, is nearing the end of its apparition by May. From late April, the ringed planet sets before midnight UT, and viewing becomes restricted to the early evening hours. It's worth catching one last telescopic look at the planet and its magnificent ring system during the coming months; by the time Saturn returns to view in autumn's early morning skies, the rings will have become noticeably more 'closed' in their presentation towards us.

Minor planets

(1) Ceres, the first of the asteroids to be discovered, will be well-placed for binocular observation, reaching mag +7 in early May as it moves retrograde (westwards) against the stars of Libra. During the first week of May, Ceres is about a degree north of the mag +2.6 star Zuben Elschemali (Beta Librae).

Comet Machholz

Continuing from its splendid showing early in the year (still mag +5 in mid-February as these notes were compiled), Comet C/2004 Q2 Machholz is circumpolar in this interval, never setting at UK latitudes. As it recedes from both the Sun and the Earth, however, the comet is expected to fade quite rapidly during April and May. By early May, when it will appear close to Delta Ursae Majoris – the third-magnitude, faintest star of the Plough – Machholz could be as faint as mag +9, and will require an 80–100mm aperture instrument for detection. Many observers have followed the comet since early December 2004, but most will lose it in twilight towards May's end, after a still remarkably-long observing span, probably exceeded only by Hale–Bopp's marathon visibility in 1996–'7 as far as many of us are concerned.

Meteors

Strong moonlight adversely affects the Lyrids, active from April 19–25 and peaking on the night of April 21–22. These are followed in early May by the Eta Aquarids, produced by debris from Comet 1P/Halley. Peak is around May 4–5, at which time the Moon is a thin waning crescent. The shower radiant, near the 'Water Jar' asterism, is only just clearing the horizon as dawn begins to brighten the sky at UK latitudes, but observers may wish to make the most of the final hour of the night to catch some of these swift meteors. Observed rates may be up to 5–10 per hour; observers at more southerly latitudes see the shower rather better.

Otherwise, April–May brings only low sporadic activity, augmented by a trickle of one or two meteors/hr from the rather minor near-ecliptic radiants of the Alpha Scorpiids and Ophiuchids. We can look forward to better things in August, when the Perseids are favourably-placed with respect to moonlight.

Variable stars

The long-period (Mira-type) variable star Chi Cygni is expected to reach maximum brightness in July, and observers using binoculars should find it starts climbing into range during May. Now is a good time to start a series of weekly magnitude estimates, and patient observers should be able to follow Chi up to and through maximum into its decline during the autumn. Chi is found close to Eta Cygni on the Swan's 'neck' between Gamma Cyg and Albireo, and a set of charts showing suitable comparison stars can be obtained from: http://www.aavso.org/cgi-bin/shrinkwrap.pl?path=/charts/CYG/CHI_CYG/

Chi Cygni has a catalogue range of mag +13.4 to +5.2, the most extreme among Mira stars. Sometimes it an be brighter than the catalogue peak – in 2004, for example, it reached mag +4.

Now well-presented, the prototype carbon star R Coronae Borealis bears nightly scrutiny in case another fade sets in. At peak, this is an easy binocular object close to 6th magnitude, but it can become as faint as mag +14.

Deep sky

Virgo, with its rich fields for galaxy-hunters, dominates the southern sky on April evenings. There are enough objects here – members of the Virgo cluster of galaxies at a distance of 65 million light years – to keep an observer with an 80–150mm aperture telescope busy for several dark, moonless nights. Among the brightest and easiest to find are M59 and M60, 80 arcminutes northeast of the mag +4.5 star Rho Virginis, just inside the northeastern (top left) side of the open Virgo 'Bowl'. At respective magnitudes +9.6 and +8.8, these appear as circular hazy smudges in a small instrument: each is a giant elliptical galaxy containing hundreds of billions of stars.

West (right) of Rho Vir by a couple of degrees is the 6th-magnitude star 20 Vir. Near here can be found a trio of giant ellipticals – M84, M86 and M87. M87 is the central object of the Virgo cluster, and M84 and M86 share with it the same low-power (×20) field in a small telescope. At mag +8.6, M87 is comparatively bright (to some, it appears almost like a globular cluster), while M86 (mag +8.9) and 84 (+9.0) are also easy objects.

By early May, Virgo is beginning to tilt over into the southwest at midnight. Orange mag –0.04 Arcturus stands high in the south at the sharp tip of Boötes' 'kite' outline. Southeast from Arcturus and Boötes, below the distinctive 'circlet' of Corona Borealis, is the poorly-defined constellation of Serpens Caput, the head of the snake held by Ophiuchus. Perhaps most distinctive in Serpens' outline is the triangle of third- and fourth-magnitude stars Alpha, Lambda and Epsilon Serpentis. These are a good guide for finding one of spring's best globular clusters, M5, 8° to their west. M5 is easily located north of the fifth-magnitude star 22 Ser, and at mag +5.7 is as bright as the better-known M13 in Hercules. A prominent object in binoculars, M5 is splendid in any small telescope, showing a large core region, with its outer parts almost resolving into some individual stars even in an 80mm at ×40. In 150mm aperture instruments, M5 can be resolved much of the way to its centre.

Many other globular clusters populate the southern sky of late spring and early summer, as the midnight view turns inwards to the centre of the Galaxy and the rich starclouds of Scorpius and Sagittarius. These will be regions for exploration during the short, twilit nights to come.

Neil Bone

Notice board

Meetings diary

Saturday 2005 April 16
Meeting of the Meteor Section at South Downs Planetarium, Kingsham Schools Site, Chichester (10 minutes' walk from the rail and bus stations). Doors open 10:30, meeting starts 11:00–13:00; afternoon session 14:30–17:00, including tea break. Confirmed speakers so far: Steve Evans, John Mason, Alex Pratt, Neil Bone. Further details from Neil Bone, bafb4@central.sussex.ac.uk

Tuesday 2005 April 19
Ceremony in honour of George Alcock in Peterborough Cathedral, Cambridgeshire. See adjacent notice.

Saturday 2005 April 23
BAA Ordinary Meeting, 14.30 hrs at the English Heritage Lecture Theatre, Savile Row, London W1. Dr Omar Almaini (Nottingham): 'Quasars, black holes & galaxy formation'.

Saturday 2005 May 14
Meeting of the Comet Section at the Institute of Astronomy, Cambridge. Doors open 10.30. The meeting will concentrate on imaging and photometry and there will be an open forum to debate these aspects. Speakers booked so far include Mark Kidger (Tenerife) and Giovanni Sostero (Italy). For more details see the Comet Section website, **http://www.ast.cam.ac.uk/~jds/**

2005 May 21–22
Open University in Wales – StarLab Event at National Museum of Wales, Cathays Park, Cardiff as part of Adult Learners Week. 11 a.m.–4 p.m. Join us as we explore the night sky, the universe and beyond in an interactive planetarium. StarLab will be accompanied by a host of hands-on learning activities using the OU's multimedia teaching packages. Advice and guidance will be available on study with the Open University. Book for StarLab on arrival in the Main Hall – sessions begin on the hour. Tel. Helen Nelmes, (029) 2026 2774.

Wednesday 2005 May 25
BAA Ordinary Meeting, 17:30 hrs at the Geological Society Lecture Theatre, Burlington House, Piccadilly, London W1. Dr Andy Norton (Open University), 'Outbursts, orbits and oscillations'.

Saturday 2005 June 25
Exhibition Meeting at the Cavendish Laboratory, Madingley Road, Cambridge.

2005 September 02–04
BAA Out-of-London Weekend, to be held this year in Cambridge on the theme of 'The Planets', on the occasion of the international Division of Planetary Sciences Conference. A unique opportunity to hear and meet speakers from the world's professional planetary science community. More details in the next *Journal* or from Dr John Rogers, jhr11@cam.ac.uk

Items for this diary should be sent to the *Journal* Editor [hazelmcgee@compuserve.com] as soon as dates and locations are known. Details of all astronomical meetings of regional or national interest are welcome. The Editor's decision on inclusion or otherwise of any meeting in this listing is final.

Tuesday 2005 April 19 at 4:30 p.m.

Peterborough Cathedral, Cambridgeshire

The Astronomer Royal, Sir Martin Rees, will unveil a carved slate memorial plaque commemorating our distinguished former member

G. E. D. Alcock MBE (1912–2000)

visual discoverer of five novae and five comets.

All BAA members and guests are invited to attend the ceremony, after which there will be an opportunity for visitors to mingle before Choral Evensong begins at 5.30p.m. Many may wish to stay for the service, for which there will be a full cathedral choir of men and boys.

Small advertisements

25p per word, minimum £5.00. Box number 40p extra.

Small adverts must be typed or printed clearly and sent with the correct remittance in sterling, payable to the British Astronomical Association, to the BAA office at Burlington House, Piccadilly, London W1J 0DU, England.

Members' private sales and wants

One advertisement of up to 35 words per member per issue is accepted FREE OF CHARGE, at the discretion of the Editor. This offer is not available for business advertisements or to non-members.

Wanted

Wanted, for private/educational observatory and library: BAA *Journals*, Vol. 1–14, 16–18, 27–35, 41–45, 49; BAA *Memoirs* Vol. 1–4, 9–15, 18, 22, 24, 25, 28, 31; *Astronomical Registers* Nos. 1–28, 94–97, 115, 133–156, 175, 177, 186, 202, 203, 209, 211, 214, 220, 224–288; Smyth *Sidereal Chromatics*; A. S. Williams, *Zeno. Fragments 1 & 2*; Franklin–Adams *Charts 140–206 (+30–+90)*; Ross/Calvert, *Atlas of the Northern Milky Way*. Complete libraries, books, periodicals, notebooks, charts, atlases and medals related to observational work. Also wanted, old brass telescopes, eyepieces, spectroscopes etc. by Cooke, Dollond, Tulley, Wray etc.; large binoculars by Zeiss; modern Zeiss boxed set eyepieces. Please contact: Andy Stephens, 01242 675719 (Cheltenham); e-mail nighthawk@glasseyes.fsnet.co.uk.

For sale

Full set *Astronomy Now*, believed complete from 1st issue (1987) to present. Also *Sky & Telescope* over similar period. Donation to BAA secures, can deliver southern England. Please e-mail Hazel McGee, hazelmcgee@compuserve.com, or phone 01483 222791.

The next BAA meetings

Saturday 2005 April 23, 14.30–17.30

The English Heritage Lecture Theatre, Savile Row, London W1

Ordinary Meeting:

Dr Omar Almaini (Nottingham University)

Quasars, black holes and galaxy formation

Martin Mobberley Sky notes for spring

Doug Ellison Bonneville and beyond: a year on Mars with the *Spirit* rover

2005 May 25, 17.30–20.00

Geological Society, Burlington House, Piccadilly, London W1

Ordinary Meeting:

Dr Andrew Norton (Open University)

Outbursts, orbits and oscillations

Martin Mobberley The summer sky

For details of other speakers see the BAA Web page, www.britastro.org

Advance notice

The 2nd BAA 'Back to Basics' Workshop

will be held on Saturday 2005 November 12 in Doncaster

Following the success of the first 'Back to Basics' workshop in Chichester, another has been arranged for 2005 November 12 in Doncaster. The aim of this event is to help everyone who has recently become interested in astronomy, to learn some of the basic methods and develop the interest to its full potential. We have planned a programme of talks covering some of the basic techniques, and practical sessions with a solar and an evening observing session (weather permitting). Speakers include Lyn Smith, Paul Money, Karen Holland and Stewart Moore. During the day experienced people will be on hand to answer questions and give personal assistance. Full details in the next **Journal***.*

Hazel Collett , *Organiser*

Notice

Nominations for the Council ballot

Each year in May, your Council prepares the balloting list from the names of those members nominated. The Balloting List is sent to members in August and the elected members serve from the AGM in October. The elected Council comprises:

1 President, 1 Treasurer, 3 Secretaries and 10 other members.

It obviously shows a robust situation if the number of proposed members exceeds the number of vacancies so that a true election occurs. Council meetings normally take place during the afternoon of a Wednesday Ordinary Meeting or during the morning of a Saturday meeting. If you would like to be nominated you must be a paid-up member. Please ask two other paid-up members to propose and second you and then sign the nomination form (available from the Business Secretary), to show that you are willing to stand. Alternatively you may wish to nominate someone else.

All nominations must be in writing and sent to the BAA office to arrive by 2005 May 6.

Ron Johnson, *Business Secretary*

Officers and Council — Session 2004–2005

Elected officers

President: Tom Boles, Peel House, Coddenham, Suffolk IP6 9QY. Tel. (01449) 761950. E-mail: tom.boles@tiscali.co.uk

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