Ordinary Meeting, 2009 May 27

held at the Royal Astronomical Society, Burlington House, Piccadilly, London W1

Roger Pickard, *President*
Ron Johnson, Hazel Collett and Nick James, *Secretaries*

The President opened the seventh meeting of the 119th session and announced that the minutes of the previous meeting were on display at the back of the lecture theatre. 47 new members were proposed for election, and those 57 new members who had been proposed at the previous meeting were approved by the audience and declared duly elected. Mr Nick James, Papers Secretary, reported that one paper had been approved for publication in the *Journal*:

> The 'Alhazen' of Johann Hieronymus Schröter, *by Nigel Longshaw*

The President said that the next Ordinary Meeting would be held as a part of the Association's Exhibition Meeting on Saturday June 27 at the Old Royal Naval College in Greenwich. The next meeting in Burlington House would be the Association's Annual General Meeting on October 28. In the meantime, the Variable Star Section would hold its annual meeting at the University of Cardiff on June 13, and there would be a BAA Out-of-London weekend at the University of Leeds on September 4–6.

In a change to the advertised programme, the President then introduced the evening's first speaker, Mr Fraser Lewis, a PhD student at the University of Cardiff working on the Faulkes Telescope project. The President expressed his gratitude to Mr Lewis for agreeing to present this talk at short notice in place of his PhD supervisor.

Pro/Am collaboration with schools using robotic telescopes

Mr Lewis began by explaining that the two Faulkes Telescopes formed part of the Las Cumbres Observatory Global Telescope (LCOGT) Network, whose construction was funded largely by the philanthropic generosity of Dr Martin C. (Dill) Faulkes, who had contributed £10 million to the project. This funding was supplemented by a £1 million grant from the Particle Physics and Astronomy Research Council (PPARC; subsequently merged into the STFC in April 2007), and a £600k grant from the Department for Education and Skills.

At its inception, the Network was envisaged as part of the Millennium Dome project, providing a platform for bringing live astronomy into the Dome during the hours of UK daylight with the help of internet communications. That plan had not come to fruition and the project's aim had shifted to providing a means of bringing data from remotely-controlled robotic telescopes into school classrooms. This remained the project's central aim, for which purpose it now owned and operated two purpose-built two-metre telescopes – the *Faulkes Telescope North* on Haleakala, Hawaii, and the *Faulkes Telescope South* in Siding Spring, Australia. The geographic placement of these instruments in opposite hemispheres and at longitudes well-separated from that of the UK made it possible to make live observations of both the northern and southern celestial hemispheres throughout much of the UK school day; typically at least one of the two telescopes was online at any time between 6am and 7pm UK time.

Giving an overview of the telescopes themselves, the speaker explained that both were housed in unusual clam-shell enclosures which completely retracted when opened to give a full view of the sky. This aspect of the design was partially historic, dating back to early plans to link the two telescopes up with the similarly-sized Liverpool Telescope on the island of La Palma to form a network of instruments, given the provisional name Robonet, for performing follow-up observations of Gamma Ray Bursters (GRBs) detected by the *Swift* satellite. Given the transient nature of GRBs, follow-up observations had to be made as rapidly as possible after their initial detection, and the absence of a dome around the Faulkes Telescopes eliminated any delay that a slowly-rotating dome might cause when slewing to such objects at speed. Had Robonet come to fruition, its three telescopes would have provided 24-hour coverage of the night side of the sky, but in practice the network was never funded. Nonetheless, the Faulkes Telescopes are kept on standby to make GRB observations during those hours when they are online.

Mr Lewis added that there are plans to imminently expand the LCOGT network, both to increase the amount of observing time available to schools, and to increase the number of hours of the day when at least one of its observatory sites would be online. It was hoped that LCOGT would soon provide its own 24-hour facility for making follow-up observations of GRBs in the place of Robonet. Whilst these plans would not involve building any more two-metre telescopes of the same class as the existing, a large number of much smaller 0.4-metre telescopes would be added to the network within the next 12 months. These would be arranged with between two and four alongside each of the current two telescopes, and, subject to planning negotiations, similar numbers at each of five further observatory sites: Cerro Tololo in Chile, Mauna Loa in Hawaii, Sutherland in South Africa, Exmouth in Australia, and Tenerife in the Canary Islands.

Mr Lewis then described the optics of the Faulkes telescopes. The current pair of instruments each had two-metre f/10 research-grade primary mirrors, which were built at a cost of £250k each. Each had a field-of-view of 4.6 arcminutes – rather smaller than that of most amateur telescopes – and was fitted with a professional-grade 2048×2048 CCD camera. Given their large apertures and small fields-of-view, the telescopes were best suited for deep imaging of small patches of sky, rather than wide-angle photography. Typically, the seeing at each of the sites varied between 0".75 at best to 2" at worst. A wide range of different colour filters was available to observers, including the traditional BVR Bessel (similar to Johnson) filter set, the u'g'r'i' filter set of the Sloan Digital

Shears & Poyner: continued from previous page

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The clamshell 'dome' of Faulkes Telescope North on the summit of Haleakala, Maui, Hawaii.

Sky Survey (SDSS), z' and y' filters to match those available on the Pan-STARRS telescopes, and narrowband filters including Hα, Hβ and OIII. Both of the Faulkes telescopes were fully robotic – to reduce costs, the observatory sites were completely unmanned – and were able to open and close automatically in response to weather alerts.

The planned 0.4m telescopes would be much more similar to regular amateur instruments. The optical tubes would be standard Meade parts, yielding a field-of-view of 30'×20' at a focal ratio of f/8. Nonetheless, professional-grade CCDs would be mounted on them, allowing 3–4 three-colour images to be taken in each of the 30-minute observing slots allocated to schools. A user-friendly pipeline interface would guide the schools through the process of taking three sequential exposures with different filters and then stacking them to produce colour images.

Outlining the research for which the telescopes were being used, Mr Lewis explained that research projects had been developed with the aim not only that they should produce genuinely useful and interesting science, but also that schools should be able to contribute to them with a wide range of different levels of commitment. Furthermore, it was hoped that each project would provide as much interaction as possible between the schools and the professional astronomers who were guiding the research to make new discoveries, whilst at the same time being accessible to schools which could not be expected to come to the project with much background expertise. The speaker thus explained that in the design of each project, considerable effort had gone into preparing training material for teachers so that they could get involved without needing to have any prior specialist knowledge; the detailed work of planning worthwhile observing campaigns was largely done for them.

The speaker remarked that the two Faulkes telescopes were not well suited for observing many of the most obvious stereotypical astronomical objects – for example, the Moon and planets – because they had such large apertures and small fields-of-view. This was in many ways a deliberate choice: it provided a useful way of driving schools into participating in a more diverse and challenging set of scientific projects (with the end reward that genuine new discoveries could be made) than they might otherwise have devised themselves.

The speaker then outlined one particularly successful project which schools had been involved with, in which they had taken time-lapse images of asteroids. On the most basic level, a school which took a single image of an asteroid discovered the impossibility of distinguishing asteroids from stars in such images: both appeared as unresolved point sources. On the next level, when a few time-lapse images had been taken and made into a movie or otherwise animated, the motion of the asteroid relative to background stars became very apparent. The most committed schools then went on to perform photometry and estimate the asteroid's brightness, and over time constructed a lightcurve for it. Eventually, it might be possible to measure the asteroid's rotation period.

In reality, this project had proven such a success, and some schools had been so committed to it, that a particularly notable first had been achieved. For some time, professional astronomers had been hoping to detect a theoretically-predicted phenomenon called the Yarkovsky–O'Keefe–Radzievskii–Paddack (YORP) effect, that the spin rate of non-spherical asteroids should change over time as a result of the pressure exerted on them by the sunlight falling on their surfaces. Einstein's theory of special relativity predicted that even though photons of light had no mass, they still exerted a force – a very tiny force – when they collided with an object; this was termed radiation pressure. Applying this theory to a non-spherical asteroid which might have, for example, a knobbly mountain sticking out of one side, it was possible that the mountain would present a disproportionately large surface area for sunlight to push against on one side of the asteroid, and by this means act as a lever with which sunlight could spin up the asteroid.

In practice, the effect was very small because sunlight only exerted very tiny forces, and hence it had never been successfully detected. However, observations of a small near-Earth asteroid by the name of (54509) 2000 PH5 by the Faulkes Telescope North, when combined with data from various other professional instruments, had revealed the rotation period of the asteroid to be decreasing by around a millisecond each year, in agreement with theoretical predictions of the magnitude of the YORP effect for this object.[1,2]

Mr Lewis then discussed some of the science which had been possible during the brief window in 2007 when Uranus' ring and moon system passed through its edge-on orientation as seen from Earth. This event was analogous to the more readily observable ring-plane crossing which Saturn would shortly be undergoing in 2009 August. Just as Saturn's system of satellites was presented in an edge-on orientation during its current 2009 apparition, and amateurs had been able to observe mutual occultations of its moons over the past few months, so the Faulkes Telescopes were able to image and obtain accurate timings for mutual occultations of Uranus' satellites in mid-2007. For example, on 2007 May 5, an occultation of Umbriel (IV; 1,500km across) by Oberon (II; 1,200km across) was observed by Faulkes Telescope South. Interestingly, however, the event had occurred 10 minutes later than was predicted by the best models of Uranus' moon system. This highlighted the surprising fact that our knowledge of the orbits of the moons of the outer planets often remained quite sketchy, and was often based on small numbers of observations.

Other projects with which schools were involved included making follow-up observations of candidate extrasolar planets as they were reported by the *SuperWASP* robotised search programme. These typically involved making photometric measurements of the parent star to build up a lightcurve over a moderately long period, in the hope of finding any short and well-defined dips which might be attributed to the transit of a planet across the star's disk. On a similar theme, lightcurves could be constructed for a variety of variable star systems, including variable X-ray sources. All of these photometric projects required the collation of data collected over a period of days, and so encouraged collaboration between schools, each taking photometry for half an hour before passing on to the next.

Finally, the speaker addressed the question of whether amateur astronomical societies could use the Faulkes Telescopes. He remarked that the enthusiasm of amateurs for the work of the telescopes was very pleasing to see, and that amateurs were very welcome to sign up with the project and make use of the data collected by the two telescopes. However, he explained that the principal audience for the project was young people who would not otherwise have access to telescopes, whereas most amateur societies had their own observing facilities. Thus, astronomical societies were generally not permitted to schedule their own observations unless there was a clear educational purpose to their work.

Following applause, the President introduced the evening's second speaker, Dr David Walker, head of the Optical Science Laboratory at University College London (UCL) and technical director of a private optical engineering company, Zeeko Ltd.

The European Extremely Large Telescope – fabricating the mirror segments

Dr Walker opened by explaining that his talk would outline some of the engineering challenges posed by the manufacture and maintenance of large telescope optics. It would go on to look in detail at the work which was in progress to develop new techniques for fabricating mirror segments for the European Extremely Large Telescope (E-ELT), which was to be built in the coming decade.

Dr Walker first took a survey of the largest telescopes which were currently available to professional astronomers. The largest telescope ever to have been built was the Gran Telescopio Canarias (Gran TeCan), a 10.4m telescope on the island of La Palma in the Canary Islands, which had taken over seven years to build and which was only just beginning to take its first observations. Behind it in the league table of size, there were around a dozen telescopes worldwide with apertures of between 8 and 10 metres, including the two American 10m Keck Telescopes and the Japanese 8.3m Subaru Telescope on the summit of Mauna Kea, 13,796 feet above sea level on the island of Hawaii. These were complemented by around a dozen more telescopes with 4- to 8-metre apertures, including the Anglo-European William Herschel Telescope (WHT) on La Palma.

The speaker remarked that it was interesting to compare this current generation of telescopes with those which had been in use in the 1930s, to see how things had changed in the intervening 70 years. In the 1930s, the available instruments had included the 100-inch (2.54m) Hooker Telescope at the Mount Wilson Observatory, which had been in operation since 1908, and work was well under way on the new 200-inch (5.08m) Hale Telescope on Mount Palomar. The mirror for this new telescope was silvered in 1934, though it had not entered service until 1948 owing to delays brought about by the Second World War. So, perhaps rather surprisingly, the change was comparatively slight: telescope apertures had grown by a mere factor of two in the past 70 years.

Over that time there had, however, been tremendous advances in the sensitivities of the detectors placed at the foci of these telescopes. In the 1930s, photographic plates with a typical light-collecting efficiency of 1% had been state-of-the-art, whereas modern CCD cameras were typically able to record 70–80% of the light which landed on their sensors. As a result, a modern imaging exposure could reveal equivalent detail in less than a seventieth of the time that it would have taken in the early twentieth century, and it was consequently possible to detect much fainter structures on the sky. But, putting these advances to one side, the lack of corresponding progress in the building of telescopes with ever-larger apertures seemed to need an explanation. Astronomy was, after all, surely unique among the sciences in that the optics of instruments such as the Hale Telescope remained among the best in the world over 60 years after their construction.

Dr Walker explained that, in essence, large telescope mirrors were very difficult and expensive to manufacture and handle. Taking as an example the two 8.4-metre mirrors of the Large Binocular Telescope (LBT; completed 2002), he said that in the accounts of such projects, the phenomenal cost of building and equipping a vacuum chamber which was large enough to use for silvering such a mirror was often exceeded only by the even more mundane expense of building a road which was good enough to transport such a bulky mirror up to a good mountain-top observing site. Aside from these cost considerations, there were naturally hazards associated with handling such large and unwieldy mirrors: a single crack could render it entirely useless. For this reason, the 8.4m mirrors built for the LBT were the largest *monolithic* mirrors ever to have been built: all larger telescopes used tessellating hexagonal mirror segments which could be manufactured individually and put together as tiles. For example, the primary mirrors of the two 10-metre Keck telescopes were built up from 36 segments, each measuring 1.8m across.

The principles involved in the construction of segmented telescope mirrors had first been demonstrated in the 1990s with instruments such as the Keck Telescopes, but the task was not easy. Typically, a sophisticated computer system was needed to continuously monitor the positions of the segments and make corrections for any errors in the shape of the mirror using actuators placed behind each segment. Issues such as the thermal expansion of the telescope structure, and its flexion as the telescope slewed across the sky, introduced errors into the shape of the mirror which had to be painstakingly corrected for. These challenges grew massively more difficult as telescope apertures got larger, owing to the increased weight of the mirrors which were having to be manipulated and kept in shape.

However, the speaker added that the scientific rewards for having a telescope with an aperture which was very much larger than anything which was currently available were potentially great. For example, in order to image Earth-like extrasolar planets around other stars it would be necessary to have a telescope with a tremendously high resolving power, but which was simultaneously able to detect an intrinsically very faint planet. Likewise, in order to see the formation of the first generation of galaxies out of the primordial gas which had been produced by the Big Bang, a telescope was needed which could detect objects which were not only at distances of billions of lightyears away from us, but also intrinsically rather small and faint.

In response to these challenges, designs for several very large optical telescopes had been proposed. In the US, plans were currently under way to build a Thirty Meter Telescope (TMT), whose primary mirror would be made up from 492 hexagonal segments, and which it was hoped would be operational by around 2017–'18. In Europe, plans for a similar telescope had stemmed from two competing proposals, which had recently been merged into a plan for a single telescope, taking the most realistically achievable aspects from each of the earlier designs.

The first of these two earlier designs had been the 50m Euro50 Telescope, which was designed around an aspherical primary mirror made from 619 segments. The speaker explained that the aspherical shape of the segments required to build such a mirror was not insignificant. Spherical segmented mirrors were relatively easy to manufacture, because every segment was of the same shape and mass-production was possible. The segments of an aspherical segmented mirror, on the other hand, all needed to have different curvatures. Not only was mass-production impossible, but the fabrication of high-precision aspherical surfaces was costly and difficult. Many amateurs would be familiar with the difference in cost between Schmidt–Cassegrain telescopes with spherical mirrors and corrector plates, and more traditional Cassegrain telescopes with parabolic mirrors. The idea of building a 50m aspherical mirror was thus highly ambitious.

The competing design, the OverWhelmingly Large telescope (OWL), was in one sense simpler: its 100m primary mirror was spherical, made from 3,048 identical segments. However, to correct for the spherical shape of this primary mirror, a 25.6m aspherical secondary mirror was required, which would itself be made from 216 segments.

Dr Walker explained that the merged proposal was to build a more realistic 42-metre telescope, called the European Extremely Large Telescope (E-ELT), which would have an aspherical primary mirror built from 984 hexagonal segments, each measuring 1.42m across. In practice, a total of 1,148 mirror segments would need to be manufactured in order to ensure an adequate supply of spare parts. The resulting telescope would be configured with a field-of-view of around ten arcminutes and a focal ratio of f/1. Despite the move to a less ambitious aperture, the task of manufacturing the segments for the E-ELT remained a serious challenge. With the best technology currently available, each segment would take around six months to polish, at a cost of several million pounds, and so it was essential that new techniques be developed.

The speaker's own involvement with the project came through his company, Zeeko Ltd, which was pioneering a new way of polishing aspherical mirror surfaces. He explained that standard polishing tools worked rather poorly on aspherical mirrors because the target curvature of the mirror was not constant across its surface. Consequently, a polishing tip which had the right curvature to hug the surface of the mirror at one point would have the wrong shape to hug the surface of other parts of the mirror. The speaker's idea had been to use an inflatable membrane with abrasive surface in place of a traditional polishing tip. One simply needed to press down on the membrane by different amounts to change the pressure inside it and change its curvature to match the desired shape at any particular point on the mirror's surface. This inflatable membrane could be mounted on a computerised polishing machine and controlled automatically.

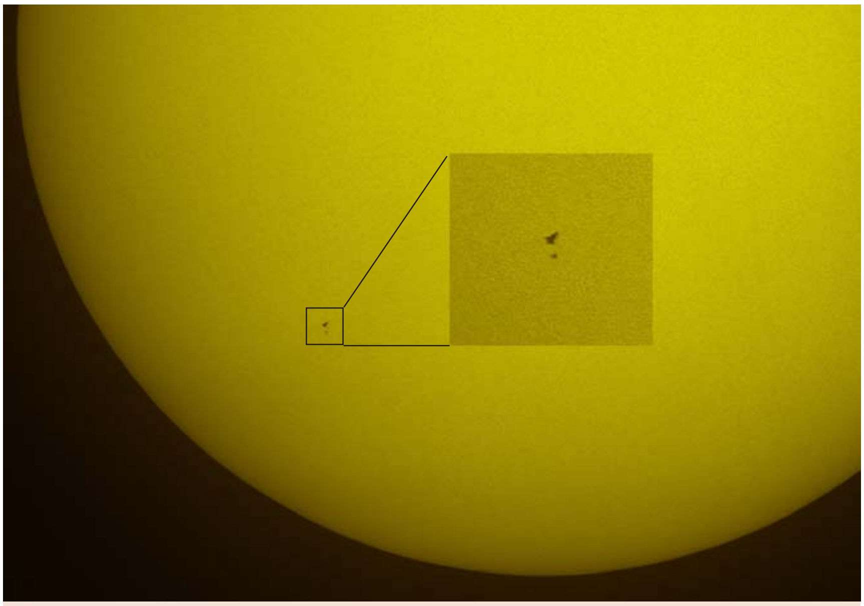
The speaker explained that having patented his idea, he had formed a collaboration with OpTIC Glyndwr Ltd in North Wales, and the partnership had accepted a contract to a build seven full-size prototype segments for the E-ELT. To provide a fair test of the most challenging engineering which was needed for the E-ELT mirror, these prototype segments corresponded to the most extremely aspherical parts of its surface, around the edges. There was also a competitive element to the contract: a rival company in France had been contracted to independently manufacture a similar set of prototype segments.

To close, Dr Walker reported that he was making good progress on the contract: in a recent test he had polished a single mirror segment to the desired surface accuracy within 31 hours. Looking ahead, he hoped to be able to deliver his first two prototype segments in April 2010, and the remaining five in late 2010. If he completed the contract successfully, he hoped to form an industry consortium and be in a position to bid for the manufacture of all 1,148 of the E-ELT's segments when the time came.

Following applause, the President invited Dr Richard Miles, Director of the Association's Asteroids and Remote Planets Section, to present the Sky Notes.

The Sky in May

Dr Miles opened by showing a pair of time-lapse videos compiled by Gustavo Muler in Lanzarote, Spain, of the motion of comet C/2007 N3 (Lulin) relative to the background stars behind it. He went on to report that the Sun's period of quietness was continuing, and that although a small group of sunspots had been visible in the past month, these had now disappeared to leave the Sun's disk spotless once again. Modest prominences remained visible around the edge of the Sun's disk in Hα images. However, some astrophotographers had been finding other uses for the Sun's disk: during the recent flight of the space shuttle *Atlantis* (STS 125; May 11–24) to service the Hubble Space Telescope (HST), French amateur astrophotographer Thierry Legault had captured the silhouettes of *Atlantis* and the HST against the solar disk as they approached one another on May 13 at 12:17 EDT. This remarkable image was a testament to Legault's skill and determination: the low orbit of the HST meant that the transit had only been correctly aligned within a 5km-wide corridor of visibility on the Earth's surface, and had only lasted 0.8 seconds. In order to ensure a sharp image, Legault used an exposure of a mere 1/8000th second.



The space shuttle Atlantis and the HST silhouetted against the disk of the Sun, 2009 May 13. *NASA Astronomy Picture of the Day, 2009 May 16; courtesy Thierry Legault.*

The speaker said that Jupiter was coming into view in the morning sky, now rising at midnight BST. However, it would not be well placed for UK-based observers in its coming apparition on account of its southerly declination in Capricornus – currently –13° and reaching –16° by September. Saturn was now setting at around 2:30am BST, and would disappear into evening twilight over the course of the summer.

Moving out to Pluto, Dr Miles reported that the Association's Asteroids and Remote Planets Section would be organising an observing campaign over the coming months to measure the dwarf planet's lightcurve as it approached opposition on 2009 June 23. Similar work had historically secured Pluto's rotation period to be 6.4 days, but as Pluto was now moving further away from the Sun, having passed perihelion in 1989 and having passed outside the orbit of Neptune in 1999, its surface temperature would now be dropping fast and its albedo features may have changed if any components of its atmosphere had begun solidifying onto its surface.

The speaker congratulated Tom Boles for the recent discovery of his 120th supernova, 2009es, in IC1525 on May 24 – his first discovery since January. He closed his talk with some images that he had captured himself using the Faulkes Telescope South on May 14, a few hours after the launch of the *Herschel* and *Planck* space observatories aboard an Ariane 5 rocket from the Guiana Space Centre. These images were taken shortly after the two spacecraft separated from the Sylda 5 payload dispenser which packaged them in the launch vehicle, and clearly showed three point sources. From their relative motion and brightnesses, the speaker said he was able to identify each of them.

Following applause, the President adjourned the meeting until the Exhibition Meeting, to be held at the Old Royal Naval College, Greenwich on Saturday June 27.

Dominic Ford

1 Lowry S. C. *et al.*, *Science*, **316**, 272 (2007)
2 Taylor P. A. *et al.*, *ibid.*, 274

Exhibition Meeting and Ordinary Meeting, 2009 June 27

held at the Old Royal Naval College, Greenwich, London SE10

The Mayor of Greenwich, Cllr Allan MacCarthy, opens the 2009 Exhibition Meeting. *(Except where noted, all photos by Bob Marriott.)*

On a fine sunny morning, at 10:15 on the lawn outside Queen Anne Court at the Old Royal Naval College, the 2009 Exhibition Meeting was opened by the Mayor of Greenwich, Councillor Allan MacCarthy. His welcoming address was both eloquent and factual, and it was evident that he had familiarised himself with the work of the Association and its place in the annals of astronomy. As usual most of the Observing Sections were represented, each mounting fine displays for the benefit of members and the general public, who were also encouraged to visit the Exhibition. The displays included equipment, videos and practical demonstrations. In addition to the Sections, the Campaign for Dark Skies, the *Handbook* and *Journal*, and Sales and Promotions, were also represented, as were several affiliated societies. Throughout the day a rolling presentation of BAA work and activities was shown in the lecture theatre and on one of the large monitors in the main exhibition area, and a number of telescopes were set up and used outside. The several trade stands appeared to be carrying on lively business.

Regalia worn by the Mayor of Greenwich, signifying the borough's historical association with navigation and astronomy.

Live sessions using the robotic Faulkes Telescope South were planned for 12:00 noon and 2:00 pm in the first-floor lecture theatre. Unfortunately the demonstrations were foiled by cloudy weather over Australia, and Jeff Moreland and Richard Miles instead presented talks on the use of robotic telescopes and what could have been achieved had the weather proved favourable. In the first session, Nik Szymanek also gave a talk and presented some of the results, including many fine images, he had obtained using the Faulkes telescopes.

At 2:45 pm the President, Roger Pickard, opened the Ordinary Meeting – the single item on the agenda being the presentation of the Association's awards for 2009 (citations below). The Merlin Medal and Gift, 'in recognition of a notable contribution to the advancement of astronomy', was presented to Maurice Gavin; the Steavenson Award, which 'shall be awarded to a mem-

From left to right: Prof. Bill Leatherbarrow, Director, Lunar Section; Dr John Rogers, Director, Jupiter Section; Mike Foulkes, Director, Saturn Section; Paul Abel, Assistant Director, Saturn Section.

ber who has made an outstanding contribution to observational astronomy', was presented to Tony Markham; the Horace Dall Medal and Gift, which 'shall be awarded to a person who has shown marked ability in the making of astronomical instruments', was presented to Dr Laurence Newell; and the Lydia Brown Award, 'in recognition of meritorious service to the Association in an honorary capacity over many years', was presented to Peter Hudson. The President then adjourned the Ordinary Meeting.

At 5:00 pm, as the Exhhibition closed, Dr Richard Dunn, Curator of the History of Navigation at the National Maritime Museum, presented a talk entitled 'The History of the Telescope : A Greenwich Perspective'. Dr Dunn was asked to sign several copies of his newly published book, *The Telescope: A Short History*. At the end of the day there was also an opportunity to visit the Royal Observatory at the top of the hill and attend a lecture on the *Cassini* mission to Saturn.

The Old Royal Naval College, with its character, atmosphere and spacious facilities, set amidst the many other attractions of Greenwich, provided an ideal setting for the Exhibition Meeting. The Mayor exceeded his scheduled time of departure having stayed for three hours, and the attendance register included the signatures of many members and non-members, including visitors from North America, Norway, Hungary and Australia. All Section Directors and other exhibitors are thanked for their participation and their considerable efforts in presenting the work of the Association, and thanks especially to Lorraine Crook, the newly-appointed organiser of the Exhibition, for making the day such a success.

Richard Miles

The BAA Awards and Medals, 2009

The Merlin Medal & Gift – Maurice Gavin


(Photo by Hazel McGee)

For many years Maurice Gavin has pushed back the boundaries of amateur astronomy by constructing his own instruments and embracing developing technology. A keen observer for more than fifty years, he has regularly carried out observations of a variety of astronomical objects.

From the first he encouraged the use of photography as a recording medium for astronomical observations. In the early 1980s Maurice wrote a book describing how amateurs could benefit from using the emerging computer technology. This encouraged many to try it for themselves. Shortly after, he set up a publication for amateurs containing computer programs provided by himself and other contributors. This had a circulation of about 300, providing an insight into using this early technology for astronomical means and encouraging amateur astronomers to start using computers.

Maurice was one of only a few amateurs using and developing techniques in spectroscopy. He was the first amateur to obtain a spectrum of supernova 1996bu in M96. In 1998 he obtained a spectrum of the Wolf–Rayet star HD192163 in Cygnus. He obtained images and spectra of several quasars including Q1226+023 (2C273) and Q0014+813, demonstrating that the spectral lines were highly redshifted. He has achieved excellent results with modest equipment, generally from light-polluted suburbia.

With the arrival of electronic imaging Maurice was keen to experiment with various cameras and equipment and by doing so motivated and encouraged others to follow suit. He has regularly contributed observations to the various observing sections of the Association as well as having over twenty papers, images and other items published in the *Journal* with a view to encouraging others to develop further their enjoyment of astronomy.

Maurice has given many talks to members at Ordinary and Section meetings outlining the work he has been doing and describing some of the instrumentation and techniques that he has developed. He has always been the first to encourage and motivate others to develop their skills by demonstrating and communicating his work and achievements.

Over the course of many years Maurice has made a notable contribution to the advancement of astronomy. He is a worthy recipient of the Merlin Medal and Gift for 2009.

The Steavenson Award – Tony Markham

On the night of 2008 December 3, Tony Markham made his 100,000th visual variable star observation.

By this achievement Tony joins Gary Poyner and John Toone in reaching this milestone. Only one other observer from the UK has achieved this total, namely Charles Butterworth who made his observations in the first half of the twentieth century. Indeed, this total has been achieved by only two dozen of the most dedicated observers worldwide, many of whom are no longer with us. Furthermore, with many observers switching to CCD work, it may be that few other visual observers will surpass this number.


(Bob Marriott)

Tony joined the BAA in 1980 although he made his first variable star observation in 1975. All his observations were made with either 10×50 or 11×80 binoculars. He is also one of those rare observers who manages to get up early in the morning to catch many variable stars as they emerge from conjunction with the Sun. This doubles the value of these observations as there are generally few people who are prepared to commit themselves in this way.

Tony was at one time Eclipsing Binary Secretary of the BAA Variable Star Section, and is a past Director of the VSS of the Society for Popular Astronomy, a post he held for many years. He also writes a regular column on variable stars for *Astronomy Now*. He is also a keen meteor observer and has edited the meteor pages in *The Astronomer* magazine for several years. As a critical observer with an eye for errors of all types his advice to others, either verbally or in print, is both detailed and highly valued.

In view of the above Council is pleased to give the 2009 Steavenson Award to Tony Markham.

Observers' Forum

NGC 7008 – a 'celestial hook'

Andrea Tasselli

One of the delights of the summer sky for planetary nebula enthusiasts is the number of objects on view. And for visual observers who don't have the luxury of remote warm-room observing, all available under a pleasant summer sky. Even the lack of truly dark skies is not a serious problem as many planetaries have a high surface brightness and the use of filters can often improve contrast. To many people summer planetaries mean the Ring Nebula or the Dumbbell, but there are numerous other objects which deserve investigation, and one of them is NGC 7008 in Cygnus.

Discovered by William Herschel in 1787, he classified it as a bright nebula rather than a planetary which, considering its shape, was reasonable. To Herschel planetary nebulae were small round objects which often appeared slightly greenish and which reminded him of Uranus, which he had discovered 6 years earlier. The true nature of what we now call planetary nebulae remained a mystery until William Huggins turned his spectroscope on NGC 6543 in 1864 and realised it was a gaseous object. NGC 7008 lies in Cygnus, close to the Cepheus border, at RA 21h 00m 33s and Dec +54° 32' 35" (2000.0), almost midway between a line joining mag 1.3 Deneb (α Cygni) and mag 2.4 Alderamin (α Cephei). As with many planetaries its stated magnitude varies widely in the literature and ranges from around 9 to 12, but with a size of only 1.4×1.1 arcmin it appears quite bright and will certainly be visible in a 20cm telescope. It is thought to lie at a distance of around 3,000 light years, with a physical size of around 1 light year.

At first appearance NGC 7008 seems a strange object. It has a hooked shape, with the hook lying north–south, and a double star (h1606, separation 18 arcsec) at its southern end. Imagers intent on capturing detail in the nebula often cause the brighter component of this double star to become bloated, so that it appears to be attached to the nebula enhancing the hook like effect, whereas visually at high power it is clearly separate. High power will also show a variation in intensity across the nebula and what were once thought to be superimposed faint stars are now thought to be knots of material associated with the planetary itself. The mag 13 central star is offset and lies slightly to the west of centre. Spectrographic investigations suggest that

The Lydia Brown Medal – Peter Hudson

The British Astronomical Association relies on the enthusiasm and goodwill of many of its members in order to function, and although these are all appreciated, few are really rewarded. One such factotum is Peter Hudson, who has served the Association in many capacities, official and unofficial, over many years. Peter has served on Council for several years, but it is his meritorious service beyond his Council role that makes him especially deserving of the Lydia Brown Medal and Gift.

Peter is always to be found when help is needed. He has appeared early to set up and stayed late to take down all recent Exhibitions, and also the BAA displays at AstroFest. He has been willing, reliable and a fine adviser to all the organisers of these meetings.

(Hazel McGee)

For many years, Peter drove around the country providing Sales and Promotions displays at countless meetings, whether of the Association, Sections or other organisations, thus helping to keep the Association actively in the public eye.

With the recent temporary move of the office from Burlington House and back, and the major changes to the Association's Library, Peter was a most willing adviser, mover, and sorter. His knowledge of Health and Safety legislation and practice during the return to the office proved invaluable.

Peter Hudson embodies the selfless giving of time and effort on which the Association thrives. It is time that this was recognised, and the Lydia Brown Medal and Gift goes some way to expressing our thanks for these achievements.

The Horace Dall Medal – Dr Laurence Newell

The committee of the Radio Astronomy Group nominated Dr Laurence Newell for the Horace Dall Medal, awarded to a person 'who has shown marked ability in the making of astronomical instruments.'

(Bob Marriott)

Over the past seven years, Dr Newell has developed *Starbase*, a 'distributed and integrated' radio astronomy observatory software package. *Starbase* controls and collects data from a number of 'plug and play' instruments, initially radio telescopes and associated instruments such as magnetometers and VLF receivers, but also, potentially, optical telescopes. In parallel with this (and with the technical support of the RAG committee), he has devised a network architecture to support instruments, designed a consistent and reliable local 'bus' protocol and overseen the development of a number of instruments, with the magnetometer and VLF receiver now ready for production.

This design and architecture is unique: there is nothing like it anywhere else in the world, in either a professional or amateur capacity. It will enable observation of the radio Sun and of intra-galactic radio emissions to be made available to anyone, without needing any special technical skills. This is a truly remarkable achievement which Council recognises by the award of the Horace Dall Medal for 2009 to Dr Laurence Newell.