



Annual General Meeting, 2010 October 27

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

David Boyd, President

Ron Johnson, Hazel Collett & Nick James, Secretaries

The President opened the AGM of the 120th session of the Association and announced that by sad coincidence, two well-known lady members, Mrs Valerie White and Mrs Wendy Maunder, had both passed away on the same day in September. Val was a Council member, and for the past six years the editor of the BAA *Handbook*, and Wendy was the wife of long-standing Council member Michael Maunder. The meeting stood for a minute's silence in memory of both.

The minutes of the previous AGM were displayed at the back of the hall and were accepted by the audience as a true record. Dr Boyd then introduced the Association's Treasurer, Mr Alan Lorrain.

Mr Lorrain referred to the Accounts published in the 2010 October *Journal*. It had been a reasonably good year, showing a surplus of around £20,000, however this was mainly due to a generous bequest and in particular the sale of historic books and other items, which was of course a one-off event. The underlying trend remained negative, partly due to the very poor investment climate. Mr Lorrain was taking steps to try to increase our income from investments subject to maintaining a low level of risk.

There being no questions for the Treasurer, he proposed acceptance of the Accounts, which was seconded by Mrs H. McGee, and approved by the audience *nem.con.* with one abstention.

Dr Boyd thanked Mr Lorrain for his hard work on behalf of the Association in a diffi-

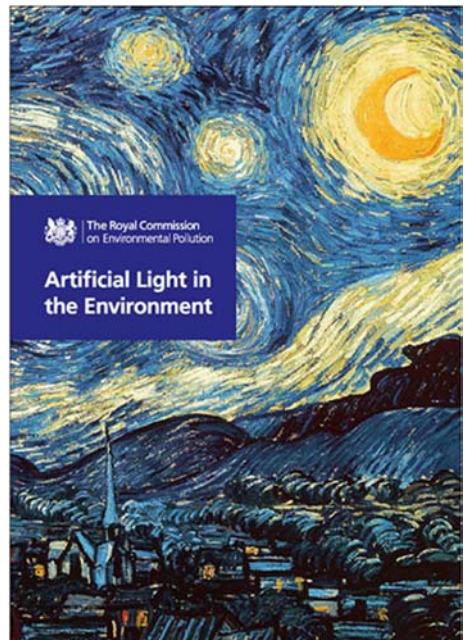
cult financial climate, and then gave his review of the Association's year.

President's Review of the Year, 2009–2010

Dr Boyd began his review by reminding members of three sad losses during the year: Past President and Treasurer Cmdr Henry Hatfield, BAA *Handbook* Editor Val White, and past Lunar Section Director Geoff Amery. Several new appointments to important roles in the Association had been made. Sheridan Williams replaced Gordon Taylor as Director of the Computing Section; Mike Frost took over from Tony Kinder as Director of the Historical Section; Paul Hyde replaced Laurence Newell as Coordinator of the Radio Astronomy Group; Geoffrey Johnstone took over from Mike Harlow as New Members' Coordinator; Peter Meadows replaced Jeff Moreland as Robotic Telescope Coordinator; Steve Owens took over from Dave Bowdley as Outreach Coordinator and Dick Chambers was appointed to the new post of the Association's Archivist. The President then thanked by name the many people who had continued to support the Association in a wide variety of roles and without whose generous commitment of time and effort we could not continue to function.

The Walter Good-acre Medal was awarded to Eric Strach, who sadly has subsequently died at the age of 96. Monty Leventhal was the worthy recipient of the Steavenson Award and a special award was made to Gordon Taylor for his long service to the Association and the world of astronomy. The President congratulated Bob Mizon, our long-serving champion of dark skies, for his award of an MBE. Two significant events during the past year in the continuing battle against light pollution were the creation of Western Europe's first Dark Sky Park in Galloway Forest Park, and publication of the Royal Commission on Environmental Pollution report, 'Artificial Light in the Environment'.

Dr Boyd reminded members of the excellent programme of meetings held during the past year, the highlight of which undoubtedly was the commemoration at the Royal Institution in London in 2009 No-



member of Sir Patrick Moore's 75 years of continuous membership of the Association.

Turning to the astronomical highlights of the year, the President showed some of the spectacular images of the Sun, Moon, planets and deep sky objects taken by BAA members and contributed to our observing Sections. The quality of these improves every year, driven by a combination of advances in software and hardware and the ever-improving skill of our members.

Many BAA members had travelled to the South Pacific in July to see the total solar eclipse. Aurorae were beginning to reappear after solar minimum and good observations had been reported of noctilucent clouds. Two impacts on Jupiter had been recorded on video by amateurs during the year, highlighting the importance of continuous observation of the planets, and several members contributed to Project NeilBone by measuring the changing brightness of asteroids at low phase angles.

Circumstances for viewing the Perseid meteor shower were particularly good in 2010 and for once the weather over much of the UK had cooperated. The variable star Epsilon Aurigae was well observed during the year as it experienced one of its rare lengthy eclipses. Tom Boles and Ron Arbour added to their tally of supernovae, and it was particularly pleasing to see the report of the first supernova discovery by David Grennan in Ireland. (*Report contributed by David Boyd*).



Meetings

Following applause for his annual review, Dr Boyd asked Ron Johnson, Business Secretary, to read the results of the ballot for Officers and Council for the session 2010–2011, which were as follows (the number of votes received is given in brackets): President, Dr D. R. S. Boyd (390); Vice-President, R. Pickard (ex-officio); Treasurer, A. Lorrain (382); Secretary, Meetings, Mrs H. Collett (360); Secretary, Papers, N. D. James (374); Secretary, Business, R. W. Johnson (352). Other members of Council: T. Boles (366), Dr J. W. Mason (353), Mrs A. Davies (345), P. Hudson (331), Dr N. D. Hewitt (323), Dr D. L. Arditti (314), Dr D. Ford (303), R. Dymock (285), A. Morris (285),

G. F. Johnstone (276), J. Chuter (239). 426 ballot papers were received, of which six were declared invalid, usually because the sender had not renewed their subscription.

Mr Johnson proposed a vote of thanks to the scrutineers of the ballot, R. Baker, N. Grabaskey, G. Harding and J. Marchant, which was approved by acclamation.

Dr Boyd then took the microphone to give his first Presidential Address, on the topic ‘Pro-Am collaboration in astronomy’. (The Address was published in the 2011 *Annual Journal*.)

Following substantial applause for what all agreed was a superb Address, Dr Nick Hewitt rose to thank Dr Boyd for an ‘out-

standing’ contribution. As a former President himself, he commented that the long day of the ‘mid-term’ AGM was a particular ordeal for the President, and that Dr Boyd had carried it off with great aplomb. The audience recognised the truth of this with a further round of strong applause.

The President then adjourned the AGM until 2011 October 26, and proceeded immediately to open the Ordinary Meeting.

Hazel McGee

Ordinary Meeting, 2010 October 27

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

David Boyd, President

Ron Johnson, Hazel Collett & Nick James, Secretaries

Dr Boyd opened the first Ordinary Meeting of the 121st session and asked members to approve the minutes of the previous OM, held as part of the Exhibition Meeting in June. These were approved. 49 new members were proposed for election, and the election of 54 new members agreed by Council that afternoon was confirmed. Nick James said that one paper had been approved by Council today for publication in the *Journal*:

T. J. J. See and the surface relief of Mercury, by Richard Baum.

Dr Boyd said that the next meeting of the Association would be on Saturday November 20, at 2:30 p.m. at the current venue. The first meeting of the reconstituted Historical Section would be held a week later at the Institute of Astronomy, Cambridge, on November 27.

He then asked David Arditti to present the current Sky Notes.

the sky, and Saturn being in conjunction with the Sun one day later. He wondered at the curious fact that none of the ‘alternative thinkers’ seemed to have noticed this alignment or predicted disaster from it.

Dr Arditti went on to note the very recent upsurge in activity on the Sun, with three sunspot groups currently visible, the first time this has occurred for several years. This was also a favourable time of the year for lunar observing, and he showed a comparison of his own recent image of the lunar swirl Reiner Gamma with images of the same feature from *Lunar Reconnaissance Orbiter*.

Dr Arditti then covered developments on Jupiter this apparition: the impact flashes observed, interactions of spots in the South Temperate latitudes, and features observed circulating round the GRS. He also showed images of Uranus and Neptune and their satellites, recently obtained by Damian Peach and Maurice Gavin.

He then noted a close approach by an unusually large Near Earth Object (NEO), 2003 UV11, in the coming days. This asteroid was moving so fast it was likely



The lunar surface between Hevelius and Reiner, featuring the bright lunar swirl Reiner Gamma, imaged by David Arditti on 2010 October 20.

that visual observers would be able to see it actually moving in real time. The major comet on display at the moment, 103P (Hartley), was shown in a gallery of images that illustrated the rich area of the sky in Perseus and Gemini that it was currently occupying. Finally Dr Arditti drew attention to the observing campaigns on Epsilon Aurigae and R Corona Borealis, and recent supernova discoveries by Tom Boles and Ron Arbour.

Following applause for Dr Arditti’s presentation, Dr Boyd adjourned the meeting until Saturday November 20 at the same venue.

Hazel McGee

Sky notes for October

Dr Arditti began by drawing attention to what he called the ‘great planetary alignment of 2010’ – the circumstance of Saturn and Uranus both being at opposition on September 31, less than a degree apart in



Ordinary Meeting, Saturday 20 November 2010

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

Roger Pickard, Vice-President, in lieu of Dr David Boyd, President

Ron Johnson, Hazel Collett & Nick James, Secretaries

Mr Pickard, Vice-President, opened the 2nd meeting of the 121st session, and with great sadness announced the death in the USA of Dr Brian J. Marsden. Dr Marsden was elected to the BAA in 1953, awarded the Merlin Medal and Gift in 1965, and the Goodacre Medal in 1979. He was also closely involved with the founding of the Asteroids and Remote Planets Section. Brian Marsden received his PhD from Yale University in 1965, and in 1968 became Director of the IAU Central Bureau for Astronomical Telegrams, and in 1978 also Director of the Minor Planet Center at Harvard. He will be remembered for recognising the group of sungrazing comets that bear his name. In UK amateur circles he was best known for his work with Guy Hurst of *The Astronomer* magazine in filtering amateur discoveries and passing them on to the professional community. He will be greatly missed. The meeting held a minute's silence in his memory.

Mr Pickard then invited the audience to approve the minutes of the last meeting. 49 membership candidates were approved and declared elected. Mr Nick James, Papers Secretary, said that four papers had been accepted for the *Journal* by Council that day:

Software architecture for an unattended remotely controlled telescope, by Robert Lucas

The grazing occultation of Jupiter on 2012 July 15, by Jean Meeus

The first confirmed superoutburst of the SU UMa type dwarf nova SDSS J083931.35+282824.0, by Jeremy Shears

GrepNova: a tool for amateur supernova hunting by Dominic Ford

Mr Pickard announced that the next Ordinary Meeting would be held on December 11, a Historical Section Meeting would be held on November 27 in Cambridge, and the following week the Webb Deep Sky Society Annual General Meeting would also be held in Cambridge. He then introduced Dr Richard Miles, Director of the Asteroids and Remote Planets Section, to give the first talk.

The strange case of 'asteroid' 2010 KQ

Occasionally, Dr Miles began, pieces of 'space junk' are seen that move like asteroids. 2010 KQ, a magnitude 18 object discovered on 2010 May 16, was believed to be an asteroid, but it has a very circular orbit, with a period of almost a year. A natural body in that type of orbit, Dr Miles asserted, would have collided with the Earth long ago. He posed the question: how can it be identified? Its variation of brightness with phase angle is inconsistent with the normal properties of asteroids – it should increase in brightness towards zero phase angle, but doesn't. Its brightness curve is consistent with being a metallic cylinder 2.7 square meters in size.

Dr Miles's work on this object involved determining its colour. He used the Faulkes Telescope to image 2010 KQ and a comparison asteroid, taking equivalent exposures using the same filters. He showed that 2010 KQ's spectrum was significantly different from that of the asteroid. In 1991 NASA had flown a mission to measure the space weathering of titanium oxide paint, obtaining reflectance spectra of the paint surface as it gradually reddened with time in space. Dr Miles showed that the spectrum of 2010 KQ corresponded to that obtained in the paint experiment.

Assuming 2010 KQ was launched from Earth, orbit back-calculations by Bill Gray have given either the year 1975, or the late '50s or early '60s, as possible epochs when it could have been launched. Accepting the likely artificial origin of 2010 KQ, the Minor Planet Center have now re-designated it RK 25285, and withdrawn the designation 2010 KQ (so it cannot now be found by searching the MPC database on that designation).

Considering possible objects, Dr Miles for a time believed it was the American *Helios-1*

probe upper stage from 1974 December, but it could not be, as this was known to have burned up in the atmosphere. It could, however, be related to the Soviet *Luna 4* probe launched in 1963. Gray has been able to estimate the area to mass ratio based on solar radiation reflection, which is inconsistent with the *Luna 4* probe itself, but consistent with the Blok-L upper stage of its carrier rocket. Dr Miles concluded that this is almost certainly the true identification of 2010 KQ.

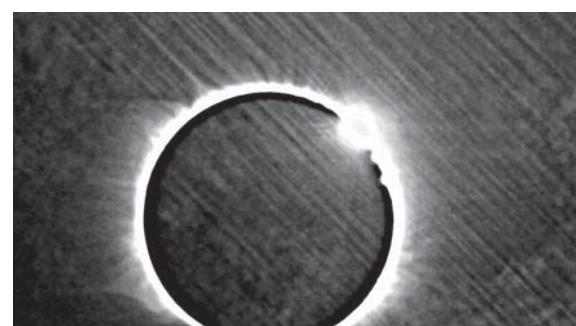
Mr Pickard thanked Dr Miles and introduced Mr Nick James to give the next talk.

Shadow bands seen on the clouds of the 2010 total solar eclipse

Mr James first explained that shadow bands, phenomena that have been noted at total solar eclipses since at least the 9th century, are not shadows at all. They are dark and light bands 20–40cm apart that are seen rippling along the ground close to totality. They have been difficult to record in the past, so there has not been much data on them. They are now believed to be due to scintillation in the atmosphere affecting the distribution of light on the ground when it is illuminated by the very narrow source of the almost totally-eclipsed photosphere. J. L. Codona published a theory¹ in 1986 explaining the size, speed and intensity of the bands, but quantitative observations to test the theory have been scarce.

Mr James showed a video he had taken in Libya in 2006, using a 72mm refractor and a Canon DSLR camera in video-capture mode, that showed shadow bands moving on the desert floor. Videos like this, which are now quite easy to produce, allow one to measure how band spacing, contrast and speed develop as second contact approaches.

Mr James observed the eclipse of 2010 July 11 from Hao atoll in French Polynesia. An interesting feature in this case was that a thin layer of cloud moved across the Sun just before second contact, and at that instant shadow bands were imaged moving across the sky, perpendicular to the axis of the diamond ring. These were not seen visually, and this appears to be the first time these sky bands have been videoed, advances in camera technology making this now possible. From the video the band frequency can be measured, and the physical size can also be determined by measuring angular size and knowing the cloud height, in this case about 500m. The wavelength measured was 2.3 minutes of arc



Shadow bands observed on cloud at the 2010 solar eclipse.
N. D. James, JBAA 120(5), 317.



on this occasion, and this was found to be in accord with Codona's theory.

Other images of shadow bands at this eclipse were taken by various observers round the Pacific. John Mason and Nick James are collating these observations for analysis, and request anybody who has observations to send them copies.

Thanking Mr James, Mr Pickard then introduced Guy Hurst.

Glimpses into astronomical education

Mr Hurst said that, surprisingly, in the UK there are hardly any tutors in science working in adult education. He himself works mainly for the Workers Educational Association (WEA), one of the main adult education suppliers, and teaches private groups for more advanced study. He has also been involved with council-sponsored workshops, National Trust branches, and the Womens' Institutes. He finds that schools often ask for assistance with astronomy and often can't get it, but pupils from 7 years of age are usually very enthusiastic and well-informed.

The WEA courses Mr Hurst teaches last 5, 7 or 10 weeks. He has had his classes working on some quite advanced research projects, such as on gamma ray bursts. He finds that class visitors, for example other amateur astronomers, are very useful in enthusing his students. He transfers his students after they have completed their courses to an astro-bulletin group to maintain continuity, and also creates Facebook groups to help them keep in touch. He has a focus on visual astronomy projects. The WEA at Cookham Dean, Hampshire, were amongst the first people in the UK to see the Comet Holmes outburst from a dark site. Mr Hurst also exploits remote telescopes such as the Bradford Robotic Telescope in his courses. He concluded that a huge number of people are interested in astronomy, most with no connections to astronomical societies.

Thanking Mr Hurst, Mr Pickard introduced Dr Nick Hewitt to present the Sky Notes.

Sky Notes for December

Dr Hewitt noted that Jupiter is currently the most prominent planet, with the SEB revival providing much interest. He showed images of this by Tomio Akutsu, Don Parker and David Arditti. Comet 103P/Hartley, now in Canis Major, was a destination for the Deep Impact/EPOXI probe. Images of a peanut-shaped nucleus have been returned, showing active regions at the ends, with the middle inactive. Hartley is the fifth comet to be visited by a probe, and the smallest. Of interest also is Comet 2010 V1 (Ikeya-

Murakami), visible in the morning in Virgo. Dr Hewitt showed images of this by Richard Miles and Martin Mobberley, both taken with remote telescopes. Another Mobberley image showed the Near Earth Object 2003 UV11 in the same field as galaxy NGC 772.

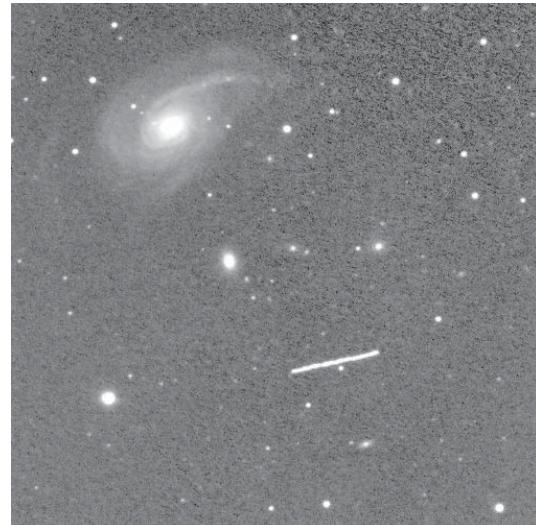
An image of the Sun by Sheri Lynn Karl showed a large filament on October 10. On November 12 there was a coronal mass ejection which passed south of the Earth. There have been no auroral reports so far. The maximum of the Geminid meteors is on December 14, with a likely ZHR of around 100, but there will be a first quarter Moon that night, hindering observations. There will be a total lunar eclipse on December 21, the partial phase beginning at 06:32. Totality begins at 07:40 but the Moon sets from London at 08:14, so it will need a very clear western horizon. Venus is a brilliant early morning object, and Saturn is also well-placed in the morning sky. Saturn, Venus and the fine crescent Moon will be nicely grouped on December 2.

Amongst variable stars, R CrB is still at minimum at mag 15. Dr Hewitt mentioned that DY Per was once thought to be R CrB-type but is now thought to represent a new class. Tom Boles discovered his 138th supernova on November 7, in UGC 4294. Allan Sandage, famous for furthering Hubble's work on the expansion of the universe, died on November 13 at the age of 84. Dr Hewitt finally pointed out two deep sky objects to look for near Jupiter, both in Cetus: NGC 246, a planetary nebula, and Messier 77, the brightest Seyfert galaxy, which contains the Cetus A radio source, thought to be a supermassive black hole.

Mr Pickard thanked Dr Hewitt, and there followed a tea break. Following this, Mr Pickard introduced the final speaker, Dr Roberto Trotta of Imperial College London.

The cosmic enigma, or, the dark side of the universe

Dr Trotta is involved with the Herschel/Planck mission, the objective of which is a full survey of the microwave sky. He began his talk with a model of the universe from 400 BC, calling it a 'good model that lasted until Galileo'. He then showed an animation that zoomed into the sky from the naked eye constellations to the Hubble deep field image. He reviewed Newtonian and Einsteinian theories of gravity, and evidence from the deflection of light by mass. Following this he reviewed models of the universe corresponding to different values of



NEO 2003 UV11 streaks across the sky near galaxy NGC 772 in a 6-minute stacked exposure. 3x120s, 20:07–20:13 UT, 2010 Oct 27. M. P. Mobberley.

the of the parameter Ω , indicating the flatness of the universe. The outcome of comparing these with observation is that 25% of the mass in the universe is believed to be in the form of 'dark matter', and 70% in the form of 'dark energy'.

Part of the evidence for dark matter comes from measurements of galactic rotation: the rotation speeds indicate there is more matter in galaxies than is observed. Furthermore, images from the Hubble Space Telescope and others show gravitational lensing, indicating the presence of much invisible mass in universe. Dr Trotta talked about the Millennium Simulation. This attempts to simulate computationally the behaviour of dark matter interacting gravitationally over the lifetime of the universe. The results show a filamentary network. We can compare this distribution with observation; by observing the large-scale 'visible' universe we can infer the dark matter 'scaffolding' distribution. There remains the possibility of studying dark matter in the laboratory – creating it in accelerators such as the Large Hadron Collider at CERN. We can add up the energy from collisions in the accelerator and see if any of it is lost through conversion to dark matter, which cannot be detected directly.

In 1998 measurements from supernova observations of the velocities of very distant galaxies indicated that the expansion of the universe is accelerating. Very distant galaxies were found to be too dim to correspond to a passively expanding big bang model. This discovery has brought into being the concept of dark energy, which may be linked to Einstein's cosmological constant. The cosmological constant, which Dr Trotta called the 'weight of nothing', is $6.4 \times 10^{-30} \text{ g/cm}^3$. This is the number derived from the cosmological observations. However, the prediction of quantum theory is totally dif-

►ferent: a factor of 10^{120} larger, in fact. A possible explanation for the discrepancy may emerge from the multiverse concept. Dr Trotta put forward the idea of the existence of 10^{500} parallel universes, a prediction which he claimed emerges from string theory. The anthropic principle may select for the possible universes that correspond to the values of the fundamental constants that we need for our existence. More on these subjects may be found through Dr Trotta's website, www.robertotrotta.com.

In questions to Dr Trotta, Sheridan Williams asked whether the cosmological constant is generally accepted as the explanation of dark energy. Dr Trotta replied no, there is not agreement on this. Nick James wondered whether, with the increasing complexity of the standard model of the universe, it might be the case that we are inventing concepts that are an equivalent of Ptolemy's epicycles, and that we need to go 'back to the drawing board'. Possibly, answered Dr Trotta: maybe we do need a new paradigm. Richard Miles asked whether the data from the Planck mission

will help. Dr Trotta hoped it would. Bernard Bligh asked about brown dwarf rotation rates on the edges of galaxies, which he claimed were not consistent with the theory being proposed. Dr Trotta said he was not an expert on that, but stated that there is a lot of other evidence for missing mass, for example, the observed baryon to photon ratio. Richard Miles said he too had his doubts on the subject of galactic rotation speeds. Tom Boles queried the relationship between the value of Ω and the pattern of the microwave background. Dr Trotta said the average distance between hot spots in the microwave background will increase as Ω increases. Mr Boles said that surely that would result in fewer spots in the visible sky. This question was not resolved at the meeting.

Thanking Dr Trotta for a fascinating discussion, Mr Pickard adjourned the meeting until 2010 December 11 at the same venue.

David Arditti

1 J. L. Codona, *Astron. Astrophys.*, **164**, 415–427 (1986). [Available through ADS]