



## From the President

Here we are with the first edition of the *Journal* in 2005. It doesn't seem a year since I prepared my notes for the 2004 February edition. I was warned when I took over the Presidency that time would fly. I was completely unprepared for just how fast it would do so. As I remember, I was complaining about the poor British weather this time last year – nothing much in that respect has changed. There have been three months of cloudy and foggy weather, too dense to observe through on many occasions and even too dense to help our fine planetary photographers to find stable seeing.

With the start of this year we are also coming to the end of an era in the BAA office. Council has placed an order for a state of the art modern computer application to replace the aging DBase III membership system that is currently in use. This system has given us valuable service for many years, but it is difficult to support and is not user friendly. It can be quite cumbersome to use, and to the uninitiated, almost impossible. The new system will streamline our operations and eliminate many possible causes of error in subscriptions that can happen due to its complexity. Installation of the new system has begun. The first stage is the translation and transfer of our membership data and information. Training will take place in March and we will have time for familiarisation before the live subscription run between June and August.

It will not of course be as easy as I have described – all new systems have teething problems. I can hope, but it is unlikely, that ours will be an exception. We will make every effort to keep the number to a minimum. There is a lot of hard work still to be done. I will keep you informed nearer the time and ask for your indulgence with any blips that might occur. The new system will fit nicely in to a new accountancy system and processing of direct debits and Gift Aid. Once up to speed, it should enable us to improve our interface with members and provide a much improved service.

On the practical side of astronomy, I am pleased to see that the Astronomical Society of the Pacific has awarded its Amateur Achievement Award to our member Nik Szymanek for his contribution to astronomy, recognising his leadership in state of the art imaging and image processing:

*'Amateur Achievement Award: Mr. Nicholas Szymanek, an amateur astronomer in the United King-*



The brass orrery presented to Sir Patrick Moore at the Christmas meeting. (Photo by Hazel McGee)



At the Christmas meeting of the BAA, held on 2004 December 18, Tom Boles (left) presented Sir Patrick Moore with a handcrafted brass orrery to commemorate the completion of his seventieth year as a member of the Association. (Photo by Martin Mobberley)

*dom, is the 2004 recipient of the ASP's Amateur Achievement Award. Given annually since 1979, the Amateur Achievement Award is designed to recognize significant contributions to astronomy or amateur astronomy by those not employed in the field of astronomy in a professional capacity. The Society's Board of Directors noted Szymanek's leadership in state-of-the-art imaging and image processing – especially his true-color, deep-sky images – and his ongoing contributions to education and public outreach.' Well done Nik.*

The end of 2004 brought a historic milestone to the Association. On 1934 November 28, a bright-eyed youth was elected a member of the

BAA by the then President and Council. There is perhaps nothing too remarkable about that, except that he was eleven and a half years old, and would rise to fame through the ranks of the BAA to become world famous as an author and television presenter. On 2004 November 28, Sir Patrick Moore celebrated the completion of his seventieth year as a member of the BAA. Sir Patrick made the effort to travel to London for our Christmas meeting on December 18. Those of you who were able to attend the meeting at Savile Row will know that I had the honour and pleasure to present Sir Patrick, on behalf of all of the members of the BAA, with a hand-crafted brass orrery made in the UK. This was considered to be a very appropriate gift for Patrick as our solar system, and in particular our Moon, is where his life-long interest lies. Sir Patrick is a past President of the Association, a role that coincidentally he held 20 years ago last year. He was also Director of the Lunar and Venus Sections for many years and served on Council for over 14 years. His high profile ▶

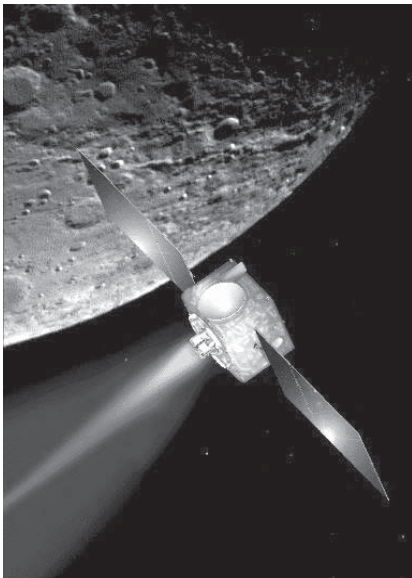


## SMART 1 – a slow probe to Luna

Remember how we thrilled to the enormous power of the Saturn 5 rocket, which launched the *Apollo* missions? The turbines that worked the fuel and oxidant pumps of the first stage (S IC) were more powerful than the turbines of the ocean liner, *Queen Mary*. The third stage (S IVB), which boosted the mission from Earth orbit to Moon orbit, weighed 116 tons and carried a further 45 tons of *Apollo* modules with a crew of three men. It was 58 feet tall and had a thrust of 203,779 pounds. More than 105 of its 116 tons was fuel.

This is very different.

An *Ariane 5* rocket launched a probe on the night of Saturday 2003 September 27, from the European Space Agency's main facility at Kourou. It was not a dedicated flight: the main payload was two commercial satel-



An artist's impression as SMART 1 fires its ion engine to enter lunar orbit. *ESA*

► in the media and as the BAA Public Relations Officer promoted the BAA and had significant effect on its membership. He is also of course, uniquely, a Life Vice-President.

Patrick's influence on astronomy has been outstanding. He has not only encouraged newcomers to the science but has also inspired many to go on to become successful professionals in the field. On behalf of all the members of the Association, its officers and Council, both past and present, I would like to congratulate Patrick on his seventy years with the BAA and to thank him for all the pleasure and help that he has given to so many when they were just starting out.

**Tom Boles**

lites, but the secondary payload was **SMART 1**, ESA's first lunar mission. It was also the first of a new breed: **Small Missions for Advanced Research and Technology**. It is small, too: just a one-metre cube, with a launch mass of 367kg of which only 82kg is fuel. This is of course far too small for a human crew.

Now look again at that launch date – 2003/09/27 – it is not a mistake. It took more than 14 months for SMART 1 to reach lunar orbit. This little probe has a tiny engine. The fuel is xenon gas and the power is solar. The thrust is 68 milli-Newtons and, if I have the conversion right, that is less than one thirteen millionth of the S IVB! But, and it is such a big 'but', SMART 1's engine is designed to work for 7,000 hours, not a few minutes. This is an ion engine, the forerunner of greater things. The ESA mission *Bepi-Colombo*, which will head for Mercury, will probably use an ion engine developed from this prototype.

SMART 1's engine is a Hall effect thruster, and fired for the first time within a few hours of the launch. Basically electric power, obtained by the solar panels, is used to ionise xenon and squirt the ions out into space. At the same time electrons are ejected to combine with and neutralise the jet. This is important: if the jet were only xenon ions, the probe would become highly negatively charged and attract its own positively charged jet, and in the end the power of the engine would not be sufficient to send out the jet and there would be no resulting propulsion.

The engine can be switched on and off whenever needed, with ground control staff running it to a finely tuned schedule. Whenever the craft was in a suitable part of its orbit and the Sun shining on it, they fired the engine. This pushed the craft along a bit faster so it would orbit a bit farther out from the Earth; SMART 1 climbed the Earth's gravitational well in a long complex spiral. In fact, the long journey to the Moon has taken about 2 months less than the original plan, so ESA are well pleased with the engine's performance. There have been 'flame-outs', when the engine broke down

temporarily, but these occurred early in the flight and performance has been near-faultless since then.

From 2004 January 30, the engine was shut down for three weeks to allow the scientific payload to be commissioned. After that it got going again indefatigably. In August, September and October, SMART 1 carried out gravity assist manoeuvres and

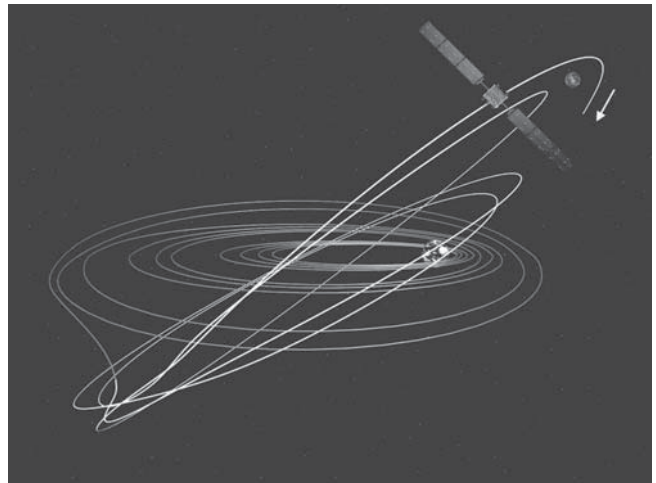


Diagram of the orbital manoeuvres used by SMART 1 to achieve its journey from the Earth to the Moon. *ESA*

used the gravity of the Moon to modify the shape and orientation of its orbit, and at long last, on November 15 after 332 orbits, it ceased to be a satellite of the Earth and became, instead, a satellite of the Moon. It had used only 59kg of its xenon fuel.

Over the next few weeks SMART 1 will reduce the period of its lunar orbit from the initial 90 hours to less than 2 hours in an ellipse of 300×3000 kilometres. After that the main science phase – the detailed mapping of the lunar surface – will begin.

One of the major instruments, D-CIXS, was built by the Rutherford Appleton Laboratory, and has not been idle during the long boost to lunar orbit. It has taken many X-ray spectra of celestial objects (e.g. Sco-X1), and soon it will be taking detailed spectra of the lunar surface to help with the geological mapping. I, for one, did not realise that we do not yet possess a detailed and comprehensive geological survey of the whole lunar surface. This work may clarify, for instance, the differences between the far and near faces of the Moon, or settle the question of whether there is any ice at the lunar poles.

During the long flight, SMART 1 has not only tested its patient and persistent engine, but also a preliminary form of OBAN – the **On-Board Autonomous Navigation** system. ESA are hoping to make future probes self-navigating by using their high-quality cameras to provide equally high-quality navigation data. This system is, at present, only being



tested on ground-based computers, but it will represent a great step forward when it achieves full operational status on another mission.

All we have to do now is wait patiently for the end of January 2005, when the geological data and detailed lunar images should start to roll in.

The SMART 1 website is well worth browsing at <http://sci.esa.int/science-e/www/area/index.cfm?fareaid=10>. Select 'Images and Videos' for diagrams of the orbits and pictures of Earth and Moon. Select 'Orbit View' and a suitable time-step, then watch how the orbit built up. The stars are real and their names or refer-

ences show if you leave the cursor on them for a step in time. If you select a one-day step, it is quite disconcerting when the probe suddenly appears to move backwards round the orbit because the orbital period now exceeds one day.

Roger O'Brien

## Solar Section

### 2004 September

On September 1 a large Hsx spot emerged around the E limb at  $-11/095^\circ$  with associated faculae. This was the return of the very active region seen on the previous rotation, in fact it could have been its third time round. A very small spot at  $-13/180^\circ$  and a pair of small spots at  $+15/176^\circ$  was also observed.

The faculae surrounding the large Hsx spot continued to develop. As the spot moved close to the CM it developed a double umbra as an Hhx spot and became a naked eye feature, crossing the CM on Sept 07/08. By Sept 10 it had developed a small satellite spot. It disappeared around the W limb on Sept 12.

On Sept 2 the single spot in the S now had a larger trailing component which under high power resolved into two parts. By the next day the lead spot had faded, however the trailing spot had developed into a small group of five components ( $-09/177^\circ$ ). By Sept 5 there were six small spots embedded in faculae. It disappeared around the W limb on Sept 6.

On Sept 15 a large spot was on the E limb at  $-12/272^\circ$ . By 18th it was a naked eye feature and covered an area of 440 millionths. The leader was the larger of the two penumbral spots while the follower spots

developed forming an arrowhead formation. By Sept 21, the number of following spots had reduced such that the total area was now 330 millionths. The group disappeared around the W limb on 24th.

The only significant northern activity started on Sept 9 when a Dai group came around the E limb at  $+05/348^\circ$ . This is thought to be the return of a group seen in July (in fact Monty Leventhal thinks this could be its third time around). As it progressed across the disk it could be seen to be enveloped in faculae and composed of several penumbral and many other spots. In all it covered an area of 280 millionths. It crossed the CM on Sept 15 by which time it was a naked eye feature. After that the group decayed to a type Hsx with 5 spots and disappeared around the E limb on Sept 21.

Naked eye spots were seen on Sept 5, 7, 8, 9, 15, 18 and 21.

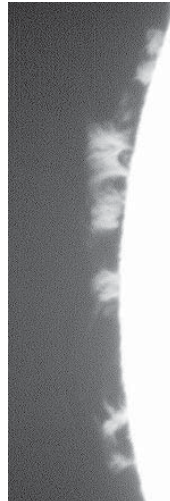
Polar faculae were recorded on Sept 2 (N), 4 (N), 6 (S), 9 (N), 15 (N), 20 (N) & 24 (N) by Alan Heath and Carl Bowron.

### H-alpha

There was a fairly marked increase of the prominence MDF in September. Throughout the month it showed great variation from a figure of 2 to as high as 26, although some were so small that it was doubtful whether they should be counted.

Activity was high on 6th with a rather short and low hedgerow type seen on the W limb extending from N07 to N12. It was still present on the following day. A hump-like prominence appeared on the SW limb, mostly detached from the chromosphere.

Sept 11 saw a more important hedgerow type on



Hedgerow prominences on E limb, Sept 15. Eric Strach. (See text)

the E limb covering it from N18 to N25°. It was still present on 12th, more extensive but somewhat fragmented from N14 to N44°, as illustrated by the CCD image. On Sept 13 only one single and small remnant of it was seen at N31 to 33°. Another more extensive but lower hedgerow type was seen on Sept 17 on the W limb from S38 to N09°.

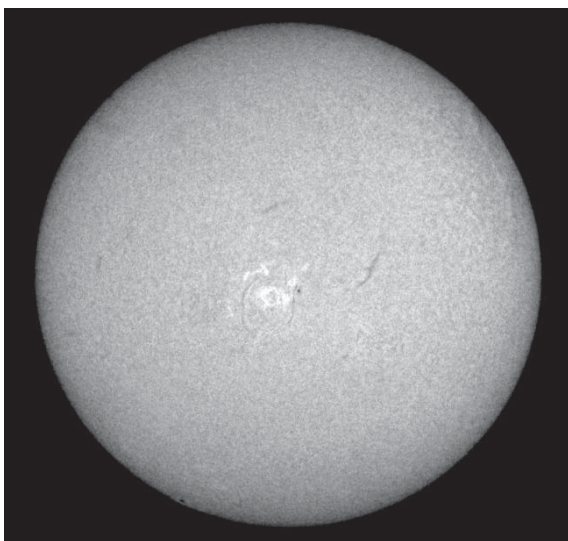
A jet type was seen on the E limb at N15° on Sept 19. It had changed to a pyramidal shape on the following day which was interactive with a low sessile prominence at S05°. Sept 26 was very active; 10 prominences counted included a large tree like

structure on NW limb, and a long, low prominence complex to E near one of the spots. Prominence MDF = 7.22 (4 observers).

Filaments were seen in close association with spot groups but several occurred independent of active areas.

A very long filament was observed on Sept 12 in the SW quadrant, starting on the equator at a point half way between the CM and the W limb and coursing in a SSE direction almost up the 40° parallel south. Its length was estimated at two-thirds of the solar radius. It was still present on 13th.

Eric Strach reports an unusual chance observation of a filamentous surge on Sept 18 at 11.10UT. He was waiting for his Daystar filter to heat up to the required temperature, a process usually taking 10–12 minutes. Looking through the eyepiece some 6 minutes before the time, he saw an unusually dark straight filament extending SE from the spot at N2/W39 for about 5°, its southern end forming a small hook. As the filter heated up further, the filament became fainter. It was hardly visible when other H $\alpha$  features came into view but at 11.20 to 11.25, only the 'hook' remained and the rest was replaced by a line of bright H (plage). A few minutes later there was no trace of it. He believes that this was a



Flare activity on 2004 Sept 15 captured by Raymond Emery.



'disappearing filament' and its unusual darkness and visibility beyond the H $\alpha$  line was due to line of sight velocity.

## 2004 October

October was a month of stark contrast as sunspot activity varied from very low at the beginning but increased to moderately high during the second half of the month. The southern hemisphere was the most active during the first half of the month, then the situation reversed during the second half, with the northern hemisphere being more active.

On Oct 1 there were two single spots on the disk, one penumbral spot at  $-08/140^\circ$  on the CM and another at  $-11/97^\circ$ , which

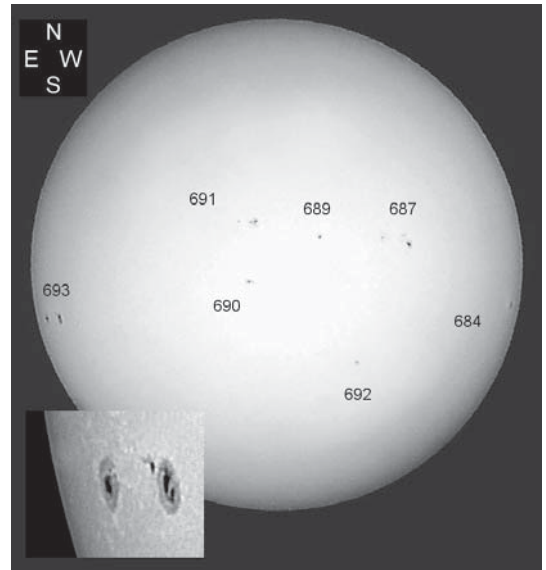
was in its third rotation, having previously been seen on Sept 1 on the E limb and also on August 7. On Oct 4 it appeared as three individual spots but by 8th it had faded and seemed to have died on the disk. The spot at  $-08/140^\circ$  by this time had developed and covered an area of 80 millionths.

On Oct 13 a spot at  $-16/272^\circ$  had rotated onto the disk and this is likely to have been its second rotation, having been seen previously on Sept 15 in a similar position. On Oct 17 a new group appeared to its west at  $-11/262^\circ$ . By Oct 18 a string of 5 groups was seen stretching from the CM towards the E limb. The largest of these was of type Dai at  $-11/276^\circ$  which had an area of 150 millionths. By Oct 21, this group had developed to a type Eac with a slightly larger area of 170 millionths.

On Oct 21, two northern groups appeared around the E limb. One of these was a compact Hax spot which became an Eac group at  $+12^\circ/176^\circ$  by 24th with an area of 270 millionths. The group crossed the CM on Oct 26 by which time it consisted of some 32 spots and was a naked eye object.

On the same day there were two active areas very near the equator, one at  $-03/229^\circ$  and the other at  $-01/139^\circ$ . The former was last seen on Oct 28 approaching the W limb. The latter seemed quite unstable in its position and at times appeared directly on the equator.

Activity peaked on Oct 27/28. The only group near the E limb was of a type Esc at  $-15/78^\circ$ . By Oct 30 this bipolar group had an area of 580 millionths which increased to 740 millionths on 31st when it was of a type Eac. Between Oct 30/31 a larger irregular penumbral spot had developed between the almost equally sized leader and follower



White light image taken on 2004 Oct 28 by Peter Paice showing the high level of activity towards the end of the month.

penumbral spots. Several other smaller penumbral and other spots were seen within the group.

## H-alpha

A rather low but intricate prominence was seen on the W limb on Oct 9, extending from  $-1$  to  $-22^\circ$ . It was still present on the following day, though much reduced in size. A similar but shorter prominence appeared on the E limb at  $43^\circ$  to  $53^\circ$  south on Oct 15. It may have been connected to a prominence at  $-35^\circ$ .

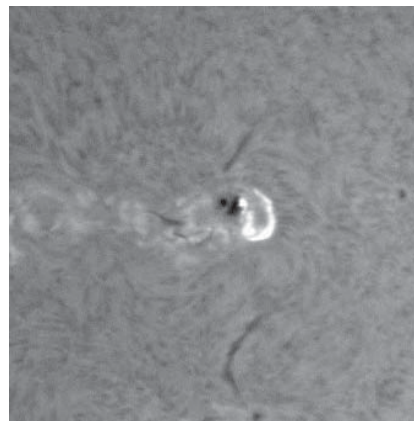
Another hedgerow type was seen on Oct 17 on the W limb from  $+01^\circ$  to  $-20^\circ$ .

Prominence MDF = 6.43 (6 observers)

On Oct 2, short filaments surrounded the two southern spot groups. A rather dark filament in the shape of an arrowhead was seen on Oct 5 in the SW quadrant, besides some 10 further filaments.

On Oct 6 a long filament extended from near the centre of the disk in a SE direction. It was still present on 7th and the length was estimated to be  $4/5$  of the solar radius. It seems to have fragmented during the next few days.

A whole series of filaments was seen on Oct 9 & 10, straddling the equator, almost aligned N-S and separated by about  $15^\circ$  in longitude. In fact although there were no spots on the disk on Oct 10, there were still some 13 filaments seen. On 14th a long filament seems to have folded on itself causing an inverted U. It was near the W limb and just south of the equator. On the next day the vertical portion was hugging the W limb. During the next two days it gave rise to small hedgerow prominences.



H $\alpha$  image taken on 2004 Oct 30 by Eric Strach showing flare activity at  $+13^\circ/19^\circ$ W.

## BAA sunspot data, 2004 September–October

Day	September		October	
	g	R	g	R
1	1	12	2	27
2	1	15	2	25
3	2	25	3	37
4	2	29	3	32
5	3	47	2	27
6	3	38	2	25
7	3	49	2	19
8	3	58	1	13
9	4	66	0	0
10	4	58	0	0
11	3	45	0	0
12	3	52	1	13
13	2	51	2	26
14	1	37	1	23
15	2	47	1	22
16	2	45	1	28
17	2	51	3	62
18	2	42	4	62
19	2	41	5	74
20	2	39	5	74
21	2	29	6	91
22	1	22	6	103
23	1	15	6	104
24	1	12	7	118
25	2	18	6	116
26	2	21	7	114
27	2	19	8	121
28	1	14	8	118
29	2	24	7	107
30	3	38	7	112
31			6	106

## North & south MDF of active areas g

	MDFNg	MDFSg
September	0.45	1.82 (28)
October	1.73	2.21 (28)

g = active areas (AAs)

MDF = mean daily frequency

R = relative sunspot number

The number of observers is given in brackets.

Mike Beales, Director



## Aurora Section

### 2004 September

The month was geomagnetically relatively quiet. Our observers noted some disturbance from Sept 5 to 8. A storm sudden commencement (SSC) on Sept 13 heralded further disturbances from Sept 13 to 18 with a magnetic storm on the night of 14/15. There was a further SSC on Sept 22 leading to stormy conditions on the night of 22/23 and disturbed conditions on 23rd.

There were the usual variations in the degree of activity measured by observers due to differences in latitude, type of instrument used, duration of observing time and whether measuring variations in the field direction D or the field strength H. However, as is normal all observers agreed when storm conditions prevailed, as was the case on Sept 13/14.

Auroral glows were observed from Ullapool on 20/21 and Trelogan on 23/24. Auroral glows and rays were noted from

Dundee on 06/07. An auroral event comprising glows, rays and some pulsating activity was observed in spite of cloudy conditions on the night of Sept 14/15 between 20.00 and 00.20 UT by seven observers between Ullapool and Morpeth. The maximum elevation was reported to be 30° in southern Scotland.

At Glen Ullin in North Dakota auroral activity comprising glows and arcs was noted on Sept 05/06 and 16/17. Glows, arcs and ray structures were recorded on 06/07, 13/14, 15/16, 17/18, 19/20 and 27/28. Those of 05/06, 19/20 and 27/28 showed some pulsating activity or moving forms.

### Campaign for Dark Skies

## The Fourth European Dark-Sky Symposium, Paris, 2004 September 24–25

The 2004 (Fourth) European Dark-Sky Symposium was ably hosted by the Association Nationale pour la Protection du Ciel Nocturne (ANPCN) and the Société Astronomique de France (SAF), with the collaboration of the International Dark-Sky Association (IDA). The delegates met in the august surroundings of the Paris Astrophysical Institute, next to the old Paris Observatory. Delegates trod the echoing spiral staircases climbed in their day by the Cassinis, Le Verrier and Arago.

About 70 delegates from dark-sky movements in ten European countries and a

contingent from the IDA came together with environmentalists, biologists, local government officers and lighting professionals, to compare notes on the international dark-skies debate, and to plan for the future. French–Canadian astrophysicist Hubert Reeves chaired the first session.

Seven members/supporters of the BAA Campaign for Dark Skies attended. Among many subjects discussed were: the impact of night-time lighting on flora and fauna (Florent Lamiot, Nord/Pas de Calais Regional Environment Manager); how an Englishman is influencing lighting policy as a local councillor in a French village (David Portsmouth); the massive environmental impact of light escaping from greenhouses in the Netherlands (Wim Schmidt); and the highly successful activities of Flemish night-sky campaigners, who have persuaded 160 Belgian towns to participate in ‘Nights of Darkness’, switching off numbers of lamps to facilitate observing. The individual Achievement Award of the IDA was presented to Joy Griffiths, CfDS Local Officer for the Plymouth area.

UK delegates told the assembly about the positive Parliamentary Select Committee report of 2003, and the new ODPM planning regulations now in the pipeline. Important steps towards better night skies are being taken in many other countries. The IDA section leaders also debated strategies and successes in a separate session.

The next European Dark-Sky Symposium will be in Belgium in 2005 April, and it has been decided that CfDS will host the 2006 event. Further details from Bob Mizon *via* the Campaign website, [www.dark-skies.org](http://www.dark-skies.org).

### 2004 October

Background geomagnetic activity was generally quiet but there was a minor magnetic storm on October 13. Disturbed conditions were recorded on 03, 04, 14, 20, 25, 30 and 31. Visual auroral observers in the UK complained about the extent of clouds obscuring the sky.

Jay Brausch at Glen Ullin reported glows and arcs on 02/03, 11/12 and 12/13 while on 01/02, 10/11 and 19/20 arcs were sometimes accompanied by occasional apparitions of rays.

An interesting event took place on October 30. Howard Miles at Pityme in Cornwall telephoned to report the presence of an aurora-like pinkish glow in the northern sky. Later he telephoned to confirm the presence of rays to an elevation of 40°. The time range was 19.00 to 20.00 UT. No other British observer reported the presence of aurora that evening. Jim Henderson near Aboyne noted absence of aurora at 23.00 UT. However the magnetometers at Pityme, Edinburgh and Aboyne were all disturbed.

Over the years Howard has reported the appearance of a number of probable aurorae seen to the north over the Bristol Channel. Some have not been confirmed by other visual observers but have coincided with some geomagnetic activity. Others have occurred when confirmed by observations further north. The evidence of Section observations in general suggests that relatively short-lived aurorae are visible from time to time at lower latitudes than most observers expect to look for them, especially in areas affected by light pollution.

Another point of interest lies in the cases where aurora has been present while magnetometers have not detected other than minor disturbances. This effect is in part related to the type of instrument in use, the latitude of its location and whether it is observing the field strength H or field direction D. This requires further investigation.



Bob Mizon congratulates CfDS local officer Joy Griffiths, who received the IDA's individual Achievement Award for 2004. Photo: Bob Griffiths.

**Bob Mizon**, *Coordinator*

**R. J. Livesey**, *Director*



## Mercury and Venus Section

## Venus at western elongation, 2004

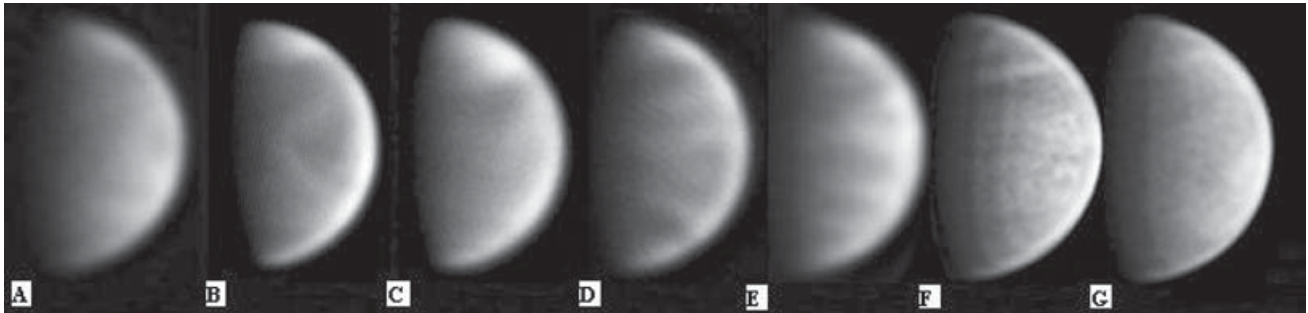
BAA observers have successfully photographed the ultraviolet markings of Venus since 1956, and from the 1990s onwards have obtained CCD images in that waveband. Recently the number of observers imaging Venus in the UV has increased, so

that daily changes in the planet's atmosphere can be followed regularly. Furthermore, a rather high level of resolution has now been attained.

Some results from the current western (morning) elongation are given below. The

Director will be glad to receive other UV images in addition to routine visual work.

**Richard McKim**, *Director*



CCD/webcam UV images of Venus in 2004 September over seven consecutive days. Note the large, bright S. polar hood in (C). The vertical streaks on (F) and (G) result from image processing. *From left to right:* (A) 15d 21h 20m, T. Akutsu (340nm filter, 32cm refl., Japan); (B) 16d 05h 24m, C. Pellier (365nm filter, 18cm refl., France); (C) 17d 05h 30m, C. Pellier; (D) 18d 20h 55m, T. Akutsu; (E) 9d 06h 07m, D. C. Peach (365nm filter, 28cm Schmidt-Cass., UK); (F) 20d 05h 25m, P. R. Lazzarotti (UV+W47 filters, 25cm refl., Italy); (G) 21d 05h 35m, P. R. Lazzarotti.

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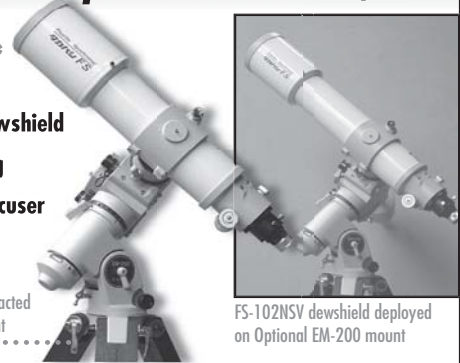
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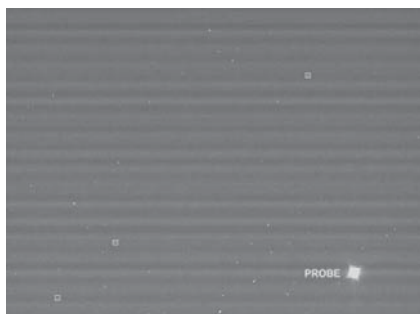
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### Huygens begins its final journey



By the time this *Journal* appears in early February, we will know if the European Space Agency's *Huygens* probe has succeeded in its bold ambition to land on Titan. Meanwhile on Dec 26, the *Cassini* narrow angle camera took this image of *Huygens* at a distance of 52km, two days after it separated from the larger spacecraft. Known stars are outlined in white boxes, and the probe is the bright object at lower right. (Other dots are artefacts of the camera).

Although only a few pixels across, the image helped navigators reconstruct the probe's trajectory since separation and pinpoint its position relative to *Cassini*, showing that at this time everything was proceeding as expected. The information was needed to help establish the required geometry between the probe and the orbiter for radio communication during the descent into Titan's atmosphere. *Image: NASA/JPL*

Hazel McGee

### Deep Sky Section

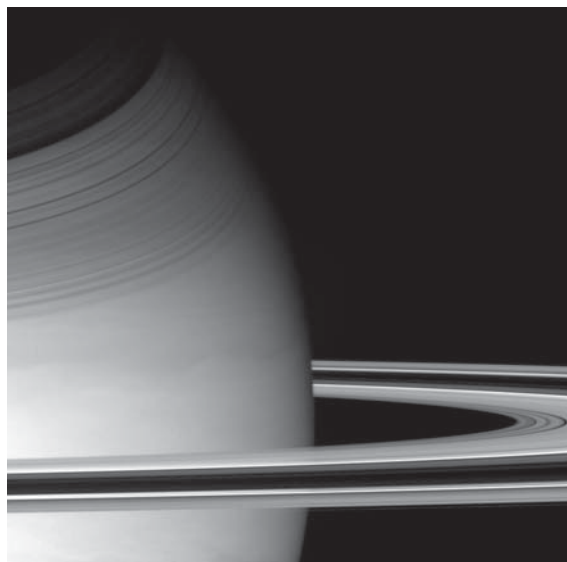
## Deep Sky Section meeting 2005

The 2005 Section meeting will take place at the Humfrey Rooms, Castilian Terrace, Northampton on Saturday March 5. It is impossible to find a venue that satisfies everyone, but Northampton has many advantages. It is easily accessible by road and rail, is reasonably central north/south, the meeting hall is good, most people know how to find it and an excellent buffet lunch is always provided.

The theme of the meeting this year is Nebulae. Speakers include Neil Bone, who after many years of meteor observing is now discovering the delights of the deep sky; George Sallit, who will be speaking on high definition imaging of planetary nebulae; Owen Brazell, who will explain what all those catalogue numbers and names mean; Maurice Gavin, who will explain and describe the spectra of nebulae

### More stunning images from Cassini

By the time you read this, the *Huygens* probe should have landed safely on Saturn's largest moon Titan and told us if the surface is solid or liquid. In the meantime, the *Cassini* orbiter's mission around the planet is well under way, and it has sent its first, enigmatic, close-up views of Titan.



*Cassini* passed through Saturn's ring plane on 2004 December 14 and captured this sidelong glance at the planet and its magnificent rings. This view looks down onto the dark side of the rings, which are lit from below. Both dense and empty regions appear dark, while regions of intermediate particle density are bright. The image was taken with the *Cassini* wide angle camera at a distance of approximately 654,000km from Saturn through an infrared filter centered at 728 nanometers. The image scale is 35km per pixel. *NASA/JPL/Space Science Institute, Colorado.*

The orbiter first flew near the giant moon on 2004 July 3, the day after orbit insertion, but at a fairly distant range of 339,000km. Subsequently, it has had a close flyby of Titan on every orbit, starting on October 26 (altitude 1174km) and then December 13 (1200km).

The images, taken in infrared to penetrate the moon's smoggy atmosphere, showed a bright surface interrupted by strange irregular dark markings, with no pattern except a general streakiness that could represent prevailing wind directions, slightly reminiscent of some features on Mars. Although the bright areas have variations in brightness, the dark areas so far appear featureless. One clue came from the visual and infrared mapping spectrometer (VIMS) on the day of arrival: spectral absorption attributed to water-ice was, surprisingly, more distinct in the dark areas than the bright. For what it is worth, my guess is that the dark areas represent the underlying solid icy surface (including water-ice which is expected to be the 'bedrock' of the planet, perhaps mixed with organic polymers), while the bright areas represent overlying deposits of a different, more volatile ice, eroded by the wind, and perhaps shifting with long-term climatic cycles.

One disappointment was that close-up images at the Oct 26 flyby revealed little more than the medium-range images at the July 3 flyby. Closer than 200,000km to the moon, images became no sharper. Apparently the thick smog limits the resolution to ~ 1 km - not enough to see if there are liquid channels. Thus the hi-res camera ('imaging subsystem' or ISS), operating in its longest waveband around 0.94 microns, showed little more than the much lower-resolution VIMS, which operates at many longer, clearer wavelengths. The third 'imaging' instrument is the radar, which produced scans of a different area, with a resolution around 0.3km; but again the patterns were enigmatic, and the surface seemed remarkably flat, with a variation in height of only about 150m over the 400km-long track. So Titan is not giving up its secrets easily; but the *Cassini* team are well placed to elucidate them with closer VIMS and radar scans at the many future flybys.

and demonstrate how to test nebula filters - so bring yours along for a free check; Adrian Catterall, who will be showing some of his superb images and describing how he obtains them; and Lee Macdonald, who will bring us back to our roots with a talk on visual observing of nebulae. *Earth and Sky* will also be in attendance to sell you the latest books.

Admission to the meeting is £5 (payable at the door) and includes free refreshments throughout the day and a leisurely buffet lunch with adequate time for socialising. The meeting will run from 11.00 to 17.30. Doors will be open at 10.00 for setting up displays. All BAA members and guests are welcome. Displays of drawings, images and instruments will also be very welcome.

Stewart Moore, Director

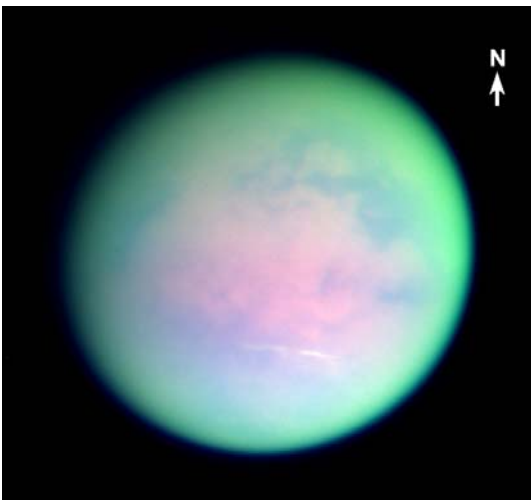


Meanwhile, during the Oct 26-28 cruise through the system, *Cassini* passed perigee just outside the orbit of Dione, and its images showed what wonderful views it will produce on each orbital passage. There were spectacular views of the dark side of the rings, and especially of the F-ring, where the shepherding moon Prometheus tugs on the ring and perturbs it into orbiting clumps. This time there were no close encounters with the moons other than Titan, but there will be plenty of those to look forward to over the next few years.

Then, a very similar trajectory on Dec 13-14 took *Cassini* past not only Titan but also Dione, revealing that the mysterious bright streaks on this moon are in fact strikingly faulted, grooved terrain. This may have been formed by tidal stresses, like a miniature version of Ganymede.

### John H. Rogers

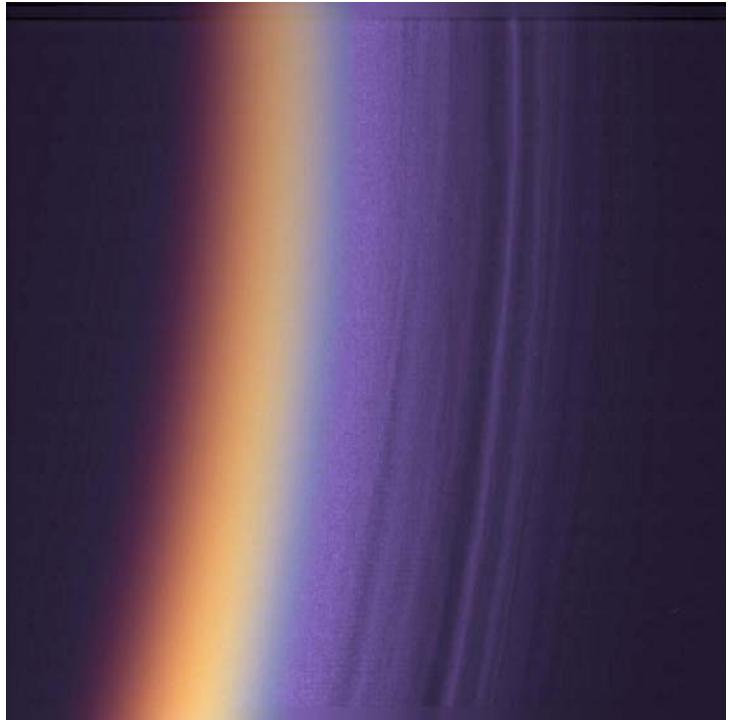
Director, Jupiter Section



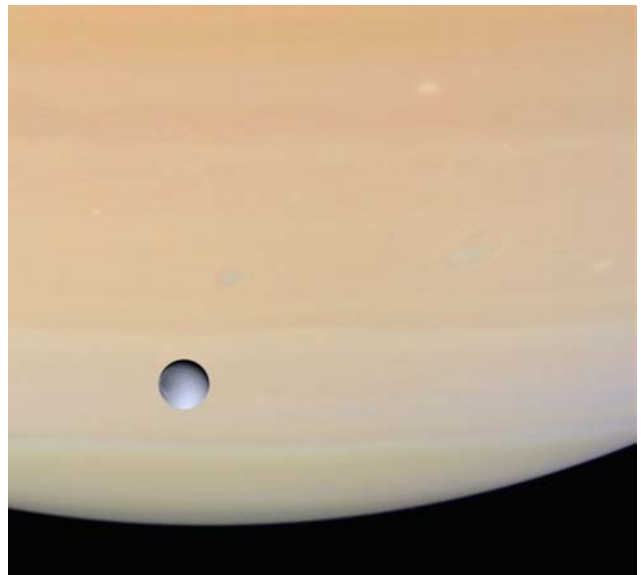
A false colour image of Titan created by John Rogers from a *Cassini* raw image taken on 2004 December 10. *NASA/JPL/Space Science Institute*



Dione imaged on 2004 December 14, showing a grooved and shattered terrain reminiscent of Ganymede. *NASA/JPL/Space Science Institute*.



*Cassini* has found Titan's upper atmosphere to consist of a surprising number of layers of haze, as shown in this colour-enhanced ultraviolet image of Titan's night side limb. The many fine haze layers extend several hundred kilometres above the surface. Although this is a night side view, with only a thin crescent receiving direct sunlight, the haze layers are bright from light scattered through the atmosphere. The image was taken with the *Cassini* narrow angle camera, with a scale of 0.7km per pixel. *NASA/JPL/Space Science Institute*.



*Cassini* captured Dione against the globe of Saturn as it approached the icy moon for its close rendezvous on 2004 Dec 14. This natural colour view shows the moon has strong variations in brightness across its surface, but a remarkable lack of colour, compared to the warm hues of Saturn's atmosphere. Several oval-shaped storms are present in the planet's atmosphere, along with ripples and waves in the cloud bands. The images used to create this view were obtained with the *Cassini* wide-angle camera at a distance of approximately 603,000km from Dione through an ultraviolet filter centered at 338nm. The image scale is about 32km per pixel. *NASA/JPL/Space Science Institute*.