Notes and News

From the President

New ideas needed for the Exhibition Meeting

Council is currently reviewing the format of our annual Exhibition Meeting. Two years ago we decided to hold the 2009 and 2010 meetings in the excellent and historically appropriate setting of the Old Royal Naval College in Greenwich to see if this would attract a larger attendance from our membership. This proved to be a good venue in terms of facilities and space available, and we were extremely fortunate on both occasions that the Sun shone, providing good opportunities for solar observing for both members and the general public. However attendance did not rise above that of previous years, which leaves us with the clear impression that, if we are to continue holding an Exhibition Meeting, its format needs to change significantly.

Council has therefore decided that we will not hold an Exhibition Meeting in 2011 and in the meantime we will consult members to find out what sort of meeting you would find interesting and be willing to attend in larger numbers in the future. Further details of this consultation will appear in future *Journals* and on the Association's website.

BAA weekend meeting at Sidmouth

I am writing this after returning from our well-attended and very successful weekend meeting in Sidmouth hosted jointly by the East Devon District Council, Sidmouth Town Council and the Norman Lockyer Observatory Society (NLOS). We were treated to an interesting programme of talks on the history of the observatory and its founder, the current state and future potential of amateur spectroscopy, and professional research on star formation and infrared astronomy. Thanks are due in particular to our Meetings Secretary, Hazel Collett, for organising the meeting and to David Strange, Chairman of the NLOS, for allowing us to use the observatory's historic telescopes on Saturday evening and for providing a planetarium show for BAA members on Sunday morning.

Your contributions to the Journal

Our *Journal* is both interesting and attractive thanks to our contributors and to Hazel McGee, our hard-working editor. To maintain this high standard we need a continual supply of good material. This need not necessarily be submitted as refereed papers, although these are of course always welcome, but can be in the form of short papers, for which we have a fast-track approval process, observing notes, or articles on any topic which you feel will be of general interest to our readers. So please take a few moments to consider if there is anything you could write about that would be of interest to other members. If you would like advice or have any questions about a possible article, please contact Nick James, our Papers Secretary, whose details you can find in the back of every *Journal*.

Two new publications from the BAA

We have published two excellent new aids to observing recently. The *Observing Guide to the Sun* produced by Solar Section Director Lyn Smith is recommended reading for anyone who likes to observe our nearest star. With activity on the Sun set to rise over the coming years towards the next solar maximum, now is the time to tune up your observing skills so you can send in reports of solar activity to the Solar Section.

BAA Council member Tony Morris has just completed a new *Introduction to DSLR Astrophotography*, which should be available by the time you read this. This is a must for anyone who has or is thinking of buying a digital SLR camera and would like to use it for astrophotography. Many of you will have seen the excellent images produced using these cameras in the pages of the *Journal* and wondered how you can also achieve them. Here is the place to find out. And remember that DSLR cameras can also be used for following the changing brightness of variable stars. Des Loughney wrote an excellent article on just this topic in the 2010 June *Journal*. So now

Jupiter Section

New fireball impacts seen on Jupiter

On 2010 June 3, Anthony Wesley in Australia discovered another impact on Jupiter. This time he observed the bright fireball live on screen while recording a webcam video, and Chris Go in the Philippines also captured it on his video simultaneously. This was the first fireball ever recorded on another planet by Earth-based observers. Wesley's video was in red light and the fireball lasted 2.6 secs. Go's video was in blue light and the fireball lasted 0.8 secs.

The fireball occurred at 20:31.5 UTC, towards the evening limb of the planet. Within hours, observers were alerted by e-mail, and western European observers (including British visual observers) watched in the dawn as the impact site rotated round onto the visible side of the planet again. However, there was no dark spot. The absence of any trace was confirmed by Tomio Akutsu with higher resolution on June 5, and by the Hubble Space Telescope on June 7.

The absence of a 'scar' should not be surprising. Evidently this was a 'small' impact, similar to the smallest fragments of Comet Shoemaker–Levy 9 in 1994. The direct imaging of the SL9 impacts by the *Galileo* spacecraft[1] showed a bright flash a few seconds long like this one even for a small fragment which produced virtually no scar (fragment N). A small impactor can explode high in the atmosphere, where it is not dense enough to produce the carbonaceous black 'smoke' that marks larger impact sites.

So, impacts like this could be frequent, but never before recorded, and still consistent with the rarity of larger impacts that leave obvious traces. Such fireballs may be frequent enough that systematic monitoring of amateur videos could detect more of them and measure their frequency.

A similar bright fireball on Jupiter was in fact imaged on 2010 August 20 by Masayuki Tachikawa and independently by two other Japanese observers. Again it left no mark. Amateur webcam imaging can now begin to measure the frequency of these 'small' impacts.

John H. Rogers, *Director*

1 Chapman *et al.*, *Geophys.Res.Lett.*, **22**(12), 1561 (1995)

you can do useful science with the same camera you use for your holiday photos.

New Handbook editor needed

After editing the BAA *Handbook* for the last six years and moving it over to an entirely digital-based method of production, Val White has decided to step down as Editor after completing the 2011 *Handbook*. We are therefore urgently looking for someone with editorial skills who is also comfortable with astronomical computation and willing to take on this important role for the Association. If you are interested, please contact Sheridan Williams, Computing Section Director, who will be happy to give you more information.

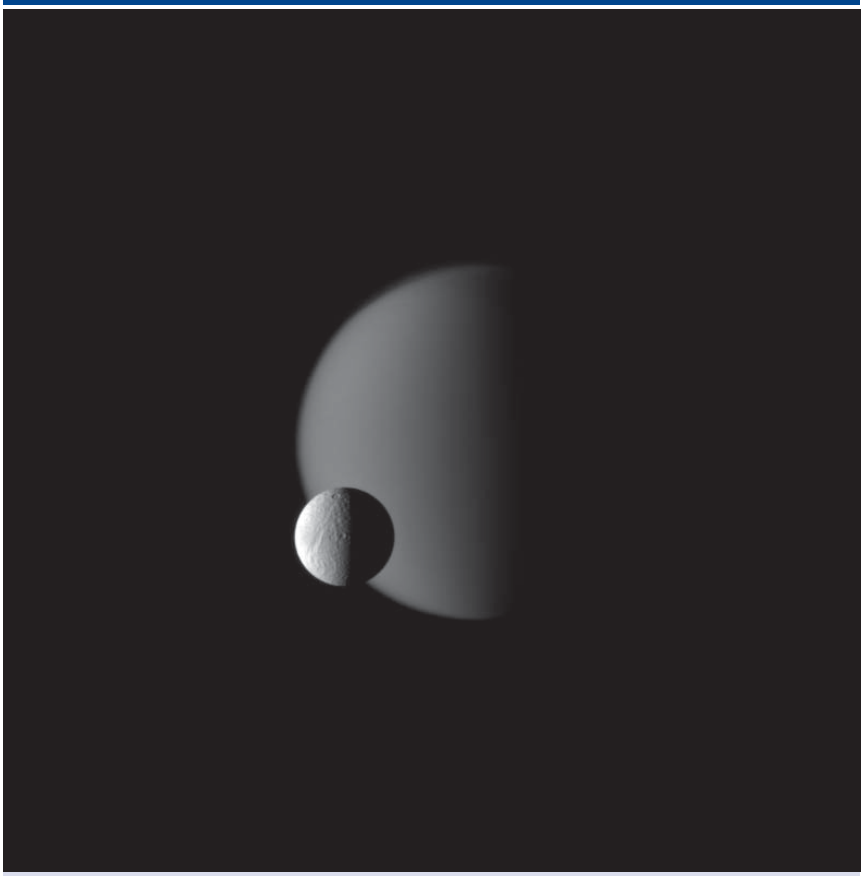
BAA annual accounts

In this issue of the *Journal* you will find the annual Report of the Council and our accounts for the year 2009–2010. It has been a difficult year financially but thanks to some generous bequests and donations including $10,000 from the estate of the late Professor Roy Garstang, and further receipts from the sale of unwanted library items, we have managed to return a reasonable surplus on the year. Without these additional sources of income, however, we would barely have broken even. Thanks are due to our new Treasurer, Alan Lorrain, for keeping our finances in good order and also for agreeing to take over responsibility for advising us on our financial investments. And finally a reminder, if you are a UK taxpayer and haven't already filled in a Gift Aid declaration, please think about doing so as it helps the Association considerably. The office can provide a suitable form on request.

Another interesting website

A new perspective on the Milky Way can be found at the ESO website **http://www.gigagalaxyzoom.org/**. This lets you zoom in from a naked eye view of the night sky through images at the scale you see in amateur telescopes to the detail visible in the largest professional instruments. It's good fun.

Tethys and Titan from *Cassini*



Saturn's satellite Tethys, diameter 1,062km, hangs in front of the hazy atmosphere of larger Titan, diameter 5,150km, in this beautiful image taken on 2009 October 17 by the narrow-angle camera on board NASA's *Cassini* spacecraft. *NASA/JPL/Space Science Institute.*

Autumn observing

The weather this summer has been disappointing for many of us but hopefully by the time you read this, we will be into better autumn weather with some cool, clear nights. Longer nights mean more opportunity to observe without compromising sleep too much. Clear skies!

David Boyd, *President*

Meteor Section

This autumn's meteor activity

During the coming autumn observing season, moonlight will unfortunately interfere with the maxima of the Orionids and Leonids, with Full Moon occurring on October 23 and November 21, respectively. However, near the times of New Moon, when major shower activity is not expected, the ever-present background sporadic meteor population can provide sufficient rates to reward patient watchers in early October and November.

The Orionids are active from October 16–31. One of two annual showers associated with Comet 1P/Halley (the other being the Eta Aquarids of early May), the Orionids are a moderately active shower, usually producing observed rates in excess of 10 meteors/hr near maximum. Thanks to the 'filamentary' nature of the debris stream laid down by the parent comet, activity can vary markedly from one year to another: good rates can be experienced if Earth encounters a rich meteoroid filament (as in 2006), but at other times activity can be disappointing. Several sub-peaks are usually seen between October 20–22, and intervals of slightly increased activity can be found even as late as October 27–28.

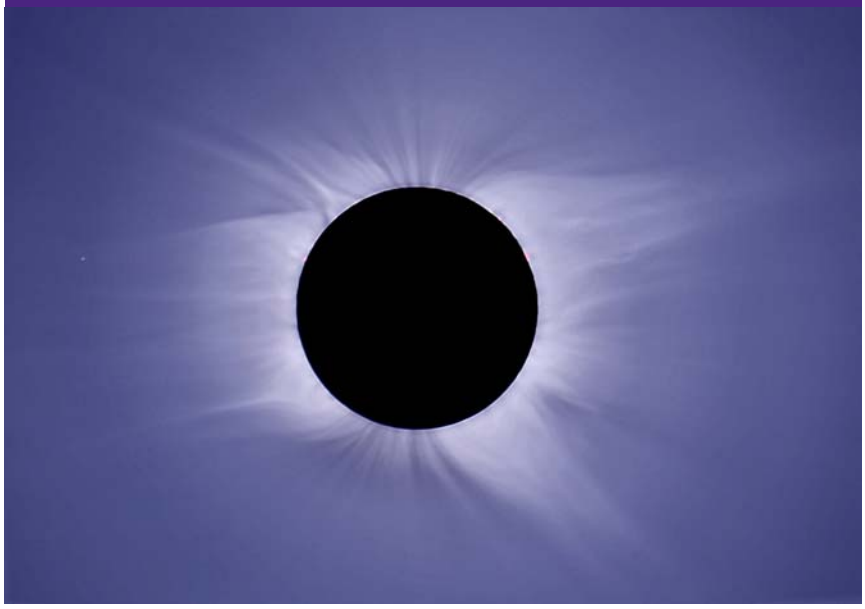
Like 1P/Halley, stream meteoroids have a retrograde orbit around the Sun, meaning that they enter the upper atmosphere at a high velocity of around 66 km/sec. Orionid meteors are therefore very swift, and the brighter ones, particularly, often leave behind brief persistent ionisation trains. Orionid meteors emanate from a region of sky midway between Betelgeuse (Orion's eastern 'shoulder') and the second-magnitude star Gamma Geminorum, and best rates are generally found in the early morning hours once the radiant has gained a respectable altitude. Unfortunately the Full Moon on October 23 will seriously hamper observations of the shower near maximum this year.

Observers carrying out watches for the Orionids may catch some slow meteors from the Taurid shower, produced by debris from Comet 2P/Encke. The shower is active for several weeks, from Oct 20 to Nov 30 (a

Continued on page 272

In the August *Journal*, Nick James, John Mason and Hazel McGee reported on the great Pacific solar eclipse of 2010 July 11 from the Tuamotu Islands in French Polynesia. Dr Francisco Diego from University College, London now sends us his own report and images from 3,300km further east on Easter Island.

Rapa Nui 2010: A magical solar eclipse



Total solar eclipses are arguably the most spectacular displays in Nature, specially when they occur over exotic landscapes. Having been lucky enough to witness these displays for over 40 years all over the world, I have now the privilege and pleasure of sharing my experience as a guest lecturer for Explore Worldwide, a large adventure tour company with recent interest in astronomy-related trips. We have done meteor showers, the transit of Venus and of course, solar eclipses.

Figure 2. The author adjusting the 450D camera on the polar heliostat. The tripod on the left has the 600mm mirror lens. Next to the heliostat is the equatorial mount with the Megrez 72mm refractor. The tripod in the background has the 500D camera pointing at the landscape (picture by Martine Langridge).

Rapa Nui

On 2010 July 11, the shadow of the Moon crossed the south Pacific Ocean, covering only a handful of islands, including Rapa Nui (Easter Island), chosen as our final destination for its amazing landscapes dominated by volcanos and the enigmatic moai statues. Totality would last over 4.5 minutes with the Sun around 40° high.

Islands are usually affected by local weather and this had a dramatic effect in our final choice of location. A massive weather front invaded the area around 30 hours before the eclipse, with non-stop torrential rain and a strong northerly wind. We visited the meteorological office at Mataveri airport on several occasions to examine the fresh satellite pictures. In the end the front broke only a few hours before first contact, leaving the island soaking wet, ready to form convective clouds as soon as the Sun came up. As the wind changed to southwest, we decided at the last minute to go to the south west tip of the island, crowned by the old Rano Kau crater. Facing the wind from the ocean would leave any convective clouds over the island, away from our location. This proved to be the right decision.

Four Explore groups converged on the island the (rainy!) night before the eclipse. Two had a guest astronomer, Andrew Green and myself. The combined group was very diverse: many first timers, some frustrated ones from previous cloudy eclipses and a few veterans looking for more. Explore had already provided everybody with safe solar viewers and distributed my traditional detailed description of what to look for, specially during the critical last few minutes before and during totality. This allows even the novice to enjoy the experience and appreciate the fast sequence of events in silent contemplation, only broken by inevitable exclamations of wonder. With only about an hour to first contact, the 80-strong group left the campsite to face the muddy steep road to the Rano Kau summit.

Equipment description

Four adjacent stations were used (Figure 2):

a) A simple tripod with a Canon 500D camera with an 8mm Falcon fish eye lens (150° field) to record on High Definition (HD) video the changes in illumination over the amazing landscape and sky. This camera started recording 10 minutes before totality, then was left unattended.

b) A tracking equatorial mount with a Canon 500D camera attached to a Megrez 72mm apochromatic refractor with a ×2 converter for a total focal length around 900mm. The camera was adjusted to record in HD video both diamond rings at a fixed exposure. A triangular aperture cut in cardboard was placed in front to produce diffraction spikes around Baily's beads, while keeping clear images of the chromosphere and prominences (Figure 5). The camera was started two minutes before totality, then left unattended, apart from occasional pointing adjustments due to (hasty!) inaccurate polar alignment.

c) and d) Canon 450D stills camera to be shared during totality by a 600mm f/8 mirror lens on a tripod (for a wide range of exposures of the corona) and an

Figure 1 *(top of page).* Composite image of the corona see text). Notice the magnetic poles and symmetric structure characteristic of periods of minimum solar activity. The star on the left is delta Gem of magnitude 3.5. South is at the top, west on the left, as seen in the sky. (Except where noted, all images by Francisco Diego).

80mm f/11 refractor on a simple polar heliostat (for high definition images of the chromosphere, prominences and diamond rings). The camera shutter was set to click twice, one to lift the mirror and the other to trigger the shutter, thus minimising mirror-induced vibrations. Mounted on the polar heliostat, the screen of this camera was well placed for everybody to appreciate the images of the partial phases.

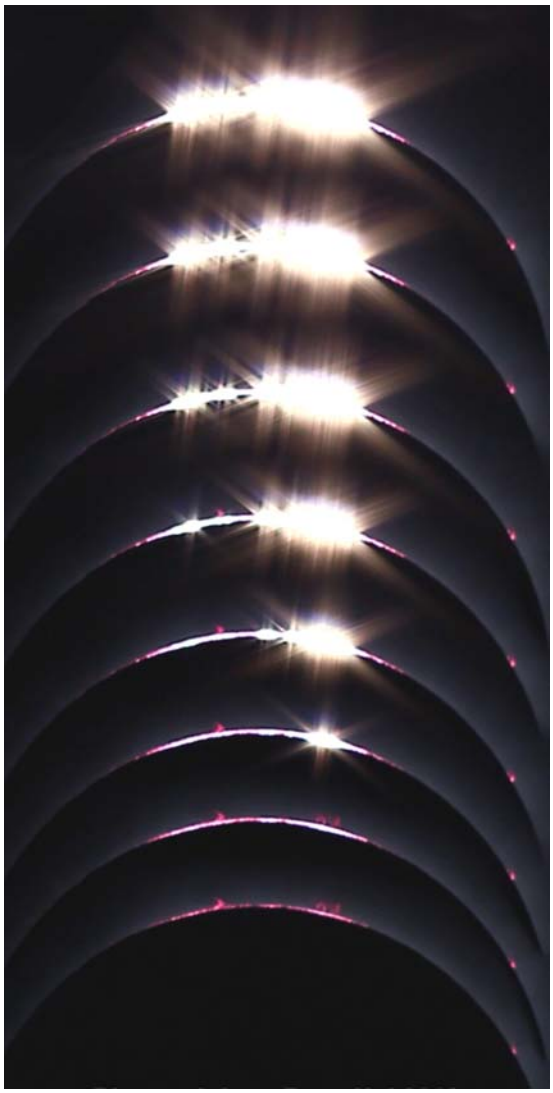


Figure 3. Selected frames from the HD video of the first diamond ring, which showed amazing Baily's beads and prominences. *(©Francisco Diego, 2010)*

As my personal guide, I have always prepared an MP3 voice recording with specific instructions, all timed from 10 minutes before the beginning of totality. Listening through headphones, I get advance warnings of the beginning and end of totality (which I transmit in a loud voice to people around me) and what to do in between, including around two free minutes to appreciate the spectacle at leisure.

Imaging the solar corona

The solar corona has a range of luminosities of several thousands, which makes it impossible to record photographically without special techniques. The one I use involves a wide sequence of exposures from 2 to 1/500 sec at ISO100, to ensure the entire corona is properly exposed from the solar limb out to a couple of degrees, within the field of the 600mm lens. The resulting 11 images were imported in *Photoshop* and registered carefully on top of each other. All overexposed areas were erased with a soft tool and the remaining concentric areas merged in a single image.

Figure 4. Prominences on the east limb at the beginning of totality taken by the 450D camera on the polar heliostat.

Figure 5. Megrez apochromatic refractor with 500D camera used for the HD video of the diamond rings.

The contrast of fine details was enhanced by creating a blurred copy (soft mask) to be digitally subtracted from the original (Figure 1). Skilful and subtle contrast manipulation is required to achieve the desired result. A more detailed description may be published in the *Journal* in the near future – the soft mask technique also produces remarkable results on nebulae and similar targets.

Conclusion

An unforgettable experience framed by a superb location and a dramatic preamble of threatening weather: our group of enthusiasts enjoyed from a magical location, one of the most spectacular eclipses in memory. The still images and HD videos were distributed to all participants and are also invaluable for public outreach and educational lectures. They are available from: **www.ucl.ac.uk/themindoftheuniverse/eclipse2010**

The author acknowledges the initiative and support from Explore Worldwide in promoting these educational tours (we also visited the Very Large Telescope and the Atacama desert, with its majestic views of the Milky Way). The success of this expedition would not have been possible without the valuable local contributions from the Kallpa agents, the Mataveri airport meteorological office and the Mihinoa campsite.

Dr Francisco Diego, *Dept of Physics and Astronomy, University College, London. [fd@star.ucl.ac.uk]*

Jupiter Section

Jupiter in 2009–2010: an interim report

In the past year, the appearance of Jupiter has changed dramatically, with the broadening of the North Equatorial Belt (NEB), and the virtual disappearance of the South Equatorial Belt (SEB). We have posted detailed reports on various phenomena on the Jupiter Section website, and this note summarises the more important ones.

2009 apparition

Our analysis of the 2009 apparition, including a preliminary survey of the JUPOS data, gives new insights into the major climatic cycles under way in three regions of the planet. These have been better observed in 2009 than at any previous occurrence.

The North Temperate Disturbance (NTD)

This uncommon phenomenon is a dark sector of the NTZ. It has developed as a late sequel to the vigorous revival of the NTB in 2007, and previous examples in 1972–'75 and 1988–'92 may have developed in similar circumstances after similar NTB outbreaks.

The NTBn had been remarkably sinuous ever since 2007. In 2009, some of the projections and streaks on the NTBn edge spread dark disturbance right across the NTZ, creating a new NTD. The observations have been analysed in detail by Gianluigi Adamoli and JHR, revealing the dynamical nature of the NTD for the first time (Figure 2).

We infer that the NTD is created by confines the *f.* end and generates dark vortices and streaks in the NTZ. Thus, initially local disturbances combine to form a persistent largescale structure.

junction of two phenomena: convective 'rifting' in the NTB, which defines its *p.* end and leads to disturbances on the retrograding NTBn jetstream; and recirculation from this jetstream at a NTBn projection, which de-

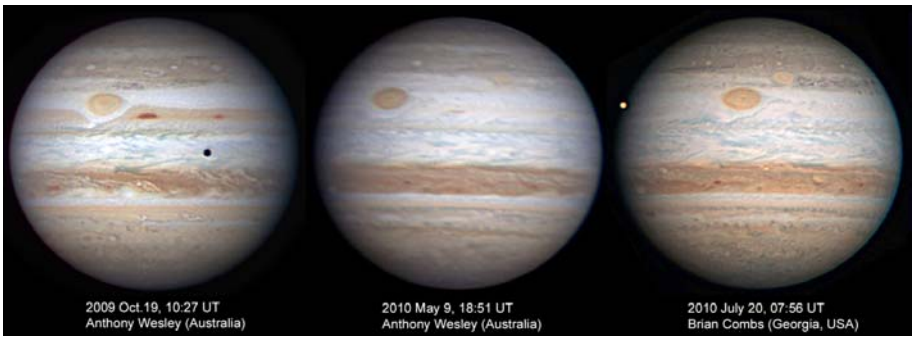


Figure 3. Images showing the GRS since our previous report (*Journal*, vol. 119, p.308). They show the continuing fading of the SEB, with the GRS standing out as an orange oval. *F.* it, very dark 'barges' developed and then faded. Just N of the GRS, a brilliant white spot is present in October and July, emitting parallel white and blue streaks *p.* it and thus creating the familiar 'blue triangle' that is a common feature of the faded SEB. Meanwhile the NEB broadening process reaches completion.

The NEB broadening event

This phenomenon, which currently occurs every 3 to 5 years, is defined by broadening of the NEB to the north. In 2009 it began on May 31 when a turbulent 'rift', interacting with a cyclonic 'barge', ejected a very dark vortex north into the NTropZ. Two more such vortices followed at the same site (NEBO-1 in Figure 1), and then two more at a second site (NEBO-2) . By the end of the year, the broadening event was proceeding all round the planet, partly by small dark spots or streaks extending into the NTropZ, and partly by general yellow-brown shading developing around them (Figure 3).

Concurrent events affected the whole width of the NEB. In mid-NEB, there was longitudinal expansion of a very active 'rift' system (from 2009 April onwards). On the NEBs, major dark 'projections' reappeared after a year's absence, and had an unusually slow drift rate (from early July onwards). The coincidence of all these phenomena suggested that they were all components of a single grand process. Indeed extensive rifts directly induced the NEBn outbreaks, and probably the appearance of the NEBs projections as well. A partial survey of previous NEB expansion events suggests that similar processes occurred, thus revealing a pattern of disturbance that involves the entire belt.

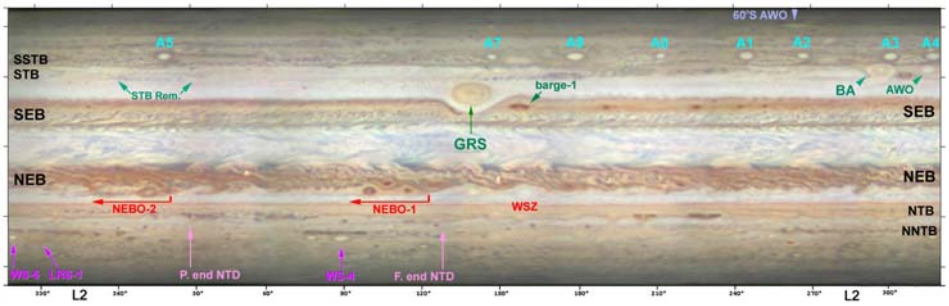


Figure 1. Map of the planet on 2009 September 5–6: Images and map by Damian Peach in Barbados. Major atmospheric features are labelled.

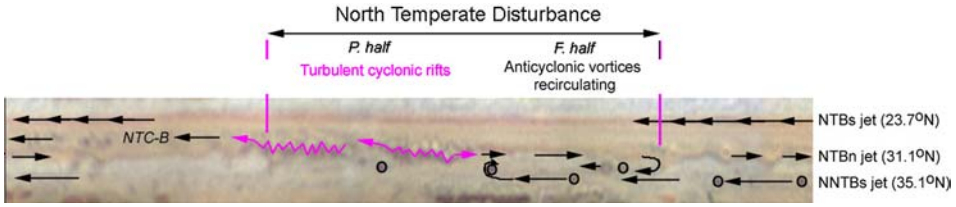


Figure 2. Model for the dynamics of the NTD. (The base map is from 2009 Sep 10–11 by Damian Peach.)

The SEB fading

This year's events reveal or confirm several consistent features of the fading phase of the SEB cycle, including positive phenomena in a phase which is otherwise characterised by absence of visible disturbance. First, cessation of turbulent rift activity in the SEB – which ceased suddenly at the start of June – was almost immediately followed by the onset of fading, confirming the connection that had been noted in 1988–'89 and in 2007. Visible fading of the SEB began in 2009 August, and was proceeding rapidly by October.

Meanwhile, five 'barges' (cyclonic dark ovals) formed in the SEB from mid-June onwards at progressively higher longitudes. This rapid process may represent a reconfiguration of the the retrograding SEBs jet. When the rifted region *f.* the GRS was active, the jet would have carried turbulence and perhaps vortices.

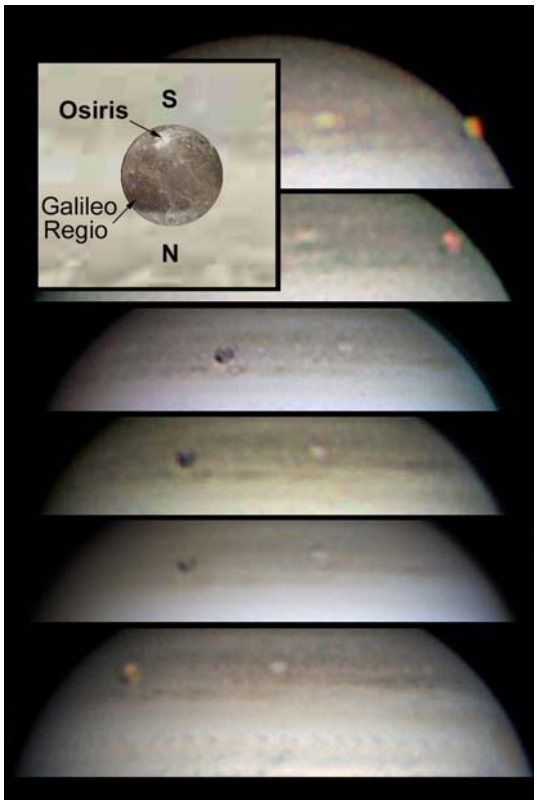


Figure 4. Ganymede passes in front of Jupiter, 2010 July 23. Features resolved on the satellite include the ray crater Osiris and the dark area Galileo Regio. (Inset: Synthetic view using spacecraft imagery, from the *WinJUPOS* program.) *From the top:* 00:59 UT, John Sussenbach, Netherlands; 01:06 UT, Sussenbach; 02:43 UT, Daniele Gasparri, Italy; 02:57 UT, Ian Sharp, UK; 02:59 UT, Antonello Medugno, Italy; 03:18 UT, Damian Peach, UK.

After the switchoff of activity, the jet probably became smooth-flowing but meandering, giving rise to the barges as eddies on its N side.

The GRS soon became a well-defined isolated orange oval, as usual (Figure 3). Immediately N of it, in October, a bright white spot and blue streak appeared. The bright spot was a methane-bright plume, which apparently acted like a miniature SEB outbreak, and was the source of the blue streak or triangle which has often been seen when the SEB is faint.

2010 apparition

The SEB fading continued

In 2010, the SEB fading has continued until the belt is virtually invisible (Figure 3) – the most complete disappearance since 1990. The SEB(N) was the last component to fade, and as it did so it consistently appeared greenish, a rare colour on Jupiter. The barges have faded away too, but a small blue-grey patch appeared on the N*p*. edge of each one (probably regions where the winds deflected around the barges cleared the clouds). The GRS is dark and strongly orange (Figure 3). The SEB Revival will no doubt consist of spectacular outbreaks of dark and bright spots, as usual, and it could start any time in the next year or two.

The S.Temperate domain

There are always two to four large-scale complexes in the S.Temperate region, each consisting of one or more long-lived anticyclonic or cyclonic circulations. In 2009 there were three such complexes. One contained the great oval BA plus a smaller anticyclonic white oval (AWO); another was the 'STB Remnant', a pale blue cyclonic circulation; and the third was a new dark segment of STB, which passed the GRS in late 2009 (Figures 1&3).

In 2010, the STB Remnant caught up with the AWO *f*. BA, and so these three circulations all collided on June 17. The arrival of the STB Remnant apparently impelled the AWO into contact with oval BA, leading to the rapid merger of the two anticyclonic circulations. Meanwhile, on the same date, a brilliant, methane-bright white plume erupted within the STB Remnant, initiating a never-before-observed outbreak in the cyclonic circulation, including intense convection at the source and rapid motion on the retrograding STBs jet.

These events seem to be miniature versions of phenomena observed in the S. Tropical domain. The merger may have been similar to the merger of the GRS and Little Red Spot in 2008, while the eruption in the STB Remnant was like a miniature version of a SEB Revival outbreak. During July, the STB Remnant established itself as a STB segment *f*. oval BA, but was still very turbulent, and emitted new dark spots on the STBn jetstream.

John H. Rogers, *Director*

Deep Sky Section

More supernova discoveries for Tom Boles

On 2010 July 11.005UT, Tom Boles discovered a supernova of mag 16.5 in UGC 9947, a mag 14.9 galaxy in Boötes. The supernova, which has been determined as a Type 1a, lies at position RA 15h 38m 39.79s and Dec +41° 00' 19.9" (2000.0) which puts it 8.0" west and 1.8" north of the galaxy centre. It has been designated 2010gb. Details were announced on CBET 2365 and TA Electronic Circular E2658, from which some of this information is taken. (Note that on the CBET announcement the month is given incorrectly as June instead of July.)

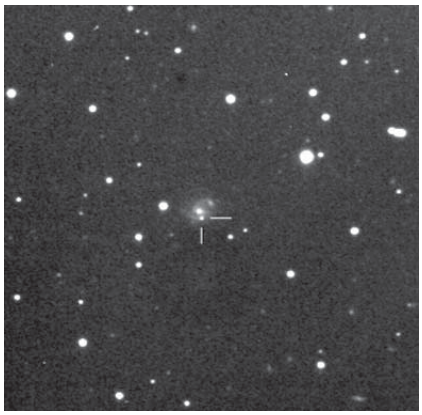
Eight days later, on July 19.015UT, Tom had further success when he discovered supernova 2010gm at mag 17.9 in MCG +07-36-25, a mag 15.2 galaxy in Hercules. At position RA 17h 33m 20.87s and Dec +44° 6' 16.4" the supernova lies 2" west and 5.8" south of the galaxy centre. Details were announced on CBET 2383 and TA Electronic Circular E2660. At the time of writing the supernova type has not been determined.

As this *Journal* went to press, no fewer than four more discoveries by Tom were announced, bringing his total to a remarkable 136. A further discovery by Ron Arbour was also reported. Details of all of these will be given in the December *Journal*.

All Tom's discoveries were made using one of his 35cm Schmidt–Cassegrain patrol telescopes from his observatory in Coddenham, Suffolk. Images for the July discoveries are shown below.

Stewart L. Moore, *Director*

SN 2010gb in UGC 9947, discovered on 2010 July 11. ***Tom Boles.***



SN 2010gm in MCG +07-36-25, on 2010 July 19. ***Tom Boles.***

Asteroids and Remote Planets Section

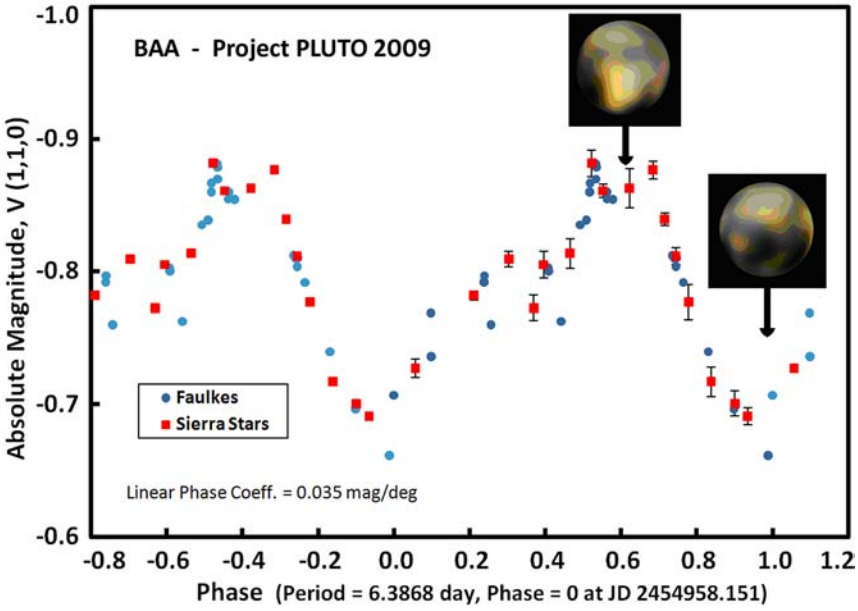
Project PLUTO 2009

Whether considered a planet, a dwarf planet or an asteroid, Pluto is an important member of the Solar System and deserves much attention from observers. One reason for its importance is that it is the prime example of a Trans-Neptunian Object or TNO. Indeed, by 'Pluto', we really mean the 'Pluto–Charon' system, an orbital pair with both bodies gravitationally locked into a 6.39-day rotation period, Charon being about half the diameter of Pluto itself and orbiting in close proximity such that their combined light is all we generally see. We now know that other TNOs also comprise binary or multiple systems orbiting their common centre of gravity and so Pluto is very much the principal member of this group of objects, comprising the Edgeworth–Kuiper Belt.

Our understanding of the Pluto system has grown significantly in recent years, mainly through observations made with the Hubble Space Telescope, stellar occultation work, and near-IR spectroscopy. In 2008, Jean Lecacheux pointed out that few photometric studies have been reported recently: the last being from HST observations in 2002–2003. Pluto clearly shows seasonal variations owing to its relatively eccentric orbit and its unusual axial tilt of 120°. We know that significant changes have taken place since it passed through perihelion in 1989, involving albedo changes and an increase in the pressure of its extremely tenuous atmosphere. An observing campaign was therefore launched by the Section in early 2009 to measure the brightness of Pluto and in particular its V magnitude.

The aim of the project was to image Pluto over several months so that a rotational lightcurve could be constructed. It is not possible to follow its rotation during a single night owing to its very slow spin rate. Instead, absolute photometry is required so that the true V magnitude can be measured. Knowing the distance of Pluto from the Sun and Earth, it is possible to combine all of the measurements by calculating what its brightness would be if it were exactly 1 AU from the Sun and 1 AU from the Earth. The result is an absolute V magnitude of about –0.7 to –0.8. Three observers contributed observations; Roger Dymock using the Sierra Stars Observatory 0.61m Cassegrain robotic telescope; Gustavo Muler at Nazaret Observatory, Lanzarote using his 0.30m telescope; and the Director using the 2.0m Faulkes Telescope North in Hawaii and the 2.0m Faulkes Telescope South in Australia.

The amplitude of the derived lightcurveshown here is 0.20±0.02 mag,



Preliminary composite lightcurve of Pluto in 2009 showing the 6.39-day rotational variability. Computer-generated images taken from 2002/2003 HST data depict the general appearance of Pluto corresponding to the maximum and minimum brightness points in the lightcurve.[2]

which is significantly lower than that of 0.26±0.01 mag reported by Buratti *et al.*[1] from observations in 1999 confirming the seasonal variations reported elsewhere. These authors predicted that, given its high axial tilt, changes in the geometric aspect of Pluto dominate the observed changes in the amplitude of the rotational lightcurve. Our results largely confirm their prediction. The Faulkes observations also included images taken in both B and Rc filters from which it was possible to determine the variability in colour arising from rotation of Pluto. Here it appears that the B–Rc colour index varies by only 0.03±0.02 mag. This result seems to suggest that the amount of colour variation arising from rotation may have decreased slightly in the last twenty years or so. The preliminary calibration gives an absolute V magnitude, V(1,1,0) of –0.79, however this is a tentative result based on one calibration method only and still needs to be checked relative to observations made by Gustavo Muler at Nazaret Observatory and by observations of selected comparison stars using absolute photometry. If accurate then it appears that the mean albedo has also brightened over the last 20 years.

More analysis is required before a full project report can be issued. The Director has been in communication with Marc W. Buie, a collaborator on NASA's *New Horizons* space probe, which is now roughly halfway on its journey towards an encounter with Pluto–Charon in 2015 July. Dr Buie indicated that he has been imaging Pluto using the Faulkes Telescope North in the last few years and would be interested in working with the Section. He points out that Pluto has recently crossed the galactic plane, thus making accurate photometry more of a challenge.

Richard Miles, *Director [arps@britastro.org]*

1 Buratti B. J. *et al.*, *Icarus* 162, 171–182 (2003)
2 Buie M. W. *et al.*, *Astron. J.*, 139, 1128–1143 (2010)

Solar Section

2010 May

Activity in May showed a slight increase on last month mainly due to higher activity in the southern hemisphere, but overall activity was still low. Most observers reported a blank disk from May 8 to 20.

AR1064 N15°/223° remained on the disk from the previous month but reduced in size to type Axx. The group was not seen thereafter.

AR1065, AR1066, AR1068, AR1070 & AR1071 were all small short lived spots appearing during the period May 2 to 7. AR1063 could also have made a short reappearance on May 3.

AR1067 N23°/170° appeared over the eastern limb on May 1, type Axx and had developed to type Bxo by the next day. The group remained on the disk largely unchanged until May 7 but was not seen thereafter.

AR1069 N42°/222° This high latitude spot appeared on May 5 consisting of 7 spots, 3 with penumbra, but by May 7 had reduced to a single penumbral spot type Hsx.

AR1072 S16°/318° type Bxo emerged on the disk on May 21 on the SE quadrant. The next day the group was type Cso consisting of 12 sunspots with an area of 60 millionths. The group crossed the CM on May 23 and by the following day the leading penumbral spot had decayed slightly and by May 26 all the following spots had decayed leaving a single Hsx spot. The group remained unchanged as it approached the western limb on May 28.

AR1073 N13°/193° appeared on May 29 type Bxo consisting of 4 small spots. The group developed a further 2 small spots the following day but was not seen on May 31.

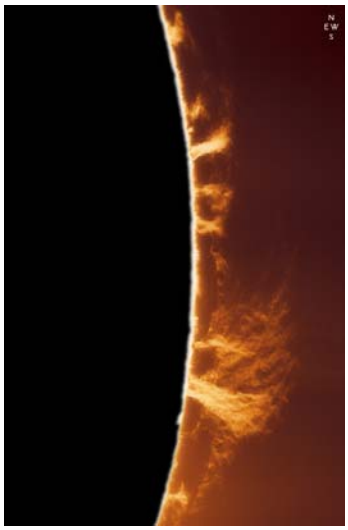
AR1074 N17°/286° appeared on the disk on May 29 type Bxo consisting of 3 small spots. The group reduced to a single Axx spot the next day and was not seen on May 31.

AR1075 S20°/229° type Bxo also appeared on May 29 and was last seen on the following day.

6 observers reported a Quality Number Q = 1.68

BAA sunspot data, 2010 May–June

	May		June	
Day	*g*	*R*	*g*	*R*
1	1	12	1	10
2	1	9	1	17
3	3	31	1	19
4	3	35	1	22
5	2	33	2	23
6	1	20	1	11
7	1	13	1	7
8	0	6	1	15
9	0	0	2	24
10	0	0	2	29
11	0	0	3	35
12	0	0	2	34
13	0	0	1	20
14	0	0	0	4
15	0	0	0	0
16	0	0	0	0
17	0	0	0	4
18	0	0	1	12
19	0	0	1	20
20	0	1	1	14
21	1	13	1	13
22	1	19	1	14
23	1	19	1	13
24	1	16	1	10
25	1	16	1	8
26	1	14	1	11
27	1	12	1	11
28	1	11	1	11
29	1	17	1	16
30	2	22	1	11
31	0	5		
MDFg	0.78 (51)		1.04 (53)	
Mean R	10.36 (44)		14.65 (45)	



Prominences on 2010 May 15 imaged by Pete Lawrence through slight cloud.

H-alpha

Prominences

13 observers reported a prominence MDF of 3.28 for May. Prominence activity was generally low and unremarkable, however some events were worthy of note.

On May 6 an active hook prominence reached an approximate height of 74,000km on the SW limb.

A prominence hearth with 4 foot points appeared on the NE limb on May 8 and remained until May 11 reaching a height of 56,000km at its peak.

A hedgerow type prominence stretched across the NE limb for 233,000km on May 15. On May 17 a very bright prominence on the western limb was observed with a barbed hook on one side.

The western limb sported a spectacular prominence hearth on May 18 consisting of 6 elements (see image).

Several observers reported an Eiffel Tower shaped prominence on May 21/22 on the NW limb. This had reduced in height by May 23 but was still strong and had reduced again in height and split into 3 pillars by the following day.

On May 28 a long, low complex hedge of activity could be seen on the western limb spanning approximately 15°, and also a small but bright prominence on the NW limb.

North & south MDF of active areas g

	MDFNg	*MDFSg*
May	0.40	0.52 (38)
June	0.47	0.60 (38)

g = active areas (AAs)
MDF = mean daily frequency
R = relative sunspot number
The no. of observers is given in brackets.

Filaments & plage

9 observers reported a filament MDF of 2.08 for May.

On May 4 very bright plage surrounded AR1069 which was nearing the western limb. A very bright spot was seen near this same group on May 5 at 08:20 which was likely to be a flare.

A small prominence was seen to extend onto the NE limb as a filament on May 9 and also bright triangular shaped plage was seen near to the centre of the disk.

On May 17 another filament was seen on the NE limb which extended over the limb as a small prominence. Also a long filament was observed near the SW limb on May 17 & 18.

Two long filaments following on from each other were seen in the NE quadrant on May 19 and also a chain like filament near the northern limb.

A long north/south filament was observed in the northern hemisphere near the CM on May 21 and another north/south filament in the centre of the disk. A third filament was

Arc-shaped filament imaged by Bill Leatherbarrow on May 30 at 11:46UT.

seen near the NE limb and bright oval shaped plage surrounded AR 1072.

On May 22 a dark filament was seen in the centre of the disk and on May 23/24 plage was again seen around AR1072. A row of dark filaments were seen in the NW quadrant.

A long dark curved filament was observed to NNE of the disk centre, halfway to the limb on May 28 and a patch of bright plage near the ENE limb.

A remarkable filament was seen on May 30 initially at 15:50 UT as two nearby curved filaments. By 16:16 UT they had formed into a single filament in the shape of an almost perfect semi-circle loop. Observations over the next 2 hours showed the middle portion of the loop disappearing to leave 2 curved filaments (see image).

CaK

All sunspots were seen accompanied by CaK plage usually following the spot group. Large areas of CaK speckles centred on 25°/095° were visible on May 12, 13, 14, 15, and 16. A larger area of speckles stretching from 330° to 290° at 20° latitude was also visible on May 19, 20, 21, 22, 23, 24 and 26.

2010 June

June showed a slight increase in activity from May, mostly in the southern hemisphere. The disk displayed a spot on most days of the month, only June 15 & 16 being reported blank by all observers. Most observers also recorded a blank disk on June 14 & 17.

AR1076 S20°/196° appeared centrally on the disk on June 1 consisting of 3 spots type Cao. The group was type Dsc by the following day and by June 3 the follower spot had increased in size to become the largest in the group with a total area of 200 millionths. The group started to decay on June 4 although still consisted of 8 elements, and 7 elements on June 5 type Cao. The group was last seen on June 6 type Hsx near the western limb.

AR1077 N19°/181° was seen as an Axx spot on June 4 & 5. A small northern pore (unconfirmed) was also seen on June 3 which could be the same feature.

AR1078 S21°/141° formed on the disk on June 8 type Dso. By June 9 the group was type Dsi consisting of 3 penumbral spots and had reduced to type Cao by the next day. The group was last seen on June 11 rounding the western limb type Hsx.

AR1079 S25°/121° appeared on the disk in the SW quadrant to the east of AR1078 on June 9 type Bxo. The group reduced to a single Axx spot on June 10, was not seen the following day and made a brief reappearance on June 12.

AR1080 S25°/107° first appeared on June 10 on the disk to the east of AR1079 in the SW quadrant. The group was type Dso by June 11 and had reduced to type Bxo by June 12 approaching the western limb.

AR1081 N24°/100° formed on the disk in the NW quadrant on June 11 type Bxo before developing into type Dsc with an area of 150 millionths the following day. On June 13 the group consisted of 8 elements type Csi but rapidly declined to type Hsx on June 14 when it was last seen on the western limb.

AR1082 N29°/300° rounded the eastern limb as a bright region of faculae with a small forming sunspot on June 15. No spot was seen the next day but an Axx spot was present on June 17. The group remained unchanged until June 20 when it developed to a small Dso group with a total area of 60 millionths, near to the CM. The group decayed to type Cso on June 22/23 before fading to a small Axx spot on June 24/25 close to the western limb.

AR1083 N19°/331° was seen on June 19 only consisting of 2 small spots type Axx.

AR1084 S19°/145° rounded the eastern limb on June 26 type Hsx. The group started its westward journey across the disk and was still present on June 30 unchanged.

AR1085 S23°/201° appeared on June 29 for one day only, type Bxo consisting of 3 small spots.

7 observers reported a Quality number Q = 2.69

H-alpha

Prominences

14 observers reported a prominence MDF of 3.19 for June. Small unremarkable prominences dominated during the early part of the month. Another Eiffel Tower prominence was seen on the SE limb on June 2/3/4.

Prominence activity started to increase on June 9/10. On June 10 a prominence was ejected from the NW limb to a height of 102,000km. Several observers reported detached ejecta above the NW limb on June 10/11.

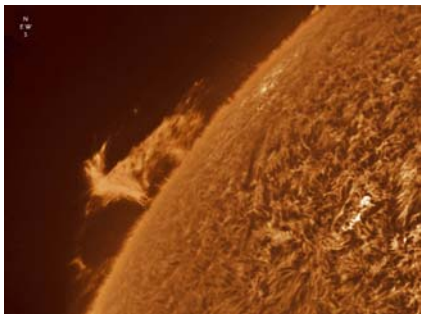
On June 11 a loop type active prominence reached an approximate height of 84,000km on the NW limb increasing its height to 112,000km the next day. This feature was also seen in association with a filaprom on June 11 at 14:30 UT.

A spectacular prominence was seen on the NE limb on June 14 rising to a height of 74,000km, and a large arch with a filaprom graced the SSW limb on June 15.

A very long flat prominence was seen on the western limb on June 16 as well as a tall flame prominence on the SW limb.

A string of prominences was seen on June 19 along the NE limb spanning 15° of limb for some 221,000km.

June 20 brought a major complex prominence curtain to the ESE limb as well as a tall prominence on the SE limb with two smaller prominences to the south.



Prominence imaged by Pete Lawrence on June 14 at 10:35UT.

A major hedge of looping arch prominences was seen at the NE limb on June 29, a major group of 'angular' prominences on the WNW limb and also a large flame prominence on the SSW limb. The month ended with major prominence hearths on the NE and WNW limbs and a flame prominence on the SE limb.

Filaments & plage

9 observers reported a filament MDF of 1.79 for June.

Many small filaments were present during the month. Of note was a chain link filament on June 2 near the N limb projecting inwards onto the disk which was still present the next day along with plage around AR1076.

A moderately long filament (20° long) was seen on the NE quadrant on June 4.

Several filaments were seen in association with AR1081 on June 11. The group was also surrounded by fairly bright plage on June 12 and a curving dark filament cut across the active area east-west.

Another 20° long filament was seen in the northern hemisphere on June 19.

Bright thin plage was seen around AR1082 on June 20 snaking away behind it in a thin curvy line, plage was also present the following day.

On June 27 a long dark filament was seen over the NE limb which persisted on June 28 with a diffuse prominence cloud on the limb nearby. The dark filament persisted the following day but had moved in from the limb and was a broken chain in appearance, towards the centre of the disk and curving westwards. The feature persisted to June 30 as a long string of dark filaments running towards the NNE limb.

CaK

Plage preceded AR1082 on June 15, 17 & 19 and accompanied it on June 22/23.

All spot groups had CaK plage alongside throughout the month and a few other CaK plage groups appeared without associated white light activity.

Lyn Smith, *Director*

Meteor Section

continued from p. 264

consequence of the ancient debris stream's spread due to gravitational perturbations by the major planets). A broad peak is seen over about ten days, centred around Nov 3, when observed rates of 5–7 meteors/hr may be found, and with New Moon occurring on Nov 6 conditions are ideal for monitoring the peaks of the shower this year. Watches may be undertaken, with little or no interference from moonlight, throughout the first two weeks of November, although the shower's most active period is compromised somewhat for UK residents by its coincidence with 'firework season'.

Taurid meteors emanate from two radiants – a northern branch which lies close to the Pleiades in early November (RA 03h44m, Dec +22°), and a southern branch which is then a few degrees west of the Hyades (RA 03h44m, Dec +14°). Note that the coordinates given here relate to the radiants' positions at maximum: thanks to Earth's orbital motion around the Sun, the radiants appear to move eastwards by about a degree per day, and this should be taken into account if observing in, say, mid-November. Taurids can appear particularly impressive because of their slow atmospheric entry velocity (27–29km/sec) and long duration in luminous flight. Like many others, this is a shower which merits more attention than it has received from observers in recent years.

In contrast to the Taurids, November's other major shower has been the focus of a great deal of attention over the past decade. The 1998 return of parent comet 55P/Tempel–Tuttle brought the expected enhancement in Leonid activity, with meteor storms in 1999, 2001 and 2002. Now, with the comet long departed from the inner Solar System, Leonid activity can be expected to settle into the more 'regular' pattern seen for roughly two-thirds of the shower's 33-year cycle.

That doesn't mean that the shower is a poor target for observation! In the mid-1980s, for example, observers who carried out watches on the Leonids were rewarded with rates of up to 10–12 meteors/hr, and even during the quieter years shower activity is laced with a reasonable proportion of bright events. Because the stream has a retrograde orbit, the Leonids impact on the upper atmosphere at 70 km/sec, and these high-energy collisions produce not only bright meteors, but also persistent ionisation trains which can sometimes be of exceptionally long duration (up to several minutes).

The Leonids are active from November 15–20, and this year the shower peak is expected around 02h UT on Nov 18, making the pre-dawn hours of Nov 18 probably the most productive for UK observers in 2010. As with the Orionids, the Leonids are a shower best observed in the post-midnight hours: the radiant, in Leo's 'Sickle' asterism (RA 10h08m, Dec +22°), rises around 23h local time, and is highest in the sky as dawn approaches. This is good news for observers because the waxing gibbous Moon will, this year, rather hamper observations earlier in the night. While very high activity is now unlikely until the late 2020s, observations of the 'quiet time' Leonids provide a very useful baseline for comparison with past and future returns.

For further information, or copies of report forms, observing notes, and details of how to carry out group meteor watches, please visit the BAA Meteor Section website at **http://britastro.org/meteor** or contact the Acting Director at the address below. He will be pleased to answer any queries regarding further aspects of visual meteor work.

John W. Mason, *Acting Director*

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The publication archives of the BAA

The bringing together of the Association's publications has, not unexpectedly, revealed a number of omissions. As reported elsewhere, sets of the *Journal* and *Handbook* are now complete and have been bound.

Gaps in an extensive sequence are an archivist's nightmare. Some difficulties were experienced with the *Memoirs* but thanks to the Astronomical Society of Edinburgh who passed over much material, and also Mrs Mitchell who kindly arranged for the library of her late husband, William Mitchell, to be made available, a complete set has been assembled and is ready for binding.

It is the aim to have a reference copy of all the Association's publications in the Office in Burlington House and to have a sufficiency of additional individual copies placed in the Bedford store. Thanks to the efforts of Jean and Brian Felles the duplicate copies of the *Journal* and *Handbooks* have been logged and organised in date order. However, for some of the earlier issues of the *Journal* there are no duplicates and this also applies to the *Memoirs*. Consequently, the Association would be pleased to receive any of these publications particularly those published before 1950.

Ephemeral material is also receiving attention. The *Circulars* are complete apart from nos. 74 and 75 (1929), 159 and 160 (1935) and 164 (1936). In the unlikely event of a member having these they would be gratefully received by the Archivist. Similarly, with the *Newsletters* (which finished around 2001), nos. 105 and 106 are missing and there are no duplicates for nos. 54, 94, 95 and 96. Again, would members look to see whether they can fill the gaps.

Over the 120 years the BAA has published a variety of material, some with quite short runs. As these are assembled an appropriate note will be placed on the website and it is planned that they will be made available for consultation, eventually by electronic means.

R. H. Chambers, *Archivist*

Nice one, Annabel!

Six-year old Annabel Forshaw snapped this circumzenithal arc with her simple digital camera, completely off her own bat, on 2010 August 31 at Kendal, Cumbria. Granddad David saw the picture a few days later and thought it just had to be shared. *Annabel Jane Forshaw, with thanks also to David Forshaw.*