



Meteor Section

Enhanced Perseid meteor activity observed

The annual Perseid meteor shower is one of the most reliable of the year, with an average peak ZHR (Zenithal Hourly Rate) of 80–100m/h, but significant variations in maximum activity do occur from one year to the next. For the Perseids, enhanced activity may be caused by an encounter with a young dust trail laid down by the parent comet, 109P/Swift–Tuttle, at a previous return, and/or gravitational perturbations by one of the planets, particularly Jupiter, which shift the centre of the main stream so the Earth passes through regions where the dust grains are more densely concentrated.

In 2004, an encounter with the 1862 (1-rev) dust trail at a distance of 0.00132 au (12 years after the comet's most recent return to perihelion) caused a 2-hour enhancement in Perseid rates with a peak ZHR of ~200 m/h, but consisting mainly of faint meteors. A similar encounter yielded a slight enhancement in Perseid rates in 2015 August, but modelling of the stream by various workers had indicated that the effects would probably be more marked in 2016 and 2017. In addition to encounters with both the 1-rev and 7-rev dust trails, it was considered likely that overall Perseid activity in 2016 could be enhanced due to a favourable gravitational perturbation by Jupiter. With the usual annual peak expected on August 12 between about 12:30 UT and 14:30 UT, during daylight hours from the UK, any enhanced activity due to the encounters with young dust trails had been predicted for the previous night, August 11/12.

Visual observations

Observations were still coming in as this issue of the *Journal* went to press, from observers

using a wide range of observing techniques, so this is only a very preliminary summary of what occurred. Visual observers who have reported observations so far are Graham Boots, Steven Brown, Len Entwisle, Richard Fleet, Richard Miles, Ron Johnson, David Scanlan, David Swain, Johan Warell (Sweden), William Worraker and the Director. Their observations indicate that the Perseid ZHR rose from ~20 m/h on August 8/9 to ~60 m/h as darkness fell on August 11. Throughout the night of August 11/12 there was a slow but steady increase in the Perseid ZHR during the night, as would be expected in the rise to maximum. Rates were ~75 m/h by 22:30 UT.

What is also clear is that there was a sudden enhancement in observed Perseid rates after 22:45 UT. This was noted not only by visual observers but also by the operators of automated video cameras. The enhancement was relatively short-lived, however, ending as abruptly as it had begun after 23:30 UT. Peak rates during this brief enhancement occurred in the 15-minute interval between 23:00 and 23:15 UT when the equivalent ZHR was ~200m/h, with slightly lower rates from 23:15 to 23:30 UT and then a marked drop after 23:30 to a ZHR of ~90m/h by midnight.

A second, although less significant enhancement evident from the visual data appeared after 02:00 UT, continu-

ing until dawn twilight interfered from the UK, with a somewhat variable ZHR in the range 110–130 m/h. The following night, August 12/13, after the usual annual peak, rates were comparable with those expected in the declining phase of a 'normal' Perseid maximum.

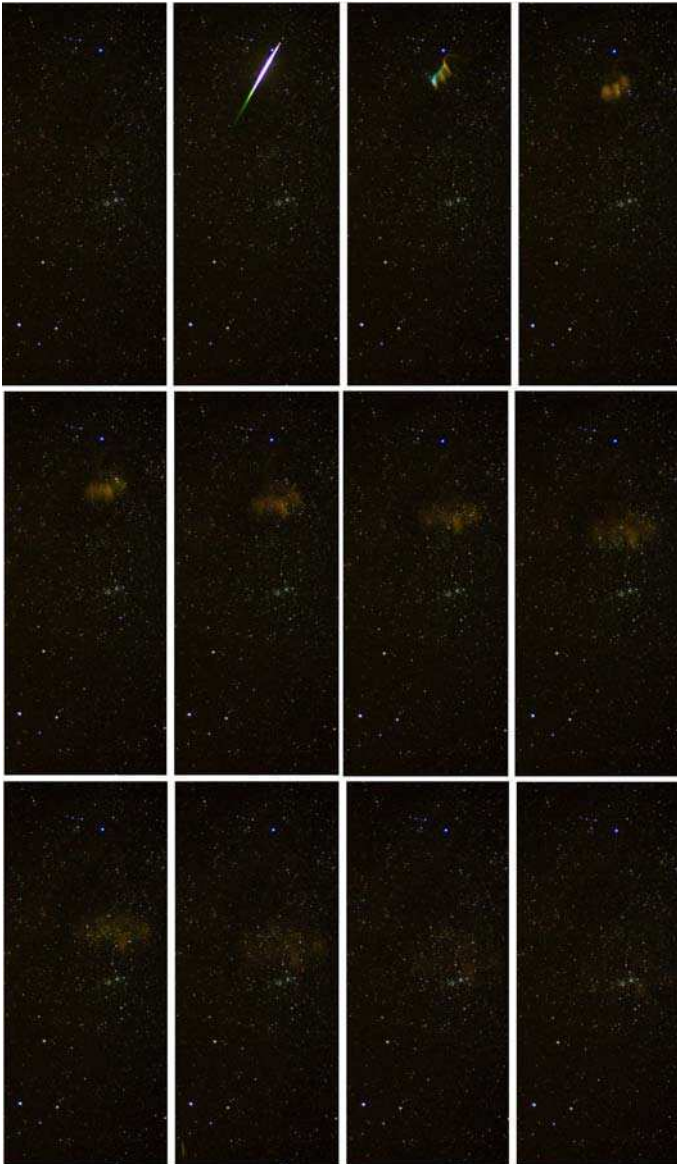
DSLR imaging

At the height of the earlier enhancement in activity, a brilliant Perseid fireball with a persistent train appeared at 23:12 UT with a peak magnitude in the range –5 to –7. It is nicely shown in the montage of images obtained by Pete Lawrence from Selsey, West Sussex, obtained using various camera and lens combinations (see cover



A mosaic of four Perseids, with the Andromeda galaxy, captured by Ian Sharp from Ham, Nr Chichester, West Sussex on 2016 August 11/12 using a Canon 6D at 1600 ISO with a Canon 50mm f/1.4 lens working at f/2.8.

A mosaic of 18 Perseids, 2 probable Perseids and a bright sporadic meteor compiled by John Kemp of Whitstable, Kent from sequences of DSLR images acquired on 2016 August 11/12.



The Perseid fireball which occurred at 00:59 UT on 2016 August 11/12 and the decay and drift of its persistent train over a 5-minute period. Images by John Kemp of Whitstable, Kent using a Canon 60Da at ISO 2000 with a Vivitar 24mm f/2.8 lens. Exposures were of 30s duration separated by 5s. Time increases from left to right and from top to bottom. The fireball, which is seen in frame 2 of the top row here, passed very close to Epsilon Cassiopeiae and the train finally dissipated near the Double Cluster in Perseus.

images). Pete had set up 4 DSLRs – one with an 8mm lens, a 14mm, 20mm and a 28mm. In addition he had a wide-angle all-sky monochromatic camera set up and attempted the same with a colour camera at the end of the session. His count for the night of August 11/12 was 88 trails on the DSLRs alone.

Another fireball of note, with a persistent train that was visible for over 5 minutes, occurred at 00:59 UT on August 12. The initial fireball and the slowly dissipating train were beautifully captured by John Kemp at Whitstable in Kent. Imagers using a range of DSLR-lens combinations reported very good Perseid capture rates on August 11/12. John Kemp captured 25 trails in 2h 47m of exposures with a Canon 60Da and 24mm f/2.8 lens, including the fireball mentioned

NEMETODE and UKMON networks, but as this *Journal* went to press most of this data had yet to be analysed and submitted. The Director is very grateful to Stephen Bosley of the Hampshire Astronomical Group at Clanfield in Hampshire, who has collected together video data for the night of August 11/12 from the three cameras at Clanfield (NW, NE and SE), for Horley (from Chris Curtis), for Church Crookham (from Peter Campbell-Burns) and seven cameras' worth for Wilcot (from Richard Fleet). Data has also been submitted for Chelmsford (from Nick James) and from Lisores, Calvados in Normandy (from David Dunn).

These video data show a clear enhancement in Perseid rates between 22:45 and 23:45 UT, peaking at around 23:15 UT. A second, broader in-

crease in shower activity is also seen between about 01:30 and 03:15 UT, peaking at ~02:30 UT and at a higher level than the earlier enhancement. Clearly, there is a great deal of video data which remains to be analysed and the best techniques for extracting useful meteor rates information from these data have still to be established. However, there are clear similarities between the timings of the observed enhancements in Perseid meteor rates in both the visual and the video data, although there are also differences in the peak activity recorded which will need to be carefully examined.

Ian Sharp, observing from Ham near Chichester, recorded 18 trails in just over 5 hours with a Canon 6D and 50mm f/1.4 lens working at f/2.8. One of Ian's image mosaics showing four Perseids and the Andromeda galaxy is shown on the previous page. The Director captured 26 Perseid trails in 3h 19m of exposures, with a single Canon 550D and 10mm f/2.8 fisheye lens, his highest ever capture rate for this shower.

It is hoped that when the individual capture times for all of the imaged meteors (including data not yet submitted) have been collated, it will be possible to derive a rates curve for the meteors imaged with DSLRs. At first glance it would appear that with the exception of the fireball at 23:12 UT, relatively few of the imaged Perseid trails occurred during the enhancement in visual rates between 22:45 and 23:30 UT.

Video data

A large number of automated video cameras was operational during the period of Perseid shower activity this year, as part of both the

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Your data is urgently needed

The Meteor Section would welcome additional data on this year's Perseid shower from observers who have yet to submit their observations, by whatever means these were acquired. It should be emphasised that visual observations continue to be of great value and will always be needed to calibrate the levels of activity obtained by other means such as video camera recording and radio detection. It is hoped that sufficient data will be available to enable a more detailed report on the 2016 Perseids to be prepared for publication in the *Journal* at a later date. Please contact the Director of the Meteor Section at docjohn@dircon.co.uk.

John W. Mason, Director

Editor's note: *If the mysteries of persistent trains, sporadics and ZHR still leave you in the dark, or you'd just like a few tips on how to set about observing them, don't miss Paul Abelf's Beginners' Guide to observing meteors on p. 268!*

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