Dust to dust – Comet C/2010 X1 (Elenin)

Comet C/2010 X1 (Elenin) is, or rather was, a long period comet (pre-1996 classification) discovered by Russian amateur astronomer Leonin Elenin on 2010 December 10 using the International Scientific Optical Network's robotic telescope located in New Mexico, USA. Its discovery was announced in Minor Planet Electronic Circular (MPEC) 2010-X101 issued on 2010 December 12. In Harold Levison's 1996 scheme, now the norm for classifying comet orbits, C/2010 X1 (Elenin) falls into the 'Nearly Isotropic, New' category. Such comets are visiting the inner solar system for the first time and have semi-major axis greater than 10,000 astronomical units (AU).

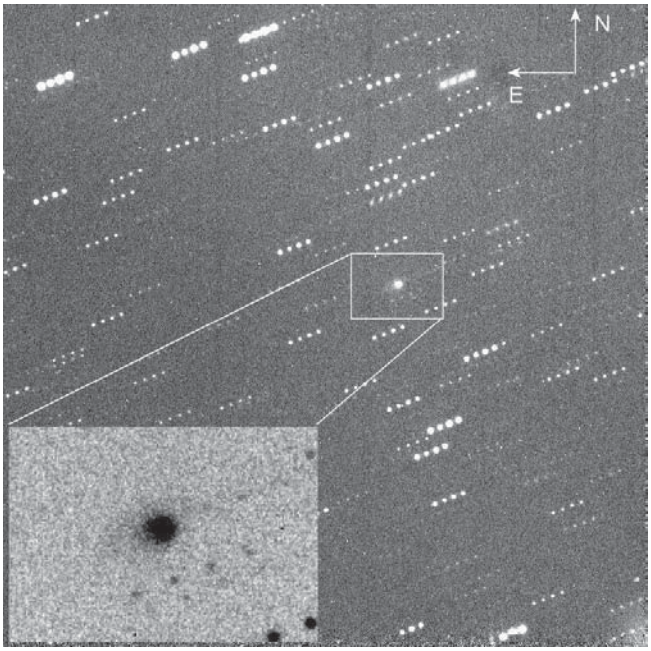


Figure 1. Comet C/2010 X1 (Elenin), 2011 April 27, 05:07UT, 20×20 arc mins, 4×60 sec exp. SSON OMI 0.61m f/10 Cassegrain, FLI Proline PLO9000 CCD, unfiltered. ***R. Dymock, MPC G68***

This particular comet is thought to have its origins in the Oort Cloud with aphelion at 63,600 AU, but after its passage through the inner solar system, would have been perturbed by planetary encounters into an 11,800 year orbit with a semi-major axis of 518 AU.

Using the Sierra Stars Observatory Network's 0.61m robotic telescope situated in Markleeville, California, I imaged the comet several times between 2011 April and June (Figure 1). These observations were supported by the BAA's Robotic Telescope Project.

As often happens with comets, this particular one did not brighten as expected and recovery of the comet after its perihelion passage on 2011 September 10 proved problematic. Finally on October 21 Ernesto Guido, Giovanni Sostero and Nick Howes, using the GRAS 2.54m, f/3.4 robotic telescope at Mayhill, New Mexico, imaged what they described as an extremely faint and diffuse blob of light measuring approximately 14×8 arc mins – the remains of the comet. A confirmation image by Rolando Ligustri, obtained on 2011 October 22 is shown in Figure 2.

The break-up of a comet at or near perihelion, or when passing close to Jupiter, is not uncommon. Comet nuclei are loosely bound aggregates of rock and ice and are thus fairly easily disrupted by tidal forces (the part of the comet closest to the Sun or Jupiter experiencing a greater gravitational pull than the opposite side of the comet). A comet may also disintegrate as it loses its volatiles after one or more visits to the inner solar system. The debris cloud, consisting of particles of rock and ice, will remain in a similar orbit to that of the parent comet but it won't come our way again for another 12,000 years or so, according to Don Yeomans of NASA's Near-Earth Object Program office.

When a comet behaves in this way, according to the Minor Planet Center's Cometary Designation System, its designation should change to reflect the fact. In this instance the C prefix (indicating a comet that has a period greater than 200 years or has only been observed at one perihelion passage) would be replaced by D (for a periodic comet that no longer exists or is thought to have Disappeared), hence D/2010 X1 (Elenin).

Figure 2. Remains of comet C/2010 X1 (Elenin), 2011 October 22, 116×87 arc mins, 6×300 sec exp. GRAS Takahashi FSQ 106ED refractor, SBIG STL-8300-C CCD, unfiltered. Image highly processed to bring out the faint nebulosity. ***Rolando Ligustri.***

Comets condensed out of the contracting solar nebula at the formation of the solar system, in the distant Edgeworth–Kuiper belt and Oort Cloud. 2010 X1 has returned to its original condition: dust to dust.

Roger Dymock

Deep Sky Section

Jones–Emberson 1: the 'Headphone Nebula'

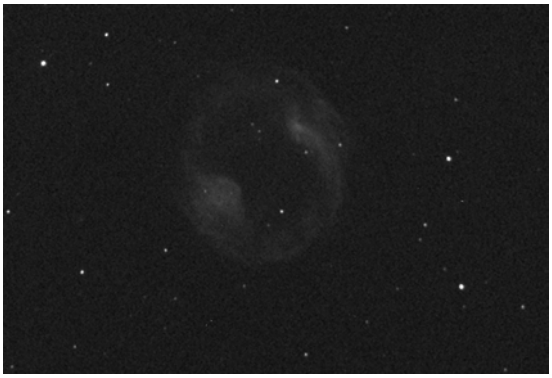
Despite having a high northerly declination, Lynx is probably a constellation that does not feature much on many peoples' observing lists. In fact under some urban skies it may be invisible as its brightest star is only 3rd magnitude with the majority around mag 4 or fainter. The constellation was created by the Polish astronomer Johannes Hevelius in the 17th century and fills the area of sky between Ursa Major, Gemini and Auriga. Nevertheless, what the constellation lacks in bright stars it makes up for in interesting deep sky targets: these include the globular cluster NGC 2419, often called the Intergalactic Wanderer – the most distant globular of our galaxy (some astronomers regard it as an object outside our galaxy); NGC 2683, a superb edge-on galaxy; and the planetary nebula Jones–Emberson 1. It also contains many beautiful double-stars ideal for small telescopes.

Jones–Emberson 1, catalogued as PK164+ 31.1 in the 1967 Perek & Kohoutek catalogue of galactic planetary nebulae, is an ancient large faint planetary that images relatively easily with narrow-band filters and CCDs. However, like many of the nebulae that escaped detection by early visual observers and were later discovered photographically, it can be

Image by Adrian Jones

a difficult object through the eyepiece. It was discovered on photographic plates in 1939 from Harvard Observatory where Rebecca Jones, its co-discoverer, also discovered another planetary that bears her name, Jones 1 in Pegasus.

JE-1 lies at RA 07h 57.8m and Dec +53° 25' (2000.0). It has a quoted diameter of 400 arcsec and a visual magnitude of 12.1; a size/magnitude combination that gives it a very low surface brightness and makes it such a difficult visual target. It is thought to lie at a distance of around 1,600 light years. Most people these days locate it using go-to systems or setting circles, but for star-hoppers wanting a challenge the best starting point is probably mag 3.5 omicron UMa, from where there are plenty of mag 6 and 7 stars forming recognisable patterns leading to the planetary 8.4° to the south-west. An alternative hopping route is to start from mag 3.1 Talitha (iota UMa). For some years after the planetary's discovery there was confusion on its position and designation with 2 small galaxies NGC 2474 and NGC 2475, which lie half a degree to the south. Indeed some charting programs still return these two galaxies when searching on JE-1's PK designation. The matter was resolved by Ron Buta who wrote about it in the 1981 April issue of *Sky & Telescope* magazine.



David Arditti

As mentioned earlier, JE-1 images fairly easily and images have been sent to the Section by David Arditti, Bob Garner, Adrian Jones, Grant Privett and Andrea Tasselli. David Arditti's image gives a good impression of how the nebula appears visually and why visual observers have named this planetary the Headphone Nebula. The image was taken with his 279mm f/7 SCT and Artemis 285 CCD from Edgware, London. Exposure was 30 min (6×5min) through the increasingly popular Astrodon 6nm H-alpha filter. The image is orientated with north up. Field width is 19 arcmin.

Grant Privett's image, through his 250mm f/4.4 Newtonian from Lower Eggleton in rural Herefordshire, was 140 min (186×45s) unfiltered. The lack of filters, longer exposure and darker site enjoyed by Grant results in fainter stars being recorded and much more structure visible in the nebula itself. Some of the many faint background galaxies near to the planetary are also visible in the image.

Grant Privett

Adrian Jones is a new Deep Sky Section member having recently joined the BAA. He observes from Maidenhead, Berkshire and although living in what he refers to as light polluted suburbia he enjoys imaging challenging objects. His image of JE-1 shown on the previous page was taken through a 250mm LX200 at f/5.5 using a Atic 16HR CCD. Exposure was 144 min RGB plus 140 min H-alpha. The magnitude 16.8 white dwarf central star is clearly visible in the image.

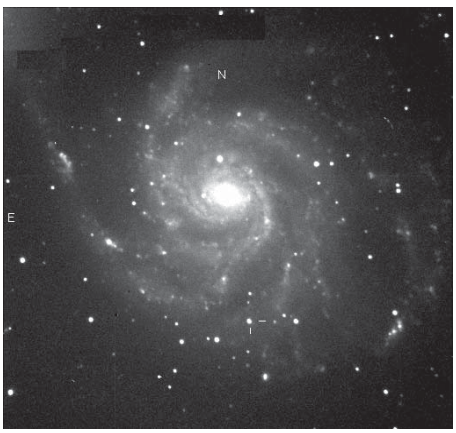
Visually I find JE-1 a very challenging object to observe, and although there are reported sightings in quite small apertures, I find a telescope in the half-metre class is needed. Even then it appears featureless and is visible only as a large C-shaped patch of faint nebulosity. An OIII filter gives a slightly brighter view – although the term brighter is very relative here – while a UHC filter gives a more pleasing view as the wider band-pass of this filter shows a few faint stars embedded in the nebula. There are many images of JE-1 on the internet and one particularly stunning one is from the Sloan Digital Sky Survey (SDSS) at: **http://astronomerica.awardspace.com/SDSS-9/Jones-Emb1.php**.

Stewart L. Moore, *Director*

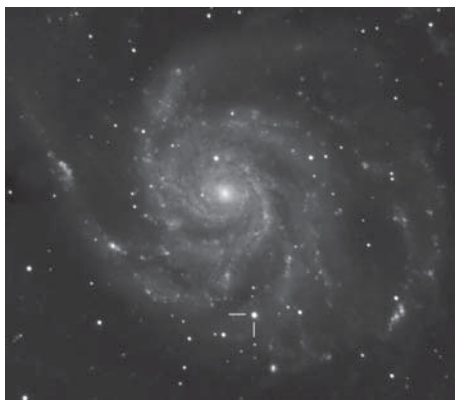
A bright supernova in Messier 101

No sooner had the 2011 August *Journal* appeared containing details of a bright supernova in galaxy M51, than another Messier galaxy surprised us with a 'new star'; this time it was the Pinwheel Galaxy, M101. M101 is a popular galaxy for imagers and visual observers alike and although best seen in the spring when it lies almost overhead, many BAA members took this opportunity to observe the galaxy lying low in the north and image the supernova.

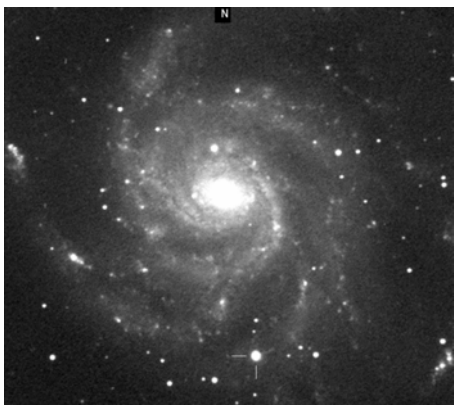
Designated 2011fe, it was discovered on 2011 August 24 by the Palomar Transient Factory and determined as a young Type 1a at magnitude 17.2 and likely to brighten considerably, which it proceeded to do, attaining a maximum magnitude of 9.9 in mid-September. Images were received from Denis Buczynski, Maurice Gavin, Martin Mobberley, Ian Sharp, Eric



SN 2011fe in M101 imaged by Denis Buczynski on August 26 at 23:46 UT.



Three days later at August 29.917 UT the supernova was noticeably brighter in comparison with nearby foreground stars. Image by Ian Sharp.

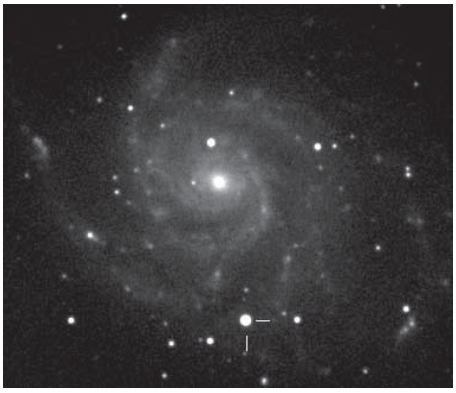


By September 1.858 UT the supernova had brightened further. Image by Martin Mobberley.

Watkins, Ron Arbour, Philip Russell, Gary Poyner (visual report using 15×70 binoculars), Glyn Marsh (visual report using 15×45 image stabilised binoculars), Bob Winter, Rob Pelling (visual observation) and David Storey, many observers sending multiple images.

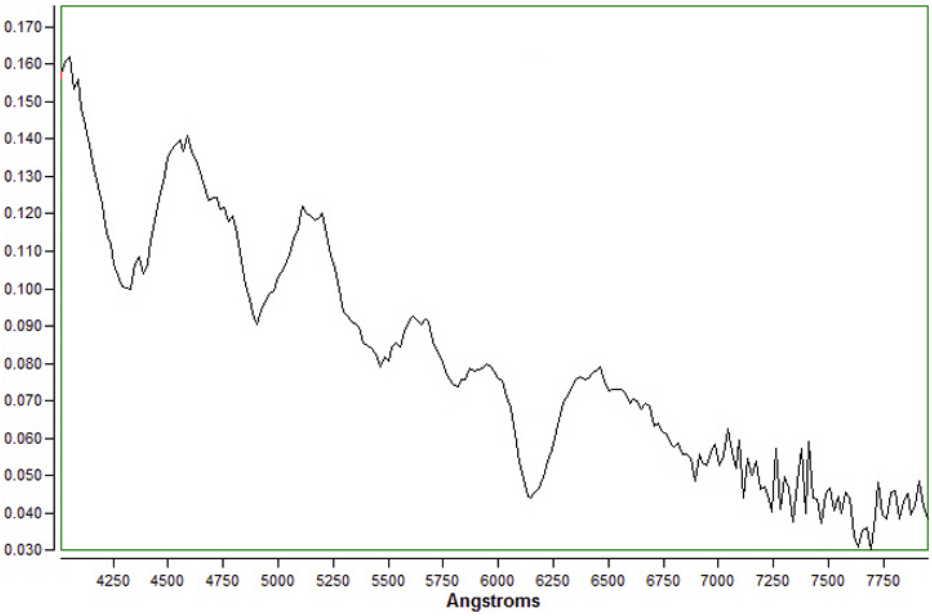
Some of the images received are shown here.

Stewart L. Moore, *Director, Deep Sky Section*



This image by Philip Russell at September 24.792 UT shows the SN at approximately mag 10.7.

Spectrum of SN 2011fe



A spectrum of supernova 2011fe recorded by Ron Arbour, 2011 Sept 01.8786 UT. 350mm f/6 SCT, SXVF H9 SA 100, average 20×60 secs, corrected for instrument response.

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