# Observers' Forum

## From the deep sky: the Leo Triplet


The Leo Triplet, M65, M66 & NGC 3628. TVNP101 APO refractor + Starlight Xpress HX916 CCD camera with ST4 autoguider. IDAS LPR filter & True Tech RGB colour filters. *Image by Peter Carson.*

Lying due south around 21:00 UT in April, the constellation of Leo is a recognisable grouping of stars even to people with only a passing interest in astronomy. To deep-sky observers Leo means galaxies; many of them bright and showing detail in only moderate apertures. Leo contains five Messier galaxies, all lying below a line joining β (Denebola) at the Lion's tail, to α (Regulus) at the base of the 'Sickle' asterism. Roughly halfway along this imaginary line is the grouping of M95, M96 and M105. These galaxies are all readily visible in a 150mm reflector, with the barred spiral M95 and the spiral M96 fitting inside a 1° field circle and the elliptical galaxy M105 lying 1° to the northeast.

The galaxies in Leo that catch the attention of imagers however are the Messier pair M65 and M66 which, along with the Sb spiral NGC 3628, have become known as the Leo Triplet. The Triplet lies 2.5° south of θ, the magnitude 3.3 star forming the Lion's rear hip joint. The spirals M65 and M66 were discovered by Messier's colleague Pierre Mechain in 1780, while NGC 3628 was discovered by William Herschel in 1783. These three galaxies all fit comfortably in a 1° field circle, with M65 and the brightest, M66, only 20 arcminutes apart. The Messier pair can be seen in handheld 10×50 binoculars from a dark site, while the fainter NGC 3628 will need a firmly mounted telescope. I have glimpsed it in my 80mm refractor, but a larger instrument is needed for structure to be discerned.

An image of the Triplet by Peter Carson is given here. Peter observes from Leigh-on-Sea, Essex, where in addition to normal light pollution, he also has to contend with a new floodlit tennis centre 250 metres from his observatory. The tightly wound Sa spiral M65 lies at the top of the figure, with the slightly more open Sb spiral M66 below and NGC 3628 to the left. Visually, I always find M66 much the easier of the two Messier galaxies in which to see detail, the bright north/south oval halo containing a condensed core which brightens gradually to the centre. Some of the detail that can be suspected visually is shown in glorious detail in the image of M66 by Adrian Catterall, who observes from Royston in Hertfordshire.

In addition to these Messier galaxies, Leo contains numerous other delights, in particular a galaxy that Messier and his co-workers missed, the Sb/Sc spiral NGC 2903. This galaxy, which lies 1.5° south of magnitude 4.3 star λ Leo at the top of the 'Sickle' asterism, is a visual beauty. Discovered by William Herschel in November 1784 – presumably near the end of an all night observing session – it is visible in almost any size of telescope and shows tremendous detail in a large aperture. It also images particularly well. The Director would be delighted to receive images and observations of NGC 2903, or of any of the other galaxies in Leo.

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

Messier 66. 250mm TEC Mak–Cass at f12 + ST10XME CCD camera. *Image by Adrian Catterall.*

# Observations of GRB 060124 from Golden Hill Observatory

Gamma ray bursts are believed to be associated with the formation of black holes in the distant universe. With the successful launch of the *Swift* satellite in late 2004, it has become possible to observe GRB events in unprecedented detail. Although most GRBs emit gamma radiation for only a few seconds, some long-lasting bursts do occur from time to time. In these cases, the satellite is able to respond to the initial burst, slewing the entire spacecraft swiftly (within 60–120 sec) in order to observe the GRB with its narrow-field instruments: XRT in X-rays and UVOT in the ultraviolet/optical range before the main emission begins.

Since the launch, only one super-long duration GRB (GRB 050820A) had been observed in detail by *Swift* and the *Konus–Wind* satellite, which revealed intense gamma ray emission lasting about 500 sec. Now with the appearance of GRB 060124, another super-long GRB has been detected by *Swift* and many telescopes have been involved in monitoring the behaviour of the subsequent rapidly fading afterglow.

GRB 060124 was detected by *Swift* on 2006 January 24 at 15:54:52 UT. The source was localised to a J2000 position of RA 05:08:10, Dec. +69:42:33 with an error of 3.0 arcmin (90% confidence). Initially, four reports of optical observations from Japan, Russia and Germany failed to detect an afterglow.

That afternoon, sky conditions in Dorset were not very favourable with a fair amount of high cirrus cloud. However, I turned on the telescopes and CCD cameras in readiness for a short observing session and noticed an e-mail alert message timed at 16:33 UT reporting a GRB trigger but no XRT or UVOT followup measurements were available at that time. I started imaging the area at the end of nautical twilight (18:38 UT, some 2.7 hours after the trigger) using my 280mm Schmidt–Cassegrain telescope working at f/10 with an SXV-H9 CCD camera, not knowing whether or not the GRB afterglow was in the 11'×8' field of view. Although transparency was not ideal, there was no wind and seeing proved very good. In all I took 100×40 sec integrations.

In the meantime, David Alex Kann at Tautenberg Observatory in Germany re-examined their images to reveal a candidate afterglow at RA 05:08:25.5, Dec. +69:44:26 with an error of 2 arcsec, and sent a general e-mail notice to this effect, which I received at 19:52 UT. By this time I had moved on to another target. Apparently, the afterglow had initially been overlooked as it was located very close to a 15th magnitude field star (separation about 8 arcsec). I corresponded with Alex Kann by e-mail reporting my astrometric position for an object that was absent from the Palomar DSS-1 and DSS-2 surveys as RA 05:08:25.85, Dec. +69:44:27.8.

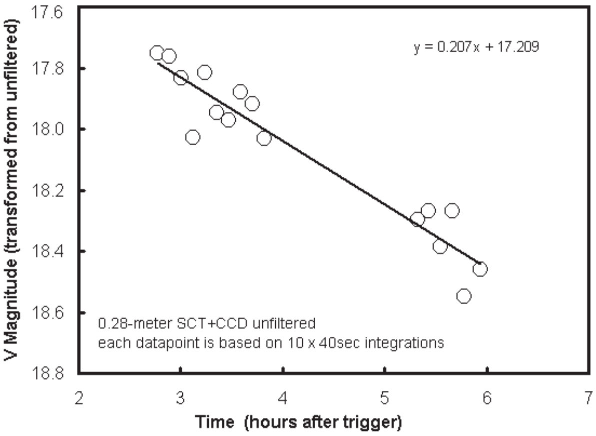


**Figure 2.** Preliminary photometry of GRB 060124. 2006 January 24, start time 18:38 UT. *R. Miles.*

Checking the first and last images of my first time series showed no significant change in brightness according to *Astrometrica*, but the magnitude derivation was difficult owing to the proximity of the bright field star. Kann also visually inspected the Tautenberg series of images and came to the same conclusion, that the afterglow seemed not to fade, which is unusual behaviour for a typical GRB. I started to doubt the reality of this as an afterglow, mooting instead the possibility of a faint red variable star or dwarf nova within our own galaxy.

However, at 20:58 UT, I received a notice of a refined X-ray analysis which shifted the location of the X-ray afterglow to RA 05:08:27.27, Dec. +69:44:25.7. That was the ultimate proof of it being a true afterglow and I was sufficiently encouraged to restart another series of images at 21:10 UT.

This particular GRB subsequently turned out to be a very long-lasting event with several X-ray bursts lasting more than 700 sec. Spectroscopic observations using the Keck telescope established the redshift of GRB 060124 to be $z$=2.297, corresponding to a distance of around 10 billion lightyears.

The image shown here (Figure 1) comprises 100×40 sec exposures with a mid-time of 2006 Jan 24 19:13 UT (T + 3.3 hr), stacked using the *Astrometrica* software. Fortunately, good seeing on the night helped to resolve the afterglow image separated by some 8 arcsec from the adjacent 15th magnitude star. The magnitude of the afterglow was about V=18.

A more detailed analysis of all 168 frames was carried out in order to identify the time evolution of the fading source. To accomplish this, I stacked groups of 10 sequential images with *Astrometrica* (9 images for the last two sets in the series) to yield sufficient signal to noise to permit accurate photometry. The plot depicts the trend in the observed lightcurve from 2.7 hrs to 6.0 hrs following the initial GRB trigger.

The scatter in the plot amounts to about 0.1 magnitude and a simple linear fit to the 17 datapoints yields a fade rate of 0.22 magnitudes per hour. This is a preliminary result since accurate multicolour photometry of this GRB field has now been reported by Arne Henden permitting a more accurate absolute calibration.

I have forwarded my images to Alex Kann at Tautenburg for a more exact photometric analysis. My data will eventually be combined with others including data from all four large telescopes on La Palma, viz. the TNG, NOT, WHT and INT, in a subsequent publication.

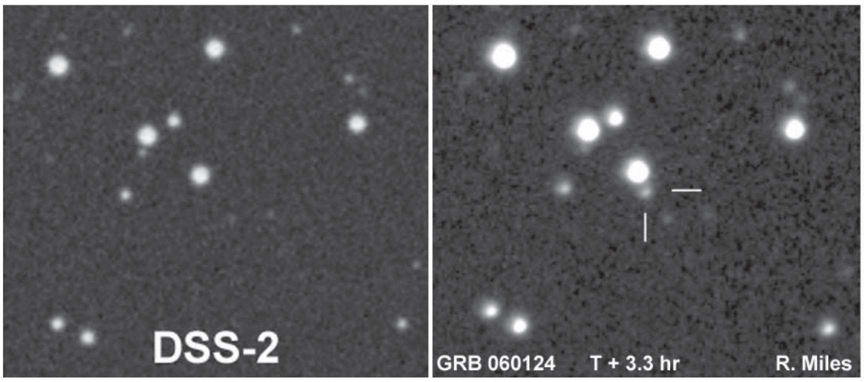


**Figure 1.** GRB 060124 imaged by Richard Miles on 2006 January 24 (right). 100×40 sec, mid-time 19:13 UT (T + 3.3 hr). The Digital Sky Survey-2 field is on the left.

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