

Colliding red giant prime suspect for luminous red nova outburst

July 9 2015, by Dr Robert Massey



Image of a "Light Echo" illuminating dust around V838 Monocerotis (V838 Mon), another rare example of a red nova. Credit: NASA and The Hubble Heritage Team (AURA/STScI)

Observations of a rare astronomical phenomenon, called a luminous red nova, suggest that this bright outburst was caused by a red giant colliding with another star. Astronomers used the Liverpool Telescope to track the outburst over several months and hunted through the Hubble Space Telescope archive to identify possible progenitors. Dr Steven Williams will present the results at the National Astronomy Meeting 2015 in Llandudno on Thursday 9th July.

The [outburst](#) was first spotted in January 2015 in the Andromeda Galaxy (M31) by the Global MASTER Robotic Network, a Russian-led network of telescopes dedicated to looking for transient objects in the night sky. Williams and colleagues from Liverpool John Moores University, Dr Matt Darnley, Prof Mike Bode and Prof Iain Steele, followed the outburst with the Liverpool Telescope's new spectrometer, SPRAT, and its optical CCD camera IO:O.

"Initially, we thought it was a classical nova, a fairly common event. But looking at the way the brightness of the outburst evolved over time at different wavelengths, we soon realised the object in M31 was much more unusual and was a luminous red nova," said Williams.

Classical novae are not particularly rare, with around 30 observed each year in M31 alone. They are thought to occur in binary systems when material falls onto the surface of a white dwarf from its larger companion star, causing a relatively short burst of nuclear fusion. By comparison, very few luminous red novae have been found to date. Their cause is still uncertain, but the evidence suggests that they may be the result of two stars merging together, causing a very dramatic and sudden brightening of the system.

The LJMU team first observed the new system, dubbed M31LRN 2015, three days after its discovery. The outburst brightened over several days. After reaching a peak, optical observations showed the luminous red

nova fading quickly in bluer wavelengths, but remaining bright in the redder wavelengths for several weeks. Spectral analysis of the light showed an initial burst of hydrogen emission. As this faded, spectral features resembling a cool red star emerged. The outburst was observed again in May, and had all but disappeared in the optical, but was still bright at infrared wavelengths.

The team used an image of the outburst taken with the Liverpool Telescope to determine precisely the position of the system. Next, they searched the Hubble Space Telescope data archives for objects in the same place. An image taken in 2004 showed the likely progenitor star: a red giant.

Interestingly, the system appears to show evidence of hydrogen emission many years prior to the outburst, although the source of this emission is not clear.

"We found that our observations of M31LRN 2015 showed strong similarities to other objects classified as luminous red novae. If a single mechanism is responsible for all these rare events, the evidence suggests merging stars as the cause," said Williams. He added, "Further observations of this and other systems are certainly needed. Astronomers have some way to go before these enigmatic objects are fully understood."

Provided by Royal Astronomical Society

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