Red Giant Binary Stars

A new discovery?

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BACKGROUND

Contact binary stars are two small stars which orbit each other so closely that they share a common envelope of star matter between them. Contact binary stars have an orbital period of less than one day, and often have an explosive death.

We have identified a set of candidate stars that appear to be long-period examples of near-contact eclipsing binaries, with orbital periods of up to a month or more.

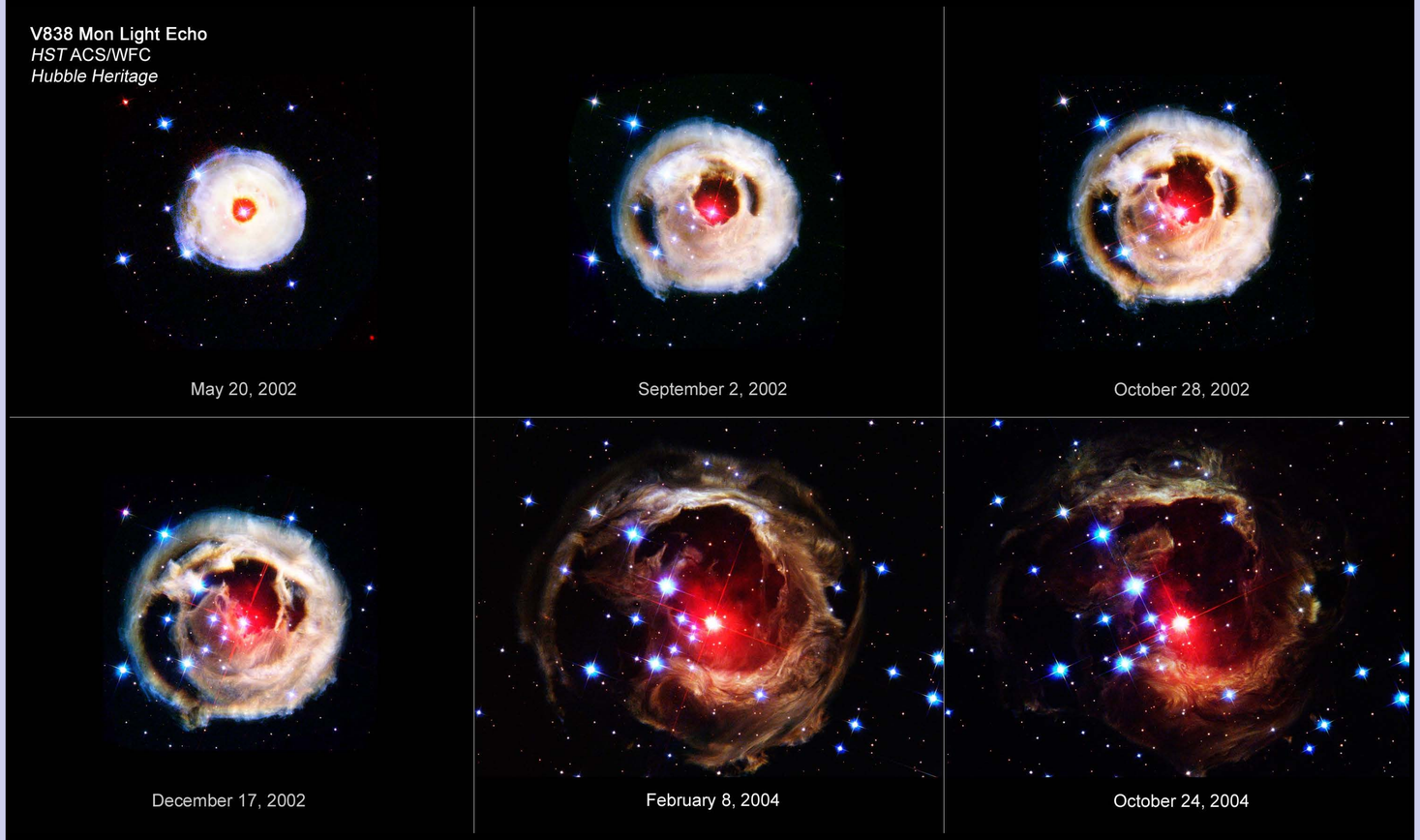
To be in contact, or near contact, at such long periods requires the both stars in the binary to be giants. **This is a new configuration of binary stars.**

Contact binary stars are thought to be the progenitors of red novae, but none have been identified pre-nova. Red novae are the smaller, dustier cousins of supernovae. There are only 16 known red novae.

METHODS

1. We identified 27 candidate binaries from a search of the *SuperWASP* and *ASAS-SN* archives, and through our *Zooniverse* citizen science project.
2. We conducted an 18 month long programme of photometric and spectroscopic observations using telescopes from all over the world.
3. We used these data to characterise our candidate stars using the PHOEBE binary star modelling programme.
4. **We have confirmed that 12 of the 27 candidates are new long-period near-contact red giant eclipsing binary stars.**

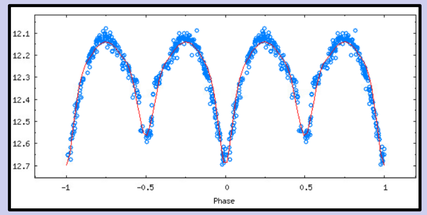
Near-contact red giant binary stars give us an unrivalled opportunity to identify binary star mergers before the merger event itself.



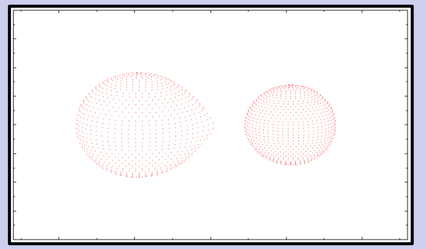
The light echo of the red nova V838 Mon in 2002, captured by the Hubble Space Telescope. This beautiful stellar event is thought to have been caused by the merger of binary stars. Our binary stars may one day merge and explode in this way. [NASA/ESA]

RESULTS

The figure below show the phase folded lightcurve (a plot of brightness over time) of one of our binary stars. The minima are of nearly equal depth, indicating that both stars in the binary are similar in size and temperature.



The figure below shows a model for this binary star. Each star in the binary is ~3 times the mass of the Sun, and between ~20 to ~25 times the radius of the Sun.



FUTURE WORK

We are currently modelling the timescales over which these binary stars might merge and form red novae.

GET INVOLVED

You can identify your own binary stars and help us to build up a better idea of what stars are in the night sky.
To join in, visit: bit.ly/3fOJEqc

REFERENCES

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