



# - RAY ASTRONOMY 2019

*Current Challenges and New Frontiers in the Next Decade*

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## Discovery of one super-Eddington neutron star in an eclipsing X-ray binary

*Friday, 13 September 2019 16:14 (2 minutes)*

We discovered eclipses and dips in one luminous (and highly variable) X-ray source (CXOM51 J132946.1+471042) in M51. It has a two-component spectrum with additional thermal-plasma emission; it approached an X-ray luminosity of  $10^{39}$  erg s<sup>-1</sup> during outbursts in 2005 and 2012. From the timing of three eclipses in a series of Chandra observations, we determine the binary period ( $52.75 \pm 0.63$  h) and eclipse fraction ( $22 \pm 0.1$  per cent). We also identify a blue optical counterpart in archival Hubble Space Telescope images, consistent with a massive donor star (mass of  $\sim 20$ -35  $M_{\odot}$ ). By combining the X-ray light-curve parameters with the optical constraints on the donor star, we show that the mass ratio in the system must be  $M_2/M_1 \gtrsim 18$  and therefore the compact object is most likely a neutron star (exceeding its Eddington limit in outburst). The general significance of our result is that we illustrate one method (applicable to high-inclination sources) of identifying luminous neutron star X-ray binaries, in the absence of X-ray pulsations or phase-resolved optical spectroscopy. Finally, I will discuss the different X-ray spectral appearance expected from super-Eddington neutron stars and black holes at high viewing angles.

### Topic

Compact and diffuse sources in galaxies and in the Galactic Center

### Affiliation

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**Session Classification:** POSTER SESSION