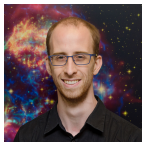
Neutron Star or Black Hole?
Telling the difference from 30,000 light-years away



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Science question:

4U 1543−624 is a binary system in which a white dwarf, the remnant of a Sun-like star, orbits around a super compact object every 18 minutes. But is that compact object a neutron star or a black hole? We collected simultaneous data at X-ray and radio wavelengths to find out, including observations from NICER & Swift.

Findings:

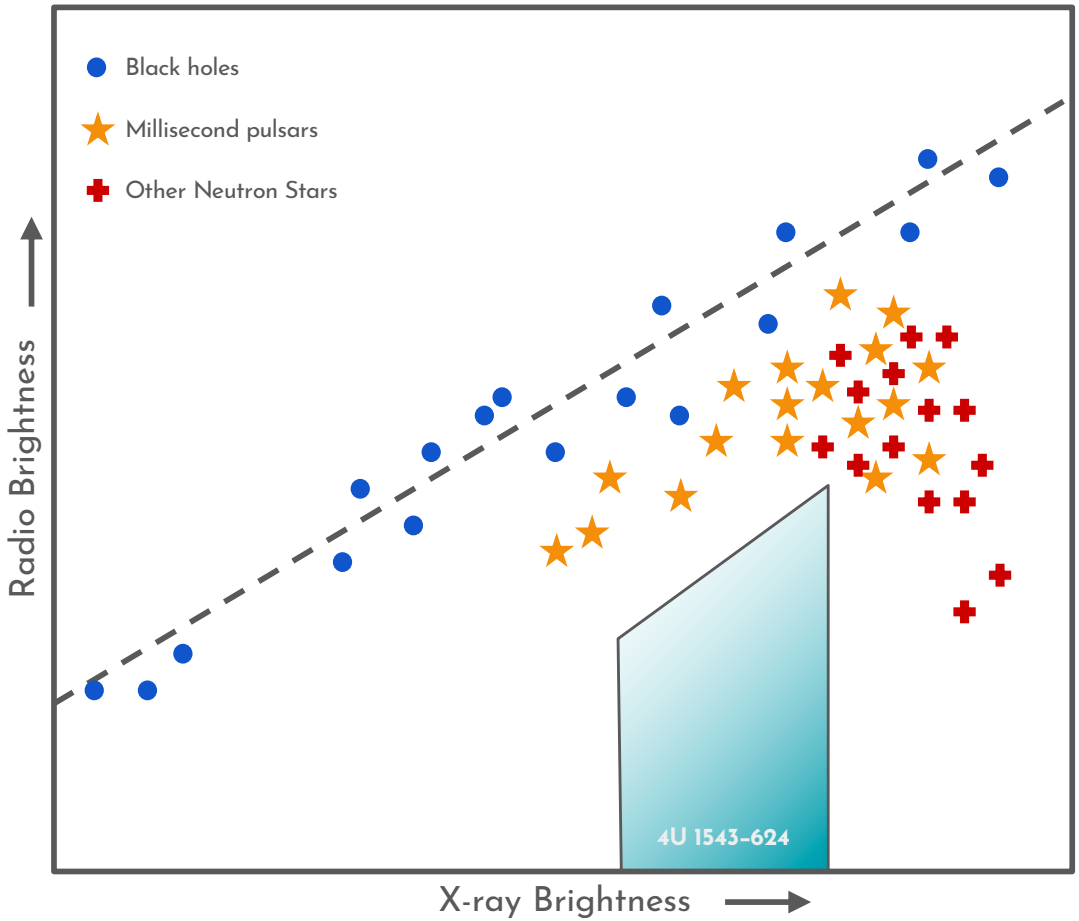
The binary system was bright in X-rays, but at radio wavelengths it proved too faint to detect. The range of brightness for 4U 1543–624 are shown in the chart on the right.

Impact:

Based on our X-ray data alone, we think 4U 1543–624 is probably a neutron star, which may explain why no radio emission was detected. The observations do raise new questions: Why do some neutron stars, like rapidly spinning millisecond pulsars, show radio emission, while other do not? What sets this binary apart?

Why does it matter:

The vast majority of known black holes and neutron stars exist in binary systems, and differentiating between the two is notoriously hard. Radio and X-ray data are thought to be useful for telling the difference, but the strange location of our measurement of 4U 1543–624 raises questions about reliability: ***If this binary is such an outlier, could there be other outliers too?***



Ludlam, Shishkovsky, Bult (662/NPP Fellow), et al. *Astrophysical Journal*, in press.