Tremendously bright pulsar may be one of many

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The starburst galaxy Messier 82 (M82) is home to a pulsar that appears to burn with the energy of 10 million suns. Credit: NASA, European Space Agency, and the Hubble Heritage Team

Recently, a team of astronomers reported discovering a pulsating star that appears to shine with the energy of 10 million suns. The find, which was announced in *Nature*, is the brightest pulsar – a type of rotating neutron star that emits a bright beam of energy that regularly sweeps past Earth like a lighthouse beam – ever seen. But what are the odds finding

another one?

According to one of the paper's authors, chances are good now that they know what to look for.

Professor Deepto Chakrabarty of the Kavli Institute for Astrophysics and Space Research at the Massachusetts Institute of Technology says he is optimistic that astronomers will find additional ultra-bright pulsars now that they know such objects exist.

"Detecting pulsations in faint sources is challenging, because the X-ray data are not always collected with sufficiently high time-resolution to make the measurement," he says. "Our discovery will now justify the additional effort required to make such timing observations."

Astronomers previously thought that this type of "ultraluminous X-ray source" was likely to be made up of black holes five to 50 times more massive than our sun, radiating energy as they pull in nearby matter. This discovery that at least one ULX source is in fact a pulsar brings that understanding into question.

"Black holes are unable to produce coherent pulsations like what we are seeing here," Chakrabarty says.

The discovery is even more surprising because pulsars by nature are not very massive objects and so have always been assumed capable of only relatively moderate X-ray signals. The newly discovered pulsar is far brighter than previously thought possible.

Chakrabarty says he believes the mysteries of how a pulsar could beam so bright can be solved through additional experimental observations – and with the assistance of theorists.

"It is clear that some sort of specialized beaming may be going on here, but coming up with a sensible and self-consistent picture may be a challenge," he says. "Observing some more examples of ULX pulsars could be very helpful in sorting this out, giving us some different sets of system parameters to work with."

More information: Turbulent heating in galaxy clusters brightest in X-rays, DOI: 10.1038/nature13830

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