

Strange star stumps astronomers

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The Arecibo telescope (aerial view). Photo courtesy of the NAIC - Arecibo Observatory, a facility of the NSF

An obese oddball of a star has left astronomers wondering how it could have formed. Dr David Champion and his colleagues at CSIRO's Australia Telescope National Facility publish their findings about the star today in the online journal, *Science Express*.

Found with the Arecibo radio telescope in Puerto Rico, the star is a pulsar – a compact, rapidly spinning star – called J1903+0327. It lies 20,000 light-years away spinning at a rate of 465 revolutions per second – the fifth fastest-spinning pulsar known in our Galaxy.

Astronomers believe such super-fast pulsars started life as the more

common, sedate pulsars that spin only a few times a second, but were later 'reborn' in their present hyperactive state. This re-birthing or recycling can take place, astronomers think, if the pulsar has a nearby companion that it orbits. At a certain point in its life cycle, the companion pours its own matter onto the pulsar and this extra material 'spins-up' the pulsar.

The process makes the pulsar's orbit around its companion almost completely circular. Or as astronomers say, the orbit has "low eccentricity".

"This low eccentricity is one of the best pieces of evidence we have for recycling theory," Dr Champion says. "But J1903+0327 is totally different in that it has a very eccentric orbit which is elliptical rather than circular. So, the question is: How could it have formed?"

The astronomers think the pulsar may once have been part of a triple system of stars and was 'spun-up' by its closest companion star – which was either ejected from the system or worn away after it transferred all its mass to the pulsar – and now remains in an elongated orbit around the third, more distant member of the original trio.

But another possible explanation for the pulsar's odd combination of properties is that it was born in a dense region of stars called a globular cluster, and spun-up by its original partner.

As well as having a highly eccentric orbit, the pulsar is heavier than normal with a mass of about 1.74 times that of the Sun. "A pulsar this massive could also rule out some theories about the state of the highly compressed matter in pulsars," Dr Champion says.

"Pulsars like this are why you do these surveys," Dr Champion says. "You don't want to just find hundreds of objects, you want to find the

two or three that are plain weird and we've found one.”

Source: CSIRO Australia

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