Giant Planet Set for a Cataclysmic Show

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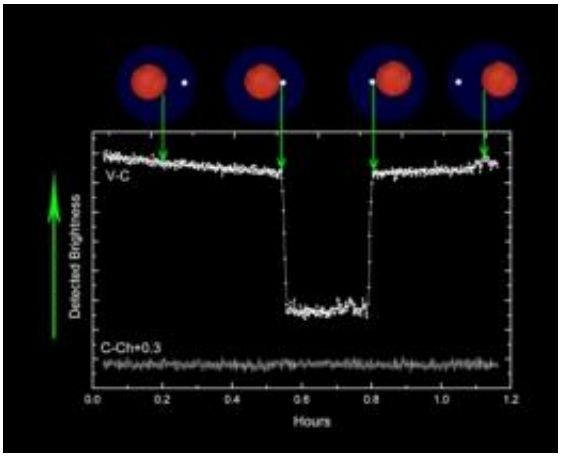

The fluctuation in light from the QS Virginis system over a period of 1.2 hours. Credit: Shengbang Qian, National Astronomical Observatories, Chinese Academy of Sciences.

(PhysOrg.com) -- A team of Chinese astronomers have discovered a giant planet close to the exotic binary star system QS Virginis. Although dormant now, in the future the two stars will one day erupt in a violent nova outburst. Professor Shengbang Qian of Yunnan Observatory leads the team of scientists who report their work in the journal *Monthly Notices of the Royal Astronomical Society*.

QS Virginis lies in the direction of the constellation of Virgo and is about 157 light years from the Sun. The system is made up of a cool red dwarf and a hot dense white dwarf (an object similar to the remnant that will be left behind by the Sun at the end of its life). The two stars are

just 840000 km (525000 miles) apart or about twice the distance from the Earth to the Moon. Being so close together they race around each other, taking just 3 hours and 37 minutes to complete each orbit. No Earth-based telescope can see them as separate stars, but as they move around the two stars successively eclipse one another, leading to a characteristic periodic dip in the brightness of the system.

In many close binaries, described as 'cataclysmic variables (CVs)', material flows from one star to its denser companion. The stars of QS Virginis are only slightly too far apart for this to happen and so are a 'hibernating' CV and relatively quiet at the moment.

Professor Qian's team looked closely at the way the light from QS Virginis fluctuated throughout each orbit. By timing the eclipses, they found that the duration of the orbit changed with the time of mid-eclipse periodically advanced or delayed.

This shift is explained by an unseen third object exerting a gravitational pull on the two stars, so that sometimes the light has to travel a little further and sometimes a little less to reach us. From their measurements, the Chinese team deduced that there is a giant planet, with a minimum of 6.4 times the mass of Jupiter, at an average distance from the stars of 4.2 times that from the Earth to the Sun (about 630 million km or 394 million miles).

The new world is the first to be found in orbit around a close pair of stars of this type. Although almost certainly uninhabited, a hypothetical observer there would see a pair of rather small 'Suns' - one red and one white appearing very close together in the sky.

But things will not look this way forever. The red dwarf star is being braked by the interaction between its stellar wind and magnetic field and is decelerating. As it loses energy it is moving closer to the white dwarf

and sometime in the next few thousand years it will be near enough that hydrogen will start to be dragged off the red dwarf by its companion star.

The hydrogen will then slowly accumulate on the white dwarf and build up in a hot dense layer close to the star's surface. In due course the density and temperature of the base of the hydrogen layer will become high enough for nuclear fusion reactions to start, where the hydrogen is very quickly fused to heavier helium. The resulting nuclear explosion will lead to a spectacular outburst of radiation and the binary system will temporarily become many times brighter than normal.

These 'nova' events are bright enough that they are often seen by amateur astronomers on Earth, so the view of the outburst from the newly discovered planet will be dramatic (and potentially dangerous for any extraterrestrial tourists who go there to watch it).

But Professor Qian sees this as a real opportunity for terrestrial astronomers. "For once we have advance notice of the formation of a cataclysmic variable and the chance to study what will happen to the planet in orbit around it. The scientific community should watch this system over the decades ahead - it should give us a real insight into these exotic stars."

More information: An Early View of the MNRAS paper can be found at www3.interscience.wiley.com/jo … l/122683015/abstract

Provided by Royal Astronomical Society