First picture of likely planet around sun-like star unveiled

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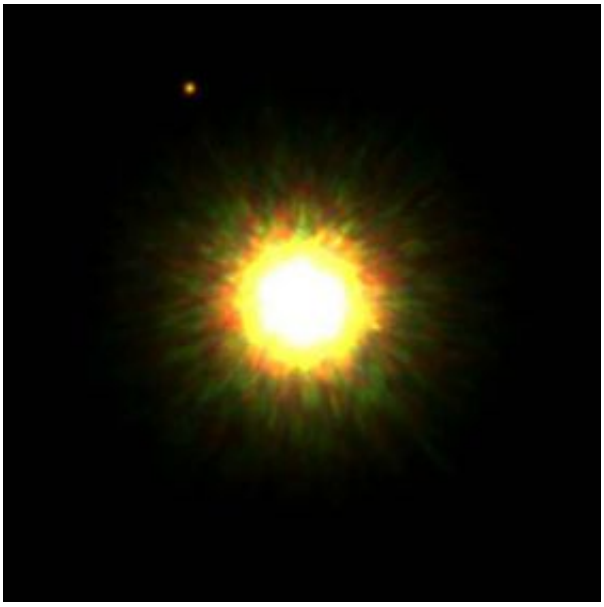

Young star 1RXS J160929.1-210524 and its faint, planetary mass candidate companion. Blue, green, and red represent images taken in J, H, and Ks, with intensities scaled such that they are proportional to the photon rates inferred from the 2MASS magnitudes of the primary. Image: University of Toronto

(PhysOrg.com) -- University of Toronto astronomers have unveiled what is likely the first picture of a planet around a star similar to the sun.

Three scientists from astronomy and astrophysics used the Gemini North telescope on Mauna Kea in Hawaii to take images of the young star 1RXS J160929.1-210524 (which lies outside the solar system at about

500 light-years from Earth) and a candidate companion of that star. They also obtained spectra to confirm the nature of the companion, which has a mass about eight times that of Jupiter and lies roughly 330 times the Earth-sun distance away from its star. (For comparison, the most distant planet in our solar system, Neptune, orbits the sun at only about 30 times the Earth-sun distance.) The parent star is similar in mass to the sun but is much younger.

"This is the first time we have directly seen a planetary mass object in a likely orbit around a star like our sun," said David Lafrenicre, a post-doctoral fellow and lead author of a paper submitted to the Astrophysical Journal Letters and also posted online. "If we confirm that this object is indeed gravitationally tied to the star, it will be a major step forward."

Until now, the only planet-like bodies that have been directly imaged outside of the solar system are either free floating in space (i.e., not found around a star) or orbit brown dwarfs, which are dim and make it easier to detect planetary-mass companions.

The existence of a planetary-mass companion so far from its parent star comes as a surprise and poses a challenge to theoretical models of star and planet formation.

"This discovery is yet another reminder of the truly remarkable diversity of worlds out there and it's a strong hint that nature may have more than one mechanism for producing planetary mass companions to normal stars," said Professor Ray Jayawardhana, author of an upcoming book on extra-solar planets entitled Worlds Beyond.

The team's Gemini observations took advantage of adaptive optics technology to dramatically reduce distortions caused by turbulence in Earth's atmosphere. The near-infrared images and spectra of the suspected planetary object indicate that it is too cool to be a star or even

a more massive brown dwarf and that it is young. Taken together, such findings confirm that it is a very young, very low-mass object at roughly the same distance from Earth as the star.

Even though the likelihood of a chance alignment between such an object and a similarly young star is rather small, it will take up to two years to verify that the star and its likely planet are moving through space together. "Of course it would be premature to say that the object is definitely orbiting this star but the evidence is extremely compelling. This will be a very intensely studied object for the next few years," Lafrenicre said.

Professor Marten van Kerkwijk described the group's search method. "We targeted young stars so that any planetary mass object they hosted would not have had time to cool and thus would still be relatively bright," he said. "This is one reason we were able to see it at all."

The Jupiter-sized body has an estimated temperature of about 1,800 Kelvin (about 1,500 C), much hotter than our own Jupiter, which has a temperature of about 160 Kelvin (-110 C) and its likely host is a young star of type K7 with an estimated mass of about 85 per cent that of the sun.

The work that led to this discovery is part of a survey of more than 85 stars in the Upper Scorpius association, a group of young stars formed about five million years ago. It uses the Gemini telescope's high-resolution adaptive optics capabilities to determine the different types of companions that can form around young stars: stars, brown dwarfs or planetary mass objects.

"This discovery certainly has us looking forward to what other surprises nature has in stock for us," Van Kerkwijk said.