Little telescope discovers metal-poor cousin of famous planet

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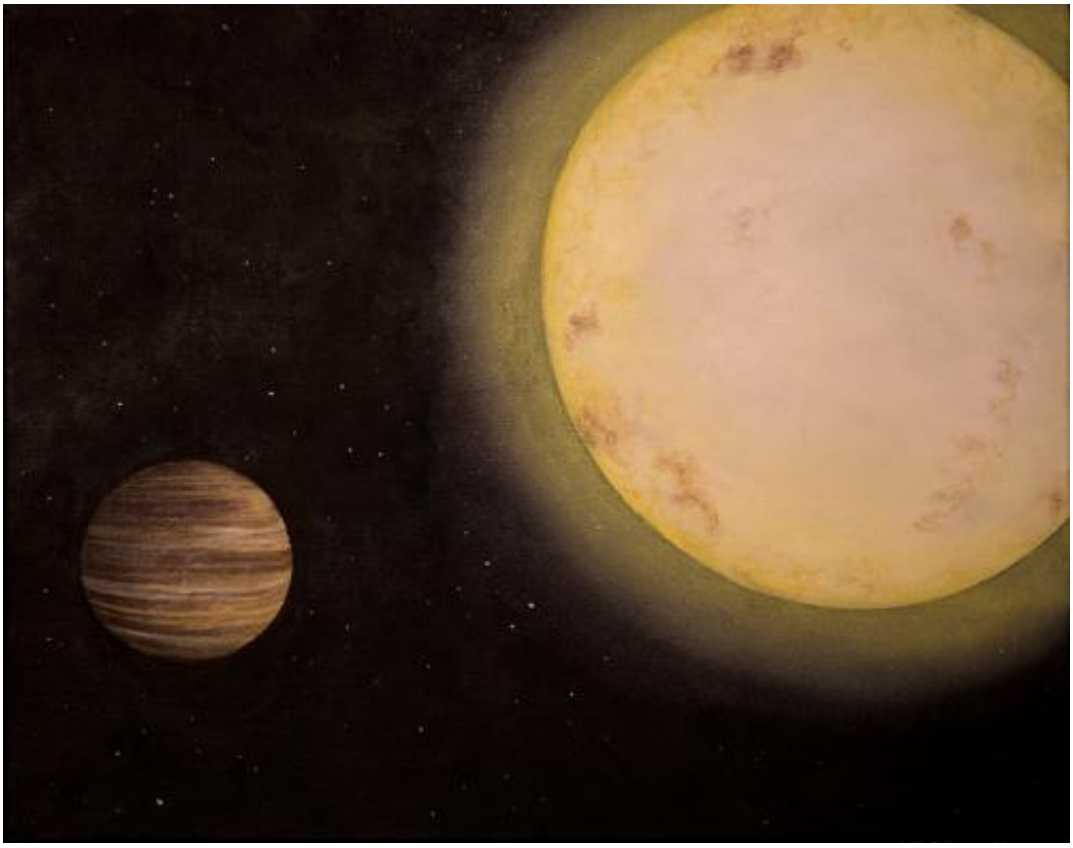

This is an artist's rendering of exoplanet KELT-6b by Lexington, KY-based artist Erin Plew of Queen of Arts LLC. Credit: Vanderbilt University

A scientific team led by University of Louisville doctoral student Karen Collins has discovered a hot Saturn-like planet in another solar system 700 light-years away.

Collins announced the discovery of exoplanet KELT-6b Tuesday, June 4, during the American Astronomical Society's national meeting in Indianapolis.

Astronomers caught sight of the planet when it passed in front of, or "transited," its host star—and they've since discovered that the planet resembles one of the most famous and well-studied transiting planets, HD 209458b.

The discovery was made using inexpensive ground-based telescopes, including one specially designed to detect exoplanets and jointly operated by astronomers at Ohio State University and Vanderbilt University.

As seen from Earth, KELT-6b resides in the constellation Coma Berenices, near Leo, and has an orbit that transits its star every 7.8 days. That means a "year" on the planet lasts just over a week, and its trip across the face of its star, as seen from Earth, lasts only five hours.

Five hours may seem like a short time, but most planets found by ground-based telescopes have even shorter orbits. So catching a complete observation of KELT-6b took more patience and substantially more luck than usual – a total of seven hours of continuous telescope time with clear skies during darkness. Collins had clear skies on both of her only two opportunities to catch the planet earlier this year at UofL's Moore Observatory.

KELT-6b is now the longest-duration full planetary transit continuously observed from the ground, she said.

Collins, an electrical engineer whose longtime fascination with astronomy led her to this second career, called the work an adventure. "To participate in planet discovery here in Kentucky, it's just incredible

to me to be able to do that," she said. Her work is supported by a NASA Kentucky Space Grant Consortium graduate fellowship.

KELT stands for the Kilodegree Extremely Little Telescope project. The KELT North telescope in Arizona and its twin, KELT South in South Africa, are no more powerful than high-end digital cameras, but they've proven that small telescopes can make big planet discoveries. But while KELT North briefly glimpsed the new planet last year, the team needed help with follow-up observations to capture the entire transit, explained Scott Gaudi, associate professor of astronomy at Ohio State and member of the KELT team.

The KELT telescopes record images of huge swaths of night sky. Scientists search for slight, periodic dimming of any stars in the images, which could indicate a planet transiting its star. Once the slight variation in light is detected, scientists use other telescopes to determine exactly which star is affected and precisely how much it dims. Collins was able to make the critical observations.

"Karen chased the planet down and got the data that we needed to ask for precious Keck time," Gaudi said, referring to the high-powered twin Keck Observatory telescopes in Hawaii. "With the Keck data, we were able to take a much closer look and confirm the discovery of KELT-6b."

Collins and her team determined that KELT-6b is a hot gas-giant planet orbiting a star about the same age as our sun. The planet resembles our own Saturn in terms of size and mass, though it has no rings. It also resembles the most studied exoplanet to date, HD 209458b, but differs because it was formed in an environment low in metals—that is, elements heavier than hydrogen and helium.

"KELT-6b is a 'metal-poor' cousin of HD 209458b." said Keivan Stassun, Vanderbilt astronomy professor and member of the KELT

team. "The role of metals in the stellar environments in which planets form is a major question in our understanding of these other worlds. This new planet is among the least endowed with such metals that we know of, and because it is so bright it should serve as a benchmark for comparative studies of how and under what conditions planets form."

Thomas Beatty, a doctoral student at Ohio State, said the discovery highlights the importance of partnerships involving low-power telescopes. "KELT would be impossible without our network of professional and amateur observers," he said. "They do a lot of the hard slogging in surveys like this one, staying up all night to watch stars that, more often than not, turn out not to have planets."

Gaudi, Stassun and Beatty, along with Joshua Pepper, assistant professor of physics at Lehigh University, and John Kielkopf, professor of physics and astronomy at UofL, all partnered with Collins on her discovery. Additional funding for the work came from the National Science Foundation, NASA and Vanderbilt University.

Collins, who plans to graduate with her doctorate in 2014, is working to confirm and characterize a second body in the same system as KELT-6b.

Provided by University of Louisville