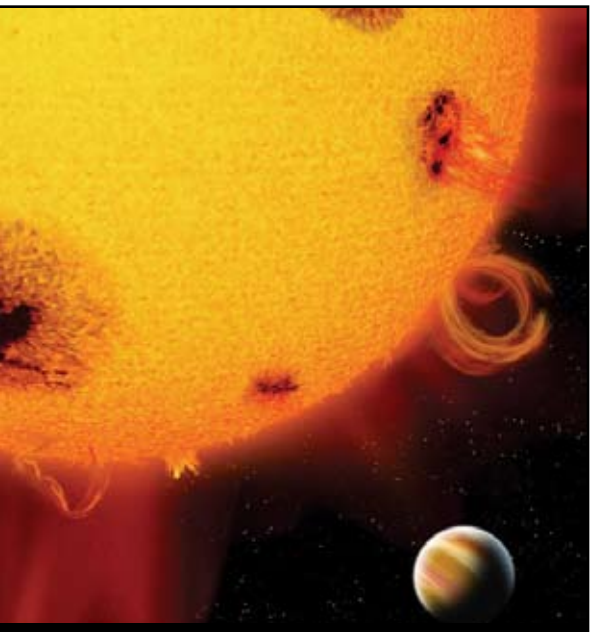
Extracts



P. Marenfeld

An artist's rendering of a planet orbiting a very young, active star pocked with dark spots and speckled with flares and other surface activity.

Faster Instrument Speeds Planet Searches

Astronomers have discovered a planet orbiting a very young star nearly 100 light-years away using a relatively small, publicly accessible telescope turbocharged with a new planet-finding instrument.

The feat suggests that astronomers have found a way to dramatically accelerate the pace of the hunt for planets outside our solar system.

"In the last two decades, astronomers have searched about 3,000 stars for new planets," said Jian Ge, a professor of astronomy at the University of Florida. "Our success with this new instrument shows that we will soon be able to search stars much more quickly and cheaply — perhaps as many as a couple of hundred thousand stars in the next two decades."

Ge and colleagues at UF, Tennessee State University, the Institute of Astrophysics in Spain's Canary Islands, Pennsylvania State University and the University of Texas presented their findings in January at the American Astronomical Society's annual meeting in Washington, D.C.

Their work is important in part because of what the astronomers found — a planet, at least half as massive as Jupiter, orbiting a star just 600 million years old. That's very young compared, for example, with the sun's 5 billion years.

"This is one of the youngest stars ever identified with a planetary companion," Ge said. Perhaps more significant, the instrument used to find the planet points the way to a much more accessible method for finding others — including those capable of supporting life.

Planets outside our solar system are typically swamped by the light of their stars, making it difficult to observe them visually. In the 1990s, astronomers began using a measurement technique called Doppler radial velocity to detect planets by observing the wobble in a star that is gravitationally induced by an orbiting planet.

This technique, which has uncovered the vast majority of the 160-plus extrasolar planets found so far, works by hunting through the spectrum of starlight for the subtle Doppler shifts that occur as the star and planet move toward and away from their common center of mass. The instrument at the heart of this technique is usually a spectrograph, but this instrument is problematic.

"A major problem with spectrographs is that they collect only a small percentage of photons from the target light source, which means that they are only useful to search for distant planets when mounted on relatively large telescopes," Ge said.

The astronomers' new instrument, the Exoplanet Tracker, or ET, eliminates this problem by swapping the spectrograph with an interferometer. Tests show the interferometer can capture as much as 20 percent of available photons, making the instrument far more powerful, which opens its use for distant planet hunting to smaller telescopes.

At a development cost of about $200,000, the interferometer-equipped ET is also far cheaper than comparable spectrographs, which cost more than $1 million. And at about 4 feet long, 2 feet wide and weighing about 150 pounds, it is lighter and smaller.

The astronomers used the Exoplanet Tracker on the special 0.9-meter Coudé feed system within the National Science Foundation's 2.1-meter telescope at Kitt Peak National Observatory near Tucson, Arizona.

Like radial velocity instruments equipped with spectrographs, the ET instrument in its present form can search only one object at a time. But Ge's team has demonstrated that it can hunt for planets around multiple stars simultaneously — a key element of its heightened utility. The team is working on a version capable of surveying as many as 100 stars simultaneously.

The Exoplanet Tracker will be used next spring for a trial planet survey on the Sloan Digital Sky Survey 2.5-meter-wide field telescope at the Apache Point Observatory in New Mexico. The new instrument is funded with an $875,000 grant from the W. M. Keck Foundation. A much more ambitious, long-term survey is in the planning stages.

The new planet is the most distant ever found using the Doppler technique with a telescope mirror less than 1 meter in size. There are hundreds of such telescopes worldwide, compared with just a handful of the larger 2- and 3-meter telescopes more commonly used in planet finding — telescopes that tend to be in extremely high demand and difficult to access.

"These smaller telescopes are relatively cheap and relatively available," Ge said, "so you can often get access to many dozens of nights on them if you have a promising proposal."

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