Finding Planets Around Ordinary Stars

The news flashed through the astronomical community like a lightning bolt: Astronomers have found two examples of planets orbiting ordinary stars that lie close to our sun.

At a meeting on low-temperature stars 2 weeks ago in Florence, Michel Mayor and Didier Queloz of Geneva Observatory reported strong evidence that a planet almost as massive as Jupiter orbits a familiar, sunlike star a mere 42 light-years from our solar system. The finding represents the first time that astronomers have inferred the presence of a planet orbiting a star similar to our sun. Earlier, researchers had detected planets around a pulsar, an extremely dense, rapidly spinning star that emits radio waves (SN: 3/5/94, p.151).

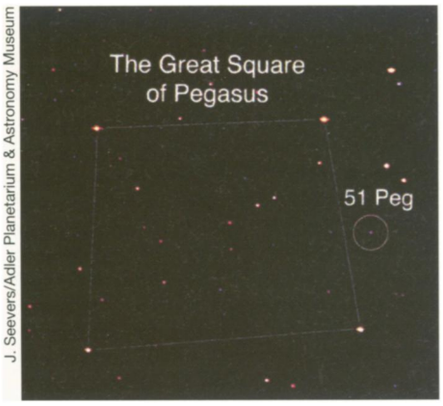
"It's a big, big step," says J. Roger Angel, director of the Steward Observatory Mirror Laboratory in Tucson.

Circling the star 51 Pegasi at just one-twentieth the distance of Earth from the sun, the newly discovered planet is lost in the glare of its bright parent star. No telescope can image it. Only a tiny wobble in the motion of 51 Pegasi, monitored over a 2-year period with a visible-light spectrograph at the Observatoire de Haute Provence in Saint Michel, France, betrays the gravitational tug of the massive planet. The planet revolves around the star, a resident of the constellation Pegasus, once every 4.2 days, causing the periodic wobble.

Last week, Geoffrey W. Marcy and R. Paul Butler, both of San Francisco State University and the University of California, Berkeley, observed the orbit of 51 Pegasi for four nights with the Lick Observatory's 3-meter telescope on Mount Hamilton in California. Marcy told SCIENCE NEWS that he and Butler detected virtually the same wobble as the Swiss team.

"I have no doubt at all about our result, but it's nice to have the external confirmation to convince other people," says Mayor. Adds Marcy, "We're excited that one of the most compelling questions in astrophysics [whether any planets orbit sunlike stars] has been answered."

That confirmation leaves other questions open. Some astronomers have wondered how a planet with roughly the mass of Jupiter can survive so close to a star nearly as hot as the sun. Adam S. Burrows of the University of Arizona in Tucson calculates, however, that even if the planet were mostly gas, like Jupiter, its gravity would prevent 51 Pegasi from boiling away the material. Nonetheless, the star's heat may have caused the planet to swell. It remains unclear whether the planet formed at its current location or the star dragged it in from a more distant orbit.



J. Seevers/Adler Planetarium & Astronomy Museum

New evidence indicates that an unseen planet circles the star 51 Pegasi.

As if one finding wouldn't suffice, a second discovery has kept planetary scientists abuzz. At the Florence meeting, astronomers described near-infrared images and spectra of an object about 20 times the mass of Jupiter circling the tiny star GL229, located 30 light-years from Earth.

The finding, based on observations with several telescopes at Palomar Observatory near Escondido, Calif., differs in several respects from that announced by the Swiss team. GL229 has about four-tenths the mass of the sun, and the planetlike object it harbors orbits much farther away—about 44 times Earth's distance from the sun, says co-investigator Shrinivas Kulkarni of the California Institute of Technology in Pasadena.

Kulkarni and his colleagues, including Ben Oppenheimer and Tadashi Nakajima, also of Caltech, note that the massive body could be either a planet or a brown dwarf—an object that forms as stars do but lacks the mass to sustain nuclear burning (SN: 9/23/95, p.200). "It's not clear exactly what the boundary [in mass] is between a planet and a brown dwarf," notes Kulkarni.

The presence of methane in the object's spectra has grabbed the attention of astronomers. If the body were a star, its intense heat would have destroyed the methane. "To my mind, the big difference [between this and previous brown dwarf candidates] is the apparent presence of methane," notes Jonathan I. Lunine of the University of Arizona. Other candidates, he says, are much more massive and straddle the line between star and brown dwarf. "It's been a long struggle to find a brown dwarf, and this is the clearest example," says Burrows.

— R. Cowen

Electric signals may herald earthquakes

After years of intense skepticism, U.S. researchers are starting to take more seriously the work of a Greek physicist who claims to make successful earthquake predictions by detecting electric signals from the ground.

"We became so intrigued because we just can't dismiss it," says seismologist Thomas V. McEvilly of the University of California, Berkeley, who organized a workshop in Berkeley last week to discuss electromagnetic methods of predicting quakes.

The meeting focused on the work of Panayiotis Varotsos, a solid-state physicist at the University of Athens and a lightning rod in the field of earthquake research. In 1983, Varotsos and two colleagues started setting up observation stations in Greece to catch potential quake precursors, using a technique called the VAN method. He claims to have predicted 10 of the 14 strong earthquakes that have hit Greece in the last 9 years, including three powerful shocks this summer.

The recent tremors caught the attention of McEvilly and U.S. scientists because Varotsos faxed his predictions to 29 institutes outside Greece before the quakes hit on May 4, May 13, and June 15. The last one caused considerable damage and killed 26 people.

The predictions impressed some researchers, such as physicist Antony C. Fraser-Smith of Stanford University, who studies electromagnetic activity in California in hopes of detecting prequake changes. "I'm not sold on the VAN method, but [Varotsos] is becoming much more credible. Although he didn't hit the earthquakes exactly right, he was close," says Fraser-Smith.

Varotsos has set up stations at seven locations known to be sensitive to prequake changes in Earth's electric field. According to Varotsos, rocks subjected to increasing stress will release electric signals weeks before they fracture during a quake. Each station responds only to particular geographic regions. When a station catches an unusual electric signal, Varotsos says, he can identify the likely epicenter of the upcoming shock.

Detractors reject Varotsos' claims of successful predictions. "I think the