Extrasolar Planets: Out of the Shadows

Claims that planets exist beyond the solar system have always required a leap of faith. Astronomers haven't seen their quarry but have inferred the existence of distant orbs from the motion of their parent stars (SN: 8/8/98, p. 88). Now, the planets take on a more vivid reality. Two teams recently detected the shadow cast by a planet passing in front of the sunlike star it orbits.

"We're no longer doing voodoo science," says R. Paul Butler of the Carnegie Institution of Washington (D.C.), a member of one of the discovery teams. "This is a real planet with a real mass."

"This is another major milestone," adds Carnegie theorist Alan P. Boss.

A few months ago, researchers gathered evidence that the sunlike star HD 209458, just 150 light-years away in the constellation Pegasus, harbors a planet. They found that the star exhibits a slight wobble in its motion along the line of sight to Earth. This wobble suggested that a planet with at least 63 percent the mass of Jupiter whips around the star every 3.52 days.

On Nov. 5, one of the two teams that tracked the star's back-and-forth motion shared its findings with a colleague, Gregory W. Henry of Tennessee State University in Nashville. Two days later, at Fairborn Observatory in southern Arizona, Henry trained a small robotic telescope on the star. He did so during the time that the team had predicted the planet might pass in front of HD 209458, briefly blocking some of the starlight from reaching Earth.

Seen from Earth, a planet can pass in front of its parent star once per orbit—but only if the orbital plane is aligned edge on with Earth. As luck would have it, this planet has that alignment, Henry found. Although the brightness of HD 209458 doesn't normally vary, it appeared to dip by 1.7 percent on Nov. 7.

Henry and his colleagues report that the planet is immense, with a radius 1.6 times Jupiter's. The orbit's alignment with Earth indicates that the previously estimated minimum mass is the planet's actual mass. Henry, Butler, Geoffrey W. Marcy of the University of California, Berkeley, and Steven S. Vogt of UC, Santa Cruz detail the findings in a Nov. 12 circular of the International Astronomical Union.

The planet's girth reveals that, like Jupiter, the object is gaseous rather than solid. In agreement with theoretical models, its proximity to its parent star exposes the planet to intense heat and radiation, which keeps it puffed up like a hot-air balloon, notes Adam S. Burrows of the University of Arizona in Tucson.

Clouds prevented Henry from seeing a second dip in starlight on Nov. 14. The star will go behind the sun in a few weeks and won't be visible until next spring. SCIENCE NEWS has learned, however, that another team observed the dimming on Sept. 8 and Sept. 15.

Artist's depiction of planet passing in front of the star HD 209458.

David Charbonneau of Harvard University and Timothy M. Brown of the High Altitude Observatory in Boulder, Colo., used a small telescope to measure brightness. Brown told SCIENCE NEWS that the observations are consistent with the passage of a planet but said he would not provide other details until his team's report has been accepted by a journal.

"I've looked at the data, and let me tell you, they are beautiful," says David W. Latham of Harvard. Last August, after he and his colleagues had observed the star's wobble, Latham suggested that Charbonneau look for a telltale dimming.

Astronomers now have a wish list of new studies. For instance, notes Butler, when the planet moves in front of the star, some of the light from HD 209458 on its way to Earth passes through the planet's atmosphere. The star's spectrum thus contains an imprint of the orbiting body. If researchers manage to tease out that information, they can find out what the planet is made of. *—R. Cowen*

DNA furnishes tips to mental retardation

Rearrangements at the ends of chromosomes, so subtle that they have eluded conventional genetic screening techniques, represent one of the most common causes of moderate to severe mental retardation, a new study finds.

The discovery raises prospects for better understanding some of the 40 percent of such cases in which no cause can be determined, contends a team led by geneticist Samantha J.L. Knight of John Radcliffe Hospital in Oxford, England.

"We suggest that subtle chromosomal rearrangements are the second most common cause of moderate to severe mental retardation after Down's syndrome," the team concludes in the Nov. 13 LANCET.

The newly identified DNA rearrangements often run in families, underscoring the need for genetic screening of children who have mental handicaps of unknown origin, the researchers hold.

Knight and her colleagues developed a laboratory technique for finding rearrangements of unusually short stretches of DNA, which usually elude standard probes. A pilot study employing the new method suggested that changes on chromosome tips often occur in children with unexplained mental retardation.

The researchers then examined chromosome ends in 284 children with moderate to severe, unexplained mental retardation. All the youngsters had IQ scores lower than 50, though their parents had normal IQs. The team also conducted genetic analyses of 182 children with unexplained mild mental retardation (IQ scores between 50 and 70) and 75 men with IQ scores in the normal range (between 90 and 110).

Subtle chromosome rearrangements had occurred in 21 children with a moderate to severe mental handicap, a frequency of 7.4 percent. Only one mildly retarded child, for a frequency of 0.5 percent, and none of the controls displayed these DNA alterations.

Further testing established that for 10 of the 22 mentally retarded kids with chromosomal rearrangements, the mother or father exhibited a pattern of chemical reshuffling along a chromosome end. It differs from the child's abnormality. These parents may possess DNA characteristics that translate into mental retardation for some of their offspring, the scientists propose.

Moreover, in 9 of the 10 families, siblings and other relatives with mental retardation also displayed signature alterations along chromosome tips.

Genetic testing with the new technique will improve counseling for retarded people harboring subtle chromosome changes and their families, comment geneticists John L. Hamerton and Leonie Stranc of the University of Manitoba in Winnipeg in the same journal. *—B. Bower*