51 Pegasi: A star without a planet?

In the hearts and minds of many astronomers, the universe teems with stars executing tiny pirouettes, pulled to and fro by unseen planets. That vision, buoyed by the indirect detection of at least eight planets orbiting sunlike stars, may prove correct, but a controversial new report states that the first such planet simply isn't there.

That's the contention of David F. Gray of the University of Western Ontario in London, who argues in the Feb. 27 NATURE that the nearby star 51 Pegasi, similar in mass to the sun, doesn't wobble back and forth, as Swiss astronomers had reported. Moreover, he suggests reevaluating three other planet finds.

In 1995, Michel Mayor and Didier Queloz of Geneva Observatory reported that certain wavelengths of light absorbed by 51 Pegasi shifted periodically to redder and bluer wavelengths, as if the star were receding from and approaching Earth every 4.2 days. They ascribed this motion to the tug of an unseen planet about half the mass of Jupiter orbiting the star more closely than Mercury orbits the sun. Geoffrey W. Marcy and R. Paul Butler, both of San Francisco State University and the University of California, Berkeley, confirmed the finding (SN: 10/21/95, p. 260).

After examining the star's spectra with a higher-resolution instrument, Gray concluded that a more subtle characteristic—the shape of an absorption peak—varies along with the periodically shifting wavelength. Astronomers do not think a planet would change the shape of a spectral peak.

Gray proposes that only something intrinsic to the star—most likely large-scale oscillations of gas at its surface—can account for both the periodic change in the geometry of the spectral peak and the previously detected shift in wavelength. The two other teams, he says, were fooled by the star's complex oscillations, which mimic the wobble a planet might have induced.

"The variation in the spectral [peak] torpedoes the planet hypothesis," asserts Gray.

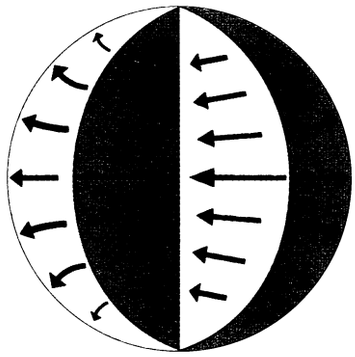
Not surprisingly, the codiscoverers of the unseen planet rank among the harshest critics of Gray's study, devoting two Internet Web sites to their rebuttal.

They argue that pulsations of 51 Pegasi, even if they occur as flows of gas along the star's surface rather than radial contractions and expansions, should be accompanied by small changes in brightness, which have never been observed. They note that astronomers have never found a 4.2-day oscillation in a sunlike star. Moreover, it is not clear why a star should oscillate at only one frequency, whereas a plucked violin string or a ringing bell has several overtones. Finally, a tightly orbiting planet could conceivably drive gas flows on the star's surface.

Gray admits that the type of oscillation he believes 51 Pegasi must undergo is unique among the 100 or so sunlike stars astronomers have studied, but he says that highly detailed studies of stellar vibrations have not been conducted. He adds that the spectra for the three other stars that seem to have planets with short periods should be reexamined.

Planet hunter Gordon A.H. Walker of the University of British Columbia in Vancouver notes that Gray's conclusion, obtained by combining 39 measurements spread out over 8 years, is "not highly significant" but adds that there seems to be a clear periodicity in Gray's 1996 observations, which represent the largest cluster of data.

"There's been a lot of emotion about this paper, and that troubles me, since some seem to forget that this is the scientific process," says Gray. "You set up a testable hypothesis and then someone tests that hypothesis." —*R. Cowen*



Model of the gas oscillations that may occur across sectors of the surface of 51 Pegasi. Near the edge of the star, such motions could be observed from Earth and interpreted as a wobble.

Mud time line clarifies dinosaurs' demise

A 16-inch core of mud tells the clearest story yet of how life on Earth suffered after a comet or meteor slammed into the planet about 65 million years ago, reports a team of oceanographers. Scientists drilled the sample from the ocean bed about 320 kilometers east of Jacksonville, Fla., earlier this year and reported their findings last week in Washington, D.C.

"This is the most significant discovery in geosciences in 20 years," says Robert W. Corell of the National Science Foundation in Arlington, Va., the primary funder of the expedition. Corell says that the sample ends the debate about what killed the dinosaurs.

That debate began in 1980, when scientists from the University of California, Berkeley discovered evidence that a chunk of rock the size of Manhattan slammed into Earth at the end of the Cretaceous period. At that time, an estimated 70 percent of Earth's species went extinct (see p. S20). The theory that the impact caused the mass extinction gained momentum after researchers discovered a 200-km-wide crater buried beneath the tip of Mexico's Yucatán Peninsula (SN: 3/5/94, p. 156).

The new mud core displays the entire time line of the catastrophic event with a clarity never seen before, says Richard D. Norris, a geologist at the Woods Hole (Mass.) Oceanographic Institution and a codirector of the recent expedition, which was part of the Ocean Drilling Program. Earlier samples showed only some of the layers, often damaged by erosion, currents, or waves.

"We've had the pieces of the puzzle for a long time," Norris says. "This puts all the pieces together in one package."

From the thickness of the fossil-poor layer above the impact debris in the new core, Norris estimates that 5,000 years passed before life recovered.

Although excited about the find, Gerta Keller, a paleontologist at Princeton University, says Corell's evaluation contains "a lot of hyperbole." Until researchers perform chemical tests on the sample, she says, the findings will add little to scientists' understanding.

Virgil L. Sharpton, a geologist with the Lunar and Planetary Institute in Houston, agrees that the finding's importance may be "overstated" but adds that it may clarify events following the impact. Overall, Sharpton calls the findings more evolutionary than revolutionary. "They will answer a few things and cause a few more to be asked." —*P. Smaglik*

The fossil-rich, white layer at the bottom of the mud core shows material before the impact. The gray-green section contains impact debris, and the reddish stripe contains iron-rich remains of the asteroid or comet. The next layer shows few fossils, while the topmost shows an abundance again.