

Two Extrasolar Planets May Hold Water

They'd been hunting for planets since 1987, but last October, Geoffrey W. Marcy and R. Paul Butler moved into the fast lane. That's when they confirmed another team's landmark finding of an unseen planet circling the ordinary, sunlike star 51 Pegasi (SN: 10/21/95, p. 260).

From that point on, Marcy, of San Francisco State University, and Butler, of San Francisco State and the University of California, Berkeley, have run their search in high gear. Working 14-hour days to crunch their data on six high-speed computers, the astronomers hoped that at least 1 of the first 60 stars in their 120-star survey would exhibit the wobble characteristic of a planet's tug.

Last week, their work had a double payoff.

At a meeting of the American Astronomical Society in San Antonio, Marcy announced before a standing-room-only crowd that he and Butler have discovered two new, unseen planets orbiting nearby stars. One of the planets, nicknamed Goldilocks, lies at just the right location from its parent star—not too close and not too far—for liquid water to exist on its surface. The other body might contain liquid water but only in its atmosphere. Water is thought to have hastened the development of life on Earth.

The astronomers found the two new planets around sunlike stars—70 Virginis in the constellation Virgo and 47 Ursae Majoris in Ursa Major, also known as the Big Dipper. Although both stars are visible to the naked eye, the planets are too small, and thus too faint, to be seen against the glare from the parent bodies. The researchers used an indirect technique—measuring small shifts in wavelengths of light emitted by the stars—to find evidence of the planets.

Marcy and Butler monitored the motion of 120 stars, including 70 Virginis and 47 Ursae Majoris, for more than 7 years with a spectrograph mounted on a 120-inch telescope at Lick Observatory on Mount Hamilton in California. A recent computer analysis revealed that light emitted by the two stars appears alternately redder and bluer, indicating that they move back and forth along the line of sight to Earth. In each case, says Marcy, the wobbles describe a nearly perfect sine curve—a motion so periodic that only an unseen object pulling the star toward and away from Earth can account for it.

Coming on the heels of the discovery of a planet orbiting 51 Pegasi, the latest findings are ushering in a new era in the search for extrasolar planets, astro-

mers say. "It's almost like the second coming of Marco Polo or Columbus. We're finding new worlds," says William J. Borucki of NASA's Ames Research Center in Mountain View, Calif.

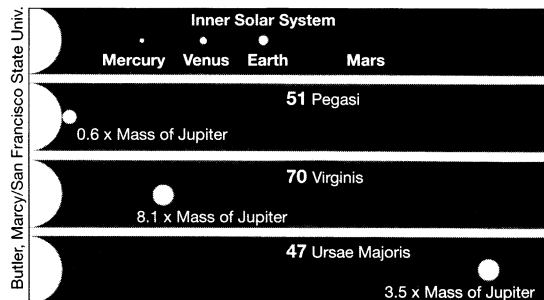
"After the discovery [the planet circling] of 51 Pegasi, everyone wondered if it was a freak, a one-in-a-million observation," says Marcy. "The answer is no. Planets aren't rare after all."

Marcy and Butler report that the body orbiting 47 Ursae Majoris has a mass about three and one-half times that of Jupiter. Circling the star at about twice the distance of Earth from the sun, the planet takes roughly 3 years to complete one revolution. "This almost smells like a planet that formed in our solar system," Marcy says. The surface temperature of the planet would be a chilly -90°C, but its atmosphere could contain liquid water, the astronomers calculate.

In contrast, the unseen object orbiting 70 Virginis has a mass about eight times that of Jupiter. Its orbit lies, on average, less than half Earth's distance from the sun. The body has a surface temperature of 83°C, roughly the same as tepid tea. "This planet could conceivably have rain or even oceans," Marcy says.

That's not to say that such a planet could sustain life as we know it. Assuming that the body has a solid surface, its enormous gravity and high pressure would prove literally crushing.

Moreover, the data indicate that this planet has a highly elliptical orbit. Because of its gravity, a massive planet on an elliptical path tends to destabilize the paths of nearby planets. Thus, 70 Virginis is unlikely to possess an array of orbiting bodies akin to our solar system, notes David C. Black, director of the Lunar and Planetary Institute in Hous-



The relative locations of planets in our solar system and the newly discovered planets orbiting 51 Pegasi, 70 Virginis, and 47 Ursae Majoris.

ton. However, notes Butler, if the planet has a moon, that smaller body might support life.

Butler speculates that the body orbiting 70 Virginis may belong to a new class of objects—superplanets, which have a mass greater than that any planet in our solar system and less than that of failed stars, known as brown dwarfs.

Alan P. Boss of the Carnegie Institution of Washington (D.C.), puts a different spin on the findings. He notes that the process of planet formation, in which material accumulates from a dusty disk rotating around a star, does not permit a massive planet to have an elliptical orbit. Therefore, he asserts, the object circling 70 Virginis is a brown dwarf.

In fact, Boss maintains, the object circling 70 Virginis is undoubtedly the lowest-mass brown dwarf ever found, and the object circling 47 Ursae Majoris is the most massive planet known.

"My hat's off to them [Marcy and Butler]," says Boss. "They set two new records in one news conference."

—R. Cowen

Debating BST 'til the cows come home

Milk from cows receiving a drug that boosts their milk production puts people who drink it at greater risk of developing breast and colon cancer, contends a new report by a long-time opponent of the drug.

The Food and Drug Administration continues to consider the milk safe, an agency spokesperson said this week in response to the allegations.

In November 1993, the FDA approved the sale of milk from cows treated with recombinant bovine somatotropin (rBST), a genetically engineered version of a naturally occurring growth hormone. Most dairy products sold in the United States now include at least some milk

from rBST-treated cows.

Samuel S. Epstein, a physician at the University of Illinois at Chicago School of Public Health, has reviewed 66 studies relating to rBST milk and concludes that they "raise very significant questions about the carcinogenic risks" of the liquid. He spoke this week in Washington, D.C., at a press conference organized by the Cancer Prevention Coalition, which he chairs, and Food & Water, a consumer group in Walden, Vt.

Officials from FDA and Monsanto Co., which produces the drug, accuse Epstein of rehashing concerns he raised in 1994, which they reviewed and disputed at the time. Epstein's report includes no origi-

nal data and cites no references published after 1994.

Studies show that milk from cows treated with rBST has a high concentration of insulinlike growth factor-1 (IGF-1), Epstein asserts. Furthermore, he argues, IGF-1 can increase humans' risk of developing breast and colon cancer. The protein occurs naturally in human blood and milk.

Among the studies Epstein reviewed are summaries released by FDA of six unpublished industry reports. They show that the concentration of IGF-1 in rBST milk ranges from 25 to 70 percent above the amount in milk from untreated cows, Epstein reports in the January *INTERNATIONAL JOURNAL OF HEALTH SERVICES*. Moreover, many studies used "flawed analytic techniques that underestimate IGF-1 levels . . . resulting in a potential 40-fold underestimate." Pasteurizing milk increases the IGF-1 content by 70 percent, he says.

Epstein cites studies suggesting that IGF-1 stimulates the growth of both normal and cancer cells. Evidence of its involvement in breast cancer comes from reports that blood and malignant tissue of breast cancer patients have high concentrations of IGF-1.

Epstein links IGF-1 to gastrointestinal cancer, citing laboratory studies that the protein, in amounts equivalent to those occurring in milk from untreated cows, stimulates the proliferation of intestinal cells. Adding IGF-1 therefore increases the possibility that milk will cause normal and cancer cells to divide in the human gastrointestinal tract, Epstein argues. Unlike most proteins, IGF-1 reaches the gut intact, without being broken down into amino acids, he claims.

"This is déjà vu all over again . . . it's amazing how many ways [Epstein] can try to say the same thing," asserts FDA spokesman Don McLearn.

"To raise unsubstantiated fears in people's minds is irresponsible," says Gary F. Barton, director of biotechnology communications for Monsanto in St. Louis.

IGF-1 "in human breast milk is at about the same concentration as that found in bovine milk" from treated and untreated cows, FDA's Richard H. Teske wrote Epstein in March 1994. Newer studies also show that milk from cows treated with IGF-1 does not have a high concentration of the protein, argues Stephen F. Sundlof, director of the FDA office that approved the drug.

Even if the milk had extra IGF-1, it wouldn't pose a risk, contends Sundlof. He disputes Epstein's claim that IGF-1 survives in the intestine. Moreover, other proteins in human blood would bind to and inactivate most IGF-1 that entered the bloodstream, he holds.

"There is no evidence that IGF-1 induces the malignant transformation of normal breast cells," Teske's letter argued. No such evidence has surfaced since 1994, Sundlof adds. — *T. Adler*

Science Talent Search names 40 finalists

Forty high school students have been selected to compete for \$205,000 in scholarships in the 55th annual Westinghouse Science Talent Search.

The finalists, chosen from 1,869 entrants at 735 high schools in the United States, plan to attend the Science Talent Institute from March 6 to 11 in Washington, D.C. There they will be awarded scholarships ranging from \$40,000 to \$1,000 at a ceremony on March 11.

The number of entrants this year ranks as the second-highest in the competition's history, surpassed only by the 2,075 students who competed in 1970. During the final judging in March, the finalists are scheduled to undergo intensive interviews by a panel of 12 scientists, including J. Richard Gott, an astrophysicist at Princeton University, and Dudley R. Herschbach, a chemist at Harvard University and 1986 Nobel laureate.

While the projects range widely across the sciences, including astronomy, medicine, and the social sciences, biology proved the most popular field among finalists, with seven entries. Mathematics ranked second, with five projects, and physics yielded four.

The 25 male and 15 female finalists, ranging in age from 16 to 18, represent 2.1 percent of total competitors and hail from 34 U.S. cities in 12 states.

This year's competition attracted high school seniors from all 50 states, the District of Columbia, and Puerto Rico. New York State produced the largest number of winners, with 16 finalists, 5 of whom live in New York City. California produced six finalists, and Virginia turned out four.

Stuyvesant High School in New York City yielded four finalists, the largest number for a single high school this year. It was followed by Stanton College Preparatory School in Jacksonville, Fla., which produced two.

"I am continually impressed with the caliber of work presented by these young scientists," says Alfred S. McLaren, president of Science Service, Inc., which in partnership with the Westinghouse Foundation has conducted the competition since 1942. "Their enthusiasm for learning and their dedication to finding scientific solutions to the complex situations that face us nationally and internationally should reassure us all that these truly will be leaders and teachers of tomorrow."

Among previous finalists, five have gone on to win Nobel prizes, and two have earned the Fields Medal, the highest honor in mathematics.

The 40 finalists are:

● California: Matthew Brian McCann, Alhambra H.S., Alhambra; Grace I-Chen Liu, Edison H.S., Fresno; Kevin Alfred

Shapiro, North Hollywood H.S., North Hollywood; Christopher Chung-Tien Chang, Henry M. Gunn Senior H.S., Palo Alto; Connie Jean Ing, Saratoga H.S., Saratoga; Susan Jean Shaw, Villa Park H.S., Villa Park.

● Florida: Matthew David Graham and Vezen Wu, Stanton College Preparatory School, Jacksonville.

● Maryland: Mani S. Mahjouri, Atholton H.S., Columbia; Jacob Lurie, Montgomery Blair H.S., Silver Spring.

● Massachusetts: Rachel Stanley, Newton South H.S., Newton Center; Brian Palmer Hafler, Roxbury Latin School, West Roxbury.

● Michigan: Chandan Gopal Reddy, Detroit Country Day School, Beverly Hills.

● New Hampshire: Simon Joseph DeDeo, Phillips Exeter Academy, Exeter.

● New Jersey: Daniel Paul Weitz, Morristown H.S., Morristown.

● New York: Juliette Lee Taska, Lawrence H.S., Cedarhurst; Michelle Anne Schaffer, Commack H.S., Commack; Sidney Hsiao-Ning Chang, Half Hollow Hills H.S. East, Dix Hills; Michael Christopher Boyer, Manhasset Junior-Senior H.S., Manhasset; John Joon Tae Cho, Hericks Senior H.S., New Hyde Park; Ofra Biener, Townsend Harris H.S./Queens College, New York; Andre Michael Bishay, Bronx H.S. of Science, New York; Dmitry L. Sagalovskiy, Brooklyn Technical H.S., New York; Aaron Michael Einbond, Hunter College H.S., New York; Flora Fan Zhang, La Guardia H.S. of Music and Art, New York; Bruce Mizrahi Haggerty, Dudley William Lamming, Ting Luo, and James Park, Stuyvesant H.S., New York; Elizabeth Pollina, Ward Melville H.S., Setauket.

● Rhode Island: William David Garrahan, Bishop Hendricken H.S., Warwick.

● South Carolina: Andrew Cottrill Campbell, Spartanburg H.S., Spartanburg.

● Texas: Andrew MacGregor Childs, Texas Academy of Math & Science, Denton; Gregory M. Budunov, Smithville H.S., Smithville.

● Virginia: Paulina Susan Kuo, Thomas Jefferson H.S. for Science & Technology, Alexandria; Brian Michael Green, Yorktown H.S., Arlington; James Stevenson Clark IV, Rappahannock County H.S., Sperryville; Katherin Marie Slimak, West Springfield H.S., Springfield.

● West Virginia: Naomi Sue Bates, Franklin H.S., Franklin; Bonnie Cedar Welcker, Parkersburg South H.S., Parkersburg. — *R. Lipkin*