ASTRONOMY

Intruder in a Star's Dust Glimpsed

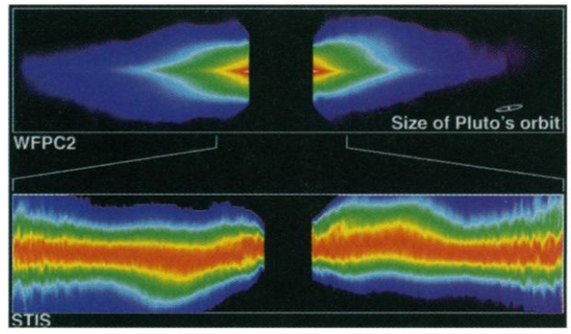
WASHINGTON, D.C.—Astronomers may have detected hints of a newborn planet in its dusty nursery around a nearby star. Images from the Hubble Space Telescope reveal pronounced warps in a dramatic disk of dust circling Beta Pictoris, a young star 63 light-years away. Researchers who unveiled the images here at a meeting of the American Astronomical Society last week said the bulges may betray the existence of at least one planet. But others suggested that gravitational nudges from a passing star or a large dim companion, such as a brown dwarf, might account for the distortions.

Astronomers first spotted a dusty veil girdling Beta Pictoris in 1984 in images from IRAS, an infrared satellite. The disk, seen from Earth nearly edge-on, may have provided the ingredients for planet formation. In September 1997, Hubble's new STIS spectrograph blocked the harsh light of Beta Pictoris to probe the disk in great detail—thereby spying features as close to the star as the orbit of Uranus around the sun, some 60% closer than a 1995 Hubble study that spied tentative signs of the warping.

Based on Hubble's 1995 observation, researchers had speculated that a planet might be perturbing the disk, but others suggested that strong radiation pressure from the star was at work instead. Astronomer Sally Heap of NASA's Goddard Space Flight Center in Greenbelt, Maryland, says that asymmetric bulges seen in the innermost part of the disk in the new image now rule out that scenario and favor a planet, circling Beta Pictoris in an orbit slightly inclined to the plane of the disk. The planet could range in size from 10 times the mass of Earth to 17 times the mass of Jupiter, depending on its distance from the star.

Astronomer Fred Bruhweiler of the Catholic University of America in Washington, D.C., a member of the observing team, isn't convinced about the planet. "I don't think it's quite that tied down yet," he says. Bruhweiler points to warpings of the disk at much greater distances from the star—as far out as 20 times Pluto's distance from the sun. Those could not possibly arise from a planet in a tight orbit, he claims. Bruhweiler prefers a disturbance on a much grander scale, from either a star that swung by Beta Pictoris but has long since disappeared or an invisible companion dwarf star.

Astronomer Sergio Fajardo-Acosta of the University of Denver notes that Heap's and Bruhweiler's deductions are not mutually exclusive. Different phenomena could distort different parts of the disk, he says. But Fajardo-Acosta also urges his colleagues not to rule out unevenly distributed clumps of matter within the disk itself or other sources of asymmetry, such as dense clouds of young comets. Theoretical models of the various proposals should eventually help astronomers decide whether a planet does indeed lurk in the dusty disk of Beta Pictoris.



A. SCHULTZ (CSC/STSCI) AND S. HEAP (GSFC/NASA)

Warped by a planet? A false-color view of the Beta Pictoris disk extends to a radius smaller than that of Uranus's orbit.

–Robert Irion

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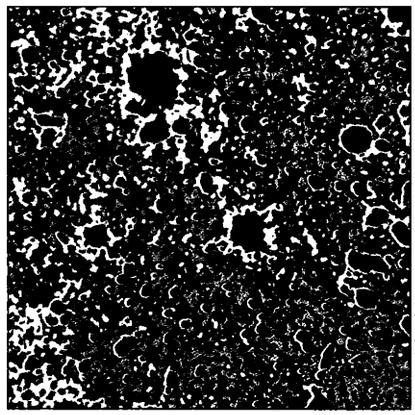
ASTRONOMY

Hubble Sees All the Light There Is

WASHINGTON, D.C.—The most penetrating view of the cosmos ever, recorded by the Hubble Space Telescope, may have revealed nearly all sources of visible light in the universe. At a meeting of the American Astronomical Society here last week, astronomers announced an analysis suggesting that little if any light shines from just beyond the Hubble Telescope's range of vision. However, many galaxies may be veiled from Hubble's view by far-off dust clouds—an idea supported by other results reported at the meeting.



M. S. VOGELEY/PRINCETON UNIVERSITY OBSERVATORY

Baring all. This Hubble image, shown in false color, captures nearly all visible galaxies.

Hubble's 2-week-long exposure in 1995, called the Hubble Deep Field, captured a rich panoply of distant galaxies freckling a tiny and seemingly barren patch of the sky. The field's faintest galaxies are billions of times less luminous than what the human eye can see. Even so, astronomers wondered whether a bigger telescope or a longer exposure would reveal countless more glowing islands of visible light in the universe's deep recesses. The discovery of more galaxies shining in the very distant universe, when it was a fraction of its current age, would affect theories that describe when and how the earliest stars and galaxies took shape after the big bang.

To address those doubts, astronomer Michael Vogeley of the Princeton University Observatory explored the blank spaces within part of the Hubble Deep Field. If fainter galaxies exist in great numbers, Vogeley reasoned, they should create subtle but detectable "ripples" of visible light between the brighter galaxies. But his rigorous statistical analysis uncovered no such ripples. "An infinitely long exposure with Hubble would find, at most, only a few percent more light at optical wavelengths," Vogeley says.

Still, many other galaxies may be hiding behind veils of dust, which sops up their light and converts it to infrared radiation. Astronomers also announced at the meeting that a NASA satellite called the Cosmic Background Explorer found a surprisingly bright infrared glow across the entire sky—evidence that dust hides more distant galaxies than previously believed (*Science*, 9 January, p. 165). "We thought the Hubble Deep Field had showed us most of the objects that emit light in the universe," says cosmologist David Spergel of Princeton University. "But nature is telling us, 'No, it hasn't.' "

Nevertheless, theorists believe Vogeley's work will help refine current models of galaxy evolution—at least until future telescopes can census the additional dust-shrouded galaxies. As astrophysicist Neil deGrasse Tyson of the American Museum of Natural History in New York City put it: "We now have added confidence that few galaxies are missing when we look to the sky with our most powerful optical telescopes."

–Robert Irion