

directions from a young star called PV Cep. The launching points of three pairs of jets appeared to trace backward toward a young cluster about 30 light-years away, a long way for a newly fledged star to travel.

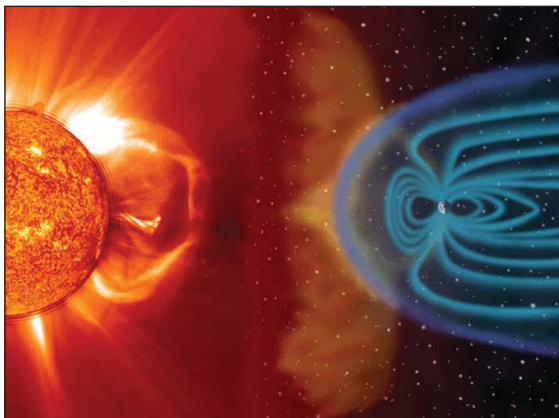
When the researchers reconstructed the star's path, they deduced that it has zipped through space for 500,000 years at 22 kilometers per second, a rate Goodman calls "bizarrely fast." She thinks a gravitational slingshot interaction with another star rifled PV Cep out of its gas cloud before it finished forming, blasting a visible dark gap in the nebula as it exited.

Goodman's evidence is compelling, says astronomer Ray Jayawardhana of the University of Michigan, Ann Arbor. "We need to pay more attention to the dynamics of star formation," he notes—an assessment that might well apply to all three extreme scenarios.

A Hot Jupiter Sears Its Parent Star

Stars are typically thousands of times more massive than the planets they spawn, even if the offspring are Jupiter-sized behemoths. But one planet has overcome its size disadvantage to create a visible mark on its parent star, astronomers reported. The hot scar, probably sparked by a magnetic interaction, should allow theorists to gauge the strength of the planet's magnetic field. "This opens a completely new realm of extrasolar planetary physics," says theorist Manfred Cuntz of the University of Texas, Arlington.

Cuntz and two co-authors predicted 4 years ago that tightly orbiting giant planets—so-called hot Jupiters—could create a noticeable reaction in their stars' atmospheres via magnetic forces or tidal attraction. Cuntz recalls that some researchers dismissed the notion, objecting that random fluctuations from stars would mask such sig-



Feel the burn. Magnetic interactions between a giant planet and its star trigger a hot spot on the star's surface.

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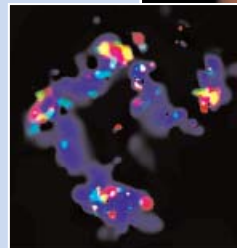
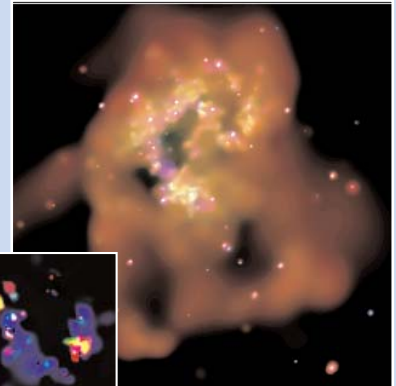
Snapshots From the Meeting

Solar sibling. A faint star in the constellation Scorpio is a dead ringer for our sun, a team of astronomers from Villanova University in Pennsylvania reported. The star 18 Scorpii, about 47 light-years away and barely visible to the eye, shares the sun's mass, temperature, chemical composition, rotation speed, and age. The star's level of activity from sunspots, as gauged by ultraviolet and x-ray emissions, also looks similar to the sun's. Astronomers will keep monitoring this "solar twin" for unusual outbursts or variations in brightness that could foretell active episodes in the sun's future.

Metal factory. Astronomers have found the richest lode of heavy elements yet seen beyond our solar system. The Chandra X-ray Observatory spied brilliant multi-million-degree knots of iron, magnesium, and silicon within the violently colliding Antennae galaxies. The ongoing crash triggers countless supernova explosions, which forge the hot lodes of metal. In some spots, concentrations of magnesium and silicon are about 20 times higher than in our sun, says astronomer Giuseppina Fabbiano of the Harvard-Smithsonian Center for Astrophysics. Such collisions could build billions of rocky planets in a wave of galactic "rejuvenation," she says.

Galactic loners. Just one of every 10,000 galaxies is truly "isolated" in space. The surprisingly low statistic comes from an analysis of 20 million galaxies in the Sloan Digital Sky Survey. All but 2980 galaxies have a bright neighbor within about 2 million light-years—roughly the distance between our Milky Way and the Andromeda galaxy. The research illustrates that gravity continues to draw most galaxies together, says astronomer Douglas Tucker of the Fermi National Accelerator Laboratory in Batavia, Illinois. Indeed, galaxy mergers are at least four times more common than isolated galaxies in the survey.

—R.I.



Iron rich. X-rays from colliding galaxies (above) reveal pockets of heavy elements (left).

nals. Even so, one team started to search for the effects, led by graduate student Evgenya Shkolnik of the University of British Columbia in Vancouver, Canada.

Shkolnik and her colleagues used the 3.6-meter Canada-France-Hawaii Telescope at Mauna Kea in Hawaii to study five sunlike stars with large, close-in planets. The planets race around their stars every 3 to 5 days in sweltering orbits just 10% of Mercury's distance from the sun. The team examined ultraviolet emissions from the stars for extra light from excited calcium atoms, ionized by disturbances in a layer of hot gas just above the visible surface. Most of the stars varied, but the light from a star called HD 179949 waxed and waned in a regular pattern.

When the team scrutinized the signals, collected during three different observing runs, they realized that the emissions tracked the 3.1-day orbital period of the star's planet. "The hot spot kept pace with the planet in

precise phase for more than a year," Shkolnik says. At 400°C hotter than the gas around it, the bright patch emits extra light revolving at a faster rate than the star's 9-day rotation speed.

Cuntz believes that the inverse sunspot arises from constant entanglement between lines of magnetic force from the star and the planet, which should have a Jupiter-style magnetic field. This connection may resemble the impulsive magnetic events on our sun that launch flares, Cuntz says, but the details require new physics to grasp. His group is trying to calculate the strength of the planet's field, based on the spot's brightness.

Although Shkolnik's team is now hunting for a stronger infrared signal from HD 179949 as confirmation, the initial data convinced astronomer Gibor Basri of the University of California, Berkeley. "There is an example of this in our solar system," he notes. Charged particles from the volcanic moon Io, the innermost of Jupiter's large satellites, trigger radio emissions from Jupiter's magnetic field and even auroras in the planet's atmosphere.

—ROBERT IRION