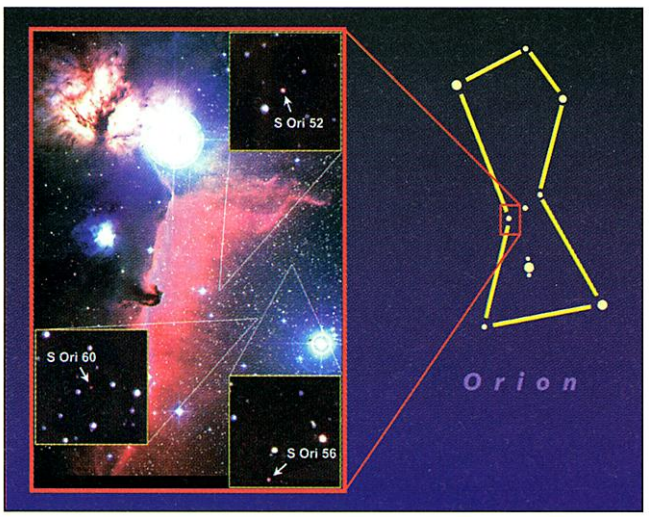
PLANETARY SCIENCE

Giant 'Planets' on the Loose in Orion?

Strange, dim objects in the constellation Orion have left astronomers hunting for words. In a young star cluster perched near Orion's belt, a team at the Astrophysics Institute of the Canary Islands has spotted nearly a score of what appear to be balls of gas several times as massive as the planet Jupiter. Unlike planets, however, the objects —described on page 103 of this issue—are celestial free agents, drifting through the cluster rather than orbiting stars. Astronomers disagree about how they got there and what to call them. Are they "a new kind of giant planet," as their discoverers would have it? Or are they something else entirely —perhaps unusually puny brown dwarfs?



Rogue Jupiters? New observations of a young star cluster in Orion reveal 18 free-floating red objects, including the three shown here, that resemble giant planets with masses five to 15 times that of Jupiter.

Brown dwarfs, objects lighter than 75 times the mass of Jupiter, never grow hot and dense enough to ignite stable furnaces of hydrogen fusion at their cores. Rather, some glow feebly by fusing atoms of deuterium, a heavier and rarer isotope of hydrogen that requires less energy to burn. Below 13 Jupiter masses, dwarfs lack enough heft to sustain even that reaction. Instead, they shed the heat produced by their gravitational contraction until they fade to invisibility.

Recent surveys of other young star clusters indicate that such small objects are common. For example, astronomer Joan Najita of the National Optical Astronomical Observatories in Tucson, Arizona, and her colleagues reported in the 1 October issue of the *Astrophysical Journal* that the cluster IC348 in Perseus is richer in low-mass brown dwarfs than in high-mass ones. The team's Hubble Space Telescope observations captured objects as low as 15 Jupiter masses, but Najita's data hint that the trend continues to even smaller sizes. "The process that makes stars shows no sign of pooping out at these lower masses," she says.

Now, the latest study strengthens that suspicion. The Canary Islands team, led by astronomer Maria Rosa Zapatero Osorio, used long exposures with two Spanish telescopes to find 18 faint, red objects in the Sigma Orionis cluster. The team's analysis suggests that most float freely amid the cluster itself rather than in the background or foreground. Spectra of three of the objects from the Keck telescopes in Hawaii revealed temperatures of 1700 to 2200 kelvin.

Because the Sigma Orionis cluster is so young—just 1 million to 5 million years old, according to other studies—the team calculated that the objects must be very small indeed to have cooled off so quickly from the heat of their formation. By examining three models of how such objects may evolve, the researchers derived a range of five to 15 Jupiter masses for its quarries. "Less massive objects cool down very rapidly and would be too faint for our survey to detect," says Zapatero Osorio, who is now at the California Institute of Technology in Pasadena.

Other astronomers find the detections convincing. But they caution that it's not clear whether the stellar evolution models are valid for such tiny objects. "None of the models have been tested at very low masses and very young ages," says astronomer Gibor Basri of the University of California, Berkeley. If the models are shaky, Zapatero Osorio's objects may not be so lightweight after all.

Large or small, the cosmic rovers still might not qualify as planets. Most astronomers reserve the "p word" for bodies that form within a planetary system and orbit stars, says theorist Alan Boss of the Carnegie Institution of Washington in Washington, D.C. "They should call them 'planetary-mass brown dwarfs,' " says Boss, whose calculations show that, depending on circumstances, clouds of molecular hydrogen may either condense into full-fledged stars or fragment to form dwarf objects as small as three Jupiter masses. The same semantic umbrella should cover all such bodies, he maintains.

However, Basri and theorist Jack Lissauer of NASA's Ames Research Center in Mountain View, California, point out that Boss's way of distinguishing "planets" and "stars" is imprecise, too. Both form in accretion disks, they note. Furthermore, gravitational tugs from other massive planets or stellar interlopers can eject large planets from a system. A few such wanderers might be drifting through Sigma Orionis, Lissauer says. "We won't be able to figure out how every object formed," he notes. "Classifying planets solely on some useful basis like mass or lack of fusion in their cores has some merit."

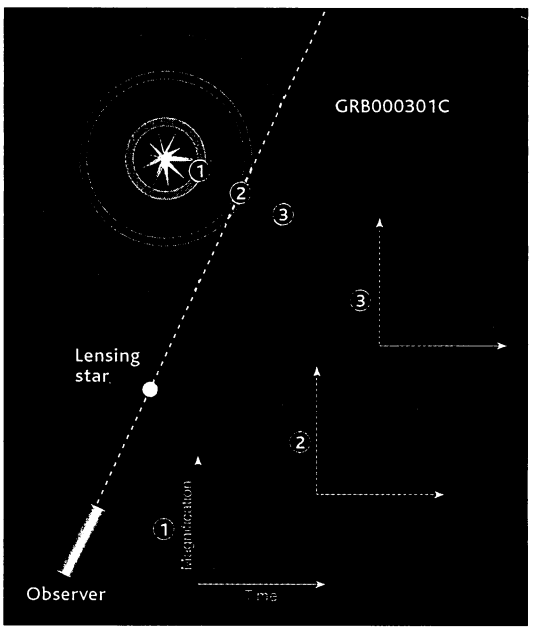
Najita thinks the name debate is inconsequential compared with the science at hand. "We should use observations of all of these low-mass objects to learn new things about how planets and stars form," she says. "That's the real strength of these studies."

–ROBERT IRION

ASTROPHYSICS

Lucky Star Sheds Light On Gamma Ray Burst

Spill a clear drink on this page, and the drops of liquid will magnify the letters into a jumble of swelling arcs and dots. Astrophysicists think an analogous effect deep in space has helped them glimpse a much harder-to-see letter: the expanding O left by the afterglow of a distant gamma ray burst. A well-placed star, they believe, accidentally acted as a telescope, focusing light from the O so that more



Distant lens. An unseen star may have amplified light from gamma ray burst GRB000301C.

CREDITS: (LEFT) GABRIEL PEREZ/INSTITUTO DE ASTROFÍSICA DE CANARIAS; (RIGHT) MODIFIED FROM A. LOEB/HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS