Astronomy

From Austin, Texas, at a meeting of the American Astronomical Society

Solar system planets: Freaks of nature?

The nearly circular orbits of most planets in our solar system may be the exception rather than the rule. Of the 17 known extrasolar planets, the 9 that lie farthest from their parent stars have elongated, egg-shaped paths.

"For the first time, we have enough extrasolar planets out there to do some comparative study," says Geoffrey W. Marcy of San Francisco State University and the University of California, Berkeley.

Marcy suggests that the oval orbits may not bode well for life around these stars. As massive planets in such orbits careen close to their parent stars and swoop back out again, they may sweep aside smaller orbs that circle the same star, including any with Earthlike temperatures. "The big bullies may wipe clean the terrestrial planets, rendering [the systems] void of any Earth analogues," he says.

Astronomers, however, have only been able to detect planets that lie relatively near their host stars, notes William D. Cochran of the University of Texas at Austin. For instance, all nine of the planets with oval orbits venture considerably closer to their parent stars than the distance between Mercury, the solar system's innermost orb, and the sun. It remains unclear whether extrasolar planets that orbit at greater distances also have elongated paths.

Several scenarios may account for the oval orbits. According to one theory, the gravitational tug between two or more massive planets orbiting the same star may propel each into an elongated orbit. Alternatively, the tug of a neighboring star passing close to the planetary system may distort circular orbits into more elongated shapes.

Elongated orbits may also arise as planets form from the material within a disk of gas and dust surrounding a young star. If a massive planet forms wholesale from the disk, rather than little by little, it may end up with an oval orbit (SN: 8/8/98, p. 88).

The eight extrasolar planets with more circular orbits all hug their host stars tightly. Their orbits may have been rounded by the immense gravitational influence of their parents.

The nine planets with elongated orbits include a new find announced by Marcy and his colleagues. The planet is at least five times as massive as Jupiter and orbits the star HD168443. Like the other extrasolar planets, this body is not seen directly. Rather, its presence is inferred from the wobble of its parent star. —*R.C.*

Heavy elements: Signposts of planets?

Stars likely to harbor massive planets have a higher abundance of so-called heavy elements than other stars. That's the conclusion of Guillermo Gonzalez of the University of Washington in Seattle and his colleagues after studying spectra of light from 12 stars whose motions suggest that they possess planets at least as heavy as Jupiter.

Each of the stars has a high abundance of elements—heavier than helium and hydrogen. On average, the stars have two to three times the abundance found in the sun, and one of the stars has the highest amounts of heavy elements of any star examined so far.

The discovery could mean that stars born in clouds of gas and dust rich in heavy elements are more likely than others to spawn massive planets. Alternatively, it could provide indirect evidence of planet migration. In this process, a giant planet moves toward its parent star, causing material that lies between the two—either smaller planets or remnants of the gas and dust from which planets grew—to spiral into the star. Swallowing such material would boost the star's supply of heavy elements.

Either way, notes Gonzalez, a high abundance of heavy elements could be another clue that a star harbors giant planets. —*R.C.*

New radio map of Milky Way's center

From a monster black hole to mysterious filaments of gas, the center of the Milky Way offers astronomers a wide variety of attractions. Now, researchers have produced the largest and most detailed radio-wavelength atlas of the galactic center.

The image is based on a new computer analysis of observations taken a decade ago with the Very Large Array (VLA), a network of 27 radio telescopes near Socorro, N.M. By more accurately accounting for the geometry of this Y-shaped telescope array, astronomers sharpened a previous radio map generated from observations made at a wavelength of 90 centimeters.

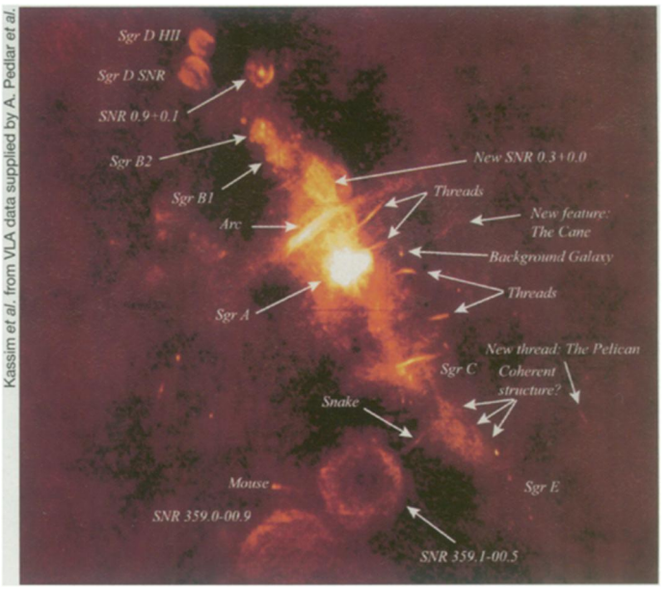
At this wavelength, notes Namir E. Kassim of the Naval Research Laboratory in Washington, D.C., radio telescopes can detect two very different types of emissions: ionized gas heated by hot stars and high-speed electrons accelerated by the strong magnetic fields found at the galactic center.

In the high-resolution map, Kassim and his colleagues found the second-closest supernova remnant to the galaxy's center. Known as SNR 0.3+0.0, the remnant—an expanding shell of gas hurled into space by a supernova explosion—lies about 150 light-years from the Milky Way's core.

Kassim and Dale A. Frail of the National Radio Astronomy Observatory in Socorro discovered a large filament, dubbed the pelican because of its shape when viewed in an enlarged image. At about 1,000 light-years from the center of the galaxy, the pelican is the most distant filament from the core and the only one aligned with the plane of the galaxy. All other filaments are aligned perpendicular to the plane.

Like iron filings, the orientations of the filaments are presumed to trace the direction of the magnetic field at the core. Kassim suggests that the pelican has a different alignment because the galactic magnetic field has changed direction in that outlying region.

Radio astronomers including Kassim are now taking a new set of VLA observations at the 90-cm wavelength. Their goal is to determine if any of the radio sources has changed since the original data were recorded in 1989. Simultaneously, the team is constructing the first radio map ever recorded at a wavelength of 4 meters. Astronomers are hoping that the 4-m map, which should show details not apparent at shorter wavelengths, will turn out to be as important a touchstone for explorers of the galactic center as the 90-cm map has already become. —*R.C.*



Radio atlas of the galactic center.