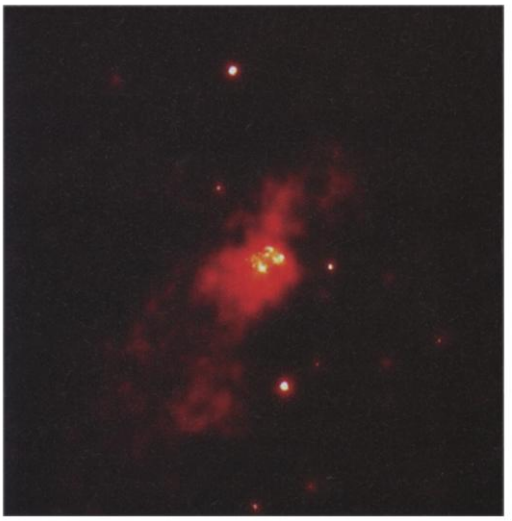
MEETING AMERICAN ASTRONOMICAL SOCIETY

Dust Disks and Black Holes Swell the Cosmic Census

PASADENA, CALIFORNIA—A surprisingly large crowd of 1400 astronomers turned out for the usually quiet springtime meeting of the American Astronomical Society, held here on 3 to 7 June. Apart from the California sun, celestial attractions included a plethora of middleweight black holes and the first discovery of a near twin of our solar system's asteroid belt.



Ubiquitous. Chandra pinpointed several new medium-mass black holes in galaxy NGC 253.

Midsized Black Holes Galore

Like the glint of diamonds in the dust, brilliant pinpricks of x-rays have led three independent teams to a precious discovery: nearly 100 surprisingly heavy black holes in nearby galaxies. A handful of similar objects had been seen before, but the teams never expected to find so many more. They suggest that these so-called intermediate mass black holes could coalesce to form the supermassive black holes thought to inhabit nearly every galaxy.

Black holes once seemed to come in two drastically different varieties. Those in the Milky Way and nearby galaxies had about the same mass as the sun; the rest were at least a million times heavier and lived in galaxies at the distant fringes of the universe. In between, there was nothing. The gaps began to fill in 2 years ago. First, astronomers using the Hubble Space Telescope discovered that the supermassive black holes were common in nearby galaxies too, and every galaxy could harbor one of the dark beasts (*Science*, 1 September 2000, p. 1484). Then, the ASCA x-ray satellite spotted an unusually bright x-ray source in the galaxy M82, thought to come from the superheated gas surrounding a black hole weighing about 100 solar masses. But was it a rarity?

Absolutely not, a chorus of speakers told those attending the meeting. Using images of 40 nearby galaxies taken with the Chandra X-ray Observatory, three teams have brought the count to almost 100. Astrophysicist Kim Weaver of Goddard Space Flight Center in Greenbelt, Maryland, who led one of the teams, argues that these black holes could spiral to the center of the galaxy and coalesce into a supermassive hole. "There is definitely enough material there to do this," agrees Andrew Ptak, an astrophysicist at Carnegie Mellon University in Pittsburgh, who leads a second team.

Not everyone is convinced that the middleweight holes can add up. "You need a lot of 100–solar-mass black holes to make a million–solar-mass black hole," says Nick Scoville, an astronomer at the California Institute of Technology in Pasadena. But then, Chandra has only begun to hunt.

Asteroids Stir Up Planets-to-Be

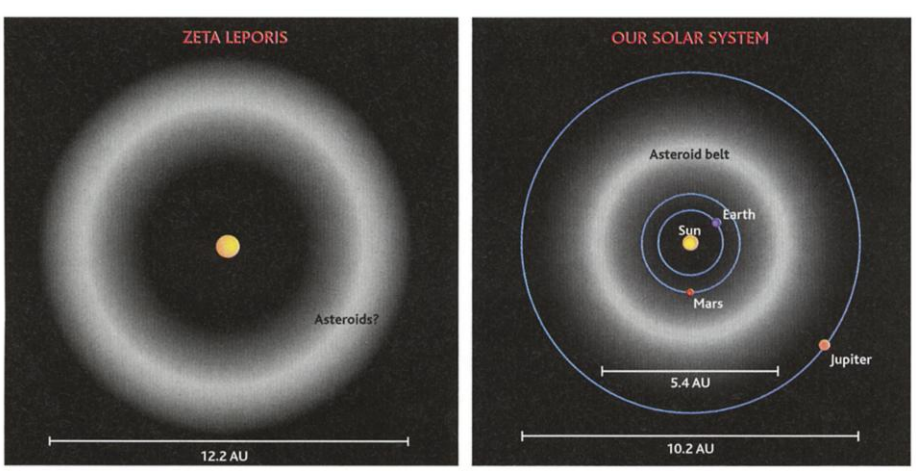
Asteroids are probably kicking up a surprisingly small cloud of swirling dust observed around a nearby star, astronomers report. The protoplanetary disk is the first ever found that is small enough to congeal into a near twin of our solar system—and it may already harbor a Jupiter-sized planet.

Astronomers, at least some of them, think they know how planets form: Chunks of rock orbiting a star in a protoplanetary disk collide and stick together, eventually clearing a path through the disk as most of the rocks in the orbit smack onto the growing planet. Clouds of dust billow out of these collisions and settle into a band of asteroids called a debris disk. In the past 2 decades, astronomers have detected infrared radiation from debris disks around several stars.

All these disks are much larger than the solar system, ranging in size from 70 to 100 astronomical units. (1 AU equals the distance from Earth to the sun.) Dust gets hotter the closer it is to the star, and a 10-year-old series of observations suggested that the dust surrounding zeta Leporis—a younger and slightly heavier version of our sun 70 light-years away—was hot enough to harbor an exceptionally small disk.

Now astronomers Christine Chen and Michael Jura of the University of California, Los Angeles, have snapped a precise photo of the disk. They find a thick disk of dust that extends to within 2.5 AU of zeta Leporis. "Dust usually spirals into a star within 20,000 years," says Chen. And because the first dust clouds would have formed with the star nearly 100 million years ago, Chen and Jura argue that "this disk must be continually replenished by asteroid collisions." They estimate that the zeta Leporis asteroid belt holds 200 times as much mass as the belt between Mars and Jupiter, enough to form a small planet.

At least one planet might already be there. Asteroids start life on circular orbits that rarely collide. The pull of a Jupiter-sized planet could be the instigator that keeps the grinding, planet-forming bumper-car game around zeta Leporis running, says astronomer Mark Sykes of the Steward Observatory in Tucson, Arizona.



Planet seeds. Dust clouds near zeta Leporis *(left)* suggest that the star system harbors an asteroid belt like the one in our solar system *(right)*.

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–MARK SINCELL

Mark Sincell writes from Houston.