Planetary potential surrounds most stars

A new survey of nearby stars has boosted the likelihood that life exists outside our solar system, according to astronomical oddsmakers. What has raised the probability, they say, is the finding that dusty disks swathe a majority of the young stars surveyed. Such a disk encircled the sun, theorists believe, during a crucial phase of planet formation.

The result implies that solar systems may be the norm and not the exception in the universe. "It signals the existence of a very large number of potential abodes of life," says astronomer Frank Drake, president of the SETI Institute in Mountain View, Calif. As a pioneer in the search for extraterrestrial intelligence, or SETI, Drake identified the variables that many scientists now use to calculate the odds of alien life.

Astronomers have no tools to directly observe planets outside our solar system, but they can look for the dust disks associated with planet creation.

Using an orbiting telescope called the Infrared Space Observatory, European astronomers surveyed 84 stars. A disk around a star glows in the infrared because the star warms the disk's dust grains.

The researchers identified the telltale infrared glow in spectra of light emanating from 14 of the stars. The instrument was not equipped to image disks, although other astronomers have used larger telescopes to view them (SN: 8/8/98, p. 91).

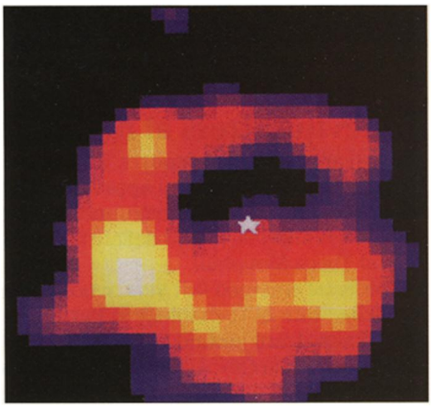
Scientists are surprised not by the disk tally but by the similarity in age among the stars that have disks.

The European astronomers used measurements of distance and brightness to estimate stars' ages, says Harm J. Habing, a member of the team who works at Leiden University in the Netherlands. To obtain these numbers, the team recruited data from other instruments, such as the satellite Hipparcos, which measured how stars' positions in the sky change subtly as Earth orbits the sun.

With their large sample size and age estimates, the European team was able to identify a trend that astronomers had not discerned before: Most young stars have disks, they found, while most older stars don't. The findings, which appear in the Sept. 30 NATURE, also suggest a typical life span for disks. Ninety percent of the stars with disks were less than 400 million years old.

Since stars usually live for billions of years, these results suggest that most of the vast number of middle-age stars may well have had disks in the past. Furthermore, the simplest explanation for the disappearance of the disks is that unseen, nascent planets swept up the dust, says theoretical astronomer Harold F. Levison of the Southwest Research Institute in Boulder, Colo. So, the new observations turn the majority of stars in the sky into candidate solar systems.

Jane S. Greaves *et al.*



A disk of dust surrounds Epsilon Eridani (star), one of the stars examined in the new survey. This false-color image comes from the James Clerk Maxwell Telescope on Mauna Kea in Hawaii. Yellow and red indicate the highest dust densities, purple and black the lowest.

The source of the dust is collisions of comet- and asteroid-size objects, says astronomer Dana E. Backman of Franklin & Marshall College in Lancaster, Pa. Planets build up from softer impacts that permit the chunks to stick together, he says.

Levison hesitates to say that dust disks always signal the creation of planets. Yet he describes the disks as the best available evidence for other Earthlike planets. Of the new study he says, "It tells us that something akin to the planet-forming process is occurring around most stars." —*O. Baker*

Weakling ants cheat by pruning the trees

In the ruthless ant wars that rage through the branches of acacia trees, a perennial loser species holds its own by some nasty pruning, researchers claim.

In a novel defense, an African ant that loses 60 to 80 percent of its overt battles with other species chews off the shoots of the trees it lives in, preventing bridges for invaders, says Maureen L. Stanton of the University of California, Davis.

The trees have evolved adaptations to make them ant-friendly. They produce nectar and swollen thorns that the ants turn into onion-domed chambers. Yet the pruning ant, *Crematogaster nigriceps*, cheats on its host instead of repaying the hospitality, Stanton says. The ant's pruning kills flower buds, effectively sterilizing the tree, she and her colleagues report in the Oct. 7 NATURE.

"Cheating has evolved to let a competitively wimpy species survive," she says. "This isn't the first time we've seen plant-ants cheating," Stanton notes, but in most other cases the evolutionary pressures that turn ants to parasitism "are poorly understood."

Four ant species compete for occupancy of the 2-meter-high *Acacia drepanolobium* trees, which form "a very bizarre, Munchkin forest," Stanton says. After tying branches together to invite tree-to-tree invasion, Stanton's team found that the pruners lost most fights.

"It's total carnage," she recalls. The morning after a battle, dead ants under a tree form a half-inch-thick carpet.

The researchers documented that *C. nigriceps* shapes tree canopies into dense, highly branched masses that don't reach to neighboring trees. Acacia protected from ants for two full growing seasons grew less dense, with 25 percent fewer branches than did trees with unimpeded pruners.

What impresses one biologist about Stanton's study is the impact of the ants' pruning. "You don't think of tree architecture as a result of ant behavior," says Lee Dyer of Mesa State College in Grand Junction, Colo.

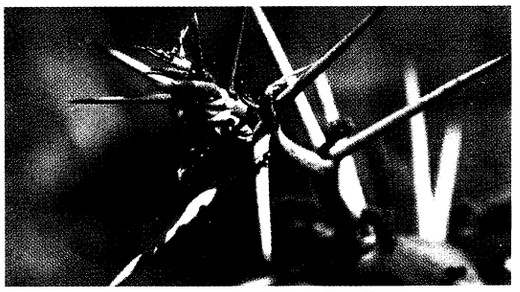
Daniel H. Janzen of the University of Pennsylvania in Philadelphia can think of only one other ant species that prunes its trees. That ant nibbles plants in Nicaragua into snarls dense enough to foil hungry birds.

Janzen wonders about the details of African acacia reproduction. For example, he asks, could an acacia patch actually be one multitrunked clone, well able to sacrifice some flower power? Or is the landscape so crowded that reducing the number of flowers doesn't matter much until a disaster clears a hole?

Ant taxonomist John T. Longino of Evergreen State College in Olympia, Wash., welcomes the new study as an antidote to a tendency to analyze ant-plant relationships as one-to-one interactions. "They always were communities," he says.

Stanton points out that one of the big questions in ecology is, "Why doesn't the best competitor drive everyone else into extinction?" Part of the answer, she contends, is that the weaklings have tricks. —*S. Milius*

Stanton



Pruning ants trim acacia shoots. Swollen thorn is in background at lower right.