habitat requirements of a species," notes Pulliam. And superficial assessment of the suitability of one habitat over another may lead to disastrous results.

"For example, 90% of a population might occur in one habitat," explains Pulliam. "On the basis of the relative abundance and breeding status of individuals in this habitat, one might conclude that destruction of a nearby alternative habitat would have relatively little impact on the population. However, if the former habitat were a sink and the alternative a source, destruction of a relatively small habitat could lead to local population extinction." This would be a catastrophic outcome of appearances being deceptive.

The most important implication of the source/sink idea, says Pulliam, is in community ecology, in which researchers try to understand what factors underlie the assembly of a group (community) of species in one habitat. The nature and abundance of food resources and potential competition among species are clearly influential here. But, says Pulliam, ecologists frequently make the mistake of focusing only on the habitat in question, ignoring the mosaic of neighboring habitats. This tends to lead to the assumption that a species is part of the community because its niche requirements are met there. The assumption may be unfounded.

For some of the species in the community, the habitat may represent a sink, and survival there depends on nearby source habitats. "In extreme cases, the local assemblage of species may be an artifact of the type and proximity of neighboring habitats and have little to do with the resources and conditions at the study site," observes Pulliam. "This is not to imply that local studies of the mechanisms of population regulation and species coexistence are unnecessary, but rather that they need to be done in concert with 'landscape' studies of the availability of habitat types on a regional basis." Pulliam's goal is "to draw attention to some of the implications of habitat-specific demographic rates."

There are sufficient data from field studies to indicate that the phenomena of source and sink habitats exist. However, the extent of their influence on the ecological issues identified by Pulliam remain to be established. "I hope that my model, like any new model, will stimulate new research and lead to the reexamination of existing data sets," Pulliam told *Science*. ■ ROGER LEWIN

ADDITIONAL READING

H. R. Pulliam, "Sources, sinks, and population regulation," *Am. Nat.* **132**, 652 (1988).

Feeding the Monster in the Middle

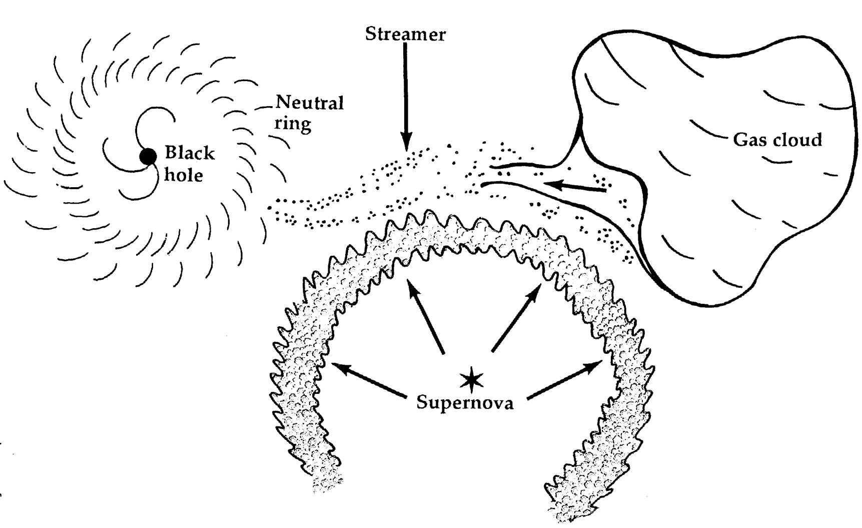
Anywhere from 10,000 to 100,000 years ago, says astronomer Paul Ho of the Harvard-Smithsonian Center for Astrophysics, a cloud of interstellar gas orbiting near the center of our galaxy was violently disturbed by a supernova. Today, he says, the material knocked loose in that event is visible to our radio telescopes as a thin streamer of gas and dust plunging down into the core itself—an energy source that many astronomers believe to be a black hole roughly 1 million times as massive as the sun.

"The results [on the streamer] are very preliminary. But if true, they are very exciting," says Ho, who discussed his observations at a recent meeting of the American Astronomical Society.* Our galaxy's black hole is a tiny thing compared to the billion-solar-mass monsters thought to power quasars and other active galactic nuclei. But the principle of its energy output is the same: matter falling into the hole is compressed and heated to a fierce luminosity just before it disappears. Moreover, our galaxy's black hole is only 25,000 light-years away, whereas the quasars are billions of light-years away. So it offers Earth-bound astronomers their best opportunity to study precisely what happens in the environs of such an object.

In particular, says Ho, if the central streamer and supernova are real they may illustrate one important mechanism for keeping massive black holes supplied with fuel. His model is based on high-resolution observations of the galactic center that he made last year at the Very Large Array (VLA) near Socorro, New Mexico, in collaboration with researchers from the Max Planck Institute in Munich, the University of Cologne, and the Massachusetts Institute of Technology. As shown in the accompanying sketch, Ho believes that the original gas cloud started out in a stable orbit about 25 light-years out from the galactic center. But with the impact of the presumed supernova shock wave, some of its material was knocked inward. And as that material fell, it was stretched by the tidal influence of the hole like so much taffy. Thus the streamer, which is at least 15 light-years long, but only a few light-years wide. Ho points out that Doppler shifts from the VLA observations, which detected the 1-centimeter emission line of ammonia molecules in the gas, indicate that the streamer is indeed flowing toward the hole.

Given the observations to date it is difficult to be sure what happens when the gas actually reaches the center, says Ho. But he suspects that the material actually cascades downward in a series of stages. For example, about 2 to 3 light-years out from the center is a well-known ring of neutral hydrogen gas, which seems to be feeding ionized gas directly into the hole along a complex series of spirals. Perhaps, says Ho, the ring simply marks the point where gas from his supernova-generated streamer accumulates before taking the final plunge. ■ M. MITCHELL WALDROP

*The 173rd meeting of the American Astronomical Society, 8 to 12 January 1989, Boston, Massachusetts.



Holly Bishop

At the core. *Has a supernova knocked gas into the central black hole?*