Astronomy

Ron Cowen reports from Tucson at the annual meeting of the American Astronomical Society's Division of Planetary Sciences

Hailing Hale-Bopp

After a fallow spring in which its brightness and activity appeared to have leveled off, Comet Hale-Bopp seems to be living up to expectations that it will be the comet of the century when it nears Earth next March. That's the consensus of researchers who have tracked the icy body with a variety of Earth-orbiting and ground-based telescopes.

Harold A. Weaver of Johns Hopkins University in Baltimore is one of these optimists. He bases his enthusiasm on spectra taken over the past few months by the Hubble Space Telescope, the now-defunct International Ultraviolet Explorer satellite, and radio telescopes on Earth. The spectra reveal that as the comet has journeyed into the inner solar system, it has begun to expel jets of water vapor. The vaporization of water-ice has replaced that of carbon monoxide ice as the driving force behind the comet's growing brightness, Weaver says.

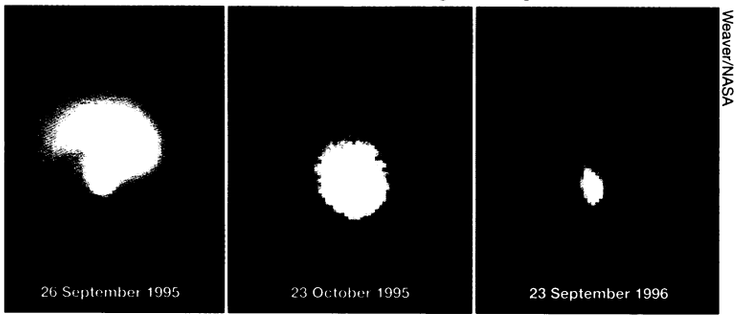
At the same time, the comet is spewing more dust—to the relief of observers. Sunlight reflected off a comet's shroud of dust makes the icy body appear bright. The upswing in expelled dust, which is probably dragged out by the water vapor, should allay worries among amateur astronomers that Hale-Bopp, like the much-ballyhooed Comet Kohoutek in 1973, will fizzle, Weaver says.

"It's really holding up pretty well," notes Brian G. Marsden of the Smithsonian Astrophysical Observatory in Cambridge, Mass. Nonetheless, cautions Michael F. A'Hearn of the University of Maryland in College Park, comets are notorious tricksters. It's fitting, he says, that Hale-Bopp will venture nearest the sun on April Fool's Day.

Hubble won't be able to view Hale-Bopp again until next July, months after it nears Earth, because the comet will lie too close to the sun's glare. From Hubble images taken over the past year, Weaver estimates that the nucleus of Hale-Bopp measures a whopping 30 to 40 kilometers in diameter (SN: 12/23 & 30/95, p. 428). Other observed comets average, at most, 10 kilometers in diameter.

Judging from the comet's recent activity and its considerable girth, Hale-Bopp "should be the most productive comet we have observed in modern times," says Weaver. Because the comet won't get any closer to Earth than 1.3 times the distance between our planet and the sun, it may appear only slightly brighter than last spring's Comet Hyakutake, he adds. Hale-Bopp will be most visible just after sunset in late March and April.

Skywatchers, however, can already take a peek at Hale-Bopp with the naked eye for the first 3 weeks of this month. It appears just after sunset as a faint object in the southwest part of the sky, above and to the right of Jupiter.



Three faces of Comet Hale-Bopp, as seen by the Hubble Space Telescope. At left, a spiral structure reminiscent of a water sprinkler appeared about 60 hours after a huge eruption of dust. The middle frame shows the comet during a quiescent phase. At right, more than five jets of dust spout from the nucleus, giving the comet the appearance of a porcupine.

Biology

Does parenting or prolactin hit first?

Many doting aunts and uncles without children of their own spend a lot of time baby-sitting their young relatives. Some bird species have similar helpers. During the breeding season, these helpers don't mate. Instead, they tend to the young of other birds, usually kin. What makes these nannies take on parenting responsibilities has bewildered researchers.

Now, Stephan J. Schoech of Indiana University in Bloomington and his colleagues suggest in the September ANIMAL BEHAVIOUR that the hormone prolactin deserves some of the credit.

Prolactin is known to promote a variety of activities, including caregiving, in many animals. Concentrations of the hormone in the blood remain high in birds—both parents and nannies—while they care for eggs and nestlings, studies have shown. However, whether prolactin stimulates caregiving behavior in nonparents or the caregiving brings on the hormone has remained unclear.

Schoech and his colleagues monitored prolactin concentrations in 89 to 130 breeding and nonbreeding Florida scrub jays each year between 1992 and 1994. They also assessed how much care each bird provided the nestlings.

So which comes first, prolactin or caregiving?

"The answer appears to be both," the reseachers state. The helpers' hormones were already on the rise before they encountered the nest or nestlings, "suggesting that high prolactin levels were not a simple response to the stimulus of begging young," Schoech and his colleagues report.

The sight of those hungry mouths may also have boosted the hormone. The most helpful nonbreeders had the highest concentrations. Those that only guarded nests scored the lowest among the helpers.

Parents had the highest prolactin counts and visited and fed the nestlings most often.

These "are the first data that quantitatively link helping behavior and prolactin titers in a cooperative breeding species," the authors assert.

A Florida scrub jay on a research vehicle.

Birds keep close track of seed business

Your little chickadee might just make the perfect accountant. These tiny birds keep such a close eye on their food supplies that they know how many seeds are missing and replace almost every one, new research suggests.

Chickadees retain very little body fat, so they have become adept at managing caches of food. A single chickadee hides one or two seeds in hundreds of spots over several acres.

Experiments had shown that when the birds grow fatter, they tend to store fewer seeds, says Jeffrey R. Lucas of Purdue University in West Lafayette, Ind. He and his colleagues suspected that the birds might compensate for a decrease in the availability of seeds by retaining extra body fat.

Carolina chickadees in the laboratory did not put on extra weight when the scientists pilfered their seed caches, however. In the winter, the birds replaced the missing seeds and doubled the amount of time they spent finding, storing, and checking on their food supplies, Lucas says.

In the summer, even though food supplies and temperature in the lab did not change, the birds failed to compensate for lost seeds. This fits with earlier studies by the group indicating that the birds' yearly rhythms regulate seed storage.