Faraway comet spins into the light

The 6-hour spin cycle of a bluish-gray ball of ice at the fringe of the solar system may hold clues to early planet formation. Called 1996 TO66, the whirling snowball is one of the biggest and brightest residents of the Kuiper Belt, a crowded ring of an estimated 200 million comets just beyond the orbits of Neptune and Pluto.

One of only 70 Kuiper Belt objects identified so far, 1996 TO66 glows brighter than its cohorts, but the faintest stars visible with the naked eye shine 1.5 million times as brightly. For an object so dim and distant, it was a feat just to measure the comet's rotation, comments Alan P. Boss of the Carnegie Institution of Washington (D.C.).

Brian G. Marsden of the Harvard-Smithsonian Center for Astrophysics says that "this may be the best determination" of the rotation of a Kuiper Belt object to date.

Scientists think that Kuiper Belt objects have changed little since the birth of the solar system 4.5 billion years ago, when all the denizens of the solar system were born from a swirling disk of gas and dust that enveloped the young sun.

Changing the rotation speed of an object as big as 1996 TO66—which measures about 600 kilometers across—requires much more energy than changing that of a tiny one.

If 1996 TO66's spin truly hasn't changed since the start, it reveals the "agitation of the stuff from which it formed," says Olivier R. Hainaut, a member of the international team of astronomers who reported the rotation at a workshop held last week at the headquarters of the European Southern Observatory (ESO) in Garching, Germany.

"If there was lots of motion in the outer solar system, this motion would have been preserved as fast rotation," he says. "If it was a very quiet place, the current rotation would be very slow."

Hainaut and his colleagues enlisted the powerful eye of ESO's 3.6-meter New Technology Telescope in La Silla, Chile, to make their observations. For six nights this fall, the scientists tracked the intensity of 1996 TO66's glow through different light filters. Fifty images later, they could detect a clear variation in brightness as dark spots spun by every 6 hours and 15 minutes.

Some researchers consider Pluto to be part of the Kuiper Belt. At least one of these astronomers is less than impressed with the new finding. "Pluto's rotation period has been known for 40 years," says Alan S. Stern, a planetary scientist at the Southwest Research Institute in Boulder, Colo. "I think this is much ado over nothing."

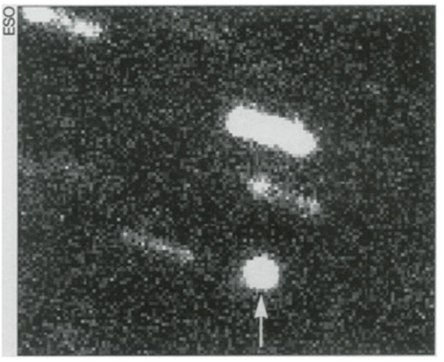


Image of 1996 TO66 (arrow) compiled from a total of 4 hours of exposure.

What is important, Hainaut argues, is that the comet joins many other objects in the outer solar system having rotation periods from 4 to 8 hours. For example, Chiron, a minor planet thought to have come from the Kuiper Belt and now in orbit between Saturn and Uranus, also rotates about every 6 hours. Scientists suspect that Earth, too, spun at that rate soon after its formation.

This rapid rotation affirms the idea that as the solar system was forming, planets and comets grew bigger by colliding with and sticking to similar-size bodies that boosted their spin.

Hainaut says that the measured rotation rate of 1996 TO66 will help theorists model the early solar system. —*S. Simpson*

Superstud grass menaces San Francisco Bay

Watch out, San Francisco. A salt-marsh grass from the East Coast is showing a new twist on conquering the world. The intruders may still be relatively rare, but they're overwhelming a widespread native plant through the power of superior pollen.

The invader, *Spartina alterniflora,* or smooth cordgrass, produces 21 times as much pollen as the native *Spartina foliosa*, report Donald R. Strong of the University of California, Davis and his colleagues. The intruders fertilize native species and produce aggressive hybrids. With its prodigious powers for siring seeds, *S. alterniflora* could rapidly swamp the natives, the researchers warn in the November American Journal of Botany.

Strong reminisces about the early 1980s, when biologists still cherished the notion that most species had built-in genetic protections against hybridizing with other species. Suggest otherwise in those days, and "you'd have been laughed out of a meeting," he says.

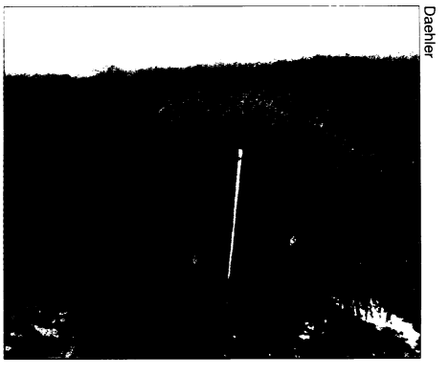
Now, researchers recognize that an alien species—plant or animal—often can move into a town, mate with the natives, and beget fertile hybrid offspring until the local species disappears.

Previous research on biological intruders focused on rare natives succumbing to common invaders, Strong observes. He sees the cordgrass study as the first specific analysis of a reproductive edge that lets an uncommon invader make fast progress against a widespread plant.

Study coauthor Curtis C. Daehler of the University of Hawaii at Manoa in Honolulu explains that the invasion got an ironic start. In San Francisco in the 1970s, people trying to restore salt marshes planted commercially available species, which happened to be from the East. Strong calls it "a pushy New York cordgrass" that's moving in fast on the native "laid-back California kind of species."

After analyzing 50 plants of each species, the researchers found that the flower clusters of the invader create much more pollen than the native clusters. Also, in a greenhouse test with four plants of each species, the team placed pollen on native plants. Invader pollen germinated at almost twice the rate of the native species'. Finally, in another test, the invader-native crosses produced almost eight times as many seeds as native-to-native pollination.

It's no wonder, laments Strong, that these super sires "are spreading like wildfire." He worries about the "genetic pollution" of the native species' genome and predicts disastrous impacts on the other creatures of the bay. The hybrids spread farther down the mud flats than the natives do, so less mud will be open for shorebirds to forage and for harbor seals to park their pups. Both the invaders and the hybrids are also choking flood-control channels and bedeviling navigation.



The taller, prolific Eastern cordgrass (brighter green) threatens California's native species (middle ground).

Controlling the invader biologically is out, Strong says, because anything that eats the invader will probably also eat the closely related native. Importing insect pests from the East Coast would be "a horrible idea," he asserts.

A chronicler of alien invasions, Daniel Simberloff of the University of Tennessee in Knoxville says that the cordgrass tale underscores the need to stop invasions promptly. "We need early detection and rapid response." —*S. Milius*