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Tightening Our Kuiper Belt

From the edge of the solar system come hints of a disrupted youth.

By Charles Liu

More and more often, some new astronomical discovery is thrusting Pluto and its home, the Kuiper Belt, into the public eye. Most of the attention focuses on Pluto's status as one of our solar system's major planets. Should it retain that status, even though astronomers know Pluto really is just a ball of ice and rock, smaller than our Moon?

A few months ago the flames were fanned again, when Michael E. Brown and Chadwick A. Trujillo, both astronomers at Caltech, announced the discovery of a large new Kuiper Belt object (or KBO) that they dubbed Quaoar (after the creation force of the Tonga tribe who lived in the Los Angeles area). No one was calling Quaoar a major planet; it's only 800 miles wide. Yet Pluto—about 1,400 miles in diameter—isn't that much bigger than Quaoar, and Quaoar's orbit looks much more like the orbits of the other eight major planets than Pluto's does. Pluto-bashers everywhere hailed Quaoar as further proof that the runt of the traditional nine planets should be reclassified as just another KBO, albeit a large one.

But all the hoopla missed the scientific point. For many of us astronomers, it's not Pluto, Quaoar, or any other individual KBO that matters; it's the Kuiper Belt itself that counts. And if you take the Pluto-Quaoar episode as an occasion for a closer look at the Kuiper Belt, you get into some pretty intriguing scientific questions. For example, R. Lynne Allen of the University of British Columbia in Vancouver and her collaborators recently published findings that, though useless to the argument about what to call Pluto, suggest that the Kuiper Belt is a surprisingly sharp edge cinching our solar system five billion miles out from the Sun, and that it holds some clues to our solar system's early history.

Eva Lee, *Eyesites*, 2000

Named after the Dutch American astronomer Gerard Kuiper, one of the first people to posit its existence, the Kuiper Belt is a doughnut-shaped zone of space, populated by comets and comet-like bodies, which lies beyond the orbit of Neptune. KBOs are small—most are less than 100 miles across—and made up almost entirely of ice and rock. They're remnants of the solar system's early history, relatively unaltered by four and a half billion years of stellar and planetary evolution.

Someday astronomers will get the chance to study KBOs up close, and the objects will provide an unparalleled glimpse into the chemical and physical conditions of the early solar system. But the scientific value of the Kuiper Belt as a whole is even greater than the sum of the information in every icy dirt ball. The reason is that in the past decade or so, astronomers have discovered disks of dusty gas as large as 100 billion miles in diameter orbiting a number of stars much younger than, but otherwise quite similar to, our Sun. According to current astrophysical models, planets originate in these disks, and our solar system represents one possible outcome of the evolution of such a disk. The Kuiper Belt is probably what remains of the Sun's original disk, so its shape, size, and thickness serve as critical benchmarks for understanding how planetary systems form, grow, and age.

Neptune's orbit, a nearly circular ellipse some three billion miles away from the Sun, traces the Kuiper Belt's inner edge. The belt's outer edge is far less certain, though. Of more than 600 KBOs discovered to date, none of those with nearly circular orbits is more than roughly five billion miles from the Sun. That suggests the Kuiper Belt's outer boundary could well lie there. But the outer boundaries of the disks orbiting the younger stars I mentioned are as much as