

Radar reveals an asteroid's strange shape

Radar images of a small, recently discovered asteroid depict not a single sphere or even a roundish lump, but two such lumps side by side. Steven J. Ostro of Jet Propulsion Laboratory in Pasadena, Calif., describes the object – designated 1989 PB – as “two-lobed” or “bifurcated.”

Less than 2 kilometers long and rotating on its axis about every four hours, the stony or “S-type” asteroid orbits the sun about every 400 days. Its elliptical path crosses Earth's orbit and carries it from between the orbits of Venus and Mercury out beyond the orbit of Mars. When discovered, the asteroid was as close to Earth as it comes – about 4 million km away, Ostro says. It will not pass that close again for several decades.

Eleanor F. Helin of Jet Propulsion Laboratory made the discovery on Aug. 9 using an optical telescope on Palomar Mountain. Ten days later, a team headed by Ostro observed the asteroid with the 300-meter Arecibo radiotelescope in Puerto Rico. The group included John F. Chandler and Irwin I. Shapiro of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and Alice Hine of Arecibo.

The Arecibo radar images of the rotating asteroid, made at approximately 9-minute intervals, show it from a distance of about 5.7 million km. Like frames of a motion picture, the images form a sequence, offering views of each side. Though they show no details smaller than about 300 meters across, Ostro says computer analysis over the next few months will make it possible to reconstruct the asteroid's three-dimensional shape. The individual images in the sequence show only one view of 1989 PB at a time, but Ostro expects to create a computer graphic that scientists can rotate to examine it from different perspectives. In addition, scientists could translate the images into a solid model of the asteroid, revealing in crude detail any craters, depressions or high elevations.

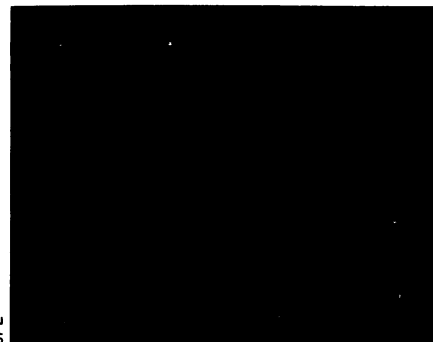
Analysis of the asteroid's shape should “let us make some statements about how tightly gravity is holding the two lobes together and begin to formulate theories about how it was formed,” Ostro says.

Astronomers know little about such basic asteroid questions and have hardly more than hypotheses at this point. “Probably sometime within the last 100 million years,” says Ostro, noting that the orbits of most “Earth-crosser” asteroids probably evolved no longer ago than that, “there was a big, violent collision between objects in the main asteroid belt [lying between the orbits of Mars and Jupiter]. A lot of stuff was thrown out at very high velocity, some at low velocity; some chunks were fractured, some unfractured.”

Among all those chunks, he says, some

may have ended up close to one another and moving at similar speeds, until mutual gravitational attraction drew them together. This process could have produced multilobed shapes like that of 1989 PB. And the collisions that formed these asteroids in the main belt may well have thrown some of them into orbits nearer the sun, where Earth-based astronomers can observe them more easily and spacecraft can visit them more cheaply.

Ostro says improvements to Arecibo, as well as spacecraft missions such as the planned Comet Rendezvous Asteroid Flyby (SN: 12/3/88, p.358), may reveal a variety of odd shapes among small asteroids, because chunks less than a few tens of kilometers across probably would not have been compressed into spheres by their own gravity. Of the 56 asteroids he has studied by radar during the past



The unusual double-lobed shape of asteroid 1989 PB is revealed by this series of 16 radar images, in a sequence that reads from left to right and top to bottom.

decade, 23 are Earth-crossers—including three or four whose radar signatures, though not as detailed as those of 1989 PB, at least suggest concavities that could signify large craters or other low spots, he says.

— J. Eberhart

Tasaday controversy grows more curious

The strange case of the Tasaday – modern-day hunter-gatherers in the Philippines, heralded during the 1970s as an isolated Stone Age group and lately denounced as a hoax by some journalists and anthropologists – grows stranger still with new evidence presented last week at the annual meeting of the American Anthropological Association in Washington, D.C.

The new research focuses on the family trees and language characteristics of the Tasaday and supports the notion that they are a people distinct from other rain-forest communities living near them (SN: 5/6/89, p.280). But the linguistic work clashes with the conclusions of most previous investigations, and supporters of the hoax argument remain steadfast.

In one study, Amelia Rogel-Rara of the Tasaday Community Care Foundation in Manila and her co-workers compiled a genealogy, or family history, for each of the 26 Tasaday individuals studied in 1971. The nearly 70 Tasaday now living in the rain forest were interviewed, as were about 40 of their relatives and friends living elsewhere.

“Our genealogical charts show conclusively that the Tasaday are a distinct group that has lived in the mountains for seven generations, probably more,” Rogel-Rara says.

Zeus Salazar of the University of the Philippines in Manila maintains Rogel-Rara's work must be closely examined before it wins acceptance. In the 1970s, Salazar collected a Tasaday genealogy that he says supports contentions the group is phony.

Linguists Cesar and Araceli Hidalgo of the University of Malaya in Kuala

Lumpur took another scientific approach last August, when they hiked to the Tasaday caves and began an investigation of the forest dwellers' language. They say their preliminary findings indicate the Tasaday speak a language distinct from variants of the Manobo tongue spoken by their closest neighbors.

Yet an analysis of previous linguistic work on the Tasaday, conducted by Lawrence A. Reid of the University of Hawaii at Manoa, suggests they speak a Manobo dialect comprehensible to other Manobo speakers but with a small proportion of unique words and word meanings. Reid says the Tasaday probably belonged to a larger Manobo community around 150 years ago and, for some reason, retreated into the forest, where their dialect has since developed.

But critics say there remains ample reason to suspect the Tasaday are impostors recruited from nearby villages by a former official of the Marcos government.

Initial investigations in the early 1970s were tightly controlled by a government official and lasted only about three hours a day, says Gerald Berreman of the University of California, Berkeley. He contends that Tasaday stone tools are obvious fakes, that there is no evidence of nearby groups that allegedly intermarried with the Tasaday, and that refuse piles – the imprimatur of human occupation – have not been reported in the Tasaday caves.

An independent archaeological analysis of the caves is urgently needed, says William Longacre of the University of Arizona in Tucson.

— B. Bower