Asteroid satellites: Social acceptability

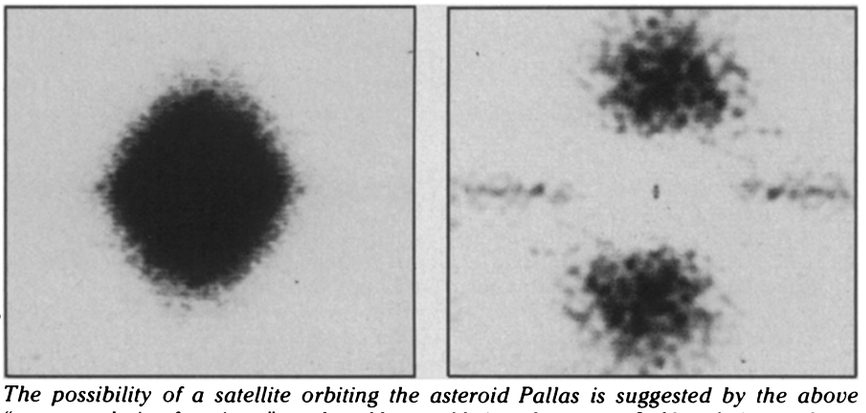
One of astronomy's controversies in the past few years has been the idea that some asteroids may have their own natural satellites — moons. Much of the cited evidence has come from observations of stellar occultations, when an asteroid would briefly block the light from a star, in some of which cases there have been reports of "secondary occultations" as though lesser objects near the asteroids in question were making their presence known. But the data have been inconclusive, whether for want of sufficient numbers of appropriately located observers, or the lack of adequate instrumentation, or because the secondary occultations themselves were uncertain. In addition, some researchers have been criticized by their more conservative colleagues for giving too much weight to the inconclusive data, which may have had the effect of "turning off" some potential contributors to the study of the rather exotic notion. As recently as a year ago, the idea was not a popular one.

"I was a doubter then," says Clark Chapman of the Planetary Science Institute in Arizona. "The thing that changed my mind was the speckle interferometry." Speckle interferometry, in which sequential high-speed images are correlated in a way that compensates for the changing distortions of earth's atmosphere, is a technique that has been successfully used for such tasks as resolving close binary stars, a problem not unlike that of distinguishing between an asteroid and its small nearby moon.

Now E. K. Hege, W. J. Cocke and E. N. Hubbard from Steward Observatory in Arizona, together with colleagues from Sacramento Peak Observatory in California, have applied "speckle" to a number of asteroids, two of which show what Chapman calls "the best evidence yet" for satellites. The case is "strong" and "highly suggestive," says Hege, that the asteroid Pallas, 550±50 kilometers in diameter, has a companion 175±20 km wide, seen at a distance of 750±100 km. Another asteroid, Victoria, yielded results that "could not even be modeled at all with a single, continuous object," instead suggesting a satellite of yet-undetermined size about 330±10 km from the primary body (diameter 120±40 km).

At the recent annual meeting in Tucson of the American Astronomical Society's Division for Planetary Sciences, where Hege presented the group's results (which had also been discussed in preliminary form at a symposium several months before), the climate for discussing asteroids with moons seemed considerably less hostile than it had in previous years. Analyzing how asteroids might form in the first place, former doubter Chapman estimated that from 1 to 10 percent of asteroids at any given time may be "binaries" if the companions result from mutual collisions, and that there could be still more if the asteroid population resulted from material that never fully accreted into planets. R. L. Millis of Lowell Observatory, noting the total lack of reported secondary events among 23 photoelectric observations of a stellar occultation by the asteroid Juno, found it worth mentioning that (because of the geometry of the occultation path) "I don't think we've ruled out satellites." (Four days earlier, two separate visual observers had noted secondaries close to an occultation by the asteroid Cleopatra.)

Asteroids are not the only solar-system objects being studied with the aid of speckle interferometry. Pluto and its possible satellite Charon were originally reported on the basis of Naval Observatory photographs that showed essentially an object with one bulging side, rather than two separately resolved bodies. Recently, two French astronomers, D. Bonneau and R. Foy, reported speckle observations that more clearly — though not completely — defined the pair. The results are consistent with Charon having fully half Pluto's diameter, suggesting more of a double-planet relationship than that of a planet and its moon. Hege, too, has speckle results from Pluto and Charon, he told SCIENCE NEWS this week, yielding an autocorrelation function that clearly shows two independent objects. There are also some other details in the data, he says, that have yet to be explained — but for which one explanation could be yet another satellite. □



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The possibility of a satellite orbiting the asteroid Pallas is suggested by the above "autocorrelation functions," produced by speckle interferometry. Lefthand picture shows an elongated pattern which, when the disk of Pallas (estimated from occultation measurements) is subtracted from it, leaves dual blobs (right) that may represent the satellite. (Only one blob would be the satellite; the other is essentially a mirror image produced by the image-autocorrelation process.)

Chemical clue to obesity found

Overeating may not be the only cause of obesity, say three Harvard Medical School researchers in the Oct. 30 NEW ENGLAND JOURNAL OF MEDICINE. Their finding of a cellular defect in obese people may indicate why some people maintain their weight on a diet that causes obesity in others.

Researchers Mario De Luise, George L. Blackburn, and Jeffrey S. Flier measured the activity of the sodium/potassium pump, a ubiquitous cell system that controls intracellular sodium and potassium transport and powers such processes as the uptake of nutrients in the intestine and neurotransmitters in the brain. This pump uses considerable amounts of energy, and may affect body weight: Fewer pumps would mean less energy use and thus fewer calories burned, suggest the researchers. "For the first time, we have evidence that obese people have a primary biochemical defect not caused by overeating or excess weight," says Flier.

The researchers counted the number of pump units and found 22 percent fewer in the red blood cells of obese persons than in red blood cells of persons of more moderate weight. They also found decreased ion transport and decreased sodium levels in the cells from obese persons. The heavier the individual studied, the fewer pumps were found, and the results held even after the obese persons lost weight.

"The physiological effects of this finding are not yet clear," says Flier. "It's conceivable the difference could affect blood pressure, the uptake of neurotransmitters in the brain, the uptake of nutrients in the gut and other tissues. It could conceivably alter kidney function or the pumping ability of the heart."

As a result of all its metabolic activities, the sodium/potassium pump produces anywhere from 20 to 50 percent of the heat manufactured by the body. With fewer of these little engines producing heat, are fat people colder? "The findings indicate that the capacity for heat production in fat people may be less," says Flier, but he notes there is no good measurement of this yet. □