

## Near-Earth Asteroid 433 Eros

(Adapted from the NEAR Press Kit)

The target of the NEAR mission is 433 Eros, the first-discovered near-Earth asteroid (NEA) and the second-largest. Eros also is one of the most elongated asteroids, a potato-shaped body with estimated dimensions of 20.5 by 8 by 8 miles (33 by 13 by 13 kilometers). Its size qualifies Eros as one of only three NEAs with diameters above 6 miles (10 kilometers).

Eros was discovered on Aug. 13, 1898, by Gustav Witt, director of the Urania Observatory in Berlin, and independently observed on the same date by Auguste H.P. Charlois in Nice, France. In a break with tradition at the time, the asteroid was given a male name: Eros, the Greek god of love and son of Mercury and Venus.

Unlike the more abundant "main belt" asteroids which orbit the Sun in a vast torus between Mars and Jupiter, NEAs are thought to be dead comets or fragments from main belt asteroid collisions. Approximately 250 NEAs are known, and scientists estimate there are at least 1,000 with diameters of 0.6 mile (1 kilometer) or more.

As a member of the NEA group known as the Amors, Eros has an orbit which crosses Mars' path but doesn't intersect that of Earth. The asteroid follows a slightly elliptical trajectory, circling the Sun in 1.76 years at an inclination of 10.8 degrees to the ecliptic. Perihelion distance is 1.13 AU (105 million miles/169 million kilometers); aphelion is 1.78 AU (165 million miles/266 million kilometers). Eros' average distance from the Sun is 1.46 AU (135 million miles/218 million kilometers).

The closest approach of Eros to Earth in the 20th century was on January 23, 1975, at approximately 0.15 AU (14 million miles/22 million kilometers). Previous close approaches occurred in 1901 at 0.32 AU (30 million miles/48 million kilometers) and in 1931 at 0.17 AU (16 million miles/26 million kilometers). Because of its repeated close encounters with Earth, Eros has been an important object historically for refining the mass of the Earth-moon system and the value of the astronomical unit. Eros is no threat to actually hit the Earth, however.

More than a century of ground-based study -- including a world-wide observation campaign during the 1975 close approach -- has made Eros the best-observed of the NEAs. Astronomers assign the asteroid a rotation period of 5.27 hours. Geometric albedo is 0.16. Thermal studies indicate a regolith, and radar suggests a rough surface. Eros is known to be compositionally varied: one side appears to have a higher pyroxene content and a facet-like surface, while the opposite side displays higher olivine content and a convex-shaped surface.

There is no air and no evidence of water on Eros.

Daytime temperature is about 100 deg. C (212 deg. F), while at night it plunges to -150 deg. C (-238 deg. F). Gravity on Eros is very weak but sufficient to hold a spacecraft in orbit. A 100-pound (45-kilogram) object on Earth would

weigh about an ounce on Eros, and a rock thrown from the asteroid's surface at 22 miles/hour (10 meters/sec) would escape into space.

Eros is one of the S-type (silicaceous) asteroids, the most common type in the inner asteroid belt and the subject of debate over their relationship to meteorites. Galileo's flyby observations of Gaspra and Ida (both of which are S-types) did not provide the answer, largely because remotely sensed spectral data cannot accurately determine the relative abundances of key elements. This is a major goal of the NEAR mission to Eros.

#### Eros Facts

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Size: 33 km x 13 km x 13 km  
Approximate mass:  $7.2 \times 10^{15}$  kg  
Rotation Period: 5.270 hrs  
Orbital Period: 1.76 yrs  
Spectral Class: S  
Semimajor Axis: 1.458 AU  
Perihelion Distance: 1.13 AU  
Aphelion Distance: 1.78 AU  
Orbital Eccentricity: 0.223  
Orbital Inclination: 10.8 deg  
Geometric Albedo: 0.16