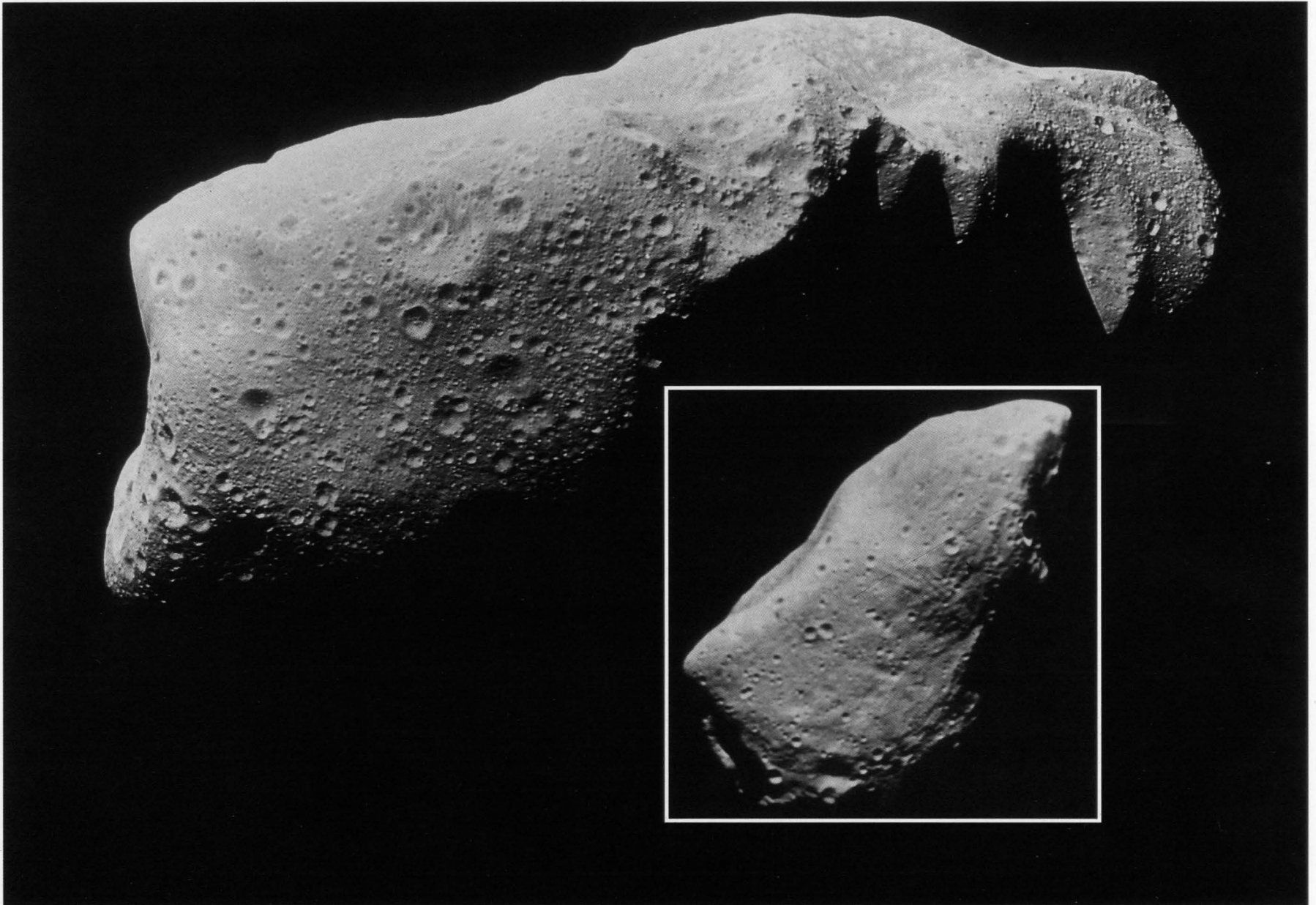




National Aeronautics and  
Space Administration

## Asteroids: Gaspra (inset) and Ida





The *Galileo* spacecraft, launched on October 18, 1989, has as its primary mission reaching Jupiter's system; however, its carefully designed trajectory path allowed the spacecraft to accomplish two "secondary" missions: flying by two "minor planets"—Gaspra and Ida—and sending back to Earth our first-ever close-up views of asteroids.

On October 29, 1991, *Galileo* passed within 1,600 kilometers of asteroid 951\* Gaspra and, with incredible navigational accuracy, took pictures of it—pictures that reveal an irregular planetary body riddled with craters and fractures. To date, over 600 craters have been identified on the asteroid, the longest measuring about 1-1/2 kilometers across. The type of cracks seen—some more than 90-meters long—are similar to ones seen before only on the Martian moon Phobos. Some planetary geologists theorize that about 4 billion years ago, Gaspra probably measured about 97 kilometers across. But, after years of catastrophic collisions with other planetary objects, the asteroid now measures a mere 19 x 12 x 11 kilometers. This history may not be unusual for asteroids like Gaspra, many of which are believed to have accreted into relatively substantial minor planets during the formation of the solar system, only to be broken down in collisions over the ensuing billions of years.

Almost 2 years after the Gaspra encounter, on August 28, 1993, *Galileo* zeroed in on another asteroid—243 Ida. This 52-kilometer-long asteroid is more than twice as large as Gaspra. The images *Galileo* sent back reveal that numerous craters—many larger than those observed on Gaspra—pepper the surface of the asteroid. The extensive craters seem to dispel the once-believed theories that Ida's surface is geologically youthful. The sharp images of Ida also seem to rule out a popular belief that Ida is a double body.

Ida, like Gaspra, is an S-type asteroid, meaning that it is a reddish object composed of a mixture of the minerals pyroxene, olivine, and iron. Approximately one-sixth of all known asteroids fall within the S-type category. One of the primary objectives of

the Gaspra and Ida encounters is to determine if S-class asteroids are the parent bodies of ordinary chondrite meteorites or stony-iron meteorites.

Asteroids, like Gaspra and Ida, have long been recognized as the source of meteorites. Our study of meteorites has taught us much about the origin of the solar system, but only in the last 20 years, with advances in telescopic instrumentation, have scientists recognized the wealth of information that asteroids themselves may provide about the solar system's origin and evolution.

NASA supports a variety of asteroid studies. Presently, two missions are gearing up to study near-Earth asteroids (i.e., asteroids having orbits that at times bring them close to the orbit of Earth). *Clementine*, a Department of Defense mission with NASA science support, will launch in January 1994.

*Clementine* will spend about 2 months mapping the Moon before travelling on to encounter the near-Earth asteroid 1620 Geographos. *Clementine's* cameras will take over 2,000 images of Geographos, an elongated hunk of rock estimated at 3 to 4 kilometers long and 1.5 kilometers wide. The images should tell us much about the asteroid's history and nature.

NASA's Near-Earth Asteroid Rendezvous (*NEAR*) mission, scheduled to launch in February 1996, will swing by Earth before reaching its main target—asteroid 433 Eros—in December 1998. *NEAR* will address such questions as "Is Eros related to a known meteorite type?" "Is it related to comets (some scientists believe near-Earth asteroids could be extinct or dormant comets)?" and "Is there evidence that Eros is a fragment of a larger body?"

## Fast Facts

	951 Gaspra	243 Ida
<b>Distance from Sun (At Perihelion) (A.U.)</b>	1.82	2.74
<b>Period of Revolution</b>	3.28 Years	4.84 Years
<b>Length</b>	19 Km	52 Km
<b>Inclination of Orbit to Ecliptic</b>	4.10°	1.14°
<b>Eccentricity of Orbit</b>	.173	.042
<b>Rotational Period (Hours: Minutes)</b>	7:03	4:38
<b>Absolute Magnitude</b>	12.9	11.05
<b>Asteroid Type</b>	S	S

## About the Image

*Asteroid 243 Ida (top) is juxtaposed against asteroid 951 Gaspra (inset). The Ida image used here is a mosaic of five image frames acquired by the Galileo spacecraft's Solid-State-Imaging System at ranges of 3,057 to 3,821 km (1,900 to 2,375 mi) on August 28, 1993, at about 3-1/2 minutes before closest approach to the asteroid. The Gaspra image is a mosaic of two images taken by Galileo from a range of 5,300 km (3,300 mi), some 10 minutes before closest approach, on October 29, 1991.*

## Significant Dates

- 1801 — Piazzi discovered first asteroid, named Ceres
- 1884 — Palisa discovered asteroid 243 Ida
- 1898 — Witt discovered asteroid 433 Eros
- 1916 — Neujmin discovered asteroid 951 Gaspra
- 1991 — *Galileo* encountered asteroid 951 Gaspra (10/29)
- 1993 — *Galileo* encountered asteroid 243 Ida (8/28)
- 1994 — *Clementine* will launch toward the Moon (January) and encounter asteroid 1620 Geographos (August)
- 1996 — *NEAR* mission will launch
- 1998 — *NEAR* will encounter asteroid 433 Eros (December)

## References

1. *Our Solar System: A Geologic Snapshot*, NP 157, NASA Headquarters, Washington, DC. 5/92.
2. "Galileo FactSheet," NASA Headquarters, Washington, DC. 3/92.
3. *Information Summaries: Our Solar System at a Glance*, PMS 010-A, Jet Propulsion Laboratory, Pasadena, CA. 6/91.

\* The number assigned to an asteroid (e.g., 951) denotes the order in which the asteroid's orbit was catalogued.