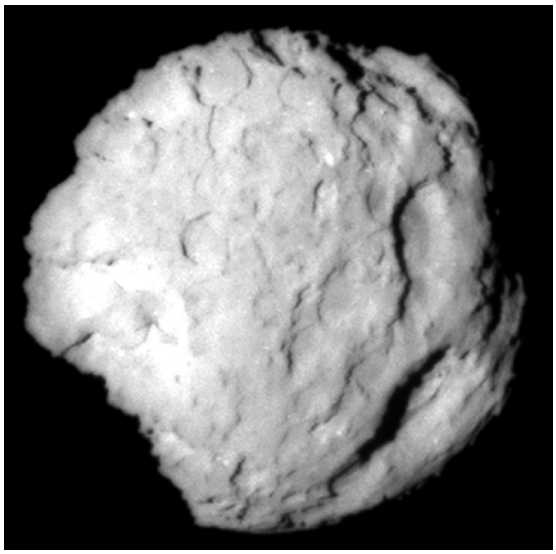
COMETS

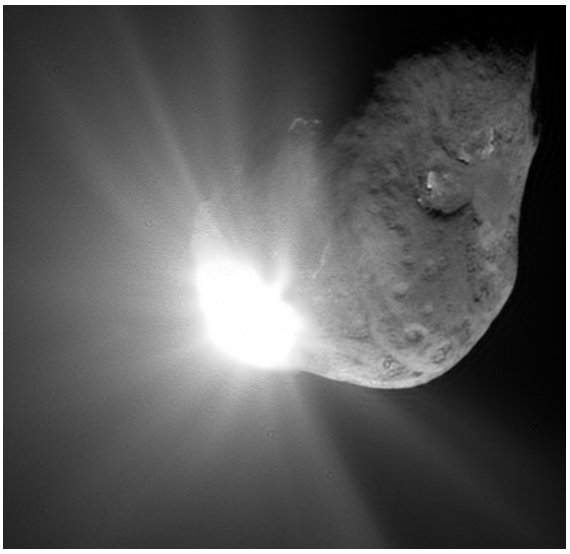
Comet *Hale-Bopp*, 1997, was visible from Earth while still millions of miles out in space. This detail of a photograph by Wally Pacholka, NASA JPL website, shows the bright white glowing ***coma*** (halo) of dust and gas around the sublimating solid **nucleus**. Two types of tails are streaming away from the nucleus. The blue, approximately straight, ***ion tail*** consists of ionized gas atoms that have lost some of their electrons. The white ***dust tail*** of particles reflecting sunlight is broader and gently curves.

Both tails point away from the Sun, so when a comet is approaching the Sun, the tails are behind it and when it is going away from the Sun, the tails are ahead of it. Visible comet tails can be hundreds of thousands of miles long and travel along with a comet's nucleus in orbit. Some comet orbits extend out far beyond all the planets in our solar system to the **Kuiper Belt** billions of miles away and the **Oort Cloud** trillions of miles in space (half-way to the next star). In contrast, the momentary quick streaks of light made by meteors are much closer (in Earth's atmosphere).



242 million miles from Earth, this image shows the 3.3 mile-wide solid nucleus of **Comet *Wild 2***, (pronounced "Vilt"). NASA's ***Stardust*** spacecraft flew to within 147 miles of the nucleus in 2004. Comet nuclei are usually described as resembling "dirty snowballs" or "icy dirtballs," however this comet nucleus is more like the consistency of astronaut "freeze-dried ice cream."

Stardust flew right through the comet's bright halo of gas and dust falling off the partially sublimating nucleus. The spacecraft was *"sandblasted"* by comet dust hitting it at thousands of miles an hour; it collected a sample of that dust (left over from the formation of our solar system 4.6 billion years ago) and it was returned to Earth in 2006.



On the 4th of July 2005 **NASA's *Deep Impact*** flyby spacecraft photographed its own 770 pound copper impactor hitting the 8.7 by 2.5 mile nucleus of **Comet *Tempel 1***. When Dr. Len congratulated Dr. Peter Schultz of Brown University, one of the co-investigators for the *Deep Impact* project, he exclaimed, "You flew that 'football' 267 million miles in space and put it right through the goal posts." Dr. Schultz acknowledged the scientific accomplishment in a more restrained fashion, "Yeah, we gave it a good whack."

A Comet nucleus fragment is included in the *Space Rocks* set of specimens that you can hold.