

Chapter 16. Space Debris



Figure 16.9. Halley's Comet as it appeared in 1910.

Note. In this section we discuss asteroids, comets, meteoroids, and interplanetary dust.

Note. Around 1800, four small bodies, Ceres, Pallas, Juno, and Vesta, were discovered orbiting between Mars and Jupiter. They are between 200 km and 800 km in size. These were the first known asteroids (or “minor planets”). Today, thousands of asteroids are known, with probably a total of 100,000 out there. However, the total mass of these objects is only about 0.0004 that of Earth's mass.

Note. Asteroids can be compositionally categorized: 75% of asteroids are carbonaceous (complex carbon molecules), 20% are made of mostly silicon bearing molecules, and 5% are metal rich (including nickel and iron). Asteroids are probably debris that never collapsed to form a planet (as opposed to a planet that disintegrated). The presence of Jupiter causes a gravitational disturbance that is also a factor in preventing the formation of a planet at the location of the asteroids.

Note. Halley's Comet was the first comet whose return was predicted. Comet's orbit the Sun in highly elliptical orbits, making any angle with the ecliptic plane. Comets are large chunks of ice containing rocks, boulders, and other frozen gases. When near the Sun, this "dirty snowball" heats up and a cloud of gas called the *coma* forms around the *nucleus*. Interaction with the solar wind causes the formation of the *ion tail* (ionized gases pointing directly away from the Sun) and the dust tail (which can be curved a bit due to the motion of the comet in the solar wind).

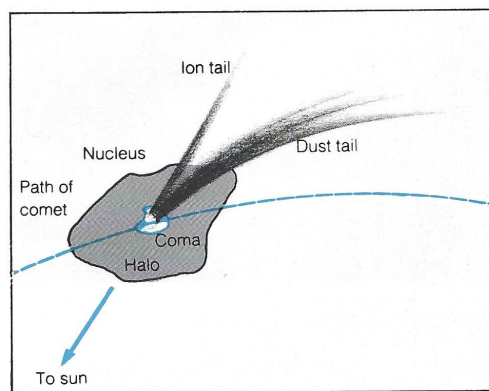


Figure 16.12. Anatomy of a comet.

Note. Small particles in the solar system can enter the Earth's atmosphere where they burn and create streak of light in the night sky. The streak of light is called a *meteor*. The dust grain or rock is called a *meteoroid*. If the meteoroid does not burn up in the atmosphere and reaches the surface of the Earth, it is then called a *meteorite*.

Note. Between the planets there are tiny particles called *interplanetary dust grains*. Evidence of this can be seen just after sunrise and just before sunrise as *zodiacal*

light. It appears as a faint, hazy light that stretches along the ecliptic. Another bit of evidence for the interplanetary dust is given by the gegenschein. This is seen as a diffuse spot in the night sky opposite the Sun. It results from sunlight being scattered back towards the Earth.



Figure 16.25. The zodiacal light (left of center).

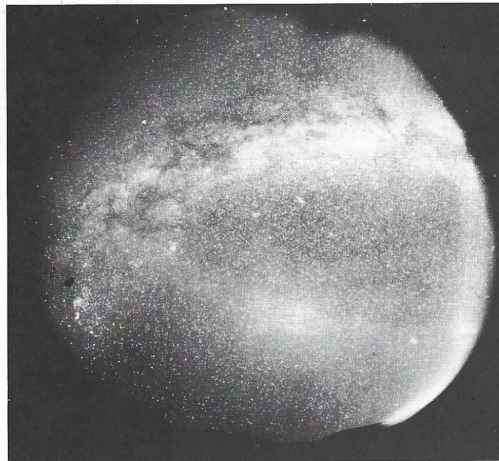


Figure 16.26. The gegenschein. The bright area stretching across the upper portion is the Milky Way. The bright region in the lower center is the gegenschein.

Note. The Earth is constantly hit by dust particles which add up to 8 tons per day.