What are Meteorites?

Meteorites are pieces of rock or metal that fall to the Earth from space. Most meteorites come from the break-up of small asteroids that never formed a planet. Some have remained unaltered for 4.5 billion years and so preserve evidence of the conditions under which they formed. A very few meteorites contain water and compounds of carbon, hydrogen, nitrogen, and oxygen. These may be samples of the material that gave us our oceans and atmosphere and provided the stuff from which life evolved.

Classes of Meteorites

**Chondrites:** These are primitive meteorites made largely of **stony** material mixed with metal. They come from asteroids that never melted. When cut apart you can see **chondrules:** small (1 mm) spheres. Chondrites are some of the oldest rocks in the solar system. They are the most common: 85 out of every 100 meteorites that fall.

**Carbonaceous chondrites:** Many of these meteorites contain a lot of **carbon** and **water,** the basic building blocks of life on earth.

**Achondrites:** These meteorites are **stony** meteorites **without** chondrules. They come from the mantle and crust of melted asteroids. About 7 out of every 100 meteorites are achondrites.

**Irons:** These meteorites are made of **metal.** They are iron-nickel alloys from the cores of melted asteroids. Out of every 100 meteorite falls, 5 or 6 are irons.

**Pallasites:** These meteorites are mixtures of **stony** material and iron-nickel **metal.** They come from the core-mantle boundary of melted asteroids. Only 1 or 2 of every 100 meteorites are pallasites.

**Others:** These meteorites come from diverse sources, such as the surface of the Moon and Mars, different kinds of asteroids, and maybe even comets.

Asteroids: Sources of Meteorites

Most meteorites come from the asteroid belt, Mars, and the Moon (not to scale).

The spectrum of sunlight reflected by the asteroid Gaspra suggests that it is made of three minerals: iron-nickel metal and the stony minerals olivine and pyroxene. The ordinary chondrite meteorites are also made of these three minerals and might be derived from asteroids like Gaspra.

About 24 meteorites are thought to have come from Mars, making them the only samples we have from the red planet. The most famous Martian meteorite (pictured above) was proposed to contain evidence of Martian life. After many detailed studies, most scientists now believe that it doesn’t have any Martian critters in it. Fortunately, this meteorite still tells us a lot about the geological history of Mars.