

Facilitator Information

(All you need to know about comets to survive the day)

What is a comet?

Comets are 'leftovers' from the formation of our solar system around 4.6 billion years ago. They have been called "dirty snowballs." They are small celestial objects, made of ice, gas, dust, and a small amount of organic material, that orbit our Sun. There are about 1000 known comets and more are discovered each year.

Where do comets come from?

Comets come from a region of icy bodies beyond the orbit of Neptune called the **Kuiper Belt**. These short-period comets are fairly predictable because they take less than 200 years to orbit the sun. Some less predictable comets arrive from a distant region called the **Oort cloud**. These comets can take as long as 30 million years to complete one trip around the sun.

What are the parts of a comet?

A comet is made up of the Nucleus, Coma, Hydrogen Cloud, Dust Tail, and a Gas Tail.



The **Nucleus** is the solid center of the comet that is made up of ice, gases (carbon dioxide, methane, and ammonia), rock, dust and organic material. The **Coma** surrounds the nucleus and contains gas and dust. It is the "atmosphere" of the comet.

Image: Nucleus of Comet Halley from the Giotto Project, European Space Agency. Note the jets of gas venting from the surface.

<http://antwrp.gsfc.nasa.gov/apod/ap000805.html>

As comets approach our Sun [within about 450 million kilometers (280 million miles)], they heat up and the ice begins to sublime (change from a solid directly to a gas). The gas (water vapor, carbon monoxide, carbon dioxide, and traces of other substances) and dust forms an "atmosphere" around the nucleus called a "**coma**." Material from the coma gets swept into the tail.

As comets move close to the Sun, they develop **tails** of dust and ionized gas. Comets have two main tails, a **dust tail** and a **plasma tail**. The dust tail appears whitish-yellow because it is made up of tiny particles — about the size of particles of smoke — that reflect sunlight. Dust tails are typically between 1 and 10 million kilometers (about 600,000 to 6 million miles) long. The plasma tail is often blue because it contains carbon monoxide ions. Solar ultraviolet light breaks down the gas molecules, causing them to glow. Plasma tails can stretch tens of millions of kilometers into space. Rarely, they are as long as 150 million kilometers (almost 100 million miles). A third tail of sodium has been observed on Comet Hale-Bopp.

How are comets named?

Comets are named after the person who first reports their discovery. For example, Comet Halley is named for Edmund Halley, who determined that comets observed in 1531, 1607, and 1682 had essentially the same orbits and thus were a single comet. Based on his calculations, he correctly predicted the comet's return in 1758, but unfortunately, he did not live to see Comet Halley. Sometimes more than one person reports a new comet at the same time. In that case, the names are combined — as in the cases of Comet Hale-Bopp or Comet Shoemaker-Levy.

What happens when Earth passes through the path of a comet?

Meteor showers occur when Earth passes through the trail of dust and gas left by a comet along its elliptical orbit. The particles enter Earth's atmosphere and most burn up in a lively light show — a meteor shower. Some meteor showers, such as the Perseids in August and the Leonids in November, occur annually when Earth's orbit takes it through the debris path left along the comet's orbit. Comet Halley's trails are responsible for the Orionids meteor shower.

For upcoming meteor showers in your area and viewing suggestions, explore *Sky and Telescope's* Observing Highlights page - <http://skytonight.com/observing/highlights>.

Why are scientists interested in comets?

Scientists think that comets formed with our planets 4.5 billion years ago, so they contain important clues to the materials and processes in our early solar system. Scientists hope to learn even more about comets with NASA missions such as Stardust and Deep Impact and the European Space Agency's Rosetta mission.

Read more about Comets at:

<http://www.lpi.usra.edu/education/explore/comets/>