Cool, Curious Comets

What are comets?

Comets are part of our solar system family. Like Grandma's mystery meat pie, they are made of old leftovers after the Sun, the planets, and the moons were formed.

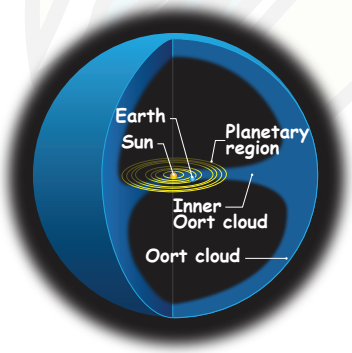
Can we see them?

About once a year a comet comes around that we may be able to see with our unaided eyes. It might look like a fuzzy cotton-ball—maybe faint, maybe bright—usually with one or two long tails.

Where do comets come from?

Most comets come from the Kuiper Belt, a region beyond the orbit of Neptune. Comets from this neighborhood usually take 200 years or less to make one orbit around the Sun. These comets are called *short-period comets*.

Two-hundred years sounds like a long trip, but that's nothing compared to the trips made by comets from their other hangout, the *Oort Cloud.*



Not to scale

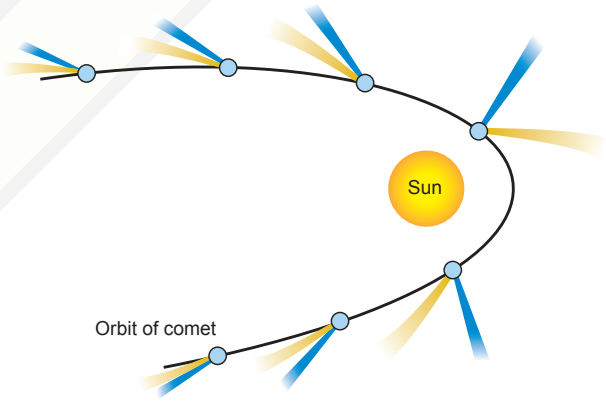
The Oort Cloud is a far-far-distant cloud of comets that surrounds the solar system. Scientists think there could be about a trillion comets orbiting way out there. One trip around the Sun could take one of these comets 30 million years! That's why they are called *long-period comets.*

What brings comets to the inner solar system?

Sometimes the gravitational pull of a passing star stirs up comets in the Oort Cloud. Some might get sent flying into the inner solar system.

Sometimes the gravitational pull of a planet can disturb comets in the Kuiper Belt and fling one headlong toward the Sun.

The Sun's gravitational pull really takes over, shaping the comet's path into a very lop-sided orbit. The comet is pulled faster and faster toward the Sun, it swings around close to the back-side, then it heads out again to more or less where it came from. Some comets dive right into the Sun, never to be seen again. When the comet is in the inner solar system, either coming or going, that's when we may spy it in our skies.



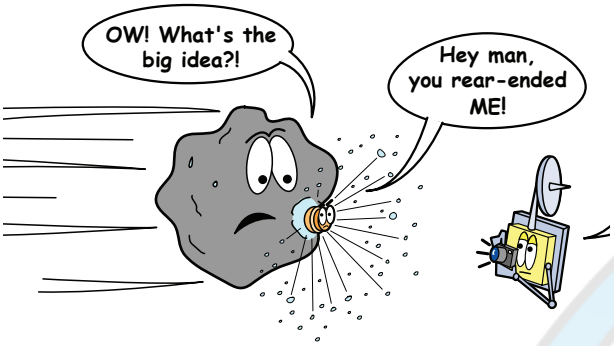
What do comets look like up close?

The *nucleus*, or solid part, of a comet is usually less than about 6 miles across, but may be as big as about 25 miles across. Recent space missions have given us some close-up views, so we don't have to guess what they look like anymore.

The Deep Space 1 mission flew close to Comet Borrelly in 2001. It found rugged terrain, smooth rolling plains, deep fractures and very, very dark material. A few years later, space mission Deep Impact flew very close to Comet Tempel 1. That comet also appeared very black on the outside, covered with something like the burned grease on a barbecue grill.

What's inside?

Comets seem to contain a lot of ice, some rocks and dust, and some gas. Deep Impact crashed a "smart impactor" into Comet Tempel 1 and studied the debris that spewed out. It found that the surface of the comet is very fragile and weak. Inside it is spongy, with lots of holes. It has ice beneath its surface. It contains material from outer, middle, and inner parts of the solar system. Other comets may be different. The Stardust-NExT mission is on its way to Tempel 1 to find out more.

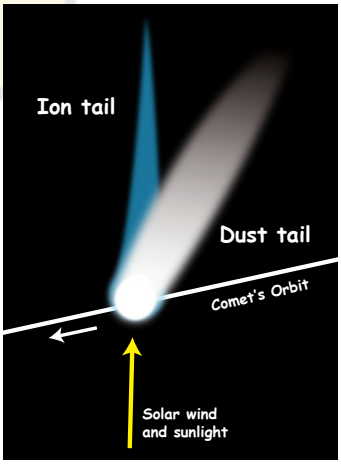


What makes comets look fuzzy?

When they are at home in the Oort Cloud or Kuiper Belt minding their own business, comets are just dull, dark chunks of ice, dust, and rock. In this state, they may not be much different from asteroids. But as comets get closer to the Sun and begin to warm up, some of their materials start to boil off. This material forms a cloud around the nucleus. The cloud is called the *coma* and may be hundreds of thousands of miles across. One mission, called *Stardust*, gathered samples of the coma of Comet Wild 2 and returned them to Earth for study.

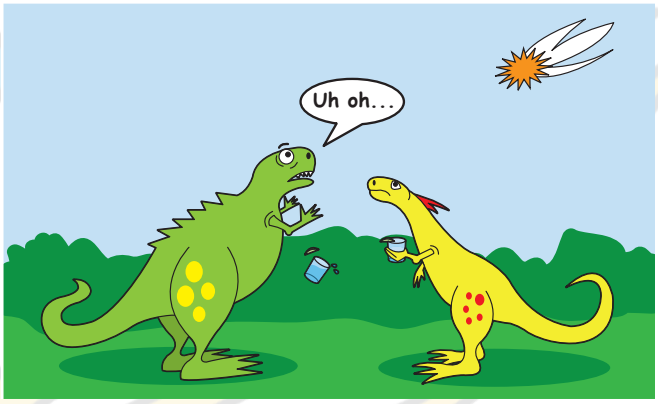
Why do comets have tails?

What do comets and lizards have in common? If either of them loses its tail, it can grow another one! Comet tails appear as the comet approaches the Sun and can grow to be millions of miles long. Tiny charged particles are constantly blasted out from the Sun. This solar wind pushes the small dust particles in the coma into a long curved path. This tail is known as the *dust tail*. Another tail, the *ion tail,* is made of electrically charged molecules of gas. the ion tail points directly away from the Sun. And a third tail, the *sodium tail,* we usually don't see. But what the Sun gives, the Sun can take away. In 2007, the STEREO spacecraft recorded Comet Encke's entire ion tail being ripped right off when the Sun got especially stormy.



Has a comet ever crashed into Earth?

Yes, indeed. In Earth's babyhood, comets often hit it. Planetary cruelty? No. Actually, scientists think comets may have contributed water for our oceans or even molecules from which life eventually evolved. Some believe it may have been a comet collision that did in the dinosaurs.



How many comets have been discovered?

Humans have discovered thousands of comets. Comets used to be named mostly after the people who discovered them. Many comets are now named for the observatory or spacecraft used to discover them.

How will scientists learn more?

Several space missions have already been sent to chase comets and study them up close. Rosetta is a mission of the European Space Agency. It is now on its way to Comet Churyumov-Gerasimenko to study the comet nucleus. Also, the EPOXI mission will fly by and study Comet Hartley 2 in 2010.

More comet fun:

Comet game, Tails of Wonder: spaceplace.nasa.gov/en/kids/stardust

Comet Wordfinds: spaceplace.nasa.gov/en/kids/cnsr_wordfind2.shtml

What's inside a comet: spaceplace.nasa.gov/en/kids/deepimpact

Ask Dr. Marc: What powers a comet? spaceplace.nasa.gov/en/kids/phonedrmarc/2004_january.shtml

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