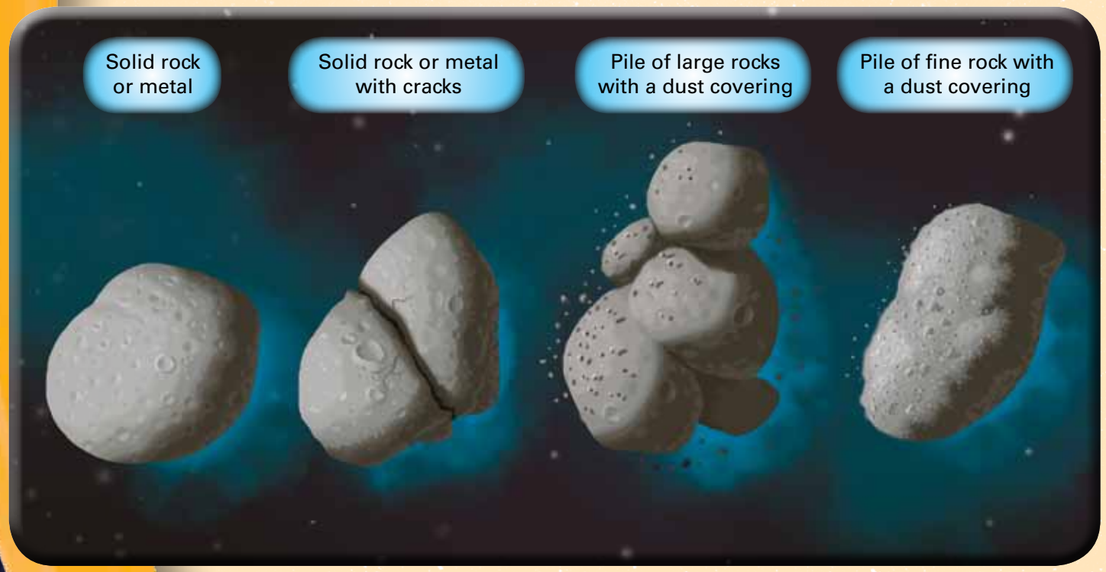
What are space rocks made of?

From Earth, we cannot tell what is inside **comets**, **asteroids** or **meteoroids**. Through **space** exploration, scientists have learned many things about these space rocks. Spacecraft send information to Earth, which tells us much more about what these space objects are made of and what their surfaces are like.

Asteroids are mostly made of rock

Most asteroids are made of rock. Some are made from metal and have a heavy iron core. Very few are made of half metal and half rock. Scientists believe that most asteroids are solid. Others are made of bits of rocks and dust that are stuck together by **gravity**.



Some asteroids are solid rock or metal, but others are made up of rock and gravel.

Asteroids are covered in regolith

Asteroids are covered in a layer of fine rock and dust called **regolith**. Larger asteroids are round, while smaller asteroids are irregular in shape. All asteroids have craters, or deep holes, that were made by space object impacts.

This asteroid is called 243 Ida and is located in the Main Belt. It is covered in craters and has a thick layer of regolith.

Space rock fact

Asteroids can be large or tiny, but most are less than 100 metres across. The largest asteroid is Ceres, which is almost 1000 kilometres across. Because it is so large and round, some scientists say that it is really a **dwarf planet**.

Comets are made of ice and rock

The **nucleus** of a **comet** is made from a mix of ice and rock dust. This is why comets are sometimes called dirty snowballs. The ice is mostly water, with a small amount of frozen **gases**. The ice and dust mix is covered in a thin layer of dark dust.

This photo of Halley's Comet was taken by the space probe *Giotto*.

Space rock fact

In 1986, a **space** probe called *Giotto* followed Halley's Comet as it **orbited** close to the Sun. The pictures *Giotto* sent back to Earth meant humans could see a comet up close for the first time.

WHAT DOES IT MEAN

nucleus the core or centre of an object

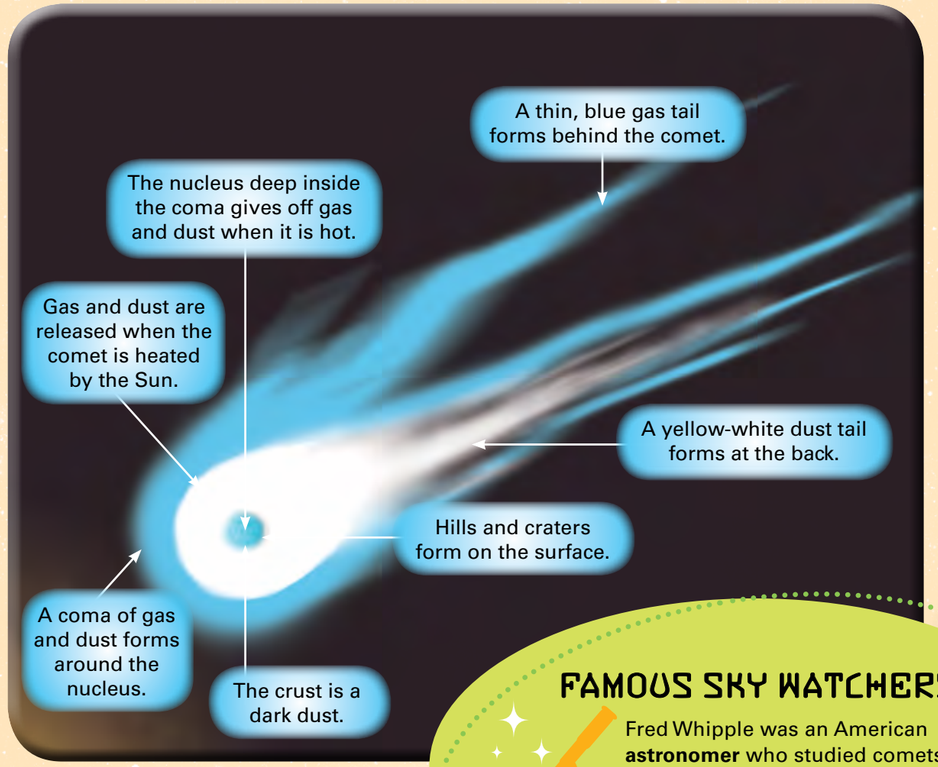
The surface of comets change

When a comet is far away from the Sun, it has a cold, dusty surface. When it comes closer to the Sun, it heats up and releases gas and dust. This forms a glowing cloud, called a coma, around the comet. It also forms two or three tails behind it.

The size of comets change

Most comets have a very small nucleus that is only a few kilometres wide when they are cold. When the comets heat up, their comas can be as wide as 100 000 kilometres. Their tails can stretch as far as 100 000 000 kilometres.

Comets only have comas and tails when they are orbiting close to the Sun.



FAMOUS SKY WATCHERS

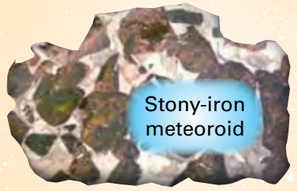
Fred Whipple was an American **astronomer** who studied comets. In the 1950s he gave them the name 'dirty snowballs' because he believed they had a spinning ball of snow and dust in their nucleus.

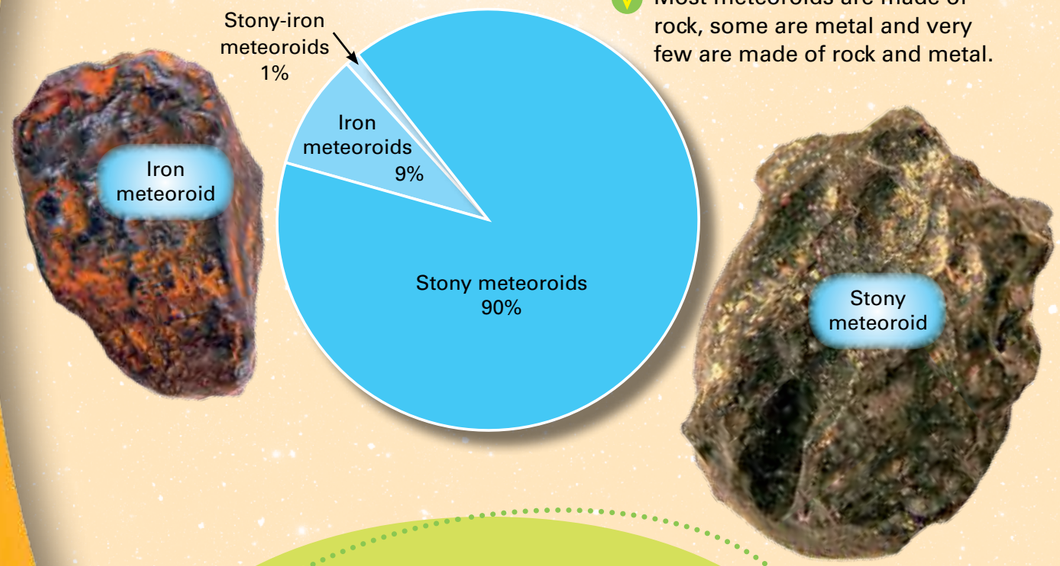
Meteoroids are made of rock and metal

Meteoroids are solid all the way through. There are three main kinds of meteoroids. Stony meteoroids are made of rock. Iron meteoroids are made of metal. Stony-iron meteoroids are made of both rock and metal.

Meteoroids come in many sizes

Meteoroids range in size. Some are as big as very large boulders, while most are the size of pebbles, or even as small as a grain of sand.





Most meteoroids are made of rock, some are metal and very few are made of rock and metal.

FAMOUS SKY WATCHERS

In 1866, Italian **astronomer** Giovanni Schiaparelli saw that the **orbit** of **meteoroid streams** he had observed were similar to two **comets** that had passed by Earth. He realised that these meteoroids were pieces that had broken off comets.

Meteoroids look rough and jagged

The surfaces of meteoroids look rough and jagged. This is because meteoroids are small pieces that have broken away or been smashed from comets and **asteroids**.

Meteors look like they are on fire

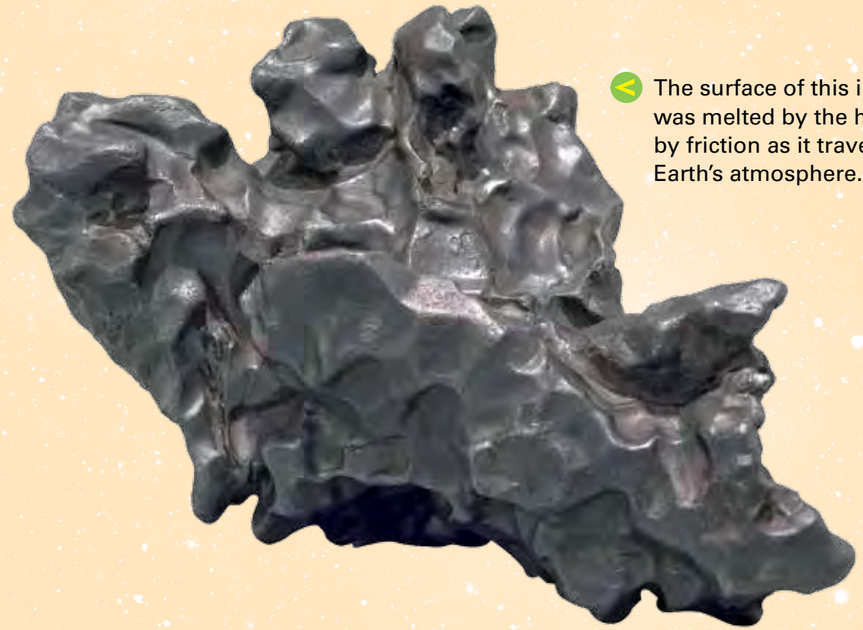
From the outside, **meteors** look like they are on fire. As they enter Earth's **atmosphere**, **friction** makes the meteors so hot that they glow and their outside layers melt.

The surfaces of meteorites are melted

The surfaces of some **meteorites** are very smooth. Others have rough or bumpy surfaces. They vary depending on what the meteorites are made of and how much they melted as they entered Earth's atmosphere.

Space rock fact

When meteoroids enter Earth's atmosphere, the force of friction causes them to heat up. Many burn up completely but others slow down before reaching Earth's surface. In this way, Earth's atmosphere protects the planet from being pelted by **space** objects.



The surface of this iron meteorite was melted by the heat caused by friction as it travelled through Earth's atmosphere.

WHAT DOES IT MEAN

friction a force that is created when one surface or object rubs against another, creating resistance