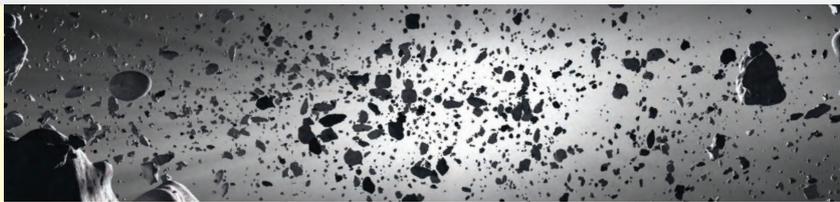




Comets, Asteroids and Meteors



Space is full of different **celestial bodies** and bits of **space junk** (manmade objects such as unneeded rocket parts of **defunct** satellites) which is floating everywhere. There are three main groups of non-manmade space debris **meteoroids**, **asteroids** and **comets**.



Meteoroids

Meteoroids are small (smaller than an asteroid but larger than an atom), hard (usually rock or **metallic** in nature) objects moving between the planets in outer space. They can range on size from a grain of sand to a truck tyre. Any smaller than this and they are typically called **micrometeoroids** or space dust.

They travel around the Sun at a range of speeds, some at 40 km/s, double the Earth's speed. When Earth's orbit comes into line with the orbit of a **meteoroid**, it will enter our atmosphere. Once it does, this is what we commonly call a shooting star or what is scientifically known as a **meteor**. Meteors travel very quickly through the atmosphere (20 km/s) hitting air particles along the way which causes them to start breaking down and lose bits of their outer layer. This creates a glowing tail or streak we can see at night.

A meteor can be any of; meteoroids, micrometeoroids, comets, asteroids or space dust as long as it travels through our atmosphere. Meteors aren't seen during the day time because they are too dull against the Sun's bright light but they do still occur. Often there are meteor showers where large numbers of sand grain sized meteoroids enter the atmosphere and burn up, creating a firework like effect. These particles are thought to come from comets and asteroids as they are **eroded** or collided with as they orbit the Sun. The bits fly off on their own path and become meteoroids. There are small meteoroids entering our atmosphere every few seconds, most of which we never see (either because it is daytime or they are so small they burn up completely in the farthest regions of the atmosphere).

Meteors come in a range of colours, depending on the metals present in them. For example, calcium produces violet and iron produces yellow. If some of the meteor survives through the atmosphere and lands in the Earth's surface, then it is called a **meteorite**. When they hit the surface, they create a crater and often the collision is so forceful that the meteorite is completely destroyed. It has been calculated that the largest meteorite to enter the Earth on any given day is 40 cm and each century a 20 m one is expected. Because of our atmosphere, the impact of meteorites on Earth is greatly reduced. The majority of their mass is burnt up before it even reaches the surface, in comparison the Moon which has pretty much no atmosphere and suffers large craters forming continuously.



'Meteor Crater' is a 50,000 year-old meteorite impact crater in Arizona, USA. It is roughly 1200 m in diameter, 170 m deep and has a rim that rises 45 m above the surrounding ground.

Asteroids

Asteroids are larger than meteors and range in size from 10 m to 1000 km in diameter. It is for this reason they are often referred to as **planetoids**, **planetesimals** or minor planets. Usually, the preferred term is small Solar System body. Typically they are **irregular** in shape and much smaller than the planets. They orbit the Sun or some of the larger planets. These large rocky bodies



can be found throughout the Solar System with millions located in the asteroid belt between the orbits of Mars and Jupiter. Many of these asteroids are believed to have been ejected by Jupiter as it reached its maximum size. The largest asteroid is Ceres which is 975 km in diameter. The larger the size of the asteroid, the fewer there are of them, so there are few massive ones and millions of smaller ones. They are composed of a metallic-rocky

core with various crusts such as ice or metals. Some smaller asteroids are thought to be collections of smaller pieces held together by gravity.

It is believed that the first water and ingredients needed for life arrived on Earth when an asteroid collided with the surface. Scientists think this because they have discovered water as ice and **amino acids** (components of proteins) on asteroids currently in our Solar System. When asteroids breakup, the pieces become meteoroids.

Comets

Comets are similar in size to asteroids, ranging from 100 metres to a few kilometres in diameter. This space body is made of rock pieces, dust and ice. They also orbit the Sun. As they near the Sun on their orbit, the heat of the Sun and severe solar winds cause the comet's **nucleus** (core) to **sublimate**, turning the frozen water and other trapped material to gas. This produces a coma – a glowing ring or atmosphere that can be clearly seen around the comet. As well as this, the tail that is **synonymous** with comets is also made during this process. As the tail of the comet forms, it grows larger and larger (mainly due to the increase in solar winds as it approaches the Sun). The tail can even become larger than the Sun itself.

Comets take a long time to complete their orbits and can be classified as one of two main time groups:

- **Short Period:** Less than 200 years and come from just past Neptune.
- **Long Period:** 200 to thousands of years.

The atmosphere around the nucleus is what distinguishes comets from asteroids. As the comets pass by the Sun many times, they lose their ice and dust so don't produce the gases anymore and come to look like asteroids. Comets originate outside the Solar System, well beyond Neptune in an icy region called the **Oort Cloud**.

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As comets pass by Earth, their tails leave behind a trail of dust and debris that create meteor showers. Comets can have one of five fates:

1. Depart from the Solar System into the greater galaxy and Universe due to extreme speeds.
2. Have all the gases evaporated due to numerous trips past the Sun and become small inert lumps.
3. Breakup due to pressure and weak structures, forming many meteoroids.
4. Collide with another celestial body and be broken into pieces.
5. Be **engulfed** by the Sun and burnt up completely.

Possibly the most famous comet is Halley's Comet which was the first comet to be recognised as passing Earth more than once. This didn't happen until the 18th century and previously thought that each comet was new and that they had a straight path through the Solar System never to return. Halley's Comet passes by every 75 years and will next be visible in 2061. It is very bright and can easily be seen with the naked eye.

