

ALL ABOUT METEOROIDS, METEORS AND METEORITES

1. Meteoroids

- A **meteoroid** is a small rocky or metallic particle of debris in our solar system.
- They are significantly smaller than asteroids, and range in size from small grains to 1 meter-wide objects.
- Objects smaller than this are classified as micrometeoroids or space dust.
- Most are fragments from comets or asteroids, whereas others are collision impact debris ejected from bodies such as the Moon or Mars.

Meteoroids travel around the Sun in a variety of orbits and at various velocities

- The fastest meteoroids travel through the solar system at a speed of around 42 kilometres/26 miles per second = 72,000 km / 45,000m per hr.
- When a meteoroid, comet, or asteroid enters Earth's atmosphere at this speed, the aerodynamic heating of that object produces a streak of light, both from the glowing object itself and from the trail of glowing particles that it leaves in its wake.
- An estimated 15,000 tonnes of meteoroids, micrometeoroids and different forms of space dust enter Earth's atmosphere each year.
- A small percentage of meteoroids fly on a path that goes into the Earth's atmosphere and then back out again, they are known as Earth grazing fireballs.
- Most meteoroids come from the asteroid belt, and are affected by the gravitational pull of the planets. But some meteoroids are fragments from bodies such as Mars or our Moon, which have been thrown into space by an impact.
- Almost all meteoroids contain extraterrestrial nickel and iron. They have three main classifications: iron, stone, and stony-iron

2. Meteors

- A meteoroid that burns up as it passes through the Earth's atmosphere is known as a **meteor**. If you ever have looked up at the sky at night and seen a streak of light or 'shooting star', what you actually are seeing is a meteor.
- The Earth's atmosphere experiences millions of meteors every day.
- When many meteors occur in a close time frame in the same part of the sky it is called a **meteor shower**. These showers arise either when Earth passes through a stream of debris left by a comet, or as "random" or "sporadic" meteors, not associated with a specific stream of space debris.
- Meteor showers get their names from the constellation in which their radiant is located – e.g. Perseids comes from Perseus.
- **Meteors** become visible between about 75 and 120 km (47 to 75 miles) above Earth. They usually disintegrate at altitudes of 50 to 95 km (31 to 59 miles).
- They are easier to see during the lower light conditions of night. During the day, their effect on radio signals enables them to be traced via radio telescopes.
- Prior to the early 19thC, meteors were seen in the West as an atmospheric phenomenon, like lightning, and were not connected with strange stories of rocks falling from the sky.
- It was the spectacular meteor storm of November 1833 and the ongoing observations and studies by the astro scientists of the day which led to the cosmic origin of meteors being firmly established. Still, they commonly remain an atmospheric phenomenon, and retain their name "meteor" from the Greek word for "atmospheric".
- The visible light produced by a meteor may take on various hues, depending on the chemical composition of the meteoroid, and the speed of its movement through the atmosphere.
- As layers of the meteoroid burn and ionize, the colour of the light emitted may change according to the layering of minerals.

- Colours of meteors depend on the relative influence of the metallic content of the meteoroid against the superheated air plasma, caused by its speed of travel:
 Orange-yellow (sodium) Violet (calcium) Blue-green (magnesium)
 Yellow (iron) Red (atmospheric nitrogen and oxygen)

3. Meteorites

A meteoroid that survives falling through the Earth's atmosphere and colliding with the Earth's surface is known as a **meteorite**.

- Meteorites that originate from asteroids are all ~**4.5 billion years** old.
- Meteorites that originate from the Moon range in age from **4.5 to 2.9 billion years** old.
- Around 500 meteorites reach the Earth's surface every year but of those only around 5 ever make it to scientists for study.
- Meteorites that are observed as they fall through the Earth's atmosphere and later recovered are called 'falls'.
- Those unobserved but found later by chance are called 'finds'.
- To this date there have been around 1000 collected 'falls' and 40000 'finds'.
- When a meteorite hits the ground, they blast out craters ten to twenty times their size.
- Meteorites are named after the places where they were found, e.g. the Nogata Meteorite found in Japan, the oldest meteorite whose fall can be dated precisely to 19 May 861.

The most famous meteorites are the Allende, the Fukang, Hoba, and the Willamette Meteorite.

- **The Allende Meteorite** fell to Earth in a fireball on February 8, 1969. It was originally about the size of a car, and pieces were strewn across the Mexican state of Chihuahua. It has become one of the most-studied meteorites of all time, and is an excellent example of a carbonaceous chondrite. These types of meteorites date back to the formation of the Sun and Planets, and are among the most primitive solar system materials around. They are made mostly of silicates, oxides, sulfides, water, organic compounds and various minerals.
- **The Fukang Meteorite** is one of the best examples of a pallasite, a type of stony-iron meteorite. Because of its large gem-like olivine crystals, pieces of this meteorite are much in demand by collectors.
- **The Hoba Meteorite** was found in Namibia (in Africa). It is a very large, 60-tonne rock, which makes it nearly impossible to move. It has been declared a National Monument in Namibia, and is one of the rare meteorites that is also part of a tourist site. Meteorite experts think Hoban fell about 80,000 years ago. It is mostly iron, with some nickel and traces of other elements.
- **The Willamette Meteorite** weighs 15.5 tons and is the largest ever found in the United States.

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