FIREBALLS in the sky

TYPES OF METEORITES

There are many different types of meteorites that come from different regions of the solar system and have formed in different ways.

To make it easier to categorise meteorites, scientists have split them into the three main groups; stony meteorites, iron meteorites and stony-iron meteorites.

IRON METEORITES

Iron meteorites are made up of pure nickel and iron metal with some impurities such as graphite and the mineral troilite which may have originated from within the metallic cores of asteroids.

Iron meteorites fall very rarely, but are easier to find because they can survive re-entry relatively intact, are very resistant to weathering and look very different to normal rocks. The largest meteorites ever discovered are iron meteorites. Ancient cultures used to use metal from these iron meteorites to make tools and jewellery.

When an iron meteorite is cut, polished and exposed to nitric acid it is possible to see the nickel-iron crystals in banded patterns on the exposed surface known as Widmanstätten patterns. By studying Widmanstätten patterns we can learn how quickly the meteorite crystallised and how the concentrations of nickel and iron changed as the meteorite cooled down.

STONY METEORITES

Stony meteorites are meteorites made of rock, but can also contain small amounts of iron. There are two types of stony meteorites; chondrites and achondrites.

CHONDRITES

Chondrites are the most common type of meteorite. These are meteorites which have not undergone any alteration or changes since they were formed. They are made up of circular mineral blobs called chondrules that formed in space billions of years ago and became clumped together over the years.

Chondritic meteorites represent the oldest rocks that we know of, and so it is necessary to study them if we want to learn more about how the solar system and the planets were formed.

ACHONDRITES

Achondrites are meteorites that contain minerals which have been melted, changed and altered since they were formed, which makes them different to chondrites. This process of change happens because they are formed on bodies with enough mass to support a molten interior. These can include large asteroids, the Moon and even Mars.

Achondrites are much younger than chondrites and have a variety of different textures and mineral compositions which can teach us about the formation history of their parent body.

STONY-IRON METEORITES

Stony-Iron meteorites are almost even mixes of both metallic and rocky material. They probably formed by mixing between metal cores and the rocky magmas within asteroids. This makes them extremely rare because there is only a small region inside asteroids where metallic and stony material can mix.

FIREBALLS in the sky

TYPES OF METEORITES

There are two types of stony-iron meteorites; pallasites and mesosiderites.

PALLASITES

Pallasite meteorites have solid metallic bodies of nickel and iron but also contain large translucent crystals of olivine within a metallic body.

Pallasites represent the boundary between the metallic core of an asteroid and the surrounding rocky magma which makes them very rare but extremely interesting. They are some of the most visually striking meteorite specimens ever discovered.

MESOSIDERITES

Mesosiderites are meteorites with an equal amount of metallic elements and silicate minerals. Unlike pallasites, the crystals within mesosiderites are made of pale silicate minerals and are not very large, giving the meteorite a speckled and irregular appearance.

Because of the presence of silicate minerals and the small size of the crystals, scientists believe that mesosiderites probably form when magma mixes with the core during a collision.

A polished cross-section of the Brahin pallasite - photo by Jurvetson (flickr)

GLOSSARY

Chondrules: Spherical grains that formed during the early accretion of the solar system and are the building blocks of the solar system. Chondrules formed by the crystallisation of molten droplets and accreted together to from asteroids and planets.

Graphite: A material made of many layers of atomic carbon sheets, commonly used as pencil lead.

Troilite: An iron-sulfide mineral. Troilite is rare on Earth but very common in meteorites and other astronomical bodies such as the Moon, Mars and the moons of Jupiter.

Widmanstätten pattern: A unique pattern found within iron meteorites formed by the slow crystallisation of nickel rich and nickel poor minerals at high temperature over millions of years.