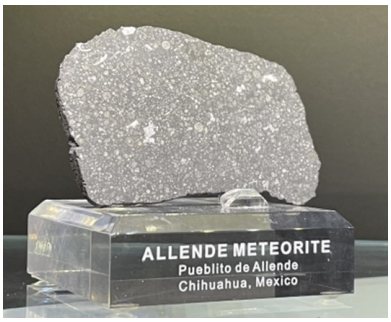
Case 15: Meteorites

What is a meteorite?

Generally speaking, a meteorite is a piece of debris from something (comet, asteroid, etc) that originates from outside Earth and survives passage through the atmosphere.

Sometimes, meteorite falls are witnessed and people will hunt for the meteorite debris. More often, though, a meteorite 'find' occurs without a witnessed fall. Luckily, we can distinguish them from terrestrial rocks because meteorites have a few diagnostic properties (high density, iridium content, magnetism, etc.) that make them unique.



Less metallic iron-rich

More metallic iron-rich

Different types of meteorites:

"Stony": These meteorites have little to no visible metallic iron. Some are rocks that were ejected from the moon or Mars – these are called achondrites. Others are chondrites, composed of small, hardened droplets of relatively undifferentiated material from the early solar system. Chondrites are considered to be older than Earth and are used as 'time capsules' to understand the process of solar system differentiation. Chondrites that have been altered by heat and have lost their chondritic structure can also be called achondrites. Chondrites can sometimes contain organic materials like amino acids – these are called "carbonaceous chondrites". **The Allende Meteorite** is a carbonaceous chondrite.

"Stony Iron": These meteorites can almost look like stained glass because they have an iron matrix in between large crystals. A pallasite is a type of stony iron meteorite that has olivine crystals, representing material ejected from the core/mantle boundary of a planet in the midst of differentiation. **The Seymchan Meteorite** is a pallasite.

"Iron": These meteorites are almost entirely composed of iron and nickel. They represent material ejected from the innermost core of a differentiating planet. Kamacite and taenite, two iron-nickel minerals, intergrow in crisscrossing crystals known as Widmanstätten patterns. The patterns, like the ones seen on the **Canyon Diablo** and **Seymchan** meteorite cross-sections, are only visible when an iron meteorite surface is etched with acid.

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Information from:

Mindat.org – The world's largest online mineral database.

***"Rock and Gem: The definitive guide to rocks, minerals, gemstones, and fossils"** by Bonewitz, R. and the Smithsonian Institute, New York, NY: Dorling Kindersle. 2008.

***"Simon and Schuster's Guide to Rocks and Minerals"** – edited by Martin Prinz, George Harlow, and Joseph Peters. New York: Simon and Schuster, 1978.

For further reading, see:

British Natural History Museum: "Types of Meteorites", available at: https://www.nhm.ac.uk/discover/types-of-meteorites.html

NASA Science: "Meteors and Meteorites", available at https://solarsystem.nasa.gov/asteroids-comets-and-meteors/meteors-and-meteorites/overview/?page=0&per_page=40&order=id+asc&search=&condition_1=meteor_shower%3Abody_type

***available for reference in the Dice Mineralogical Museum

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