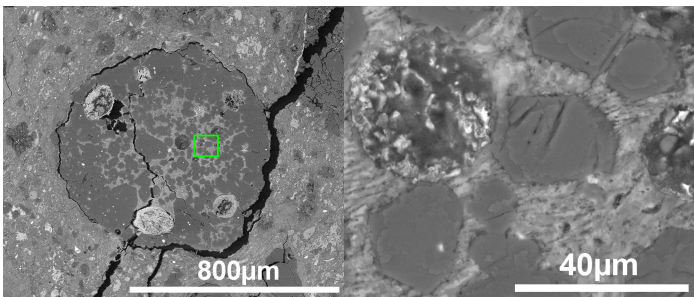


## What are CM chondrites?

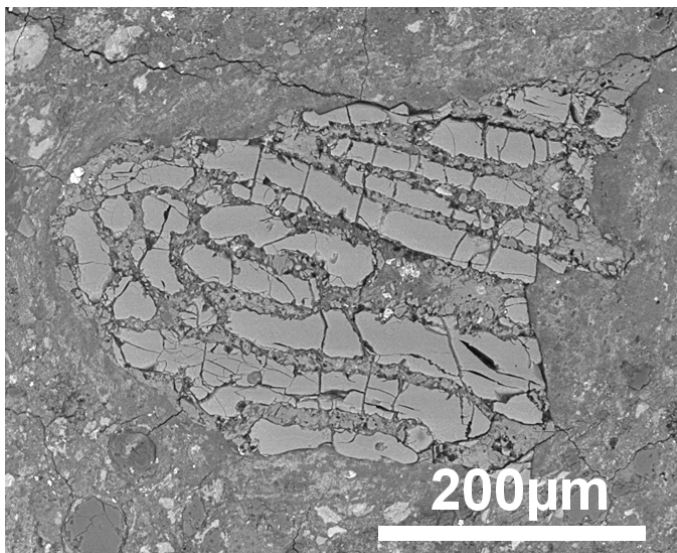
CM chondrites are a subcategory of carbonaceous chondrite. A meteorite is classed as a chondrite if it contains structures called chondrules, which were molten droplets from the formation of the solar system. Carbonaceous chondrites are characterised by a primitive composition closely matching the overall solar system, and so these meteorites represent some of the earliest material, although much of it has been altered by water.

## What do CM chondrites contain?

CM chondrites are made up of a large assortment of materials. Chondrules are present, but not in great abundance, and a number of them are fragmented. They vary in size from ~1mm to 10µm. Those chondrules that are present are partially or entirely altered.

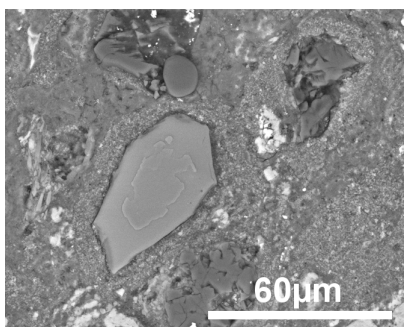


A chondrule from the CM chondrite Murray, with a zoomed section showing the alteration within.



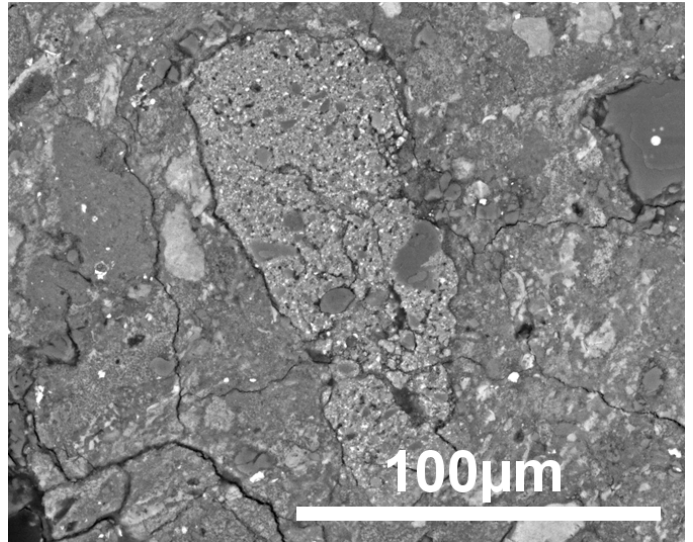
A fragment of an originally barred chondrule

Olivines and pyroxenes make up the chondrules that have not been altered and can also be found as individual crystals. Both chondrules and single crystals, as well as many other features have rims of a different composition from the surrounding matrix, though it is not known why this should be.



Single crystals surrounded by a rim

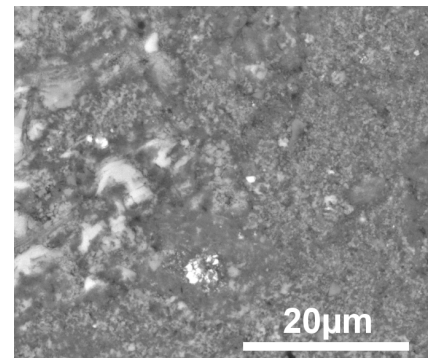
Clasts of varying compositions are mixed in with the chondrules and single crystals. The different sources of the clasts are the result of processes on the surface of an asteroid. Some clasts have compositions that are similar to different categories of meteorites. For instance a clast can be from a CI chondrite, distinguishable by the presence of magnetite.



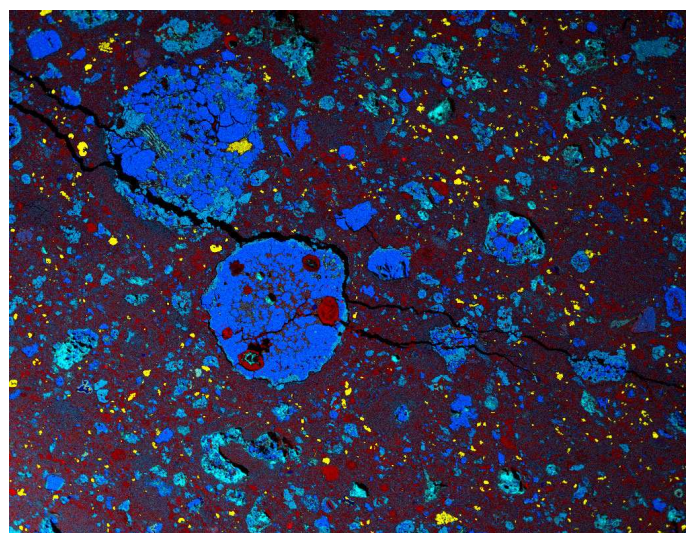
A clast, distinguished by containing different constituents from the surrounding matrix

Small crystals of carbonates are also present. Often the carbonates have been replaced by a pseudomorph, a different mineral that has retained the appearance of the carbonate.

A large amount of iron sulphides are mixed in with the matrix and in some clasts, however the majority of CMs are made up of clay minerals from the aqueous alteration.



High magnification image of the matrix. The white material is iron sulphide.



X-ray map of a CM meteorite called Murray. Red=iron, blue=magnesium, cyan=silicon, and yellow=calcium. The corresponding minerals are: blue=olivine, red=iron metals and sulphides and yellow=calcite