Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

Meteorites

CANADA 1842 GEOLOGICAL SURVEY – COMMISSION GÉOLOGIQUE

What are they

Meteorites are pieces of rocks and metallic iron that have fallen to earth from outer space. They vary in size from that of a pinhead to masses weighing several tons. Large ones may impact with sufficient force to produce craters a mile or more in diameter, such as the New Quebec crater in northern Quebec, but the smaller ones generally land with little effect and are found at shallow depth or loose on the surface. In rare instances, they have been found embedded in buildings. Although meteorites may differ widely in their chemical composition and physical properties, they all have one important criterion in common: they are of *extra-terrestrial* origin, coming from space far beyond the earth's atmosphere.

Meteorites are related to, but quite distinct from, *meteors* which are the 'shooting stars' that are often seen streaking through the night sky with a brilliant, silvery light. Meteors are the incandescent paths that objects produce on their fiery flights through space. Fragments and pieces of meteors that reach earth are called meteorites.

Meteorites are generally believed to originate when *comets* or small *planets* — called *asteroids* — collide with one another in space. Each earth-bound piece or fragment resulting from these collisions is set ablaze by the tremendous friction developed as it hurtles through the earth's atmosphere. The brightly glowing fragment and the tail of glowing debris it sheds in flight, produces the luminescent streak or *fireball* of a meteor. Most fragments burn up completely, but, fortunately, some survive. A meteorite fall may consist of only one specimen or a shower of several hundred specimens.

Meteorites have been put to some strange uses. A tribe of Alberta Indians used one as a fetish or ceremonial stone. The famous Black Stone held most sacred throughout the Islamic world is believed to be a meteorite. In early Asia Minor, iron tools were fashioned from meteorites and, in more recent time, a lump of metal used as a barn door stop on a farm in Western Canada turned out to be a meteorite.

Their importance to you

Because meteorites are natural materials recovered from space, they are invaluable as a source of information to scientists in their study of outer space and space-vehicle re-entry problems. Also, because they are probably pieces of broken *planets,* they could provide important clues to what the interior of the earth is like. For these and other reasons, they are in great demand by the Geological Survey of Canada and also Canadian universities and museums, many of which will purchase genuine samples.

A national collection of more than 350 meteorite specimens is maintained by the Geological Survey of Canada, Ottawa, for research and display. The importance of this *National Meteorite Collection* is such that the Geological Survey will pay $100 or more for the first specimen of any Canadian meteorite. Payment has already been made for a number of specimens submitted by amateur collectors.

Should you find a specimen possessing the apparent characteristics of a meteorite, please forward it to:

Director
Geological Survey of Canada
601 Booth Street
Ottawa (Ont.) K1A 0E8
Attn: Meteorite Identification

The specimen will be examined and reported on free of charge. Payment will be made after positive identification. If the specimen is too large for mailing, a letter describing its appearance and exact location should be sent instead.

How to identify them

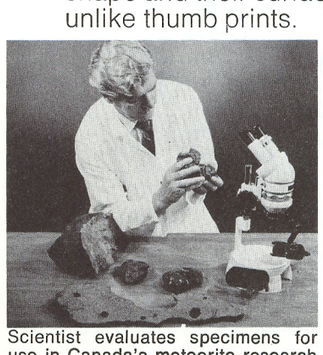
Meteorites are divided into three groups which vary widely both in appearance and properties. The groups, their popular and scientific names, and their general characteristics are:

stones or *aerolites:*	resemble common rocks, and are the most abundant group of meteorites
irons or *siderites:*	masses of metal with some silicate minerals, and very heavy
stony-irons or *siderolites:*	composed of about equal parts of metal and silicate minerals

Despite many resemblances to natural rocks and minerals, and man-made slags and metals, meteorites possess a number of distinctive characteristics — as listed below — that aid in their identification.

Meteorite specimens generally possess a fusion crust, which is dull black to brown in colour, and quite soft. This crust is more prevalent on the *stones* and *stony-iron* and may have partly flaked off.

Irons and *stony-irons* contain much nickel and are strongly magnetic. They are irregular in shape and their surfaces are characterized by the presence of many smooth pits, not unlike thumb prints.

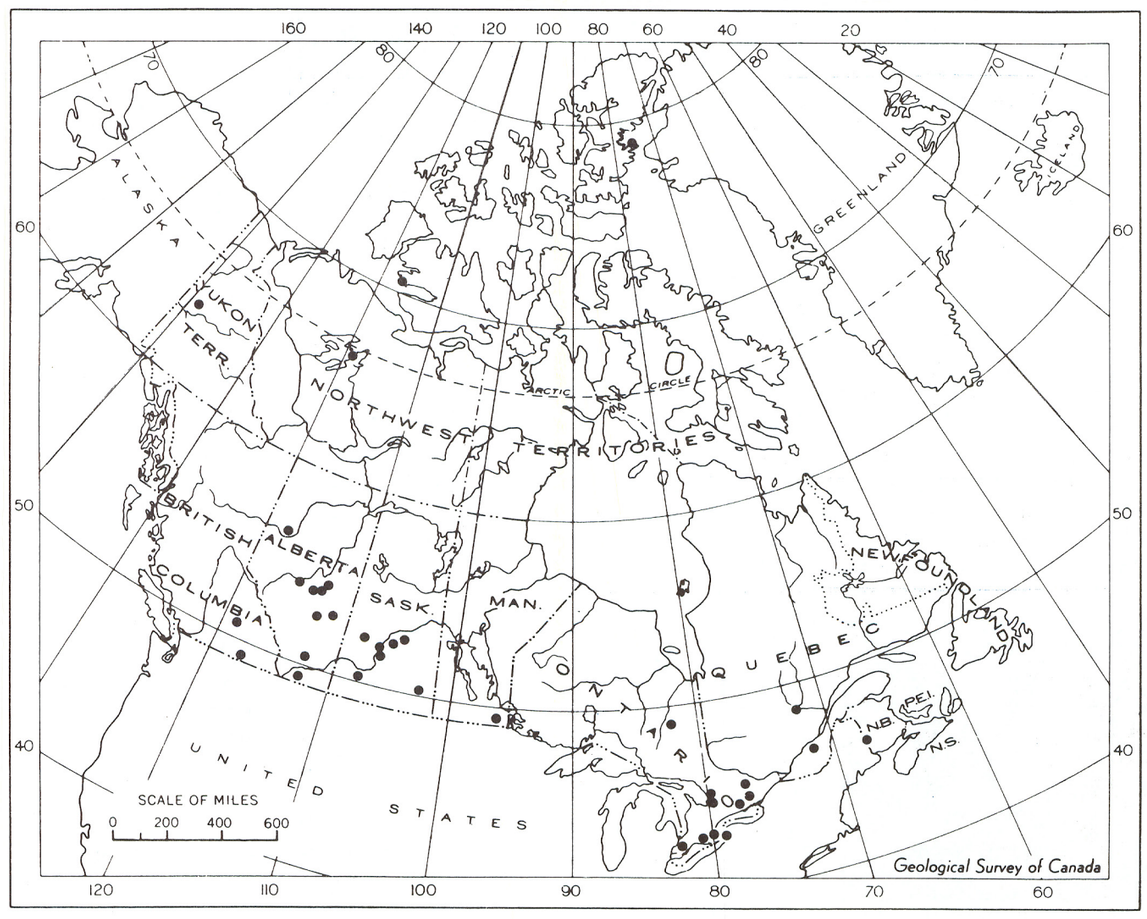


Scientist evaluates specimens for use in Canada's meteorite research program.

Stones contain metallic iron in the form of scattered grains that are visible on broken or polished surfaces. They also commonly contain curious structures called *chondrules.* These are small spheres of silicate minerals and are generally visible to the naked eye on broken or polished surfaces. Surface pits on *stones* are shallower and less noticeable than on irons.

Some meteorites may not exhibit these distinctive characteristics and may require laboratory tests to confirm their identity.

The accompanying illustrations will help to distinguish between meteorites and some of the earth materials commonly mistaken for meteorites.

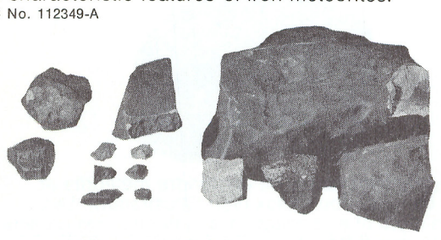


Dots on map above indicate vicinity in which meteorites have been found in Canada.

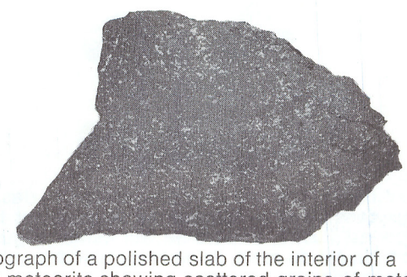
These are meteorites

Iron meteorite found near Annaheim, Sask. The smooth deep surface pits and very irregular shape are characteristic features of iron meteorites. GSC No. 112349-A

The stony meteorite found near Abee, Alta., has an angular shape and generally smooth black fusion crust, with shallow surface pits and a pebbled surface texture. Size 12 x 16 x 18.5 inches. GSC No. 109341-B



Stony meteorites found near Bruderheim, Alta. Note the irregular shapes and the shallow surface pits. Lighter coloured areas are where the black fusion crust has broken off, exposing the interior of the stone. GSC No. 112350



Photograph of a polished slab of the interior of a stony meteorite showing scattered grains of metallic iron (white) that are characteristic features of such stones. GSC No. 201633-U

These are not meteorites

Heavy iron balls used for grinding ores are man-made objects often mistaken for meteorites. The shapes of iron meteorites, however, are much more irregular than even worn grinding-balls such as the lower specimens. GSC No. 201633-Q

Close-up photograph of a pyrite concretion which, because of its shape and dull black surface, could be mistaken for a meteorite. Because of its high pyrite content it is heavier than ordinary stone. But unlike a meteorite, it is non-magnetic. GSC No. 112316-G

Specimens of pebbles in a limey sand like that shown above are sometimes mistaken for meteorites because of their irregular shape. They have none of the characteristics of a meteorite. GSC No. 112293

Furnace slag, like that shown above, is often mistaken for meteorites. It lacks all the surface and interior characteristics of a meteorite. Its surface is shiny in contrast to the dull black color of the meteorite's surface. Numerous bubble-shaped holes may occur throughout. GSC No. 112316-F