Telling Meteorites from Wrongs

"Is this a meteorite?" is probably the most common rock identification questions I get. Many people not only find meteorites fascinating, and would love to find one, but also they are aware of their value and hope for a windfall. Here are my clues from telling meteor-rights from -wrongs.

First, is it magnetic? Most meteorites contain at least some iron-nickel alloy so will respond to a magnet. Those that don't are so rare, weather rapidly and usually have such drab appearances that they aren't normally recognizable. We find these rare ones when they've been seen to fall from the sky, or they are found in areas where few other rocks accumulate such as on top of glaciers or on the deep sea floor.

Unfortunately, there are a number of earth rocks that also will respond to a magnet, so the magnetic test is not enough. Where I live, the landscape is covered by debris from glaciers that scrapped across magnetic iron formation and gabbros to the north. People picking through this material find lots of magnetic "meteor-wrongs", bring them excitedly into my office and come away bitterly disappointed. I'm sorry - but they are what they are.

Second, does the rock show layering? Meteorites don't show layers or bands but earth rocks often do. This includes veins, particularly ones with openings containing crystals. These are not signs of a meteorite.

Third, what does the rock look like on a freshly broken surface? Many weathered surfaces contain dark iron and manganese oxides, which make them look dark. Dark is "burned" to many people, who conclude that weathered surface "must" be a fusion crust formed when the sample roasted during passage through the air. Nature is, unfortunately, good at making dark crusts through oxidation, hydration, microbial action and so forth at room temperature. A fresh surface will reveal a lot about the rock. Fresh surfaces will often reveal the details of a rock's composition and texture and allow its identification - usually as a meteor-wrong.

Also, holes are not a good indicator of a meteorite. Many people assume rocks with holes have "boiled", thus must have hurtled through the air at high speed. Some meteorites may contain pits, called regmaglypts, but not holes. Holes are from earth processes of weathering, erosion or volcanic activity.

On a fresh surface a true iron-nickel meteorite will be steely and not very brittle. Stony meteorites will often have small spherical objects known as chondrules. Beware, though, as earth processes also can make spherical objects in rocks, such as oolites in sedimentary rocks and spherulites in volcanic ones.

My fourth test is this: are there minerals present that are known NOT to occur in meteorites. Quartz and feldspars are common minerals found in many earth rocks but not in meteorites. If any of these are present, the sample is not a meteorite.

Fifth, if there is metallic iron present under the altered crust, does it have significant nickel in it? You want to make sure you haven't found a rusted chunk of Uncle Ned's old Model T. Meteoritic iron always has several percent nickel in it. Iron we find, smelt and use on earth does not. There are fairly simple wet chemical or spectroscopic tests that can be done at most universities to determine if nickel is present in any significant amount.

Some excellent books and web sites are out there to help. My favorite book for budding meteorite hunters is Rocks From Space by O. Richard Norton (1998 Mountain Press). Some good web sites are maintained by: Aerolite Meteorite Men http://www.aerolite.org/found-a-meteorite.htm and Washington University in St. Louis http://meteorites.wustl.edu/meteorwrongs/meteorwrongs.htm The Washington University site has many pictures of meteor-wrongs.

If you are only finding meteor-wrongs, don't despair. Meteorites, although rare, can be found anywhere on our planet, so keep looking!

-Dr. Bill Cordua, University of Wisconsin-River Falls