

Did I find a meteorite?

By Stephen Greb and Warren Anderson

Twenty-seven confirmed meteorites have been found in Kentucky. These are meteorites that people saw fall, or were found and verified in laboratories. Many more pieces (100's to 1000's) of naturally occurring iron ores or man-made materials are misinterpreted as meteorites every year. Be cautious when buying "meteorites" on the internet or in stores. Make sure they have been authenticated or verified by a professional research institution. Most specimens that are brought to labs and professional meteorite researchers for verification are actually something else. In Kentucky, most of the brown-red, iron-like specimens that are brought to the state's Universities for identification are man-made iron slag, rather than meteorites. Shiny, silver-metallic specimens brought in for verification as meteorites tend to be man-made metallic silica, which is a slag or byproduct of glass production. Before and during the Civil War, iron furnaces were common in Kentucky. In the 1830's, Kentucky ranked third among U.S. states in iron production. Slag is the left-over material from those furnaces. It looks like iron and can easily be mistaken for a meteorite; even by well-meaning teachers and scientists that are familiar with rocks and minerals. Slag can be found far away from known furnaces because the iron (and sometimes slag) were shipped in all directions from the furnaces to industries and people who needed the iron.

Some steps to take to determine if your specimen might be a meteorite.

Determining if a rock is a meteorite can be difficult even for professionals. The following is a list of questions concerning the physical description of your specimen and the location where your specimen was found that might help you to answer if the specimen you found could be a meteorite. You can also see examples of iron meteorites on display at the Kentucky Geological Survey (KGS), or see images and descriptions in [Space Visitors in Kentucky](#), an educational KGS publication that can be viewed online at http://kgs.uky.edu/kgsweb/olops/pub/kgs/sp01_12.pdf for comparison to the specimen you found.

A) Physical description.

1) Is the specimen heavy for its size? Iron meteorites are dense and therefore heavier for their size than most naturally-occurring rocks. Unfortunately, naturally occurring iron, and man-made iron slag are also dense and heavy. Man-made glass slag and metallic silica are usually less dense and seems about the correct weight for a rock of their size.

2) Is the specimen rust-like, brown, or orange colored? Weathered meteorites (found buried or in soil) will tend to be dark and rusty looking. Man-made iron slag has similar colors. Naturally-occurring iron compounds in Kentucky can also be dark and rusty, but sometimes have a purplish color or hue.



Specimens with iron-colored or drab-colored exteriors and metallic interiors (silver or gold) that have been found in Kentucky, but are not meteorites

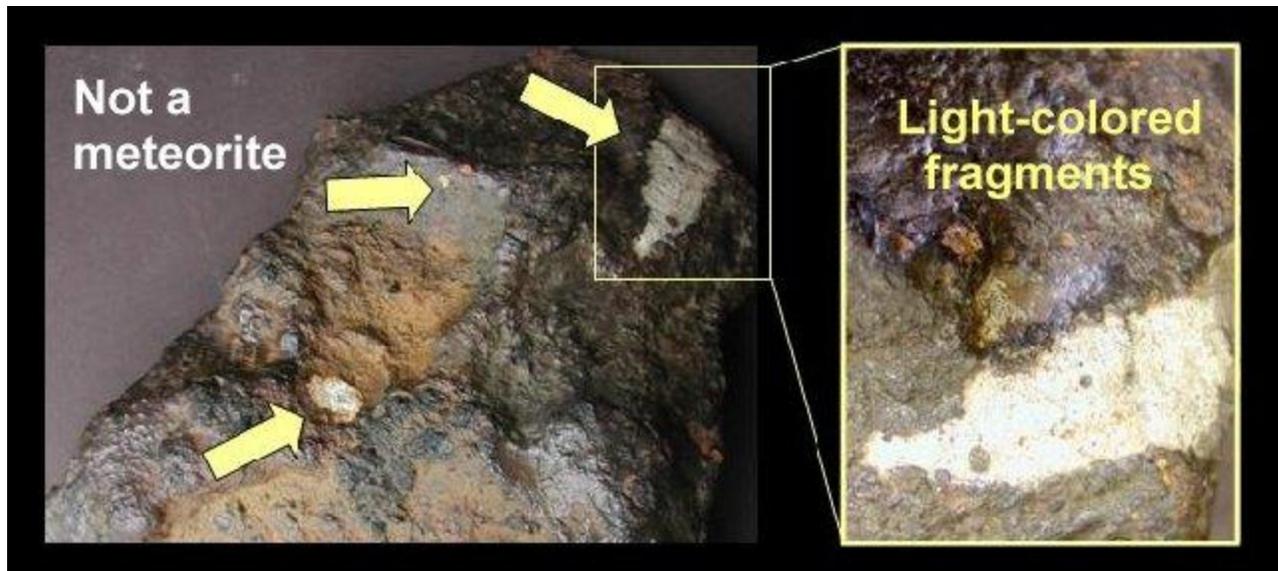
3). Is the specimen metallic, shiny, and silver? Meteorites are rarely bright and metallic on the outside, although they can be on the inside. Specimens that are bright and metallic on the outside, and have been found in the ground in Kentucky, may be man-made metallic silica slag. If the specimen is shiny on the outside it is not a meteorite.



Specimens with silver or metallic, highly reflective exteriors that have been found in Kentucky, but are not meteorites.

4). If the specimen is iron-looking, rust-colored, or metallic, and you think it could be a meteorite, look for fragments or pieces of light gray or white, cement-looking pieces or coal fragments in the specimen. If it contains pieces of other types of rocks or minerals, its probably not a meteorite. Iron or metallic meteorites are usually relatively homogenous, which means that any specimen will look like it

is composed of one material. Some meteorites may contain greenish minerals (olivine), but so do many igneous rocks. Metallic (iron) meteorites do not contain pieces of cement or limestone. Iron slag from Kentucky often contains fragments of other lighter colored rocks from the smelting process. There are stony meteorites that look like they contain pieces and specks of a wide variety of rock types, but these are not iron-colored, rusty, or metallic specimens most people report as possible meteorites.



Iron-appearing specimen that contains light-colored fragments that was found in Kentucky, but is not a meteorite.

- 5) Is the specimen irregularly shaped or round? Meteorites are not round. Most are irregularly shaped. Round rocks that look like what amateur collectors think a meteorite should look like are usually man-made materials or natural concretions and geodes, which are common in Kentucky. Round, heavy white and gray specimens from 1 to 3 inches in diameter may be ceramic “mixing balls”, which used to be used for mixing paints and dyes and are sometimes found in Kentucky.
- 6) Does the specimen have circular holes, markings, or bubbles on its outer surface? This is called vesicular texture and is common in volcanic rocks and some slags, but not iron meteorites. Meteorites are solid and lack a bubbly texture. If the specimen has circular holes or bubbles it is not a meteorite.
- 7) Does the specimen have a dark rind or outer covering, when compared to the inside surface (if the inside is exposed)? Many meteorites develop a fused crust or rind when they enter the earth’s atmosphere. Unfortunately, many natural and man-made iron-bearing rocks also can have an exterior rind. Liesegang banding is a type of iron precipitation common in rocks along the Cumberland escarpment (Greenup to McCreary counties) in eastern Kentucky. These bands are formed naturally from iron in the rock. They tend to have a dark brown, orange, red, or purplish color. Pieces can weather out of the rock or be eroded in streams.
- 8). Does the specimen have striations (scratches) or colored streaks in one direction on its side? When meteorites enter the atmosphere they may streak or partially melt resulting in streaks. Slag can also sometimes have streaks, especially yellowish streaks from limonite in the slag when weathered.
- 9) Does the specimen have small depressions (not holes) that look like someone pressed their thumb all over the outside of the rock? If yes, these might be regmaglypts, which are characteristic of meteorites (see pictures in [Space Visitors](http://kgs.uky.edu/kgsweb/olops/pub/kgs/sp01_12.pdf) at http://kgs.uky.edu/kgsweb/olops/pub/kgs/sp01_12.pdf).

10) Is the specimen magnetic? You can use a magnet, metal shavings, or you can place the specimen next to a compass to see if the compass needle is deflected by the specimen to determine if it is magnetic. Iron meteorites are magnetic, while most naturally-occurring rocks in Kentucky, and silica slag are not. Some people think this test proves a specimen is a meteor but this is not true. Iron ore and iron slag can also both be magnetic.

B) Location description

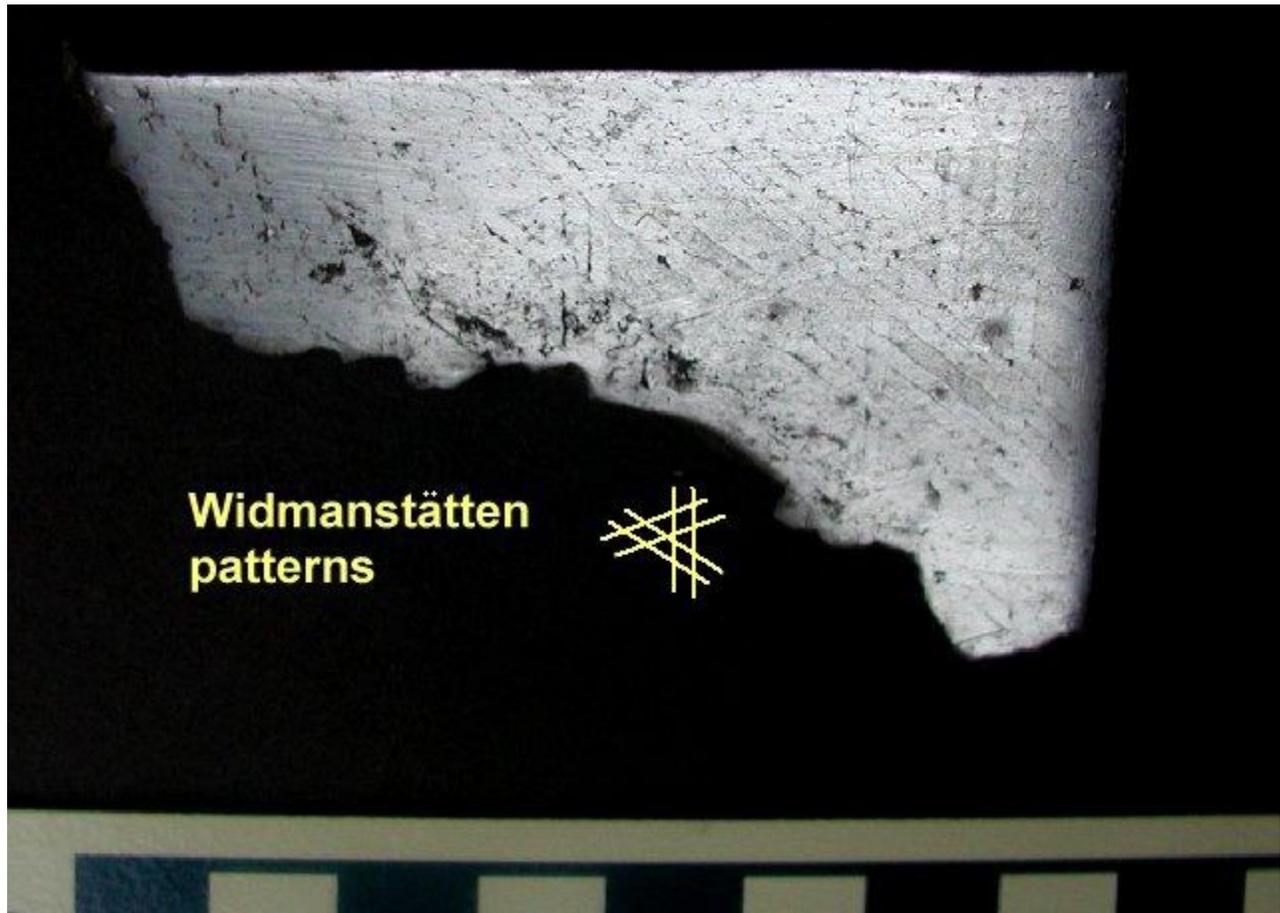
11) Do you live in Bath, Bell, Boyd, Bullitt, Calloway, Campbell, Carter, Crittenden, Edmonson, Estill, Greenup, Hart, Lawrence, Lewis, Livingston, Lyon, McCracken, Menifee, Muhlenberg, Powell, Russell, Scott, or Trigg counties? If yes, these were all counties in which iron furnaces are known to have operated, and it is very likely that you have a piece of slag from an old furnace. More furnaces were operated than are known from historic records so not living in these counties does not mean your specimen is a meteorite. Also, living in these counties does not preclude the possibility that a meteorite could be found there, but the likelihood is that the iron-like material found was from one of the old furnaces.

12) Do you live along a historic road to a major Kentucky town, an old railroad, or the Ohio, Cumberland, or Kentucky rivers? These were all transportation corridors along which iron (and slag) were transported from the furnaces to people and industries that needed iron. Certainly, living along a transportation corridor does not preclude the possibility that a meteorite could be found there, but the likelihood is that the iron-like material found was from an old furnace and fell off a cart, train, etc.

C) More detailed description and testing

13) Does the specimen leave a streak on ceramic tile? One of the tests geologists use in mineral identification is called a streak test. Different minerals leave different colored streaks when scratched across an unglazed ceramic tile. According to the University of Arizona Center for Meteorite Studies, meteorites do not commonly leave a streak unless they are highly weathered. In contrast, naturally occurring iron will leave a brown streak, and natural magnetite will leave a gray-black streak. Iron slags may or may not leave a streak.

14) Does the specimen contain Widmanstätten patterns? These are characteristic cross-hatched patterns on the inside of nickel meteorites (see pictures in [Space Visitors](#)), which might be visible in broken specimens. In some cases, Widmanstätten patterns might also be visible on weathered specimens without treatment. They do not occur in slag. Although diagnostic for meteorites, a specimen usually needs to be cut with a rock saw to see the patterns. Then, sawed surfaces must be etched with acid. This requires professional laboratory services. Warning: cutting steel-hard specimens is dangerous and should not be attempted by amateurs. Likewise, working with acid is dangerous and should not be attempted by individuals not trained to work with acids or outside of laboratories. Some metallic compounds in specimens that look like meteorites can react with acids or produce hazardous dust that can cause harm if inhaled or put in contact with your skin or eyes. Do not saw or apply acids to your specimen!



Cut and etched iron meteorite showing characteristic Widmanstätten patterns.
Scale at the bottom is in centimeters.

If you go through the questions listed above and think there is still a good chance you may have a meteorite, there are meteorite research labs associated with major universities that offer cutting and testing services for small fees.

References

[Cascadia Meteorite Laboratory, Portland State University](#)

[Did I find a meteorite? Arizona State University](#)

[Did I find a meteorite? Department of Geological Sciences, University of Missouri](#)

Ehamnn, W. D., 2000, Space Visitor's in Kentucky: Meteorites and meteorite impact sites in Kentucky: Kentucky Geological Survey, Ser. 12, Special Publication 1, 53 p. Available online at http://kgs.uky.edu/kgsweb/olops/pub/kgs/sp01_12.pdf

Kentucky Historical Society's historic furnace marker list online at <http://kentucky.gov/kyhs/hmdb/MarkerSearch.aspx?mode=Subject&subject=110>