Education • Astronomy • Earth & Space Science

Fleischmann
Planetarium
University of Nevada, Reno

Potential Meteorite Inspection

NOTES

Name of staff person performing test: _____ _____
Date: _____ _____

Visitor name: _____ _____
phone: _____ _____
email: _____ _____

Test 1: visual/physical inspection

- Is it dark in color? ☐ YES ☐ NO
- Is it compact and smooth/rounded with no holes, sharp edges, or veins of different material? ☐ YES ☐ NO
- If irregular, does it have thumbprint-like indentations (regmaglypts) or was it found in a field of many similar specimens? ☐ YES ☐ NO
- Is it heavy for its size? ☐ YES ☐ NO
- Does it have a flaky crust? ☐ YES ☐ NO

Test 2: streak test

- Does a cleaned section the specimen leave a dark grey, brown, or red streak on unglazed ceramic tile? ☐ YES ☐ NO

Test 4: magnetism (not recommended) or electrical resistance

- Is a magnet strongly attracted to the specimen? ☐ YES ☐ NO
- Using a handheld multimeter, is the resistance low (<100 ohms?) RESISTANCE (ohms): _____

Test 5: interior

When filed, is the interior bright metal, or stony with flecks of bright metal? ☐ YES ☐ NO

Test 7: density (not to be considered official classification)

Mass (g): _____ _____
Volume (ml): _____ _____
Density: (g/ml): _____ _____

NOTES:

Test 7: density (advanced—not to be considered official classification)

Using a graduated cylinder and accurate scale, calculate the density in g/ml.

- **Ordinary chondrites** normally fall between **3.00 and 3.50 g/ml**
- **Enstatite chondrites** normally fall between **3.50 and 3.75 g/ml**
- **Carbonaceous chondrites** normally fall between **2.10 and 3.50 g/ml**
- **Achondrites** normally fall between **2.80 and 3.30 g/ml**
- **Stony-irons** fall at **4.25 or 4.75 g/ml**
- **Irons** fall at **7-8 g/ml**

If *not* in the right range for its possible type, then it is *not* a meteorite. If *yes*, then it *might* be a meteorite only if all other tests are positive.

Test 8: nickel content (advanced, perform on a small sample in a dish if possible)

Using a solution with dimethylglyoxime indicator and muriatic acid / ammonium hydroxide, check for significant nickel content (pink/red to purple color that that doesn't disappear within 5 minutes). Perform this test on a small sample in a dish if possible.

If there is *low* or *no* nickel content, then it is not a meteorite. If there is *high* nickel content, then it *might* be a meteorite.

Test 9: cut and etch (advanced, not available on campus)

Allow a professional to cut the specimen with an abrasive-type blade on a water cooled drop saw. Etch the face with ferric chloride and hydrochloric acid. Iron meteorites will show crystalline Widmanstätten patterns.

What next?

If your specimen might be a meteorite, it probably isn't worth much more than any other interesting rocks, but we would love to document it with pictures and finder information. If you'd like to donate it to our collection we'd be excited to feature it in an exhibit and publicly recognize you!

If you want to have it officially identified and classified, please contact

- **New England Meteoritical Services** at meteoritetesting.org

If you are interested in selling your specimen, please contact

- **Southwest Meteorite Laboratory** at meteoritelab.com

Meteorite FAQs

Where do meteorites come from?

Most meteorites that fall to Earth's surface are believed to originate from the asteroid belt, between Mars and Jupiter; these meteorites are either knocked out of their orbit of the Sun by colliding with other objects, or are pulled out of orbit by the Sun's gravitational field. They are the remains of the "building blocks" of terrestrial planets, such as Earth, that never collected to form into a full-sized planet.

A handful of meteorites appear to come from the Moon and Mars. These meteorites are broken off when another object collides with the Moon or Mars with enough force to launch the debris away from the planet and into orbit around the Sun.

Where are meteorites found?

Meteorites fall all over the planet, but they are best preserved and most easily found in deserts, whether they are hot (like Arizona) or cold (like Antarctica) deserts. The dry climate of a desert slows rusting of the metal within many meteorites and the lack of vegetation in deserts makes meteorites easier to find.

What primary types of meteorites are there?

Stony meteorites, the most common type of meteorite, are composed of approximately 75-90% silicon-based minerals, 10-25 % percent nickel-iron alloy, and trace amounts of iron sulfide. Stony meteorites account for 94% of observed meteorite falls; of the two subgroups, chondrites are the most abundant, making up approximately 86% of all falls.

Chondrites, the most abundant type of stony meteorite, contain many of the first objects to have formed in the solar system, such as calcium-aluminum-rich particles and chondrules (from which chondrites get their name). Their chemistry is very primitive because they have undergone very few chemical interactions with other objects since their formation. Chondrites also contain flecks of nickel-iron alloy.

Achondrites originated from another planet or asteroid, having been reformed from molten fragments that were flung into space as the result of another collision. Because achondrites closely resemble Earth rocks to the naked eye, they are rarely encountered as finds.

Iron meteorites come from the core of large asteroids and are composed almost entirely of nickel-iron alloy, which is also a primary component of the Earth's core. Even though they account for only 5% of observed falls, they are more easily recognized than other types of meteorites.

What do meteorites look like?

- **Size:** meteorites vary in size from a few centimeters across to several feet in diameter.
- **Shape:** meteorites are rarely round in shape. Typically, they are irregular in shape with rounded edges.
- **Weight:** In general, meteorites are heavier than Earth rocks of the same size because they have a higher nickel-iron content. Naturally-occurring Earth rocks and materials are typically relatively poor in metals, particularly nickel, in comparison.
- **Color:** the surface of a freshly fallen meteorite will appear black and shiny due to the presence of a "fusion crust," the result of frictional heating and abrasion (or ablation) of the outer surface of the rock as it passes through the Earth's atmosphere. The longer a meteorite has been on Earth, however, the more the fusion crust wears away, leaving the meteorite a rusty brown color.
- **Surface:** Most meteorites have a smooth surface with no holes. However, some meteorites will exhibit thin flow lines or "thumbprint"-like features called regmaglypts. Flow lines are cooled streaks of once-molten fusion crust. Regmaglypts are most likely caused by the severe melting and abrasion of the components of the meteorite as it passed through the Earth's atmosphere.
- **Interior:** Most stony meteorites, especially ordinary chondrites which are the most common type of meteorite to fall, will exhibit tiny metallic flecks on a broken, cut, or polished surface (see Warden, below). In addition, most stony meteorites will exhibit small round chondrules (see Plainview, below). As their name implies, iron meteorites will be made almost entirely of metal, while stony-iron meteorites will contain approximately half metal.
- **Magnetism:** a magnet will be attracted to most meteorites, even stony meteorites, due to their nickel-iron content.