LAFAYETTE SCIENCE MUSEUM

Meteorite Exhibit Guide

Our meteorite exhibit displays many different types of meteorites from many different states and countries. There are even two from Louisiana and one that's likely from Mars!

Things to find in the nickel-iron meteorite display case

Widmanstätten Patterns. On some of the nickel-iron meteorites you can see a "criss-cross" pattern called a Widmanstätten pattern (Widmanstätten is pronounced like "VID-mawn-shtetten," and is the name of an Austrian scientist who helped explain the pattern). These patterns are related to the percent of nickel in the meteorite and only become visible after specially treating the meteorite. On the left side of the case is a slice polished like a mirror, in which there is enough nickel that the pattern becomes microscopic. Right beside that slice is a piece of the same meteorite as it is found in the field. Compare their appearances—judging from the outside, would you have guessed what that meteorite was like on the inside?

Meteorite weights. Nickel-iron meteorites are denser than normal rocks and can be surprisingly heavy for their sizes. The largest nickel-iron meteorite on display is about the size of a bowling ball. A bowling ball typically weighs about 14 to 16 pounds (6 or 7 kilograms), but that meteorite weighs 78 pounds (35 kilograms)! If you have children or grandchildren in elementary school, have them compare that meteorite's weight with their own.

Rust. Some of our nickel-iron meteorites have rust on them. Rusting is a real problem for meteorites because being on Earth where there is water and oxygen is an alien environment for them. Humid places such as Louisiana are particularly harsh. The Museum tries to control rusting by using small green containers in the meteorite cases that release an invisible vapor that coats the meteorites, isolating them from the environment. Unfortunately some of the corrosion starts with the chemistry of the meteorite itself, and no vapor coat can stop that. About once a year, some of our meteorites are taken off display for an anti-corrosion chemical bath. The museum can't stop some of the meteorites from corroding, but the treatments do slow that down.

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Things to find in the stony meteorite display case

Chondrules. Look for particular types of stony meteorite called chondrites, characterized by the presence (sometimes hard to see) of round spots called chondrules (pronounced "KON-druls"). Chondrules appear to be melted drops that cooled enough to become solid and then came together to form small asteroids. Chondrites are the most common type of meteorite.

Carbonaceous chondrites. Among other characteristics, these meteorites have water molecules as part of their mineral structure and are richer than other meteorites in carbon. Look for the small Murchison meteorite on display. Falling in 1969 in Australia, it contains amino acids, the so-called "building blocks of life," that are not found on Earth. This does not mean that this meteorite contains evidence for life elsewhere, but it does mean that organic chemistry can be found elsewhere.

Achondrites. Look for achondrites, stony meteorites with no chondrules. These are the surface rocks of asteroids large enough for their interiors to have melted, forming nickel-iron centers, and the rock of achondrites to have flowed like lava on or near their surfaces.

Things to find in the special meteorite display case

Louisiana meteorites. Only three meteorites have been found in Louisiana, and LSM has slices of two of them. The Atlanta meteorite was named for the town of Atlanta in Winnfield Parish (meteorites are usually named after nearby towns or geographic features), and the Greenwell Springs meteorite was found outside Baton Rouge. This may be the only place in the world where the Greenwell Springs meteorite is on public display—there are other pieces at natural history museums in Washington, DC, New York City, and Vienna, Austria, and with the meteorite collection of New Mexico State University, but as far as known none of those places have any actually on public display. Most of this meteorite is owned privately rather than by museums. A third small meteorite fell in New Orleans shortly before Hurricane Katrina, hitting a house, but most of it was lost in the aftermath of the hurricane.

Martian meteorite. Near the front center of the case is a small piece of the Zagami stony meteorite—an actual piece of Mars! About 120 Martian meteorites are now known (out of the tens of thousands of collected meteorites). They are thought to be Martian because they match well with Martian rocks found by landers; they are volcanic and significantly younger than most meteorites (with Mars being one of the few places in the solar system with volcanism in geologically recent times); and atoms matching the Martian atmosphere have been found between the meteorite mineral crystals.

Vesta meteorites. Several meteorites in a group at the front right of the case appear to be from the asteroid Vesta. That asteroid has a giant crater at its south pole, and material ejected from that crater can be found as other asteroids in the asteroid belt. These meteorites match well with the minerals in the surfaces of Vesta and the other asteroids, and the recent Dawn spacecraft that orbited Vesta for over a year confirmed that identification in more detail.

Things to look for concerning impact craters, tektites, and shatter cones

The crater map. Over 150 impact craters are known on Earth. Because Earth has erosion, earthquakes, and more, most craters are eroded or buried by sediments. They can be difficult to impossible to see, but geologists can find them. One of the most dramatic is the Barringer crater in northern Arizona, pictured in the lower left of the map panel. Compare the crater's size with the curving road leading to its nearest edge!

Tektites and strewn fields. Look at the different shapes of tektites, particularly the ones at the lower left of the display. Some entered the atmosphere while still nearly molten, stretching into "dog bone" shapes as they rotated. Teardrop shapes are dog bones that rotated fast enough to split in half; their tips show the glassy interiors of tektites. Small pits and gouges in the tektites were caused by entry into the atmosphere at very high speeds. The Muong Nong tektite has layers in it, and no one knows exactly why. Be sure to look at the small button tektite at the bottom right of the exhibit. Its shape happened when it became stable during entry into the atmosphere. The stable shape of button tektites was studied for the design of landing probes to Mars and Titan (Saturn's largest moon). Northern Louisiana should be in the North American tektite strewn field, but none have been found there. If you visit northwestern Louisiana, keep an eye out for glassy rocks that may look like georgiaites and bediasites!

Shatter cones and where they are found. Shatter cones are earth rocks found below impact craters. The cone-shaped crack lines in them happen when shock waves from an impact go through the rock. It can be hard to decide if a crater is volcanic or impact in origin, but shatter cones are only found under impact craters (and nuclear bomb test sites!). When geologists find shatter cones under a crater, they know they are dealing with an impact site. In our exhibit, the shatter cone shape is best seen in the small shatter cone from Sierra Madera, Texas, near the bottom center of the display.

<u>*Things to look for concerning the 1957 meteor*</u>

In 1957, people across the southeastern United States witnessed an extremely bright meteor. It was so memorable that people who saw it still ask about it when visiting the museum over 50 years later! As is common, many people who saw it think it must have hit near them, but in fact observations from the Galveston area show it must have come down over the Gulf if it survived the trip through the atmosphere at all. Our meteor map shows where observations were reported, and small "X" marks indicate incorrect claims of impacts. If you have parents, grandparents or great-grandparents who were alive then, they might be able to tell how it looked to them!

<u>*Cool meteorite facts*</u>

Between the end of the luminous "meteor" phase and an object's impact on the ground as a meteorite, the object falls the final 5 to 20 miles (8 to 32 kilometers) as a dark object. There is no particular technical term for that phase, sometimes informally called "dark flight."

Meteorites cool as they fall in dark flight and are not particularly hot when they hit the ground!

Meteoroids enter Earth's atmosphere at speeds between 7 ½ and 45 miles per second (12 to 72 kilometers per second), but the atmosphere slows them so much that impact speeds of small meteorites are roughly a few hundred miles or kilometers per hour.

Sometimes people find odd rocks that they think might be meteorites, but which turn out to be something else. Meteorite scientists call those "meteor-wrongs."

Except for a couple of meteorites at the planetarium console kept aside specifically for visitors to hold, our museum meteorites are never handled even by staff without gloves. That's not because *they* are dangerous to *us* but because *we* are dangerous to *them*—oils and fluids from our hands can start corrosion of some meteorite minerals.