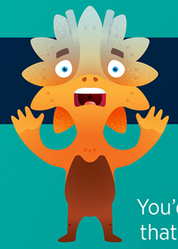
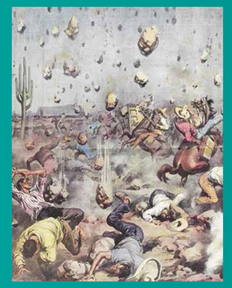


Is the sky falling?

You'd think that with the 40,000 tons of extraterrestrial material that falls to the Earth yearly, we'd all be covered in space dust. But we just so happen to live on the biggest rocky planet in the solar system and most of the material that falls to the surface are microscopic pieces of rock called "cosmic dust". To put it in perspective, one teaspoon of extraterrestrial debris falls over the equivalent of 43 football fields (57 acres), so needless to say, it gets spread a little thin! Stone-sized meteorites are actually pretty rare. Anything leaning more toward car-sized are once in a lifetime occurrences. The most we have to worry about regarding the debris from meteorites is a few sneezes from the dust!

The Holbrook Meteorite Fall—On the evening of July 19, 1912, the small town of Holbrook, Arizona was disturbed by a deafening explosion heard from more than 40 miles away. A series of smaller explosions followed, sounding like clamorous thunder rolling through the Navajo County desert. Many thousands of small meteorite stones bombarded the town, the largest of which weighed 6 kilograms (14 pounds). Due to the extremely high velocity of the meteoroid as it passed through the thin upper atmosphere of the Earth, any fragments which were not completely vaporized, developed a thin layer of melted rock that quickly solidified into smooth, black fusion crust. It is estimated that over 16,000 stones fell during the event, battering roofs and kicking up dust. Afterwards, more than 14,000 stones, with a collective weight of 233 kilograms (536 pounds), were recovered. Specimens from this fall are still being found today.



Holbrook
Fell: Navajo County, AZ, July 19, 1912
Mass: 220 kg
Classification: L/LL6, chondrite
Specimen Wt: Various
Provenance: Abrams Planetarium

This image, called a strewn field map, shows the geographic area where the meteorites from the Holbrook, Arizona Fall were recovered. Strewn field maps give us information about the size of the event, the slope of the meteor's trajectory when it entered our atmosphere, and the direction and speed of the wind during the event. Meteors with a steeper angle will generally create smaller strewn fields. Conversely, shallower angles create larger strewn fields. The Holbrook Fall produced a large strewn field spanning more than 10 kilometers (6 miles) along the Santa Fe railway line.

Meteor showers are different from meteors producing meteorites

Courtesy of Derek Demeter

These amazing light-shows in the sky happen when streams of cosmic debris from the tail of a comet hit the Earth's atmosphere lightning-quick at parallel trajectories. Because of their parallel nature, the meteors that make up a shower all seem to originate from the same point in the night sky. Meteor showers are named from the constellation that they appear to originate from. For example, a shower that seems to come out of the constellation Perseus is called a Perseid shower. Lucky for us, the meteors that make up a shower are almost all smaller than an individual grain of sand and vaporize in the Earth's atmosphere well before they reach the surface. If they didn't, we'd have a lot of trouble on our hands since some intense showers, called either a "meteor outburst" or a "meteor storm" can produce at least 1,000 meteors an hour! That's one heck of a hailstorm!

DID YOU KNOW

Did you know that the color of light that meteors produce during meteor showers is related to their chemical composition? Meteors with a higher percentage of calcium will create violet streaks in the sky, whereas magnesium-rich meteors give off a verdant green glow.

Did you know that sand is made up of tiny rocks? Grains of sand are actually bits of minerals that have been weathered and worn down over a long period of time. The composition of sand varies quite a bit but more often than not, non-tropical sand will contain quartz in the form of silica. Scientists have learned that meteorite impacts can transform the crystalline structure of the mineral and create new kinds of silica. This means that scientists can use sand to learn more about where and when meteorites may have struck the Earth thousands of years ago. When you put your toes in the sand, you could be standing on some grains from a meteorite fall site without even knowing it!

Sand
The most common ingredient in sand is silica, usually in the form of quartz. **Meteorites do not contain any substantial amount of quartz.**

You can search for your own micrometeorites

Rain gutter debris
Holt, MI
Acquired: April 4, 2020
Provenance: Abrams Planetarium

What is a Micrometeorite?
Exactly what it sounds like! Micrometeorites (MM) are tiny bits of extraterrestrial dust that fell to Earth from space. Because they are so small they could be anywhere, even in your own yard! Most MMs retrieved on Earth are cosmic spherules, rounded droplets of stone or metal that were once melted and have now solidified.

However, not all spherules are micrometeorites. Nature creates spherules with the heat of volcanic eruptions or lightning strikes. Humans also make spherules as a byproduct of industrial processes, or through the usage of power tools. This is very common, so it's important to look for the right signs when seeking out MMs.

1 **Know where to look.** Flat roofs are a great starting point, as MMs will be less likely to roll and fall off. If your roof is pitched, check the gutters! Placing a bucket at the bottom of your rain spout can help ensure that you don't miss any. Be patient: it may take a year or two before you hit the jackpot.

2 **Use the right tool.** Since most MMs, almost 80%, contain small amounts of iron and nickel, they can be picked up with a magnet—the stronger the better!

3 **Look closely.** Most cosmic spherules are tiny, only about 0.2 to 0.4 millimeters in diameter. Start with your magnet to collect a sample and weed out the big pieces by hand.

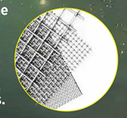
4 **Sort your findings.** Place your magnet inside a small plastic zip bag. Put that bag and your hand inside a second bag, making sure that the bag is snug around the magnet. Touch your samples with the outside of your bag, allowing the magnet to make contact through the plastic and pick up any magnetic particles. With your free hand, use a third small zip bag to collect the magnetic particles clinging to the outside of the second bag.

Label your magnetic samples with the date, location, and other details.

Clean your samples with water. The MMs, mostly black in color, will be more visible if you use a white ceramic or plastic bowl. Very carefully clean your samples with hot water and dish soap, making sure to stir gently with a wooden or plastic spoon.

Carefully rinse and collect all the particles, even the smallest ones at the bottom of your bowl, then place on a plate to dry.

After your samples are dry, screen them with strainers starting with a mesh size of 1.5mm, then working down to 0.4mm mesh. Since most MMs are smaller than 0.4mm the smallest fraction of your sample, the bits that fall through the mesh, could be micrometeorites! **Place your screened samples into separate containers.**



5 **Your Search Begins.** Use a USB microscope to take a look for MMs. Want to learn more? *On the Trail of Stardust - The Guide to Finding Micrometeorites: Tools, Techniques, and Identification* by Jon Larsen is a great resource!

Happy hunting!