

Start Here

With this page facing you, the presenter,
set out your rocks and meteorites for the visitors to handle.

Remove the sliced stony meteorite (no number)
and the magnet for use later.

Hook them with an introduction like...

"Have you ever seen a rock from outer space?"

At least one of these rocks is a meteorite.

Can you figure out which ones are space rocks?"

Flip this page towards
the visitors to get started



1

Our First Clue:

The space rock made it through Earth's Atmosphere

As space rocks come through the atmosphere,
they are traveling *really* fast (>20 miles/sec).

Most small porous rocks explode or vaporize when they hit
the atmosphere and never make it to the ground.

*Does anyone know what we call
a space rock vaporizing in our atmosphere?*

2



A Meteor!

Rocks with lots of holes **vaporize** or **explode**
in the atmosphere (they don't "burn up")

Only **strong** space rocks **without lots of holes**
make it to the ground to become meteorites

Audience:

Rocks with lots of holes are likely Earth rocks.

These likely aren't meteorites.

3

The Atmosphere Also... Melts the Outer Layer of Space Rocks

Some meteorites get a dark crust

Other meteorites can look like

a splash of metal.

They're all **dark** (at least on the outside).

Audience:

Light colored rocks are probably Earth rocks.

These probably aren't meteorites.

4

Examples of Meteorites



The dark crust
can rust over time

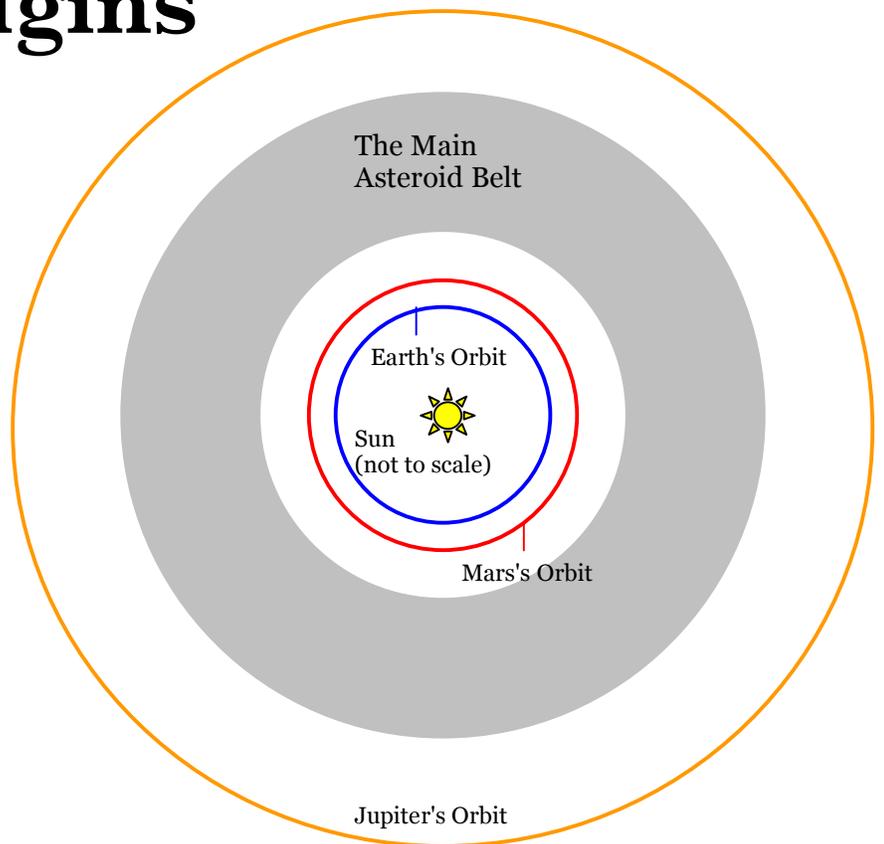


Meteorite Origins

Collisions in the
Asteroid Belt



Art by Don Davis © SwRI 2007



The Next Clue

Comes from meteorites' origin

Almost all meteorites on Earth
come from the Asteroid Belt.

How are asteroids different from
rocky planets like Mars and Earth?

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Asteroids are Small

Most never got big enough or hot enough for the metal to
liquefy and sink to the core, like on Earth.
Metal is still mixed in with rock and dust.

These are **stony meteorites**.

A few did get big and hot and formed metal cores.
Sometimes these collided too, sending pieces of the iron core
to Earth. We call these pieces **iron meteorites**

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Meteorites come from Asteroids

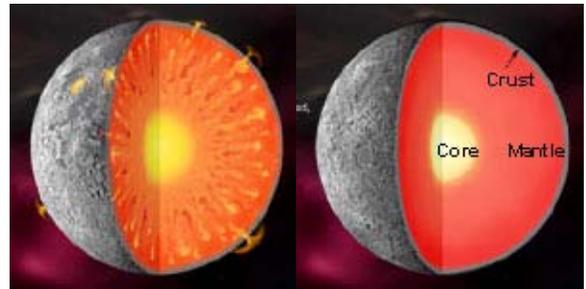
Most asteroids are small and never got very hot inside.

They are still a mixture of **stone** and **metals** from the formation of our Solar System



Stony Meteorites

Only a few asteroids got bigger. Iron meteorites come from the cores of big asteroids. They are made mostly of **metals (iron)**



Pictures courtesy Smithsonian National Museum of Natural History

Iron Meteorites

Metal is Heavy

Both types of meteorites **contain a lot of iron.**

So meteorites are usually heavier than Earth rocks of the same size.



Meteorites are Heavy

Iron is heavy and meteorites contain a lot of iron.

So a meteorite is usually heavier than an Earth Rock of the same size.

(Of course we know that we are talking about the rock's density, but many people do not understand this concept.)

Audience:

Remove any lightweight rocks-

Lightweight rocks are not likely to be meteorites

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Iron is Attracted to a Magnet

Since almost all meteorites have lots of iron in them, they should be attracted to a magnet.

Audience:

Remove any rocks that are not attracted to the magnet-

Rocks without iron are not likely to be meteorites

But this is not a definitive test!

There is also a piece of **lodestone** in the set. (**Marked # 3**)

This is an Earth Rock that contains a lot of iron.

More detailed tests will show that this rock does not have nickel in it like meteorites do.

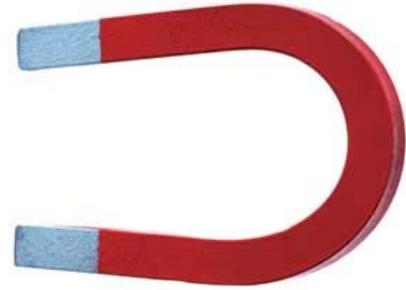
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Which do you think will be more strongly attracted?

An Iron Meteorite

or

A Stony Meteorite?



Iron Meteorites

The biggest meteorites on Earth are iron meteorites.

This is the largest meteorite ever found- the Hoba meteorite in Namibia.



Iron Meteorite

Marked # 4

Background Information:

- Only about 5% of the meteorites that hit the Earth are iron meteorites. But because they are stronger, more of them survive the trip through the atmosphere. Also, iron meteorites are more resistant to weather effects and easier to find. Over half of the meteorite finds are of this type.
- Iron meteorites were once part of the core of a long-vanished large asteroid and originated within the Asteroid Belt between Mars and Jupiter.
- They are among the densest materials on Earth and will stick very strongly to a powerful magnet. Iron meteorites are far heavier than most earth rocks-if you've ever lifted up a cannon ball or a slab of iron or steel, you'll get the idea.
- The largest space rock ever found on Earth is an iron meteorite. The Hoba meteorite in Namibia weighs 60,000 kg (about 50 tons).

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Common Stony Meteorite

Marked # 2

Take a look at this sliced specimen.

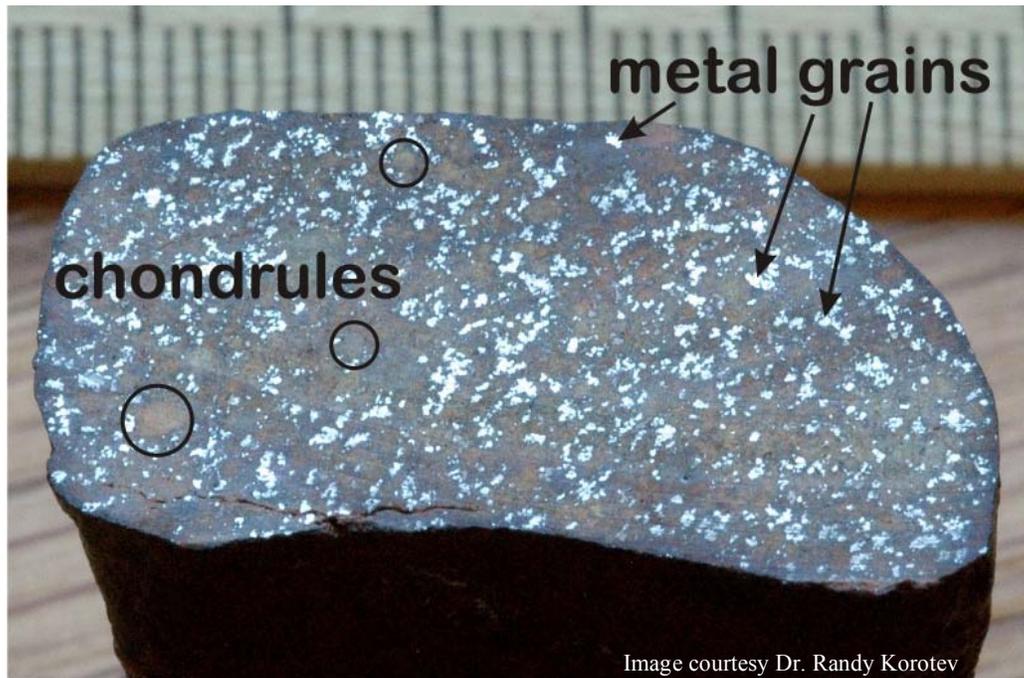
You can see the mixed metal and stone.

Background Information:

- 94% of the meteorites that fall to Earth are Stony meteorites.
- Of these, most are *chondrites*, which are named for the small, round particles composed mostly of silicate minerals or stone (shown opposite).
- Even though these are the most abundant type of meteorite, only about 40% of all meteorites that have been found are stony. This is partly because they weather quickly and also they look a lot like earth rocks.
- At 4.5 billion years old chondrites are some of the oldest and most primitive materials in the solar system. Chondrites are often considered to be "the building blocks of the planets."

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Common Stony Meteorites



Not Meteorites, but

Tektites



Melted sand from large impacts gets thrown from the crater and out of our atmosphere

Tektite Marked # 6

Do any of your visitors know what the result is when sand gets so hot that it melts? *Glass!*

- Tektites are not meteorites, but they do have something to do with large Earth impacts. These are natural glass objects up to a few centimeters in size that were formed--according to most scientists--by the impacts of large meteorites on Earth's surface.
- In a cratering event, soil and rock are liquefied, or vaporized. This liquid rock formed a type of glass as it was ejected from the impact site. Tektites are typically black or olive-green.
- The tektite included here was ejected out of our atmosphere and landed back on Earth as glass.

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Other Types of Meteorites

Other types of rare meteorites are not included in this kit.

Some of these are:

- Achondrites are stony meteorites without the small round specks called chondrules. Most of these are from the crust of the asteroid Vesta.
- Stony-irons, some which probably come from the boundary of the core and mantle in large asteroids.
- Lunar and Martian meteorites come from our Moon or Mars, not from the Asteroid Belt. These are the most rare types of meteorites and do not look like the meteorites we discussed here.

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Other Types of Meteorites

Stony-iron meteorites can be very beautiful

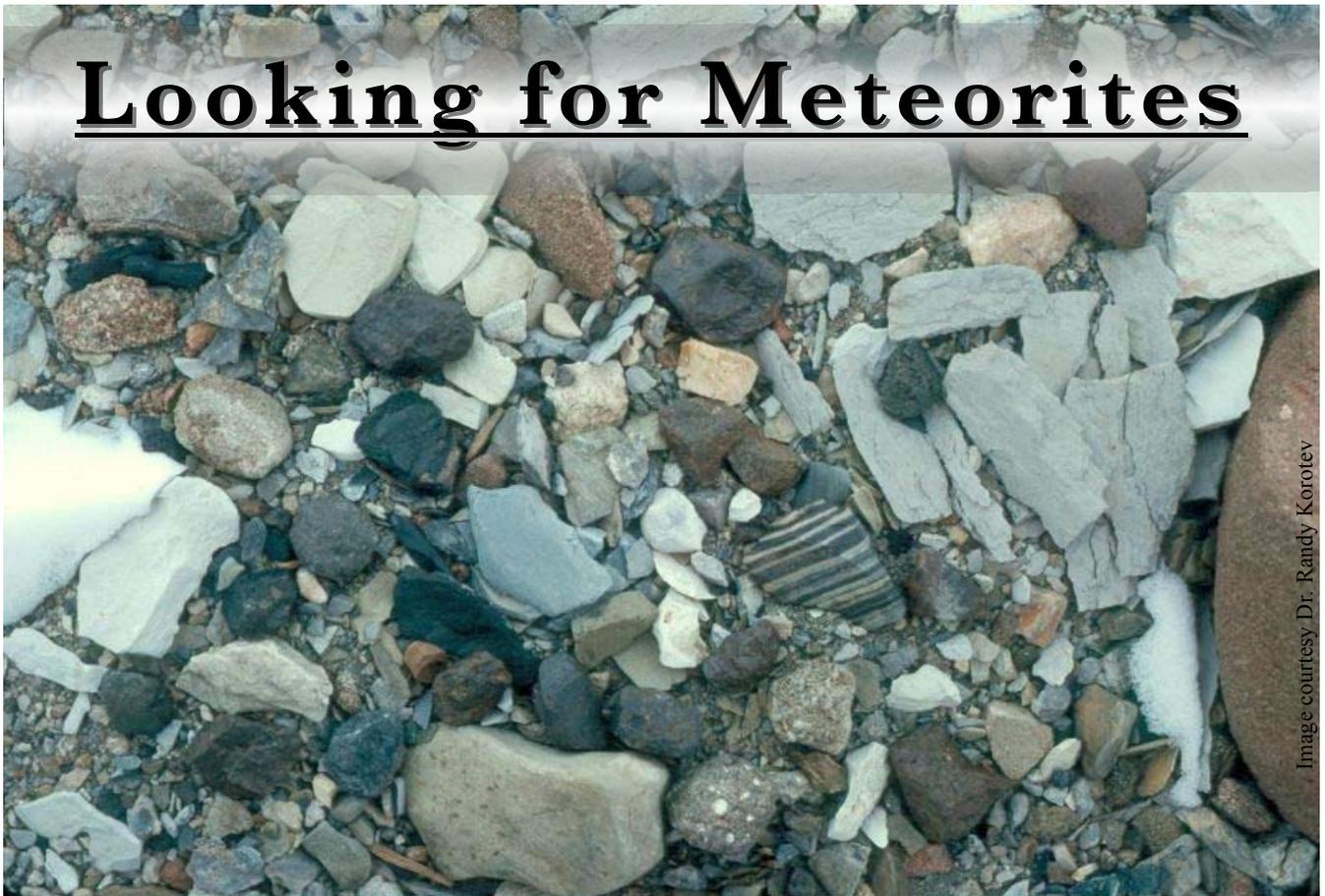


Lunar meteorites are very rare and not like others



There are even a few meteorites from Mars!

Looking for Meteorites



Can you find the meteorites?

These two in the red circles are meteorites. But it's nearly impossible to find meteorites surrounded by other rocks. **Good places to look:** a glacier, a newly plowed field, or a desert.



Key to rocks:

- 1) **Pumice** from a volcano
- 2) **Stony chondrite meteorite** NWA 869
- 3) **Lodestone** a magnetic Earth Rock (tricky...)
- 4) **Iron meteorite** Sikhote-Alin from Russia
- 5) **Fossilized turtle shell** about 1 million years old
- 6) **Tektite** glass formed from sand during a huge impact
- 7) **Pyrite** "fool's gold" or more accurately iron sulfide
- 8) **Marble** the same kind that statues are made from

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