# JOURNEY IN TIME THROUGH QUARRIES

*Exploring evidence of the past with geologists*

**VISIT**
a quarry with a geologist

**COLLECT**
rocks from the quarry to identify evidence of the past

**RECREATE**
the scene millions of years ago

**EXPLORE**
how these rocks are used in our lives


Smithsonian National Museum of Natural History | Q?rius The Coralyn W. Whitney Science Education Center

NSSGA NATIONAL STONE, SAND & GRAVEL ASSOCIATION

*The National Museum of Natural History would like to thank the Rocks Build America Foundation and its sponsoring organization, the National Stone, Sand and Gravel Association, for their support.*

## MOUNTAIN BUILDING
## OROGENY

Morrison Quarry in Morrison, Colorado

*"The rocks I found in this quarry in Morrison, Colorado, help me understand how the Colorado Rockies formed."*

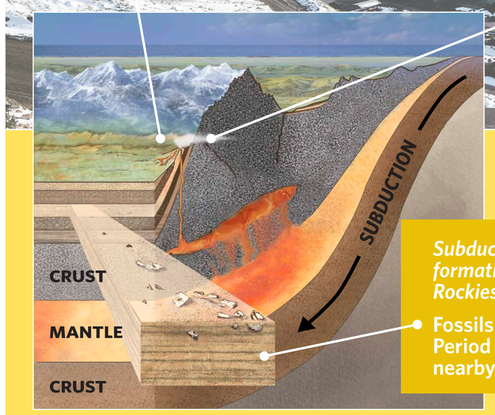
**Dr. Lang Farmer**
Geologist

Lang examines volcanic rocks in the central Colorado mountains.

**Sandstone**
**Catalog Number:** 401466*

*"Finding a layer of this sandstone sitting above the gneiss tells me that the sandstone was deposited after the gneiss formed. In fact, the gneiss is 1.7 billion years old, and the sandstone is only 300 million years old!"*

**Gneiss**
**Catalog Number:** 401691*




*Subduction and the formation of Colorado Rockies*

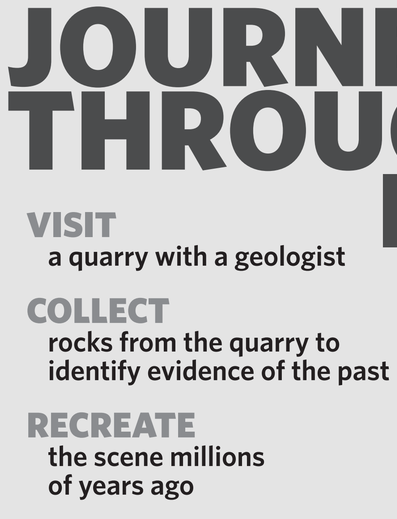
Fossils from the Triassic Period can be found in nearby layers of sandstone.

**What makes the gneiss from this quarry useful for concrete, but not the sandstone?**

Gneiss from this quarry formed under extreme heat and pressure deep in the earth, making it harder and stronger. The sandstone formed near Earth's surface and did not encounter the extreme conditions needed to change it into a very durable rock.

## VOLCANIC ERUPTIONS

White River Quarry in Enumclaw, Washington



*"The rocks I found at this quarry in Enumclaw, Washington, help me understand the volcanic history of the region."*

**Dr. Ben Andrews**
Volcanologist

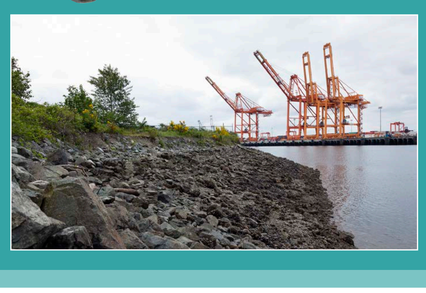
Ben uses his hand lens to inspect the minerals in a piece of basalt.

*"This rock is made from volcanic ash and pumice, and tells me there were explosive eruptions in the past. It tells me there were probably pyroclastic flows - hot clouds of ash, pumice and gas that raced down the sides of the volcano."*

**Pyroclastic Flow Deposit**
**Catalog Number:** 401523*

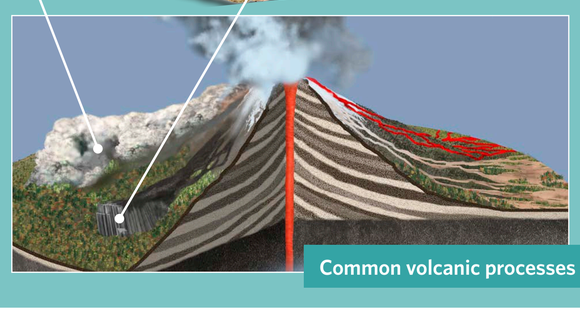
*"This piece of a basalt column is evidence of large lava flows. As the flows cooled and solidified, they fractured into tall columns with 4, 5 or 6 sides."*

**Basalt Column**
**Catalog Number:** 401521*



**Why are rocks from this quarry used at local seaports?**

Basalt from the ancient lava flows at this quarry is hard and very resilient, and can stand up to strong waves, the salt water, and the weather.



Common volcanic processes

## METEORITE IMPACT

Kentland Quarry in Kentland, Indiana



Cari inspecting a rock found at the quarry.

*"This limestone quarry in Kentland, Indiana, reveals the story of a meteorite impact. The rocks I found here help me understand what happens when meteorites hit the earth."*

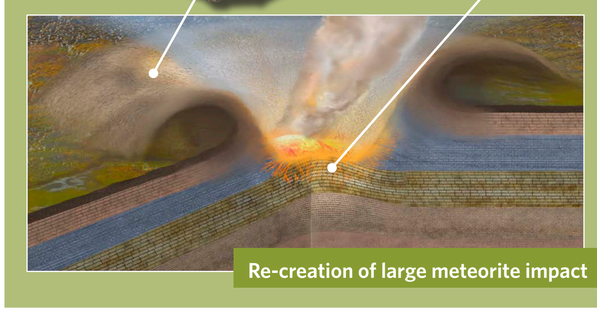
**Dr. Cari Corrigan**
Cosmochemist

*"This piece of impact breccia is made up of pieces of all different types of rock from around where the meteorite struck. Finding it here tells me we are around the edge of the crater."*

**Impact Breccia**
**Catalog Number:** 401461*

**Limestone Shattercone**
**Catalog Number:** 401456*

*"This shattercone is a great find! It is definitive evidence that there was a meteorite impact nearby. That explains why the layers of rock in the quarry wall are all tilted upwards."*



Re-creation of large meteorite impact

**What makes this limestone ideal for rail beds?**

Hard Indiana limestone aggregate can stand up to the constant force of trains running above it.

## RIFTING
## BREAKING UP CONTINENTS

Manassas Quarry in Manassas, Virginia

Tim looks at some old lava flows in Hawaii.

*"The rocks from this quarry in Manassas, Virginia, tell me what this area looked like about 120 million years ago. They are clues to what happened and help us create an image of the past."*

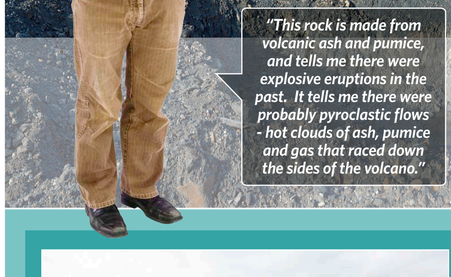
**Tim Rose**
Geologist

*"The wavy lines in this rock tell me that the sediments that make up the rock were carried by water down a river or lake, and later became sandstone. The hot body of magma nearby heated and changed that sandstone into this metamorphic rock, hornfels."*

*"Large crystals in this diabase are evidence that there was an underground body of magma that cooled slowly."*

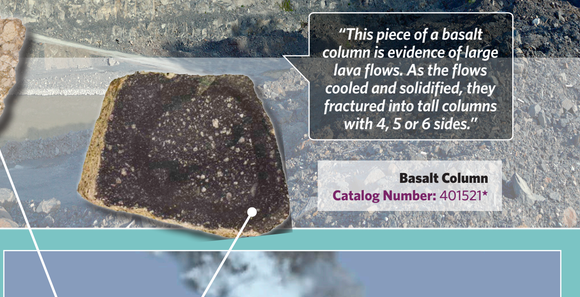
**Diabase**
**Catalog Number:** 401515*

**Hornfels**
**Catalog Number:** 401518*



**Why did the Smithsonian use diabase from Manassas to build the newest museum, the National Museum of African American History and Culture?**

Manassas diabase is very hard and very local. Aggregate from farther away would be more expensive to transport to Washington, D.C.



Basin about 150 million years ago

## ANCIENT TROPICAL SEAS

Golden Gate Quarry in Naples, Florida

*"The tropical marine fossils I collected from this quarry are evidence of a 2-3 degree Celsius warmer period 3-3.35 million years ago that caused higher sea levels and allowed warmer-water organisms to move north to Florida."*

**Dr. Maggie Toscano**
Marine Geologist

Maggie checks out fossils dug up at Golden Gate Quarry

*"Solitary rose corals still live in the sand among the seagrass in modern shallow tropical lagoons."*

**Solitary Coral**
**Catalog Number:** 401570*

*"The hole drilled into this clam tells me that marine snails have been preying on other mollusks for millions of years, just like they do today."*

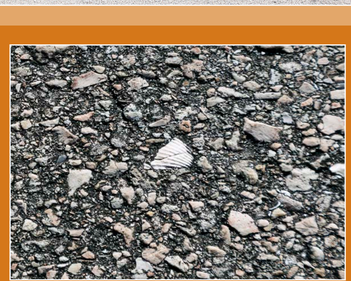
**Sea Snail**
**Catalog Number:** 401565*

**Clam**
**Catalog Number:** 401563*

Shallow marine environments in Florida were more tropical, with organisms found today in Caribbean lagoons

**Why are there fossils in this Florida road?**

Southern Florida is an ancient marine environment full of marine fossils, a plentiful resource. Other rocks are brought in because the fossils alone aren't enough to support the heavy traffic.



Hey Educators! Find out more at: **qrius.si.edu/TeachingGeology**

**Adam Blankenbicker**
Museum Geology Educator

***CATALOG NUMBERS**

Find out more about the rocks on this poster by visiting:

**qrius.si.edu**

Once there, click on the **Browse Collections** link and type in the catalog number.

## QUARRIES IN GEOLOGIC TIME