

Land of Extremes

QUESTIONS? Contact Local Content Editor Richard Montenegro Brown at rbrown@ivpressonline.com or 760-337-3453.

EDITOR'S NOTE A series of stories on the history of man in our desert and the efforts of the Imperial Valley Desert Museum to tell that story will run through October, replacing the Teen page until a new crop of interns return in the fall connected to the IVHigh journalism program.

CRYSTALLIZED MINERALS

GEODES: nature's treasure box



A geode cut in half at the Gem and Mineral Society building reveals a hidden treasure. IVP FILE PHOTO

Geode A hollow concretionary or nodular stone, often lined with crystals.

BY NEAL V. HITCH
Special to this Newspaper/Imperial Valley

There is a reason that the most fun thing to do at the California Mid-Winter Fair & Fiesta is cutting open a geode at the Gem and Mineral Society building. Opening a geode is like finding a treasure box; you never really know what will be inside.

Most people know that geodes are filled with crystallized minerals.

Fewer people know that they are made by volcanoes.

Geodes are some of the most recognizable of all volcanic rocks.

They start as a simple cavity inside volcanic rock. Igneous rocks form the cavities when bubbles of carbon dioxide and water vapor get trapped in cooling lava, like the bubbles in a soft drink.

When the lava cools and the gas dissolves, an empty cavity is left behind.

As mineral-rich water moves through the hole in the rock, tiny crystals form along the inner walls of the cavity.

Over thousands of years these crystals build up forming large crystals, or mini-crystals packed so tightly together you can't tell one from another.

The result is a rock inside of a rock.

As the softer volcanic rock erodes and weathers, the harder crystalline rock remains. This is the geode.

The science of geodes

Most geode interiors are made of quartz, chalcedony or calcite, although agate, jasper and other minerals can also occur.

Different colors form in the crystals based on the different minerals in the water that formed them.

There is no real way of knowing what is inside a geode until it is actually cut open, although geodes in one location will tend to have the same interiors since the minerals that formed them are the same.

The exterior of a geode tends to be an unremarkable, lumpy chalcedony that blends into its sur-

roundings.

While most geodes are small, they have been found up to several feet in diameter. Geodes are found around the world, with the most concentrated geode "beds" found in deserts.

Riverside and Imperial County have what is often considered the best concentration of geode sites in Southern California.

The volcanoes of Imperial County

When we think of volcanoes in California, we generally think of Mount Shasta or one of the other active volcanoes in Northern California.

In 2012, however, the U.S. Geological Survey elevated the Salton Buttes to active status.

The Salton Buttes volcano actually consists of five small



ABOVE: Geodes usually look like lumpy rocks until they are cut open.

LEFT: Map of Salton Butte volcano. BELOW: A lava rock from Imperial County with hundreds of holes filled by quartz crystals. PHOTOS COURTESY OF IMPERIAL VALLEY DESERT MUSEUM



rhyolitic lava dome volcanoes: Mullet Island, Red Island (two domes), Rock Hill and

Obsidian Butte.

Lava domes are a type of volcano that builds up by slow eruptions of highly viscous lava.

The viscosity of the lava, high in silica and rhyolite, prevents it from flowing far from its original vent, creating a dome-like shape of lava that slowly cools.

The best known of the Imperial County lava domes is Obsidian Butte.

This outcrop of obsidian sits just southeast of the Salton Sea.

Today, it looks almost like an island extending into the water.

Obsidian Butte last erupted in about 940 BCE (Before Common Era), which makes it one of California's youngest volcanoes.

It became the primary source of obsidian for the southernmost part of California.

Artifacts made from Obsidian Butte rock begin to show up in archaeological sites with dates around 510 BCE.

Before this it is possible that the buttes were covered by water from Lake Cahuilla.

Obsidian Butte would have been underwater when ancient Lake Cahuilla was at its highest.

The water would have needed to recede to 180 feet before the volcano was visible as an island.

But even so, it would have been about seven and a half miles from the lake's shoreline.

The water would have needed to drop to 230 feet below sea level before Obsidian Butte was connected to dry land and its readily resources available.



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