

MINERAL EXPLORERS

Arkansas



Arkansas | SYNOPSIS

It's one of the most abundant minerals on Earth, but quartz is anything but ordinary. Despite having worked with it for over 35 years, Thomas has several new experiences with this unique mineral. In this episode, he explores the metaphysical side of quartz and a local curiosity that's long been closed to the public, The Crystal Cave.

Thomas meets a unique cast of characters while judging the World Championship Quartz Crystal Dig and visits the renowned Coleman Mine to help extract a newly discovered pocket of quartz.

A man in a dark jacket and light pants is kneeling in a field of large, clear quartz crystals. He is holding a camera with a long lens, pointing it towards the right. The background is a hazy, open landscape with more crystals scattered across the ground.

MINERAL
EXPLORERS
Educator's Guide

DISCOVER ARKANSAS

GEOLOGY

The Natural State Geology

**ARKANSAS' MINERAL WEALTH IS
DIRECTLY RELATED TO ITS
GEOLOGY.**



Ouachita Mountains and Quartz

The Ouachita Mountains stretch from the center of Arkansas westward into Oklahoma, and their geological formation is ideal for mineral growth. Over time, shifting plates and the folding of the Earth's strata allowed for quartz veins to form, break, and then reform.

Quartz Destinations

Some geologists say that Arkansas and Brazil have the best quality quartz in the world. With his favorite mineral being quartz, Thomas Nagin moved to Hot Springs, Arkansas because of its beauty and the mass quantities of quartz. Nearby Jessieville and Mount Ida draw experts, families, and tourists from all over the globe to try their hand at prospecting the quartz deposits of the Ouachita Mountains.

TAKE A CLOSER LOOK

Investigate the relationship between mineral locations and Arkansas' geologic formations.

Why are some areas of Arkansas so rich in minerals?

How do each of Arkansas' Geological Divisions contribute to the state?

DISCOVER ARKANSAS

GEOLOGY

The Natural State Minerals

Although quartz gets its duly-earned recognition, a large number of other minerals also call Arkansas their home. There are over 300 minerals in Arkansas, ten of which were first discovered in the Natural State.

Crater of Diamonds

The Crater of Diamonds State Park is the only place in the world where the public is invited to hunt for diamonds, and allowed to keep any and all discoveries! The State Park also contains a wealth of over 40 different types of collectible rocks and minerals. Amethyst, jasper, garnet, quartz, calcite, and hematite, along with diamonds, have been discovered and taken home by visitors as precious souvenirs. Located near Murfreesboro, the Crater of Diamonds is one of Arkansas' most visited attractions.

Cat's Eye

Behind quartz, wavellite is the second best known collectible mineral of Arkansas. Some geologists refer to the mineral as Cat's Eye because of its shape and radiating green colors. Wavellite has been mined near Mount Ida at the Montgomery County quarry, and near Avant on the northeast end of Lake Ouachita in Garland County.



Minerals Found in Arkansas Counties

A	Stibnite	Di	Diamond	P	Pyrite
B	Barite	F	Fluorite	Ph	Phosphates
Bx	Bauxite	G	Gypsum	Pb	Galena
C	Copper	M	Cinnabar	Q	Quartz
Ce	Celestite	Mn	Cryptomelane	T	Rutile
Cl	Clay	N	Millerite	Ta	Talc
D	Dolomites	NS	Nepheline Syenite	Z	Sphalerite Smithsonite

Arkansas Discoveries

Of all the known minerals in science, ten were first identified in Arkansas: rectorite, laubmannite, miserite, kimzeyite, benstonite, kidwellite, eggletonite, strazcekite, delindeite, and lourenswalsite.

DIG DEEPER!!!

Learn about the minerals nearest to where you live. How are they mined? How are they used?



DISCOVER MINERALS

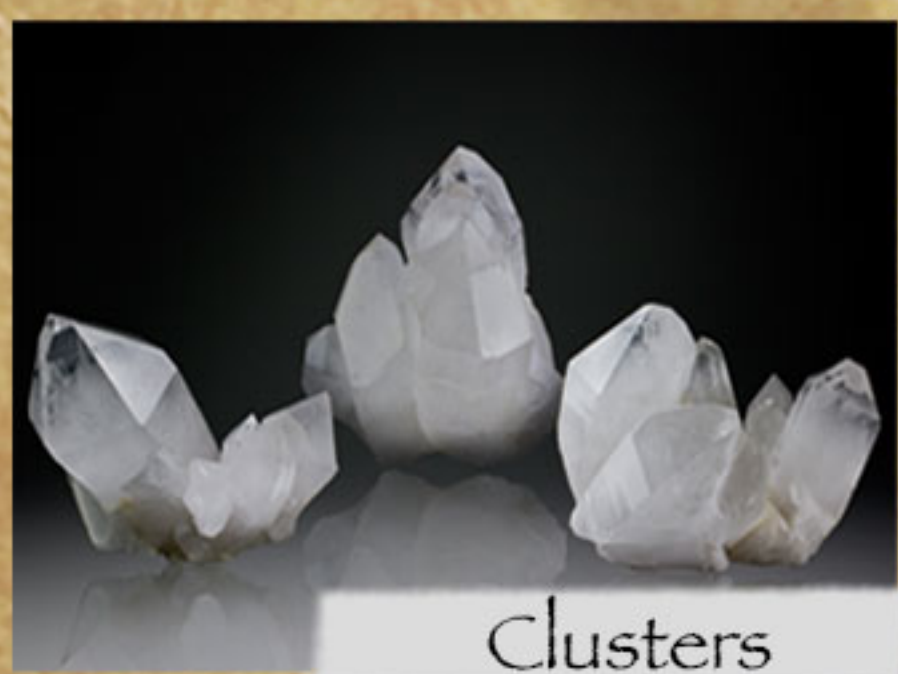
ARKANSAS QUARTZ

Clear Quartz

Quartz is one of the most beautiful, as well as one of the most abundant minerals in the earth's surface. In fact, it may be found on every continent. Not only is quartz visually appealing, but its technological importance demands a knowledge of this prized mineral.



Points



Clusters

Formation

A cavity, or crack, is formed in the Earth's crust, where there is or was lava close to the Earth's surface. These cavities fill up with a silica-rich liquid that may contain small amounts of impurities. Eventually, the water evaporates due to high heat or pressure (similar to salt crystals forming by the evaporation of salt water) and the water table drops causing silicon dioxide to form in the spaces provided in the cracks. These cracks are called quartz veins. In the case of the Ouachitas of Arkansas, as the earth pushes together to form mountains, the veins are pushed upward toward the Earth's surface. The shapes and sizes of the quartz crystals are determined by the space provided in the veins, and if the crystal was broken while the veins were pushed upward.

Color

When chemically pure, quartz is transparent to light and is commonly referred to as rock crystal. Rock crystal occurs independently in nature, but other types of quartz are formed in conjunction with other minerals. When iron is infused into the chemical formation of quartz, the crystals take on different colors. This is how we get citrine, amethyst, or ametrine. Other impurities create the coloring of rose quartz, blue quartz, and green quartz. Types of radioactivity during formation can also affect the color, giving it a darker appearance known as smoky quartz.

Citrine

Smoky Quartz

Rose Quartz

Amethyst



MINERAL SHOUT OUT!

See Mineral Explorers: Bolivia for more on Amethyst.

DISCOVER MINERALS

ARKANSAS QUARTZ

Quartz Variations

Collector's are drawn to quartz crystals for their unique shapes and colors, while geologists treasure quartz as a readily available mineral for study. Similar to people, the size and appearance of each quartz crystal is heavily influenced by the environment in which it is formed, so no two quartz crystals are exactly alike. The limited space for growth also means it is rare to find a perfect crystal.

If quartz is fractured during the growth process, it can heal itself as it regrows. Pressure and temperature may also cause breaks within a crystal. These imperfections, however, can be quite beautiful, with a rainbow effect that will sometimes occur when light passes through the fracture.

Although not identical, quartz can develop certain forms more commonly than others, and this is called the crystal's habit. Although the list is ongoing, a few common habits are pictured to the right.

Quartz Profile

Scientific Formula: SiO_2 (silicon dioxide)

Luster: Nonmetallic (Vitreous)

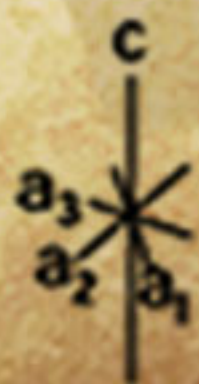
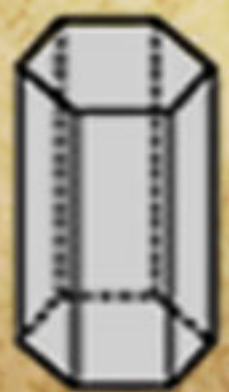
Cleavage: Does not display cleavage

Mohs Hardness: 7

Crystal System: Hexagonal

Fracture: Conchoidal (shell-like curves)

Four axes. Three of the axes fall in the same plane and intersect at the axial cross at 120 degrees between the positive ends.



$a_1 = a_2 = a_3 \neq c$
angles a_{1-3} to $c = 90$
angles between axes = 60

Alligator



Laser



Included



Tabular

DISCOVER MINERALS

ARKANSAS QUARTZ

Uses

Even today, quartz is one of the most widely used minerals, but not many students are aware of its impact on everyday life. The properties of quartz and its ample quantity in the Earth's crust have made it a highly-desired resource for societies throughout the ages. From metaphysical practices to the technological uses, quartz is one of the most widely used minerals available.

Piezo-Electric Effect

In 1881, scientists applied pressure to opposite sides of a quartz crystal and discovered that one side displayed a positive electrical charge and the other side a negative charge. They also discovered that by placing positive and negative terminals on each end of the crystal, the crystal changed shape. This realization led to the development of specially sliced quartz to be used in devices such as clocks and watches. By applying electricity to the quartz, industries can use the vibrations of the quartz to have a particular, set rhythm. The most common uses today require quartz crystals to vibrate 32,000 times every second!



Everyday Uses

Optical lenses and lamps use quartz in order to be chemically resistant while still remaining transparent. In computer chips, silicon is derived from quartz. Magicians sometimes use quartz to create flickers of light by rubbing two crystals together.

Commercially-mined quartz is largely used in the construction industry for concrete and as sand in mortar and cement. Therefore, nearly every building and road contains quartz in different quantities.



Healing

Building upon the properties of pure quartz, some believe that quartz amplifies whatever energy or intent is programmed into it. Some even believe it can improve the body's immune system.

MINERAL MYTH

During ancient times and the Middle Ages, people believed that rock crystal was ice that could not melt.



Quartz Competition

Even before being cut or formed by jewelers, quartz shows that nature is truly an artist. Due to its availability and relatively low price, faceters and sculptors count quartz as one of their favorite minerals. In Arkansas, mineral enthusiasts get to explore mines near Mount Ida and Jessieville where they can dig for quartz and keep the treasures they find. As Thomas judged the World Championship Quartz Crystal Dig in Mount Ida, he awarded points based on the following criteria:

Condition

The confining size of quartz veins paired with the transformative conditions during crystallization make it difficult to find a crystal in top condition. The condition of the crystal is determined by how well its points remain intact. Even if a quartz was formed in an ideal environment, it must be extracted carefully to avoid breakage. When crystals are removed, they are cleaned by using oxalic acid to remove impurities, such as iron and manganese, that also grew alongside the crystal.

Clarity

When it comes to crystals, the clearer, the better. Typically, miners search for a glassy shimmer embedded in the clay. But sometimes other minerals, along with liquids and air pockets, can form within the crystal. These inclusions may make the crystal appear cloudy, but they also tell the story of the crystal's formation. Since quartz has such a simple composition, imperfections can be easily noticed.

Inclusions can occur when quartz engulfs another mineral as it forms. The engulfed minerals either remain the same size, or grow simultaneously with the quartz, like in the phantom crystal habit. A third type of inclusion can take place during crystallization when temperature or pressure becomes ideal for other elements to bond the silicon and oxygen in quartz. These inclusions lead to odd colors and shapes, as in rose quartz.

Terminations

The condition and number of terminations, or points, on a crystal greatly affect its value. A chipped point can reduce the value of a crystal by 90 percent! Rarely, quartz forms points on each end, called *double termination*. These crystals form in free floating pockets of liquid that slowly evaporate, leaving perfectly formed crystals with terminations on both ends. Clusters with multiple points in good condition are also highly valued.

