

MINERAL EXPLORERS

Bolivia



Bolivia | SYNOPSIS

A journey into the jungles of eastern Bolivia takes us deep underground to a world of natural wonder. Join Thomas as he explores the Anahí Mine, renowned for its production of amethyst and ametrine.

The adventure begins over 400 miles away in the bustling city of Santa Cruz before the Mineral Explorers travel by boat through the Pantanal wetlands to the mine. Then it's deep underground to discover the minerals and the myths. See how the minerals are mined, watch their transformation from gem rough to gemstones, and experience, first-hand, the world's largest gem pocket!



MINERAL
EXPLORERS
Educator's Guide

DISCOVER BOLIVIA

GEOGRAPHY

The Country

Located in the west-central part of the South American continent, Bolivia is both geographically and culturally diverse, with more than 50 different ethnic groups and Latin America's highest percentage of indigenous peoples.

The country is landlocked by Brazil, Paraguay, Argentina, Chile, and Peru. Its landscape ranges from the Andes Mountains of the west to the lowland plains of the Amazon Basin in the east. It boasts the highest capital city in the world, La Paz, and shares with Peru the world's highest navigable lake, Lago Titicaca.

With an area of 424,165 square miles, the country is about the size of Texas and California combined.

Population: 10,461,053
(82nd in the world)

Capital City: La Paz
(pop. 1.642 million)

Language: Spanish is most common but Bolivia also recognizes 36 indigenous languages

Government: Republic

Agriculture: Soybeans, coffee, coca, cotton, corn, sugarcane, rice, potatoes, Brazil nuts, and timber

Industry: Mining, smelting, petroleum, tobacco, handicrafts, clothing, and jewelry

Minerals: Tin, zinc, tungsten, antimony, silver, iron, lead, gold, amethyst, and vivianite



La Paz is the world's highest capital at 12,005 feet.

Lago Titicaca is the world's highest navigable lake.

DIG DEEPER!!!

Research and investigate the typical day of someone your age living in Bolivia.

DISCOVER BOLIVIA

GEOGRAPHY

Pantanal Wetlands

At 65,000 square miles, the Pantanal is the largest freshwater wetlands on the planet! Its wildlife is extraordinarily concentrated and diverse with hundreds of species of reptile, fish, mammals, and birds. The Pantanal also boasts a remarkably diverse plantlife and a landscape spanning several disciplines of ecology. Often overshadowed by the Amazon, the Pantanal is truly one of the world's greatest natural treasures.



The Anahi Mine

Comprised of numerous deep tunnels, the Anahi Mine is a source of high-quality amethyst, and the world's only commercial source of the gem mineral, ametrine. It is also home to the largest known amethyst gem pocket, which the owners hope to someday extract in its entirety. Working with only crowbars, hammers, and chisels, miners find and remove huge amethyst clusters weighing between 100 and 200 pounds from the tunnel walls!

ECOTOURISM **TAKE A CLOSER LOOK:**

Thomas has invited you to join him on his next adventure to Bolivia! Plan the trip and create an itinerary that describes where you will travel and what you will see. Use a map and locate your route!

DISCOVER MINERALS

AMETHYST & AMETRINE

Mineral Profiles

Amethyst



Scientific Formula: SiO_2 (silicon & oxygen)

Color: Purple to violet to pale red-violet

Luster: Nonmetallic (Vitreous)

Cleavage: Does not display cleavage

Mohs Hardness: 7

Crystal System: Trigonal (Hexagonal)

Name Origin: "A-methystos" (Greek)
meaning "non-intoxicating"

Amethyst, a member of the quartz family, gets its color from a combination of trace amounts of iron and aluminum. Cutting shops produce thousands of carats of faceted amethyst daily. Light shades are more common and quite inexpensive. Dark, transparent crystals are very rare and therefore more costly.

DIG DEEPER!!!

Research the Greek myth of Amethyst and Dionysus



Ametrine



Scientific Formula: SiO_2 (silicon & oxygen)

Color: Yellow (citrine) with pale to deep purple (amethyst)

Luster: Nonmetallic (Vitreous)

Mohs Hardness: 7

Crystal System: Trigonal (Hexagonal)

Name Origin: Combination of two minerals:
Amethyst and Citrine

Ametrine are usually cut into gemstones which distinctly highlight both minerals. The separation of color in ametrine is due to differing oxidation states of iron inside the crystal.



Mineral Formation

How do crystals form?

Amethyst and ametrine crystals do not form overnight. Like most of the Earth's geologic processes, the formations can take millions of years to grow. Evidence shows that water is a key agent in moving minerals, and plays a vital role in the formation of amethyst and ametrine. Water can dissolve many minerals and carry away components such as silicon in solution. Typically, the crystals form relatively near the Earth's surface through the following process:

- Step 1:** A cavity, or crack, is formed in the Earth's crust, where there is or was lava close to the Earth's surface.
- Step 2:** The cavities fill up with a silica-rich liquid that contains trace amounts of iron.
- Step 3:** Silicon remains dissolved until the water evaporates due to high heat and/or pressure (similar to salt crystals forming by evaporation of sea water).
- Step 4:** The water table falls, leaving behind deposits of amethyst and ametrine in cracks (called quartz veins) and cavities.

Because crystals are left behind from liquid, and crystallize in water-filled spaces beneath the Earth's surface, they have the potential to be well-formed and extremely beautiful.

Why does it have its color?

The color of amethyst is most often caused by the presence of trace amounts of iron, though it can also be colored by natural sun exposure. The iron forms a concentration which absorbs all the colors except those in the purple/violet region which are the colors our eyes perceive. The intensity and color of the amethyst depend on how much iron is in the quartz crystal, and where it is located in the atomic structure of the quartz, and the possible presence of aluminum which can cause a lightly smoky color in the amethyst.

What makes minerals so valuable?

The prices and values of crystals can vary tremendously, depending on the size and quality of the stone. When selecting amethyst and ametrine specimens, Thomas looks for the most pure and untarnished crystals. Primarily, he values the size, the quality of the points, and the depth of color in the crystal. The deep colors are the most valuable, particularly a deep purple with hints of almost red.