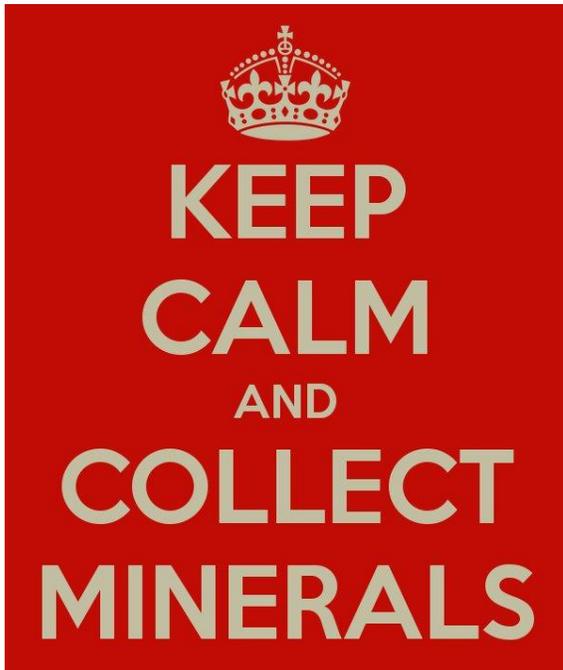


MINI MINERS MONTHLY

Vol. 8 No. 5 A Monthly Publication for Young Mineral Collectors

May 2014

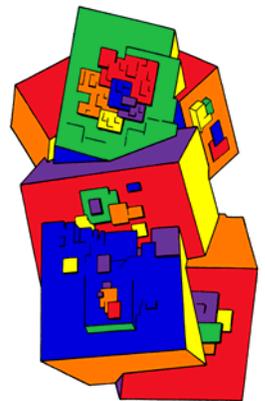


There's a funny thing going around the internet, Facebook, emails and other things lately. The phrase is "Keep Calm and _____." Keep Calm and Eat a Cookie. Keep Calm and Go Shopping. Keep Calm and Call Batman. We wondered where this came from and learned that it began in 1939 in London, England. The original phrase was "Keep Calm and Carry On." It was meant to help the British stay calm at a time that they expected their cities to be bombed just before the beginning of World War II. It wasn't used much and only a few copies of the original poster have survived. But in 2000 someone took the original poster and used it to create other sayings. Since then, literally millions of different "Keep Calm" signs have been created. Since we all love collecting minerals, it seems only proper that we have

"Keep Calm and Collect Minerals."

We are always trying to find interesting and creative ways for you to use your interest in minerals to create fun, interesting and colorful items that will help you build a better mineral collection. A really good mineral collector is one who knows a lot about minerals and mineral collecting. This month we have decided to focus on "Mineral Trading Cards" to give you something really colorful and fun. Print them out, cut them out and give them away. Then, create your own (there are blank card formats here for you to use) and trade them with your mineral collecting friends who have created their own.

Make mineral trading cards for an earth science project in school or for scouts. Make your own mineral trading cards and give them away or sell them at your club's mineral show. (This is a great project for young visitors to your annual mineral show as well!) Included here are 10 different themes. Some have been published in Mini Miners Monthly in the past. However, this is the first time the entire collection has been published in one issue. We hope you enjoy them.



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Amethyst and Fire Agate

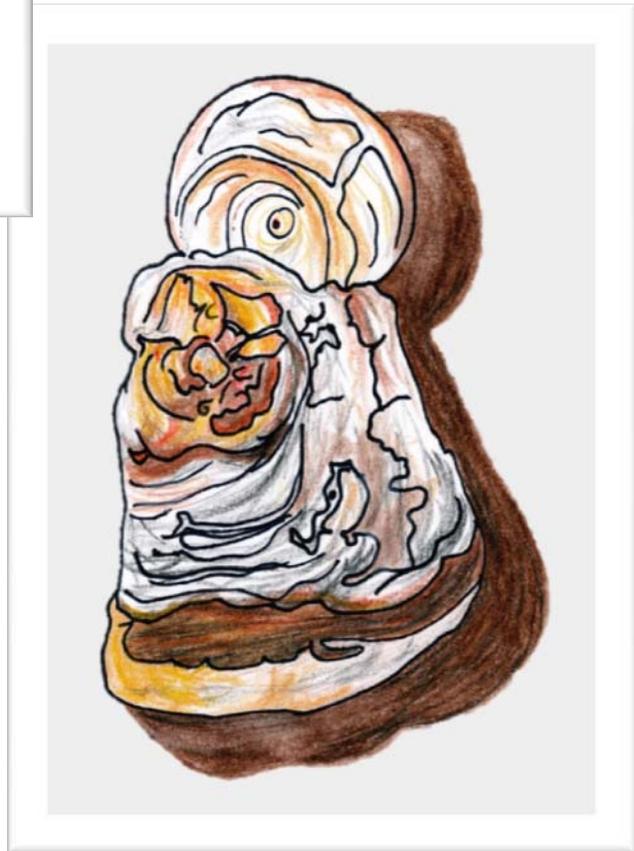
By Emma Fajcz



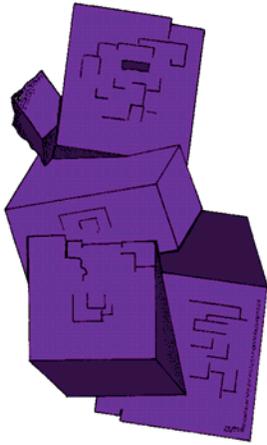
Amethyst Cluster by Emma Fajcz. Graphite pencil, technical pen, and colored pencil. April 2014. 2.5 inches by 2.9 inches

The specimen on the right is fire agate. A lady from the Golden Isles Gem and Mineral Society, of which I am a member, gave this to me a while ago. I have always admired its beautiful colors and unique shape. If you look carefully at the round part at the top, it might remind you of the head of an octopus.

This month I did two mineral drawings: one of amethyst, and the other of fire agate. I enjoyed looking carefully at this amethyst specimen and noting the details of this mineral. Notice how the shade of purple varies throughout the crystals, and how the bottom of the rock is a gray-green color.



An Octopus behind a Rock by Emma Fajcz. Graphite pencil, colored pencil, and technical pen. April 2014. 4 inches by 2.5 inches.



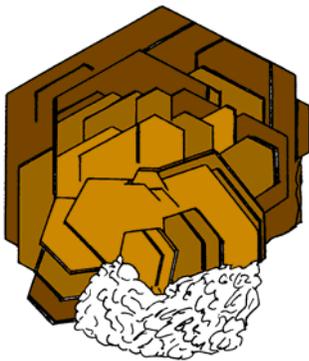
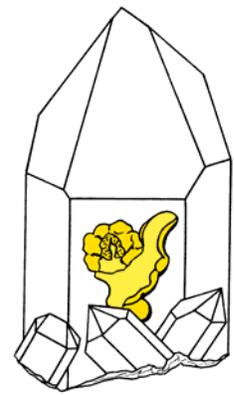
Minerals in Your Home

A lot of minerals are needed to make the items in your home. Minerals are needed to make the ingredients that go into products you use in your home every day. Do you know which minerals are used in these items? A number of minerals are listed after each household item. Circle the minerals that are needed to make each item. Then, turn the page and check your answers.

BATTERIES Graphite, Gold, Galena, Sphalerite, Fluorite, Orpiment, Calcite

TOWEL Galena, Sphalerite, Asbestos (fibers), Quartz, Chromite, Sulfur, Cinnabar

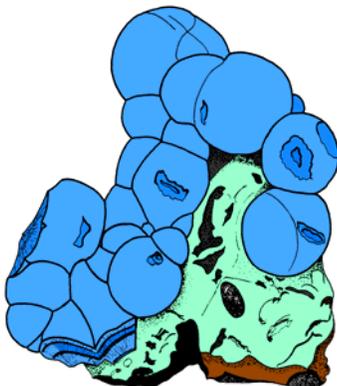
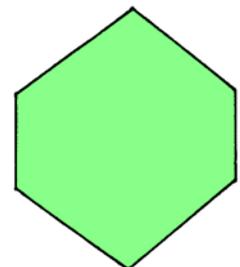
SUNSCREEN Fluorite, Tourmaline, Sphalerite, Chromite, Zincite, Malachite, Muscovite



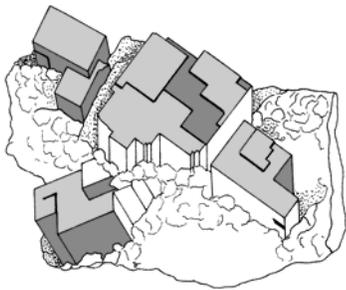
COSMETICS Muscovite, Stibnite, Hematite, Graphite, Pyrite, Garnet, Talc

TOILET Feldspar, Hematite, Magnetite, Smithsonite, Pyrolusite, Chromite, Copper, Azurite, Malachite, Sulfur, Flint

RECLINER CHAIR Sulfur, Halite, Hematite, Barite, Adamite, Magnetite, Sphalerite, Gypsum, Wulfenite

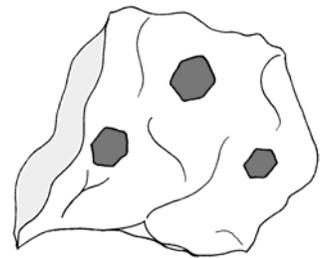


DENTAL CARE Silver, Gold, Muscovite, Barite, Rutile, Calcite, Fluorite, Cinnabar, Selenite



Minerals in Your Home

BATTERIES Graphite, Galena, Sphalerite. Galena is a source of *lead*. Sphalerite is a source of *zinc*.

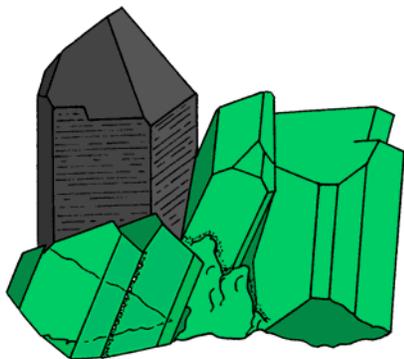
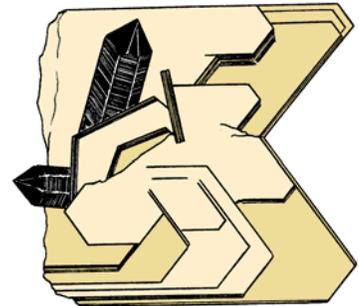


TOWEL Sphalerite and Chromite. These two minerals are used to create dyes that are used to color towels. Bet you wondered how something hard like a mineral could be found in something soft like a towel!

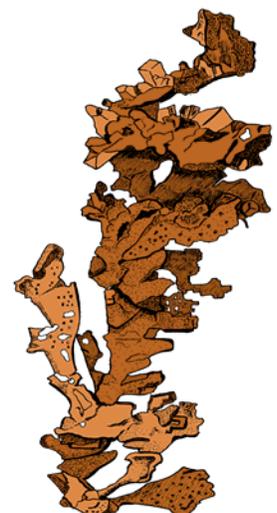


SUNSCREEN Sphalerite and Zincite. Sunscreen contains a compound called *zinc oxide*. The element zinc is removed from the minerals sphalerite and zincite.

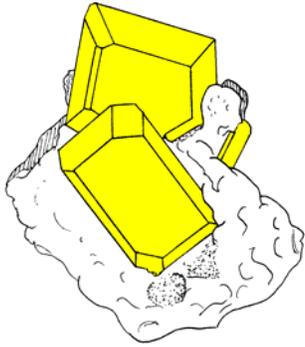
COSMETICS Muscovite, Hematite, Talc. Talc is crushed into a very fine powder and used to make talcum powder and other cosmetics. Muscovite is crushed and added to cosmetics like lipstick and face powder to give a glittery look. Hematite is crushed to a powder and added to cosmetics to give a deep red color.



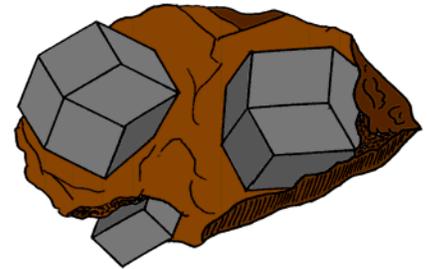
TOILET Feldspar, Hematite, Magnetite, Pyrolusite, Chromite, Copper, Azurite, Malachite. The toilet is made of porcelain which contains feldspar as its main ingredient. Pyrolusite is used to make coloring for the porcelain. Hematite and magnetite are used to make the steel parts (handles, inside valve pieces, etc.). Handles are often covered with a shiny metal called *chrome* that comes from the



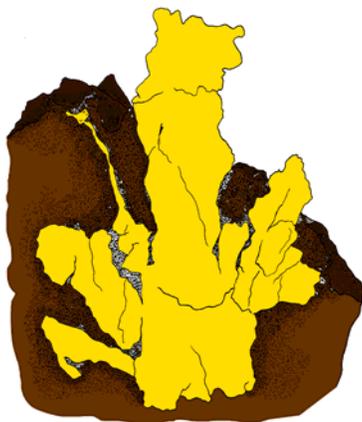
mineral chromite. Copper and copper ores (like azurite and malachite) are used to make the pipes that bring water to the toilet. Today, many pipes are made of plastics or flexible metal tubing as well.)



RECLINER CHAIR Sulfur, Hematite, Magnetite, Sphalerite. Sulfur is used to make the foam rubber that is used for soft padding in the chair cushions. Hematite and magnetite are the source of iron for making the steel that is used to make the

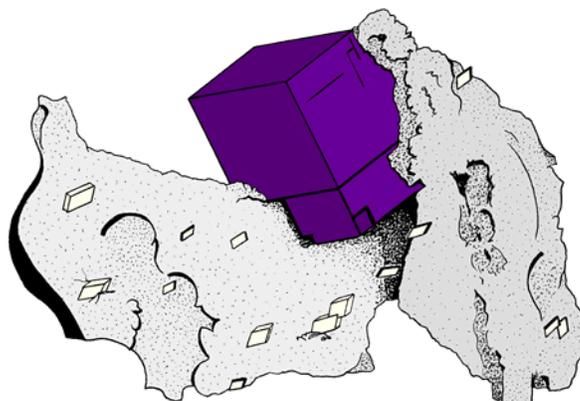
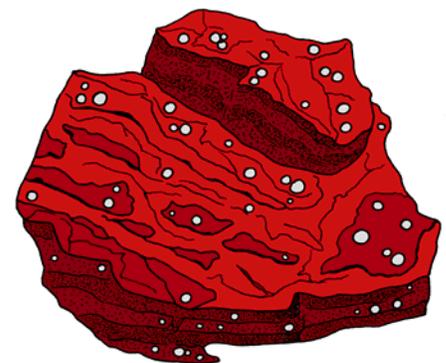


chair frame. Sphalerite is a source of zinc that is needed to make some dyes for the cloth covering.



DENTAL CARE Gold, Rutile, Fluorite, Cinnabar.

Gold is used to cover damaged teeth and for fillings in cavities. Rutile is used to give color to false teeth so they look real. Fluorite is the source of the element *fluorine* which is combined with other elements to make the compound *fluoride*. Fluoride helps make teeth stronger and resistant to decay. Cinnabar is the main source of mercury. A mercury compound (called *mercury amalgam*) was used for many years to fill cavities. Mercury is VERY poisonous, however, and mercury amalgam is no longer used.



MINERAL TRADING CARDS

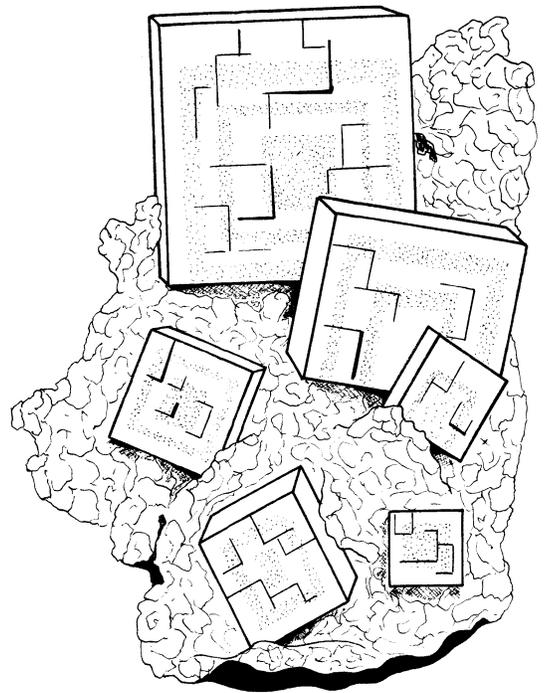
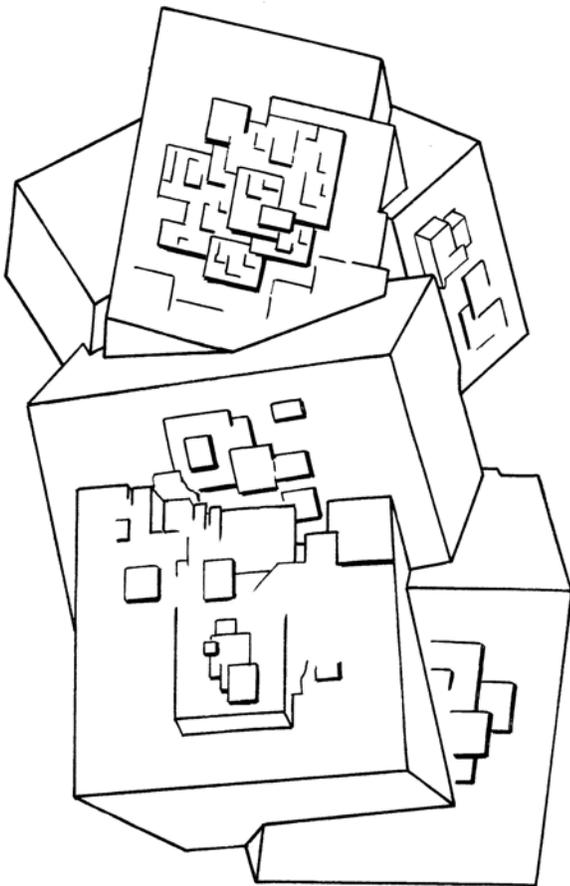
On the following pages is a set of mineral trading cards. The theme for this issue is *FLUORITE*. The shapes (meaning the crystal forms) and the many colors in which fluorite occurs makes it one of the most popular minerals for most collectors.

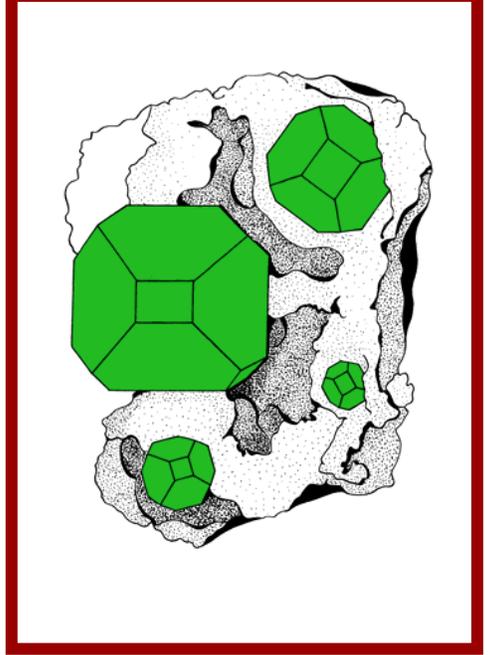
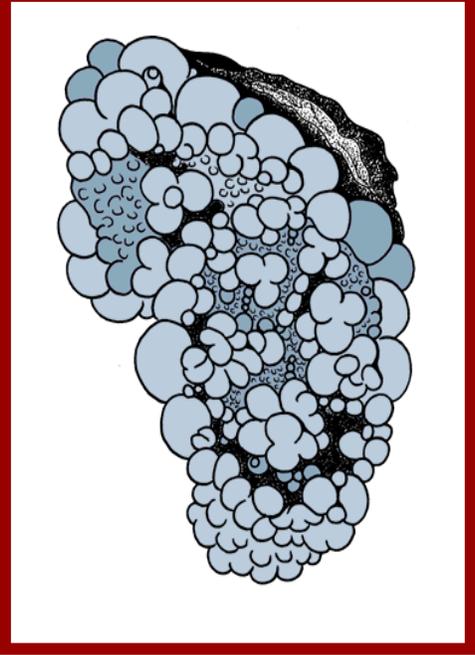
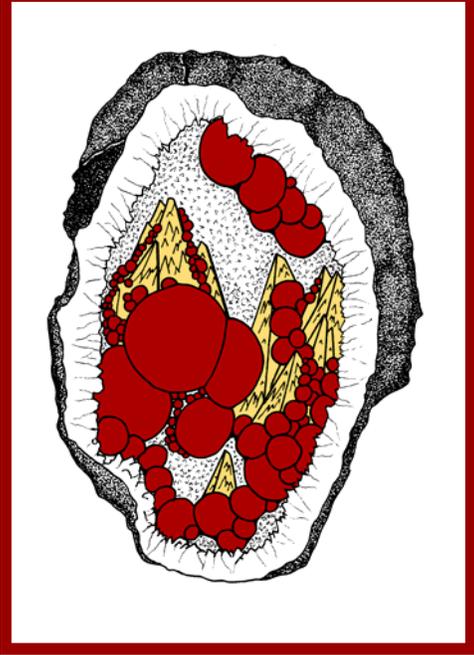
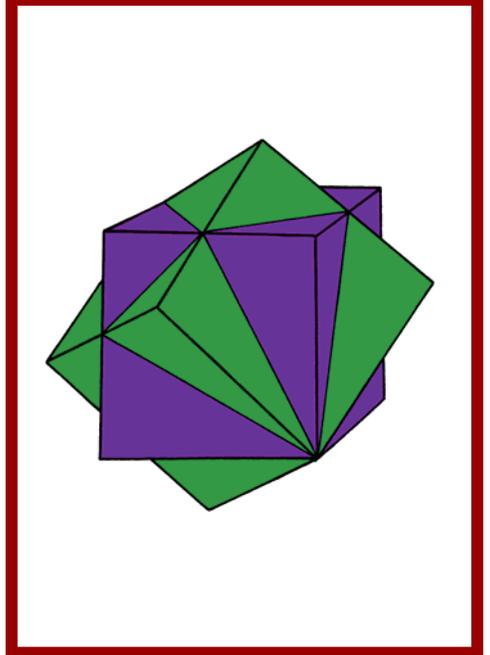
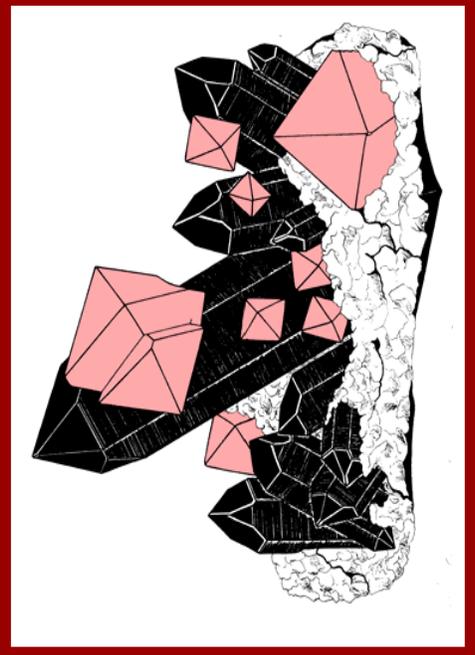
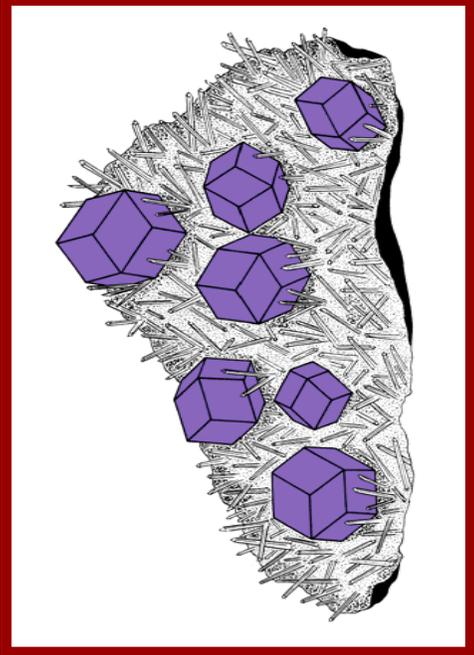
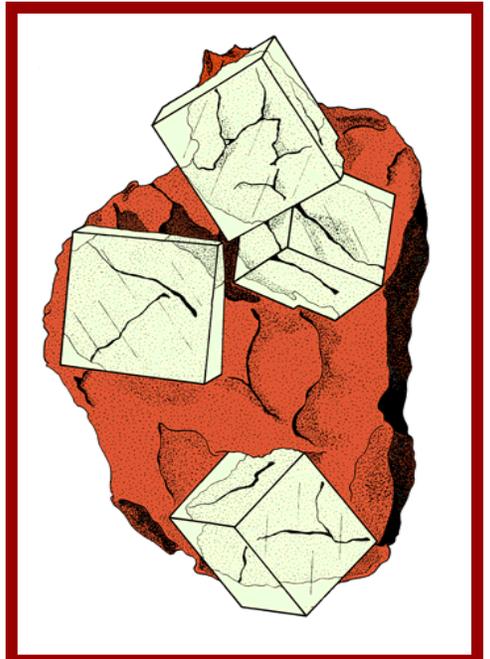
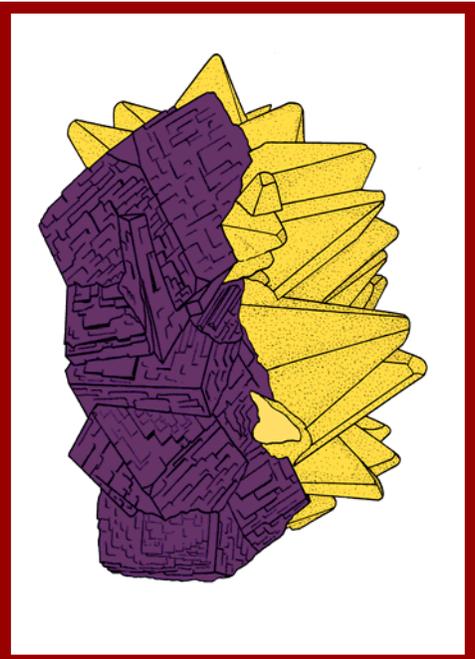
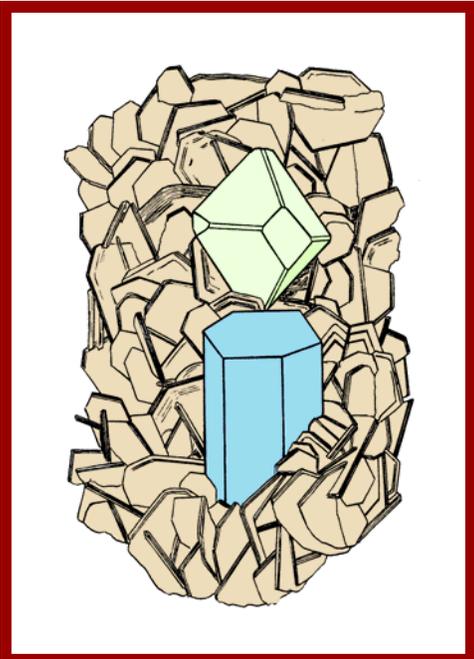
Print the picture side of the trading cards on heavy paper. Then, turn it over and print the text on the back side. When the printing is done, carefully cut out each card on the red box around each picture. A second set of Fluorite Trading Cards is also included; this one is in black and white. You can print it out (one side or both) and color it in yourself.

Included in this issue are two “blank” pages that you can print out and use to make your own mineral trading cards of any theme you would like. Draw your own minerals. Or, search for pictures of fine mineral specimens on the internet and add them to the cards.

Fluorite to Color. Left: Illinois fluorite - it can be yellow, blue, or purple.

Below: Brown fluorite from Ohio.





Fluorite Cubes on Matrix Dal'negorsk, Russia

Four perfectly clear, undamaged fluorite crystals sitting on rust-red matrix. They are so clear that not only can you see right through them, you can also see that they magnify the matrix on which they sit! The fluorite is a very light, pastel green.

Fluorite with Calcite Hunan, China.

Deep purple fluorite cubes with orange-yellow calcite crystals. This form of calcite is called *scalenohedral*. Because the calcite crystals have grown out like spines, this specimen has been described as "Hedgehog Calcite."

Fluorite with Aquamarine on Muscovite Gilgit, Pakistan

Light green fluorite (top) with blue aquamarine (below) on silver-tan muscovite crystals. The fluorite crystal is a combination of an octahedra modified by a cube. The edges of the octahedra are also modified by another crystal form called the dodecahedra.

Fluorite Penetration Twin Weardale, County Durham, England

Two glassy fluorite crystals that have grown into each other. This is called a twin or twinned crystals. When two of these fluorite cubes grow together, a penetration twin is formed. Pictured is a "perfect" penetration twin. The individual crystals are colored in different colors so you can see them more easily.

Fluorite Octahedra on Smoky Quartz Goscheneralp, Uri, Switzerland

Some of the rarest and most sought-after fluorite crystals are the beautiful light pink octahedra from the mountains of France and Switzerland. They may even be the most wanted of all mineral crystals for serious mineral collectors.

Dodecahedral Fluorite Crystals on Quartz Sweet Home Mine, Alma, Colorado

A rare crystal form for fluorite is the rhombic dodecahedral crystal. These crystals have 12 faces and each face has 4 sides.

Fluorite Octahedra modified with Cubic Faces

Erongo, Namibia, Africa

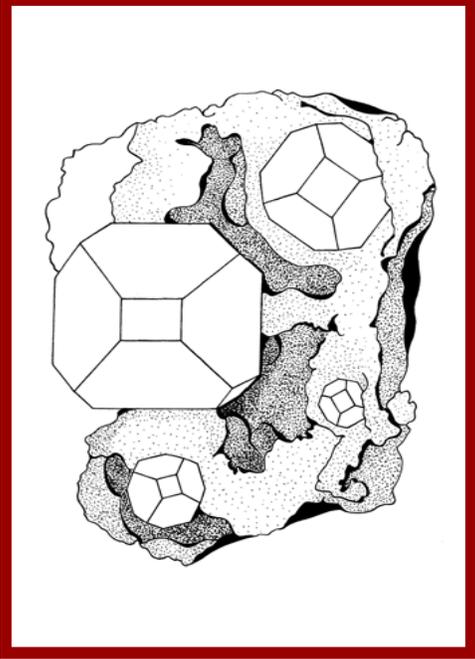
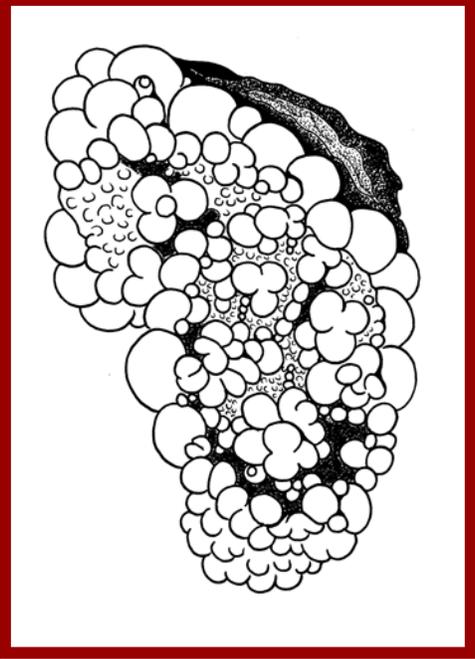
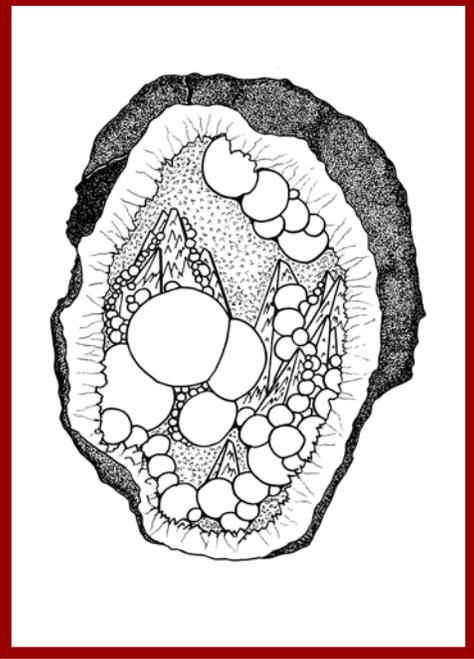
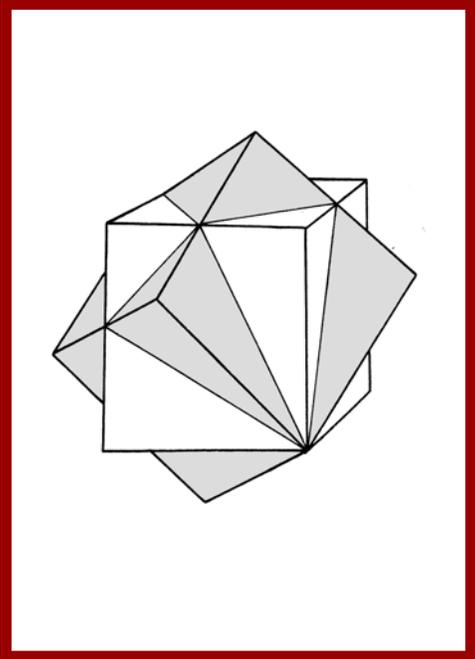
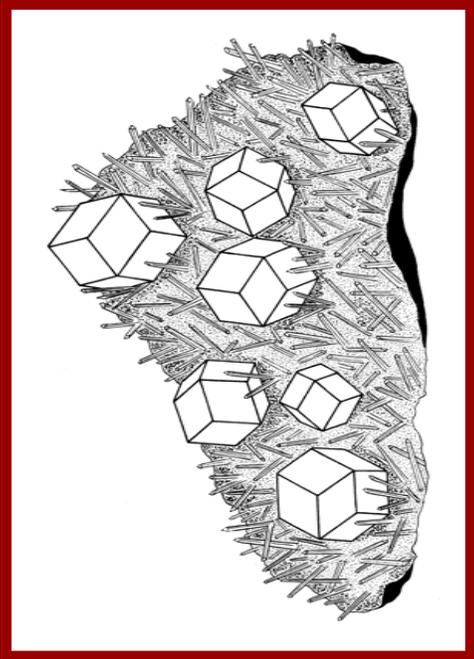
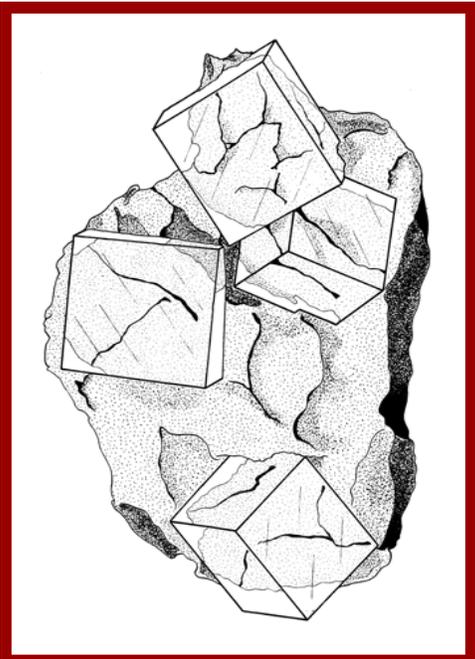
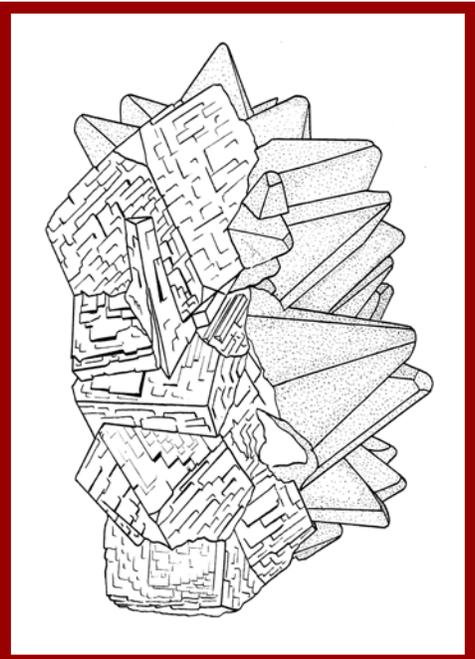
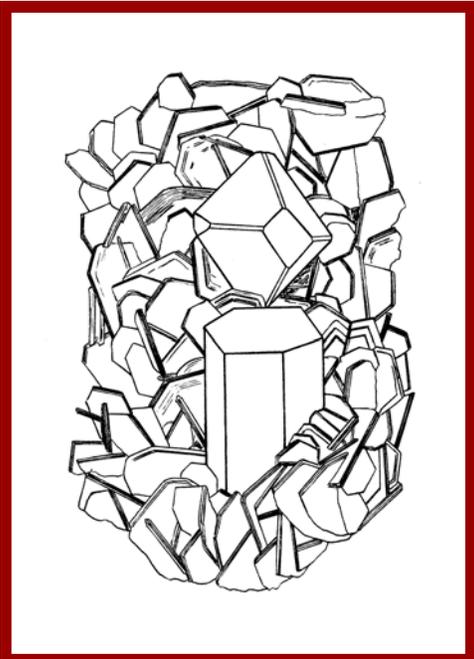
Extraordinary octahedral fluorite crystals that have been modified with a simple cube. The 4-sided flat face is the cubic modification.

Botryoidal Fluorite Fourmile Creek, Fremont County, Colorado

A rounded fluorite specimen. When any mineral forms in this rounded, lumpy formation, it is described as *botryoidal* which means *grape-like* because, as you can see, it looks like a bunch of grapes.

Botryoidal Fluorite with Calcite in a Vug Mahodari, Nasik, India

Fluorite can be found in rounded masses like this specimen. It is a vug in the black igneous rock called basalt. The vug (or hole) is filled with small, white quartz crystals. On top of the quartz has grown yellow-brown calcite and on the calcite has grown the red fluorite spheres.



Fluorite Cubes on Matrix

Fluorite with Calcite

Fluorite with Aquamarine
on Muscovite

Fluorite Penetration Twin

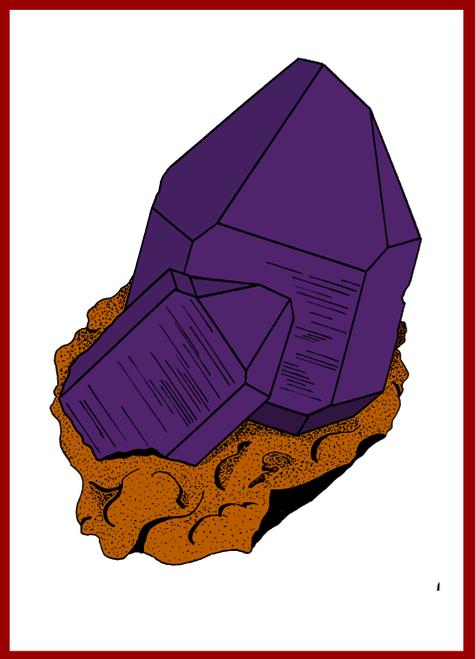
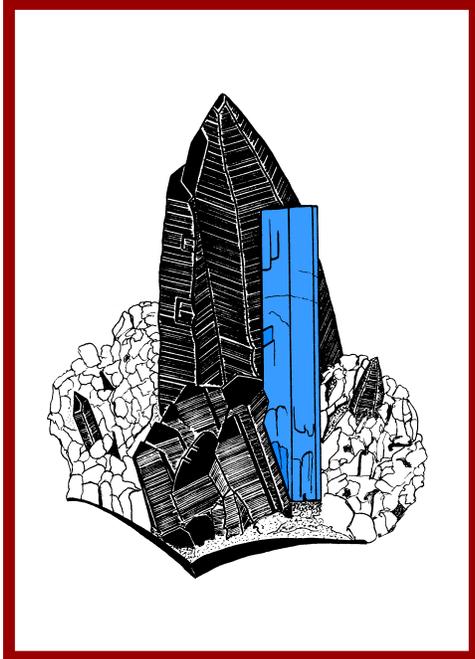
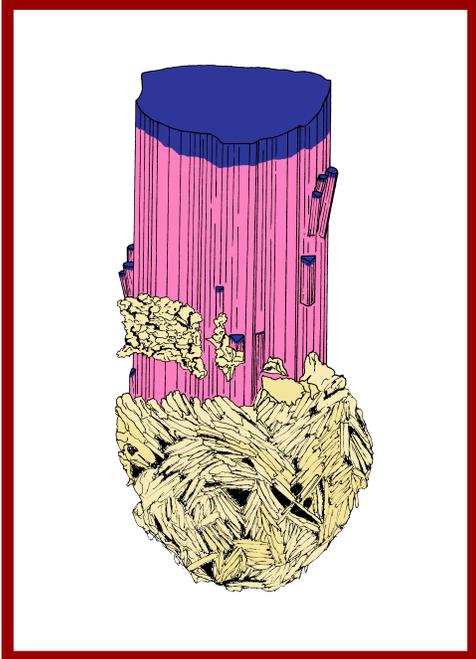
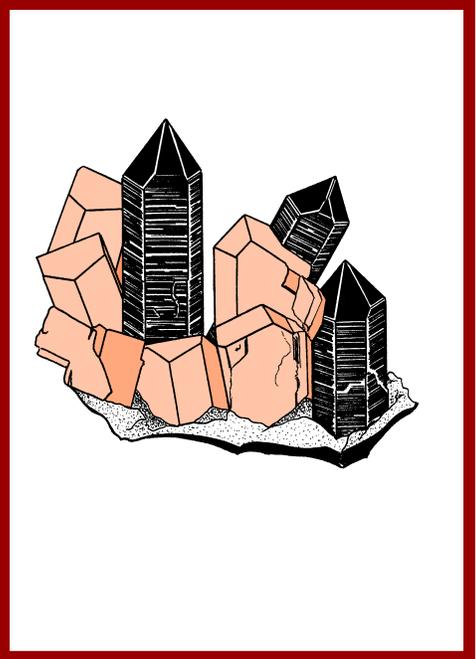
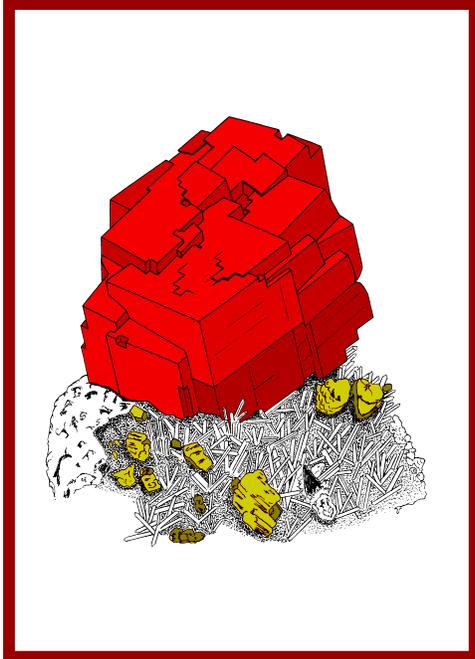
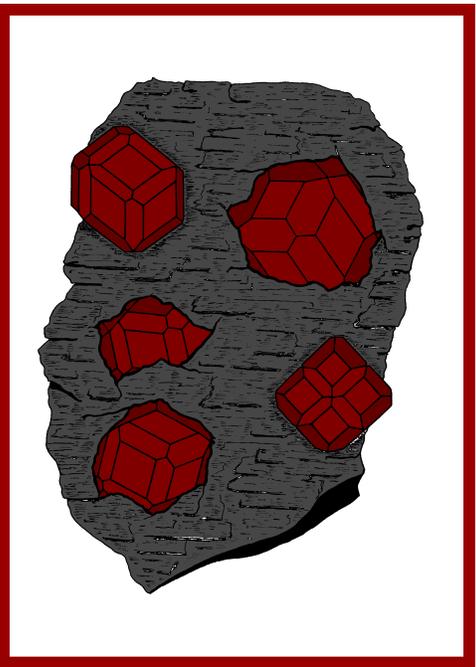
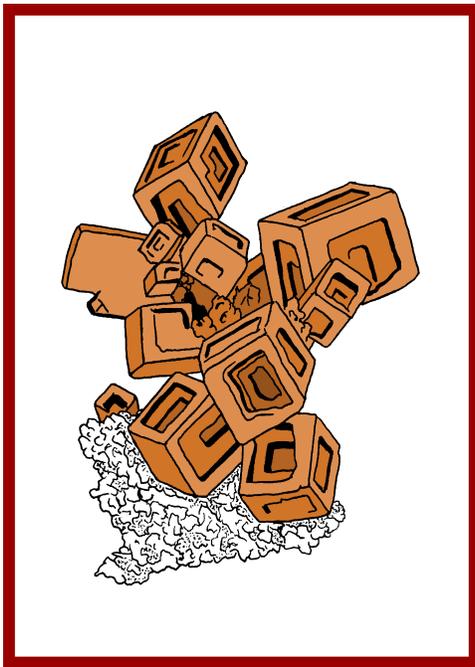
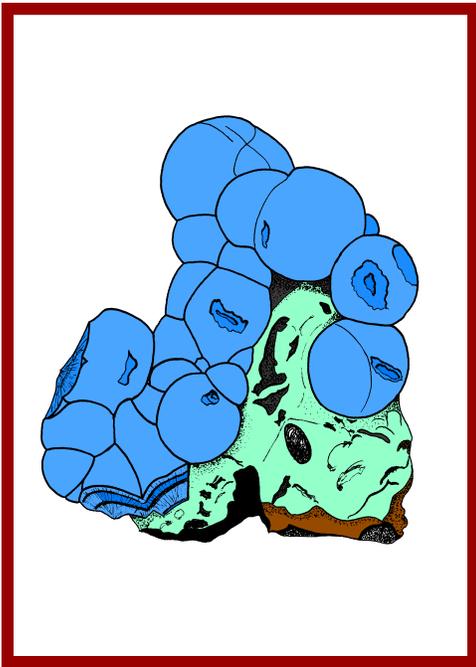
Fluorite Octahedra on
Smoky Quartz

Dodecahedral Fluorite
Crystals on Quartz

Fluorite Octahedra
modified with Cubic
Faces

Botryoidal Fluorite

Botryoidal Fluorite
with Calcite in a Vug



Garnet

Fort Wrangell, Alaska

Fine, well-formed, deep red garnet crystals were discovered in a ledge on Wrangell Island. A former mayor of the Town of Wrangell willed the ledge of garnets to the children of Wrangell. The children remove single crystals and crystal groups in their rock matrix (a metamorphic rock called schist) and sell their finds to tourists and collectors that come through the area on cruise ships.

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Copper

Ahmeek mine, Michigan

These crystals are described as *hopper crystals* because the edges have grown faster than the faces, leaving depressions in each of the crystals. The native copper deposits found in Michigan's Upper Peninsula are unique in the world. The copper contains a significant amount of silver as well. In fact, native silver specimens are sometimes found with the native copper.

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Azurite

Bisbee, Arizona

Mining began in the Copper Queen mine in Bisbee, Arizona in 1877 and lasted until 1975. In just under 100 years, this mine produced more than 8 BILLION pounds of copper! Native copper and fine specimens of azurite and malachite were found here. The city of Bisbee was named after Judge DeWitt Bisbee. He was one of the people who financed the Copper Queen mine when it first began.

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Feldspar

New Hampshire

Feldspar is the most common mineral in the crust of the earth's continents. It is a silicate mineral. Trapped inside nearly all feldspar are radioactive elements. When these radioactive elements break down, they release radiation. This radiation causes clear quartz to turn black. The smoky quartz that is typically found with feldspar is black because of this radiation. Feldspar crystals like the ones pictured here are found in mountains made of the igneous rock granite.

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Rhodochrosite

The Alma Queen

Sweet Home Mine, Alma, Colorado

In 1965 a man named John Soules hired a miner named Warren Good and they discovered a good sized pocket filled with fine rhodochrosite crystals. Mr. Soules went to Texas and while he was gone, Mr. Good discovered a HUGE cavity filled with spectacular rhodochrosite crystals. Mr. Soules said it was 7 feet high, 4 feet deep and 2 feet wide! The Alma Queen, pictured here, came from this great find. Today, the Alma Queen is considered one of the finest mineral specimens ever found anywhere in the world.

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Gold

Jamestown, California

In 1848, gold was discovered by James Marshall on the American River at Sutter's Sawmill. Word spread of this discovery very quickly. By 1849, hundreds of people from all over the world rushed to California in search of finding their fortunes in gold. Some of these "Miner 49ers" were very successful; others were not.

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Quartz

var. Amethyst

Wilkes County, Georgia

Gem-quality amethyst was first discovered in Wilkes County, Georgia in the 1920's. Back then, the famous jewelry company, Tiffany & Company, mined deep purple amethyst crystals to make gems. In 1988 a new deposit of amethyst was found in an area known as Jackson's Crossroads near the town of Tignall. Some of the finest amethyst crystals found in the United States, and possibly in the entire world, come from this site.

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Beryl

var. Aquamarine

Mount Antero, Colorado

In the fall of 2004 a miner named Steve Brancato discovered a very large pocket that was filled with large, beautiful, gemmy aquamarine crystals. The specimens were even more spectacular because the aquamarines grew with large, black smoky quartz crystals, silvery books of mica crystals and small, white feldspar crystals. Steve named the pocket after his mother, Diane.

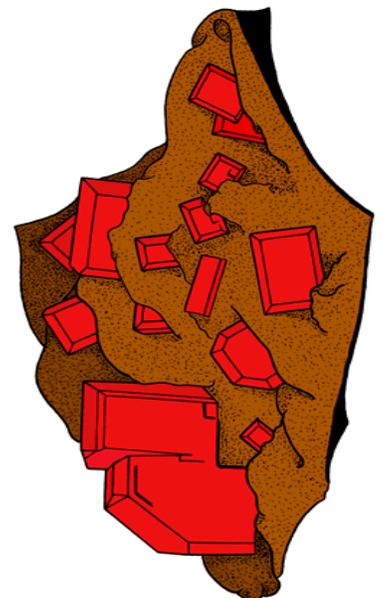
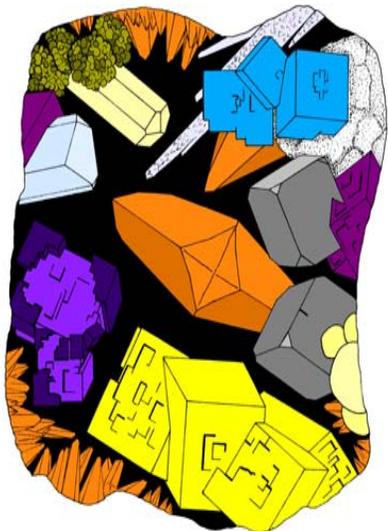
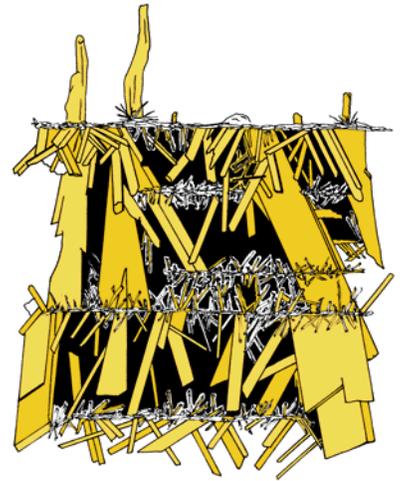
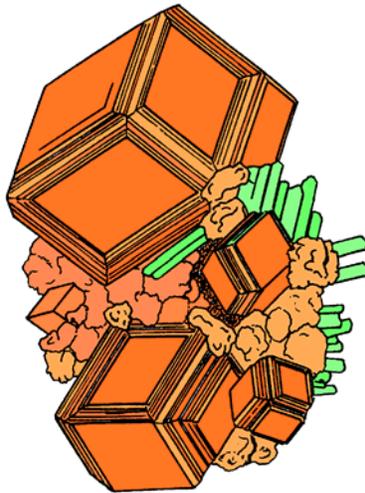
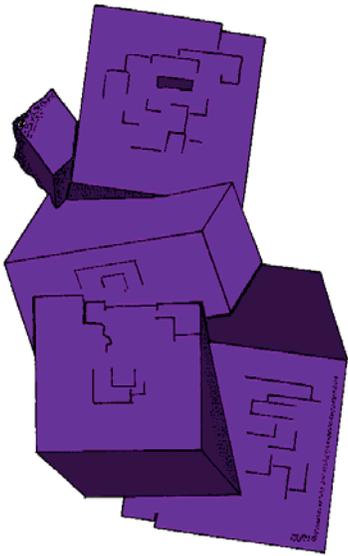
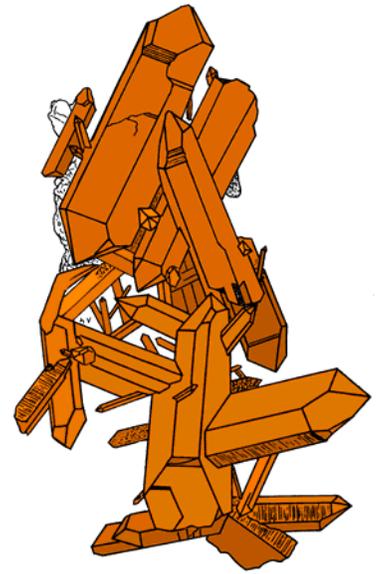
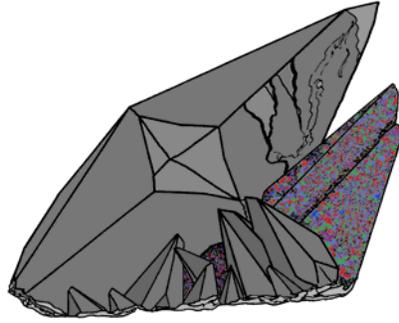
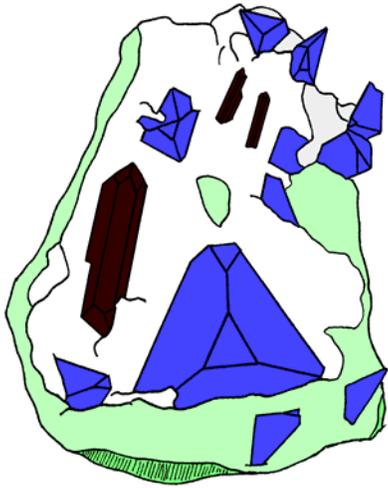
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Tourmaline

Himalaya mine, California

For over 100 years gem-quality tourmaline crystals have been removed from the Himalaya mine in San Diego County, California. The mine has over 5 miles of tunnels. It first opened in 1898 and since that time has produced about 250 thousand pounds of pink and green tourmaline crystals! This is more tourmaline than any other mine in all of North America. Many mineralogists, gemologists and mineral collectors claim that the Himalaya mine is the most important tourmaline mine in the world.

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Quartz

Little Rock, Arkansas

Water-clear, well-formed, large quartz crystals have been mined in the Little Rock, Arkansas region for many generations. These pure, sharp, gem-quality crystals are eagerly sought by collectors all over the world. Most of these crystals have to be cleaned after they are mined. This specimen is coated with orange iron oxide. When the coating is removed, the specimen will be perfectly colorless.

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Calcite

Brushy Creek Mine,
Reynolds County, Missouri

The gray, scalenohedral calcite crystals from the Brushy Creek Mine are world famous. Groups and individual, single crystals are common. Twinned crystals are commonly found as well. Some of these crystals are coated with a sprinkling of iridescent chalcopyrite.

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Benitoite

San Benito Co., California

In 1907, J.M. Couch was camping near New Idria, California. When he woke up, the morning sunlight was bouncing off of thousands of sparkling blue crystals. What he discovered was a new mineral that had never been known before. This mineral was eventually named "Benitoite" because it was found in San Benito County. It is California's official State Gemstone.

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Gypsum

Australia

Gypsum is number 2 on the mineral hardness scale. It is so soft that it can be scratched with your fingernail. Gypsum crystals can be as fine as hair and as large as a bus! Pure gypsum is colorless, but yellow, brown, green, golden yellow, black, and white gypsum is also known. Gypsum is crushed into a powder and heated. This drives off the water in its crystal structure. The white powder this creates is Plaster of Paris. Add water to this powder and the plaster can be used to make walls and decorative items.

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Garnet

Jeffrey Mine, Asbestos,
Canada

The mineral name "Garnet" comes from the Latin word "Granatum" which means "a pomegranate" because groups of small, red garnet crystals look like the seeds found inside a pomegranate. Garnet crystallizes in the cubic (isometric) crystal system. Most garnet crystals have 12 faces, and each face has 4 sides. This crystal form is called "Dodecahedral." The clear, cinnamon-orange garnets from the Jeffrey Mine are some of the finest garnet crystals in the world.

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Fluorite

Cave-In-Rock, Illinois

Fluorite is one of the most common minerals. Some of the best fluorite specimens came from the Illinois-Kentucky fluorite district. Pictured here are intergrown purple fluorite cubes. The fluorite from this region is also blue, yellow, and colorless. Sometimes a single crystal can have two or more colors.

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Wulfenite

Red Cloud Mine,
Yuma, Arizona

Mineral collectors agree that the Red Cloud mine is one of the world's great sources of mineral specimens, especially wulfenite. It was first opened in the 1870's. It was mined for its silver and lead ores. The well-formed, bright red, transparent, glassy wulfenite crystals have no value as an ore. But they are extremely valuable today to mineral collectors. Even very small specimens can be very expensive.

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Malachite

Democratic Republic of
the Congo, Africa

Malachite is a beautiful green copper mineral. It often forms as enormous masses. When the masses are sliced open, you can see it has zones or bands, each of which is a slightly different shade of green. Massive malachite is cut and polished to make jewelry and other decorative items like bowls, statues, boxes, and vases.

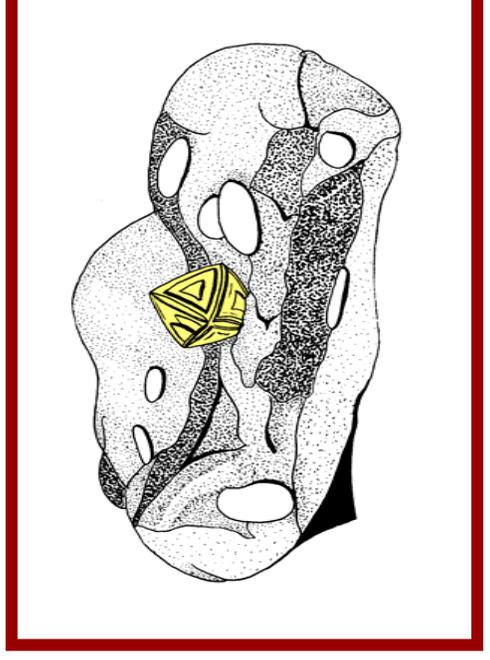
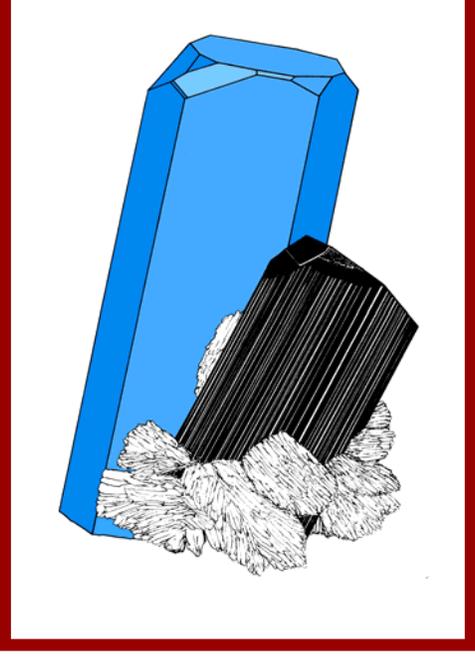
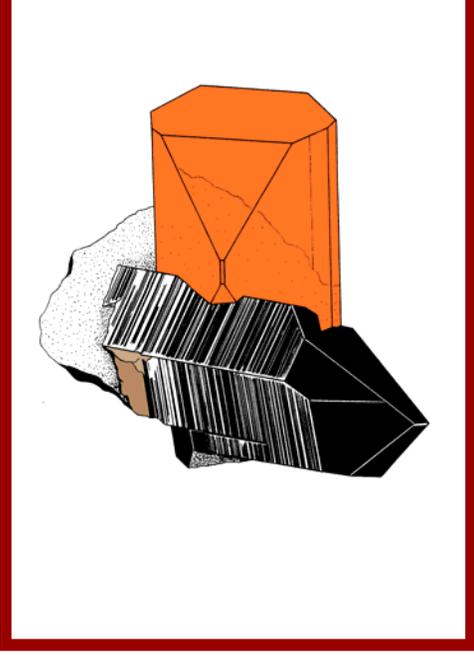
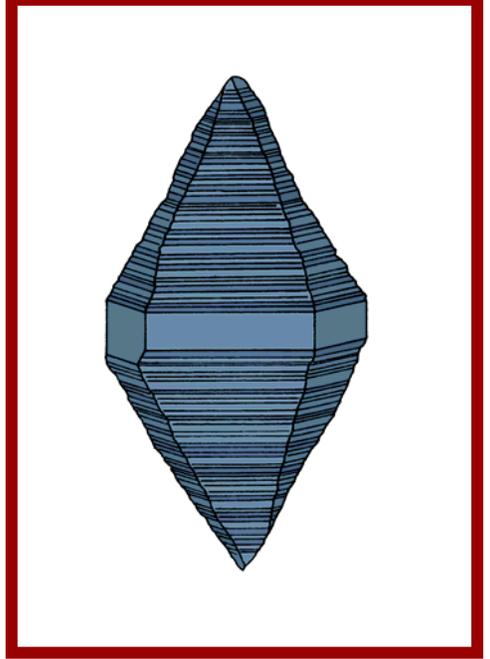
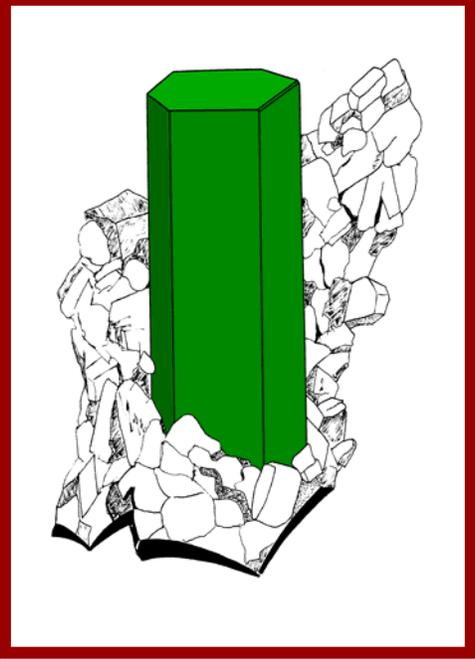
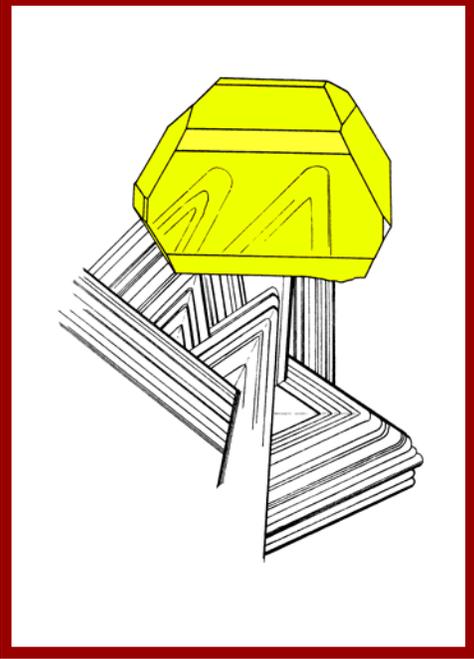
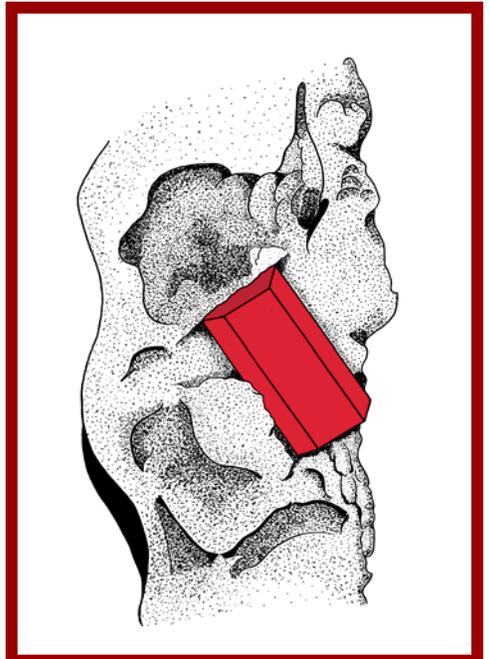
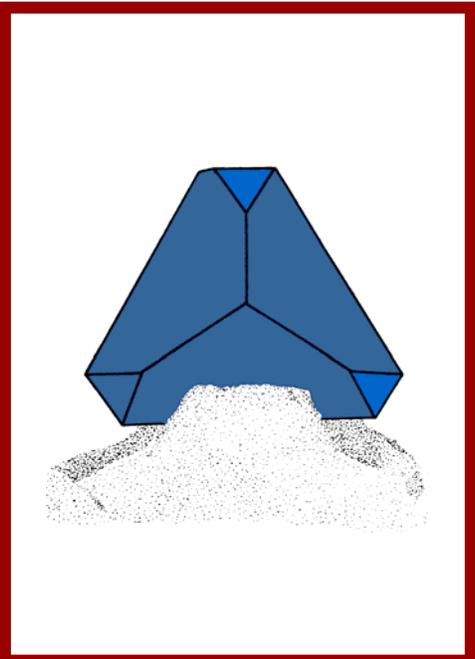
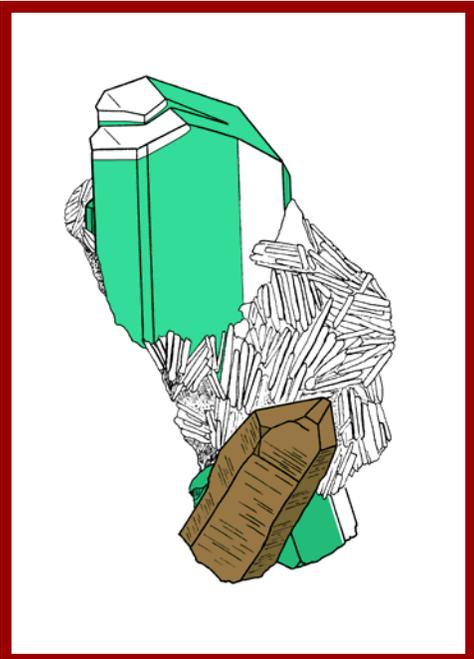
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Fantasy Pocket

Cave-in-Rock, Illinois

Nearly every public and private mineral collection in the United States has fluorite from the Illinois-Kentucky fluorite district. The region was mined for over 175 years. In this "Fantasy Pocket" you find yellow fluorite cubes, small orange calcite crystals, purple fluorite, light blue celestite, greenish chalcopyrite balls on a light yellow calcite, long grayish-white strontianite, light blue fluorite cubes in front of a large orange calcite, a single gray galena cube on purple fluorite, and a second galena crystal on yellow calcite.

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Bixbite

Wah Wah Mountains,
Beaver Co., Utah

Bixbite is a very rare red variety of the mineral beryl. Beryl is a group of minerals that is only different in color. They all crystallize in the hexagonal system, have a chemical formula of $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$, and have a hardness of 7 1/2 to 8.

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Benitoite

San Benito County

Benitoite is a relatively new gemstone. It was first discovered in 1906 in San Benito County, California (can you see how it got its name?!) by James M. Couch who was camping in the hills. The story goes that he woke up to find the sunshine bouncing off of the faces of benitoite crystals that were on the ground around his campsite. Not only is benitoite a rare mineral but gem-quality crystals are even rarer.

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Amazonite

Pike's Peak Region, Colorado

Amazonite is also called Amazon stone. It is opaque (this means light does not pass through it) so it is not faceted like diamonds or emeralds. It is carved into small figurines and polished to make semi-precious gems for rings, necklaces and ear rings.

Amazonite is a variety of the group of minerals called feldspars. Specifically, it is the turquoise-colored variety of microcline feldspar.

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Sapphire

Sri Lanka

Sapphire is the blue, yellow and colorless variety of the mineral corundum. It is number 9 on the Mohs' Hardness Scale. Because it is so hard, corundum is used to make grinding wheels and papers for grinding and polishing softer materials like porcelain, metals and wood. Pure corundum is aluminum oxide, Al_2O_3 , and is colorless. The presence of the elements iron and titanium in corundum gives sapphire its blue color.

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Emerald

Colombia

Emerald is the green variety of beryl. People have believed emerald to have many different "powers" through the ages. The Romans thought it was a symbol of the power of nature to reproduce.

The ancient Greek scientist, Theophrastus, claimed emeralds could bring rest to the eyes and relieve eye problems. Others believed an emerald could help a person predict the future.

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Brazilianite

Minas Gerais, Brazil

Brazilianite was named after the country in which it was first discovered, Brazil. It is yellow to yellow-green, rarely occurring as dark, olive green specimens. It was discovered in 1945 making it a fairly new gemstone. Brazilianite is often found growing on and with silvery muscovite crystals. These muscovite crystals form a shape that looks like a star.

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Diamond

South Africa

One of the most famous, popular and valuable of all gems is the diamond. Diamond is number 10 on Mohs' Hardness Scale, making it the hardest substance on Earth. It is so hard that it is actually 4 times harder than corundum (number 9 on the hardness scale) and 8 times harder than topaz (number 8 on the hardness scale). In very rare situations, diamonds can have deep colors, like blue, yellow, red, orange or pink.

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Aquamarine

Pakistan

Aquamarine is the blue variety of beryl. The name aquamarine comes from two Latin words, aqua marina, which mean water of the sea or ocean. Deep blue aquamarines are popular gemstones, both as gems and as specimens. In ancient times, sailors wore aquamarine because they believed it would give them courage and protection from the dangers at sea.

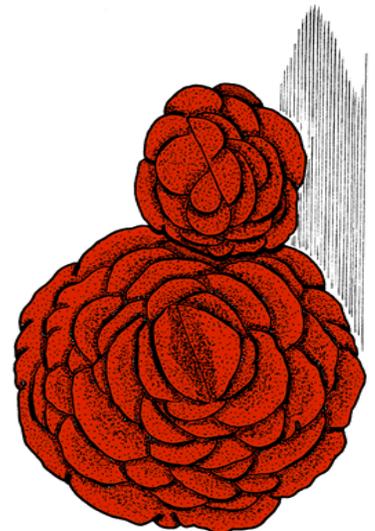
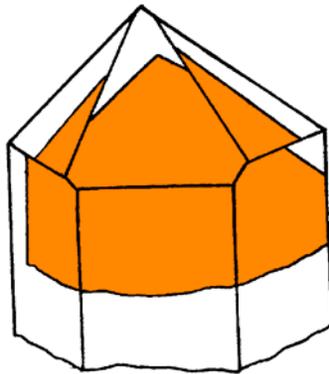
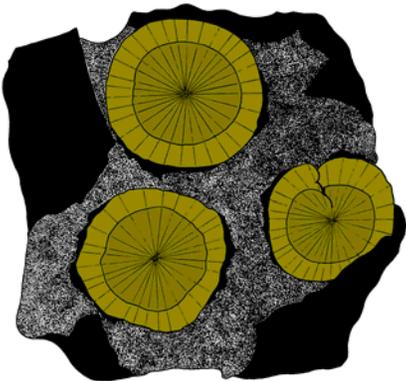
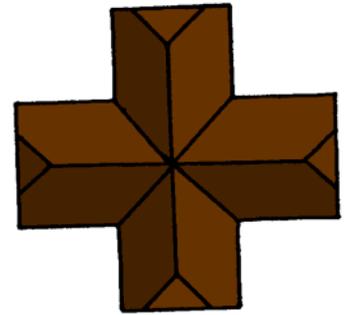
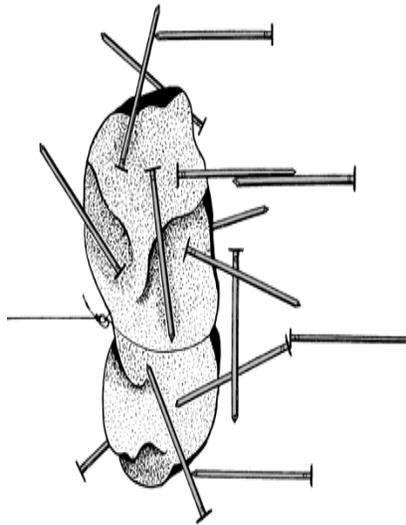
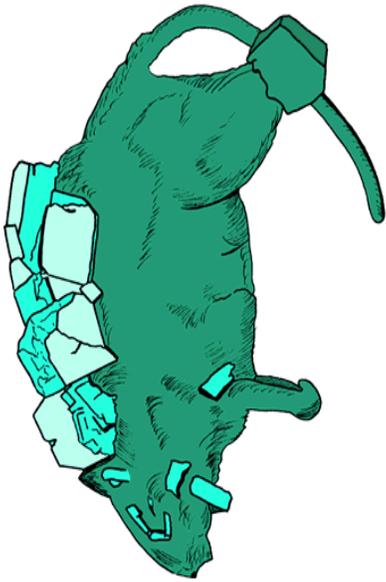
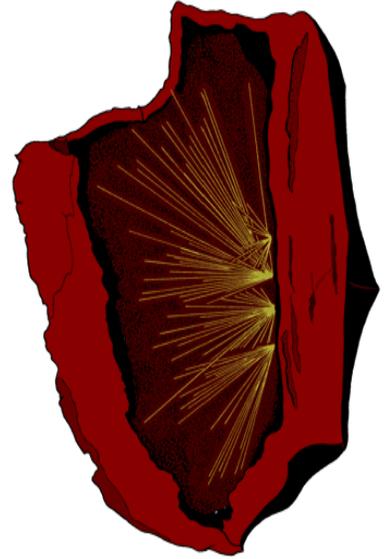
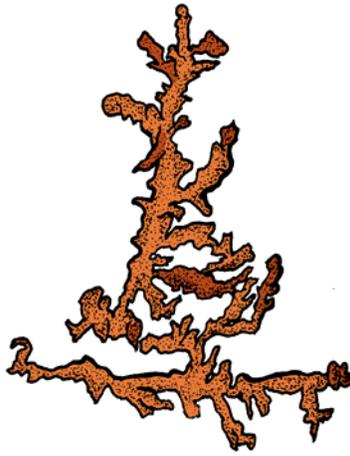
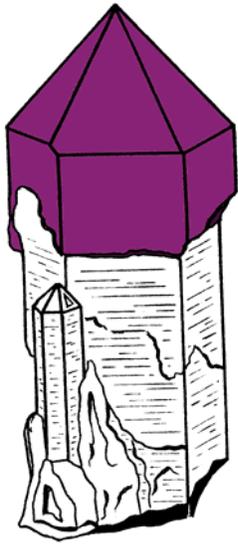
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Topaz

Skardu District, Pakistan

Topaz is number 8 on the hardness scale. It can be colorless, red, blue, pink, yellow, golden brown, sherry red, and even orange. Orange topaz is also referred to as Imperial Topaz. Colored topaz gems are beautiful and very popular. Topaz crystals can be less than an inch long and can be as large as a boulder. The world's largest topaz crystal is from Minas Gerais, Brazil and weighs almost 600 pounds!

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Acicular

Millerite

"Acicular" is from a Latin word "acicula" that means "a little needle." Acicular crystals are minerals that crystallize as long, thin, hair-like needles. The needles are extremely fragile. Even a light touch can break them off. The list of minerals that form acicular crystals include aurichalcite, artinite and millerite. The millerite pictured on this card is from the Sterling mine, Antwerp, New York.
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Arborescent

Copper

"Arborescent" means "like a tree". Some minerals, like this copper specimen from Itauz, Djezkazgan, Central Kazakhstan, grow in forms that resemble tree branches and so are described as arborescent.
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Scepter

Amethyst on Milky Quartz

A "scepter" is a long stick that is held by a King as a sign of the king's power. The end of the scepter is topped with a large ornament that is covered with beautiful jewels. A "scepter crystal" is one in which there is a long, lower portion that is topped with a larger, wider crystal termination. This scepter is from the African nation of Namibia.
©2008 Darryl Powell

Twinned Crystals

Staurolite

There are times when two or more crystals grow together at a specific angle. When this happens, the crystal is called a "twinned crystal." Pictured here is a staurolite twin. In this specimen two individual crystals have grown together in a cross formation.
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Magnetism

Magnetite, Lodestone

The ancient Roman naturalist, Pliny the Elder, told about a shepherd named Magnes. Magnes was out watching his sheep when the nails in his shoes stuck to the rocks in the ground. Items made out of iron, like nails, are attracted to and stick to magnetite. This property is called "magnetism." Massive magnetite is called "lodestone."
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Pseudomorph

"The Atacamouse"

The word "pseudomorph" literally means "false form." A pseudomorph is a mineral that starts off as a particular mineral. But when the chemical environment changes, the chemistry of the mineral changes. The mineral has the shape of the original mineral but the chemistry of another mineral. Pictured here is a mouse that has been changed into the copper mineral atacamite.
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Rosette

Barite

There are some minerals in which many individual crystals grow together in such a way that they resemble a flower. Any rose-like crystal groups are called "rosettes." The minerals that typically form rosettes are gypsum, barite and hematite. Pictured here is a "rose" made of intergrown barite crystals. The barite grew in red sandstone and the red sand was trapped in the barite.
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Phantom

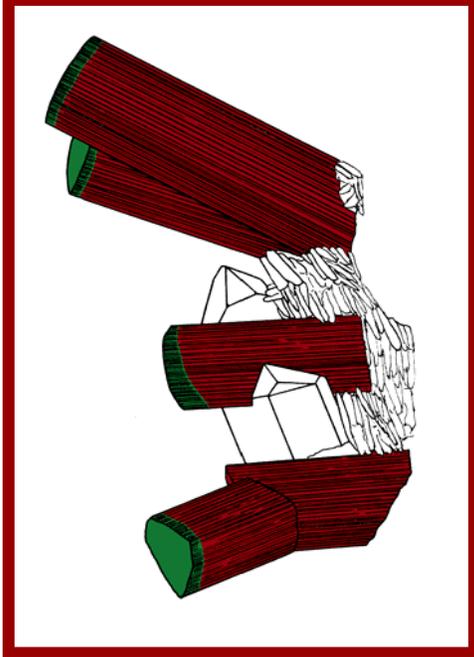
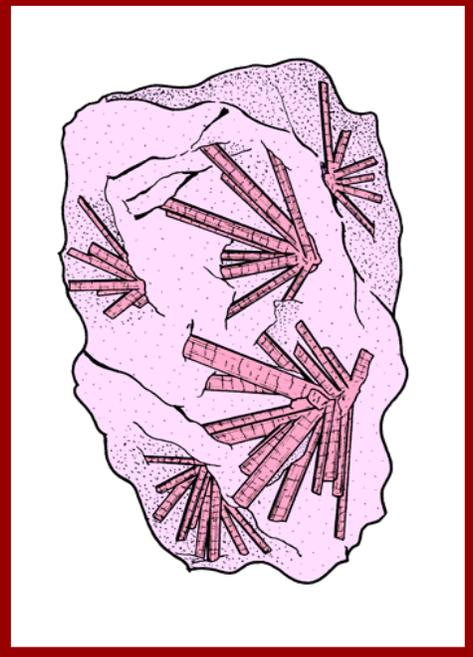
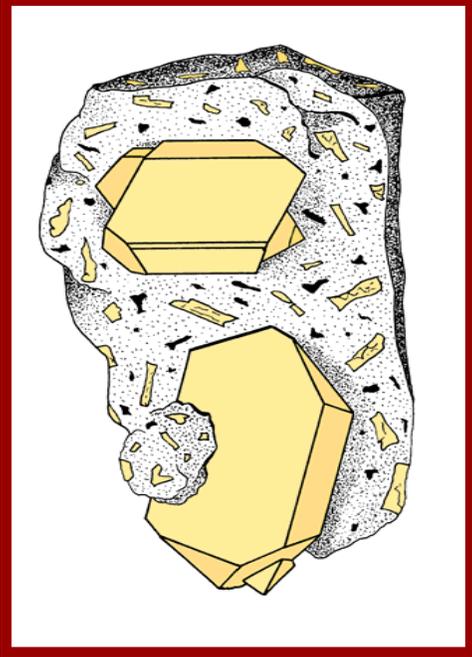
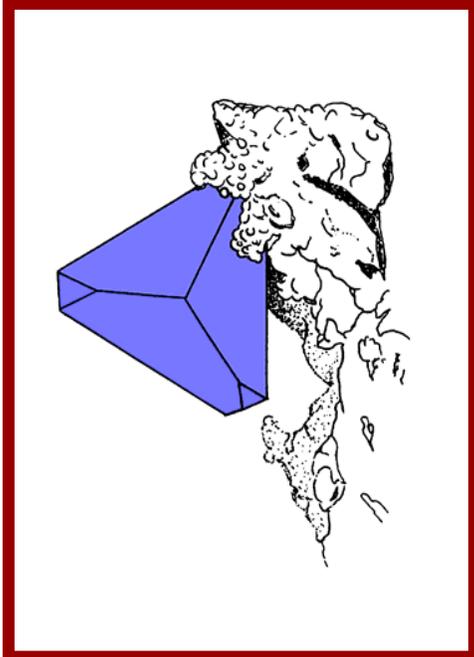
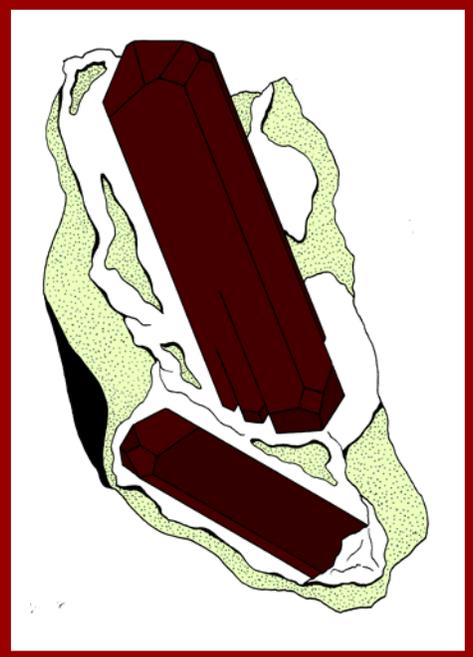
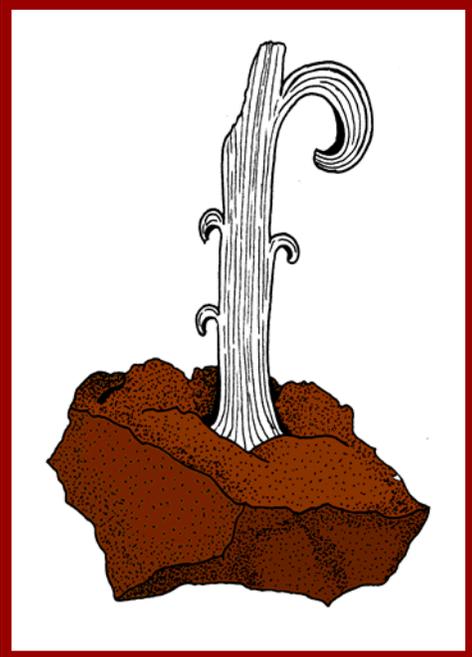
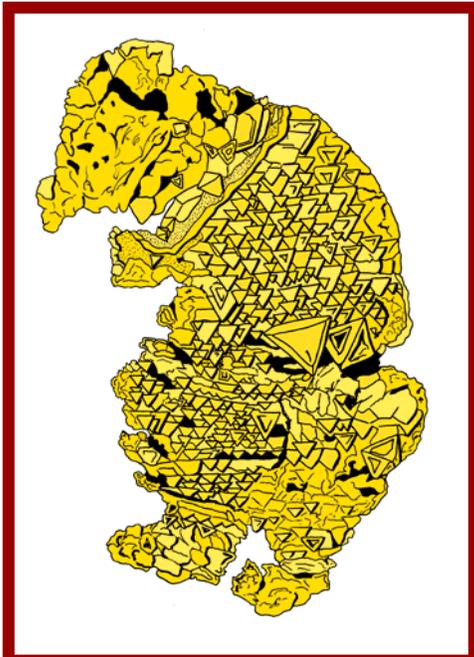
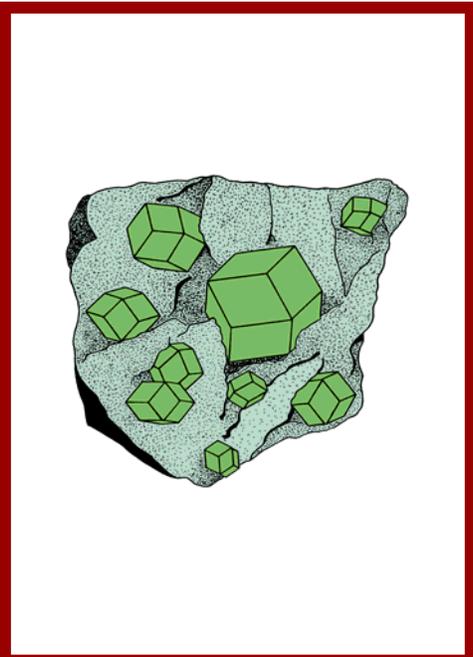
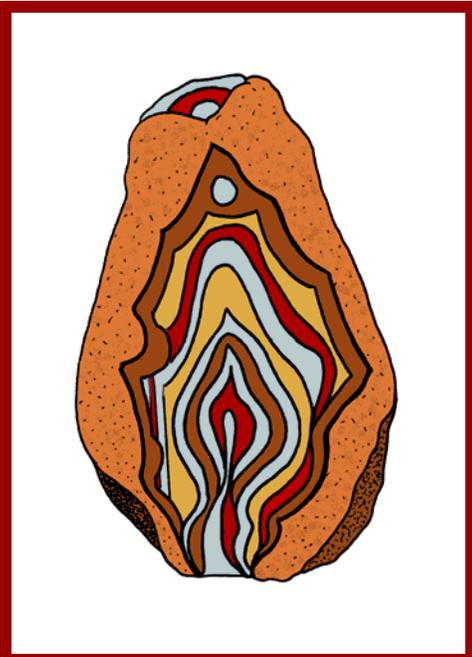
Quartz

Sometimes a crystal will grow to a certain size and then stop growing. Later on, the crystal growth started again, but the new material can be a different color. When the growth is all complete, the larger crystal looks like it has a smaller crystal trapped inside. The original, smaller crystal is the same shape as the larger, later crystal. Mineralogists call this situation a "phantom crystal."
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Dollars

Pyrite

Among the most unusual and popular mineral specimens are the "Pyrite Dollars" from Sparta, Illinois. They are found in coal deposits, forming between layers of black shale. The crystals grow from a center point like rays of light moving out from the sun. The pyrite forms into thin, flat discs that collectors call "Dollars." They really do look like big coins!
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The Golden Bear Nugget

Georgia Hills mine, Jim

This famous gold specimen is a crystallized nugget that is 2 1/4 inches high and 1 5/16 inches wide.

It weighs a little over 1 troy ounce. It was discovered by a 14 year old girl in 1857. When she died, her brother took care of the nugget. It was eventually sold to the California Federation of Mineralogical Societies. It is now in the Los Angeles Museum of Natural History.
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Benitoite

New Idria, San Benito Co.

In 1907 a man named J.M. Couch was camping near the town of New Idria. When he woke up, the morning sunlight was bouncing off of thousands of sparkling blue crystals. He had them studied by a mineral expert who discovered that this was a mineral that had not been known before. He named the mineral "Benitoite" because the crystals were found in San Benito County. It is California's official state gemstone.

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Tourmaline

Himalaya mine,
San Diego Co.

The name "tourmaline" refers not to one mineral species, but to an entire group of minerals. For over 100 years a number of different gem-quality tourmaline crystals have been mined from the Himalaya mine in San Diego County. The mine has over 5 miles of tunnels. It first opened in 1898 and since that time has produced about 250 thousand pounds of pink and green tourmaline crystals!

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Garnet

Idria region

Garnet is found in both metamorphic and igneous rocks in California. Pictured here are light green andradite garnet crystals.

They sit in a light bluish-green matrix. They are "dodecahedral" crystals. A dodecahedral crystal is one that has 12 faces and each face has four sides.

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Neptunite

New Idria, San Benito Co.

In San Benito County, neptunite is found with the beautiful gemstone, benitoite. Neptunite is deep red. It is so dark that at first look, you may think that it is black. But if you were to see a small chip of neptunite, the light would shine through it and the deep red color would be easy to see.

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Tourmaline

in Lepidolite

Stewart mine, Pala District,
San Diego Co.

Lepidolite is a mica mineral that is rich in the element lithium. Lithium gives it its delicate lavender-purple color. The lepidolite is a mass of very small flakes. Though the crystals are not gem-quality and are even full of small cracks, they are beautiful as they sit in the lepidolite matrix.

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Agate

Hauser Geode Beds, near
Blythe, Riverside County

Chalcedony is a variety of the mineral *quartz*. There are different types of chalcedony, one of which is agate. Pictured here is banded agate. Each band is a different color. Sometimes the bands in banded agate are different shades of gray and grayish-blue. Other types of chalcedony are jasper, chrysoprase, onyx, and flint.

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Gypsum

"Ram's Horn Selenite"
Del Mar, San Diego Co.

Gypsum is mined in a number of places in California such as at the Mojave Desert and Inyo, Kern, Los Angeles and Ventura Counties.

This interesting cave growth formed as gypsum-bearing water slowly oozed out of a cave wall. As the water evaporated, the gypsum solidified, adding a little at a time and creating this attractive "Ram's Horn" shape.

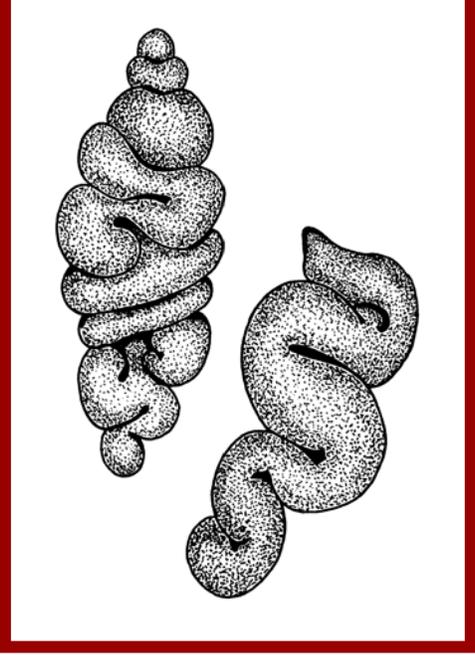
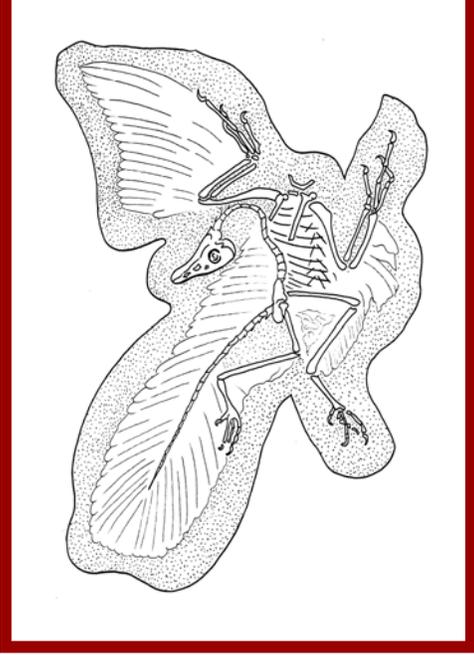
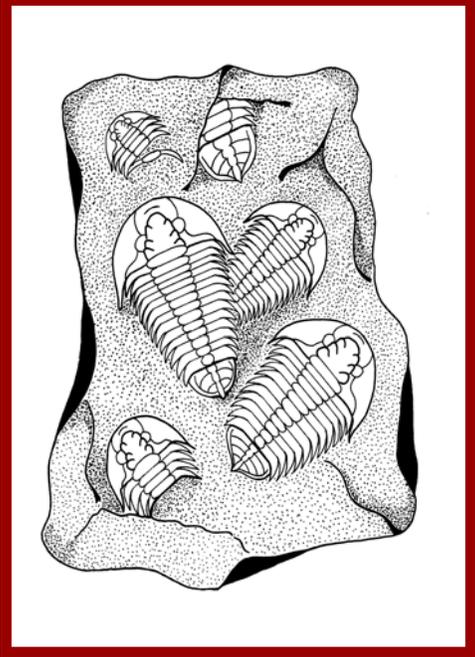
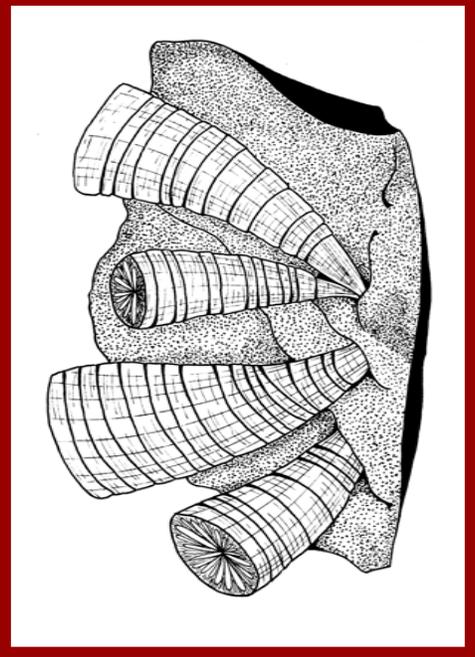
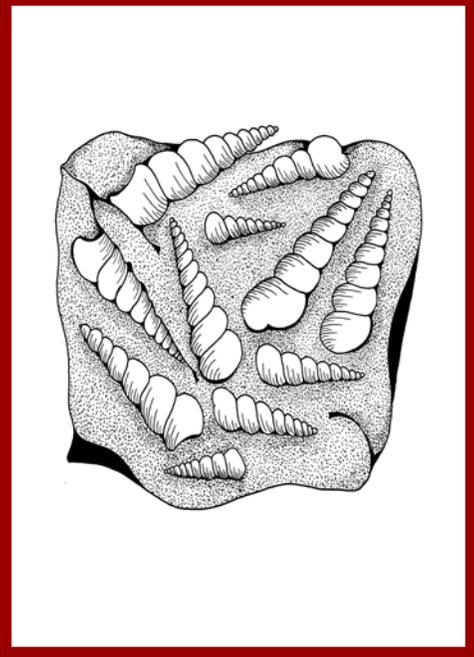
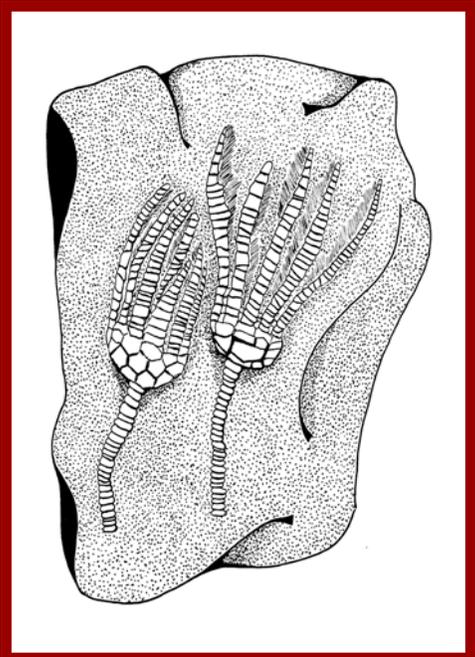
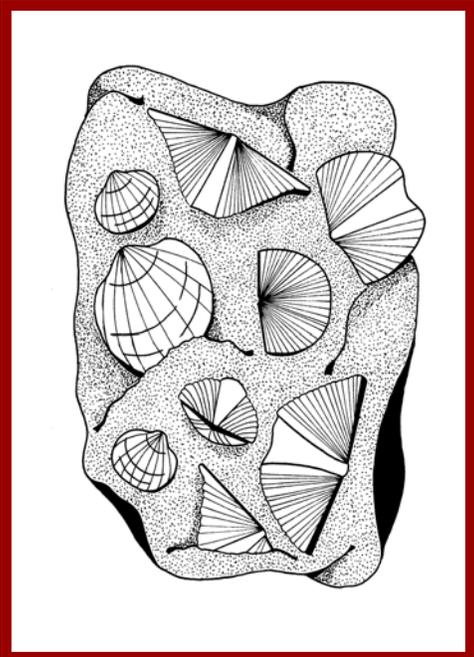
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Orthoclase Feldspar

Water Canyon, near Cinco,
Kern County

Here are two "Twinned Crystals" of orthoclase feldspar. This particular twin form is called a Carlsbad Twin. Twin crystals form when two individual crystals grow together in a definite formation. Other minerals that form crystal twins are quartz, rutile, staurolite, gypsum, and chrysoberyl, to name a few.

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Crinoids

The name "crinoid" comes from two Greek words that mean "lily form" because crinoids look like flowers with "roots," a long "stem" and a "flower" on top. Don't be fooled, though: a crinoid is NOT a flower, it is an animal. Modern crinoids can live in shallow water, but have also been found at depths of 6,000 meters. The earliest known crinoids come from the Ordovician Period (over 450 million years ago).

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Ammonites

Ammonites are part of a class of organisms called "cephalopods" which means "head-foot." They are extremely common and are one of the best-known groups of fossils. Ammonites are extinct, but they are related to the modern octopus and chambered nautilus. They first appear in rocks that are 400 million years old, a geologic time called the Permian Period. They became extinct and disappeared from the rock record 65 million years ago in the Cretaceous Period.

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Brachiopods

Brachiopods are bivalves which means that they have two shells or "valves" that fit together. They were marine organisms. We say "were" because most brachiopods became extinct during the great Permian-Triassic Extinction that took place over 250 million years ago. It is estimated that over 90% of all marine organisms and nearly 70% of all land-dwelling vertebrates became extinct during this event.

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Trilobites

One of the best known - and most popular - of the marine fossils are the trilobites. The name "trilobite" means "three lobes." Look at a trilobite and you can see three sections: one lobe is the head (called the cephalon), one lobe is the body (called the thorax) and the third lobe is the tail (called the pygidium). When a trilobite needed to protect itself, it would roll up in a ball, like an armadillo does today. There are approximately 17,000 known trilobite species!

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Rugose Coral

The Rugosa Coral (also simply called "Rugose Coral") is an order of extinct coral. They lived in warm, shallow seas in the Middle Ordovician through the Late Permian Periods. Their common name is "Horn Coral" because rugosa fossils look like horns. They first appear in the fossil record in rocks over 540 million years old, in the Cambrian Period. Just like modern coral, they formed extensive reefs.

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Gastropods

Gastropods include snails and slugs (think of a slug as a snail without a shell). They live both in the sea and on the land. Gastropods have coiled shells. The coils are called "whorls." Gastropod literally means "stomach foot." They are named this because it looks like the move around on their bellies. It is estimated that there are over 15,000 different species of gastropods! The earliest gastropods lived in the oceans.

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Tyrannosaurus

The fossil record shows that dinosaurs were the most important 4-legged animal on Earth for over 150 million years! They were the "Kings" of the land throughout the Mesozoic Era. The name "dinosaur" was created by the British scientist, Sir Richard Owen, in 1842. It means "Terrible Lizard." Tyrannosaurus Rex was a carnivore. This means that it ate meat, most likely other dinosaurs.

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Coprolites

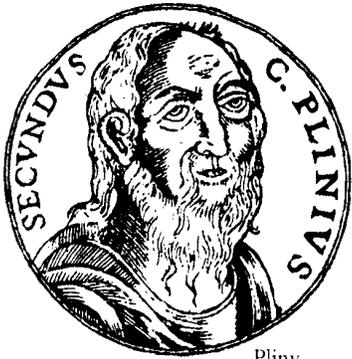
Coprolites look like something your dog would leave in the backyard. Yes, coprolites are fossilized dinosaur dung. Surprisingly, there is a lot of fossilized dinosaur droppings in the rock record. They turn out to be very important fossils. Paleontologists have discovered that when the dung was fossilized, much of what was trapped inside was also fossilized. When coprolites are studied under a microscope, a paleontologist can discover what a dinosaur ate.

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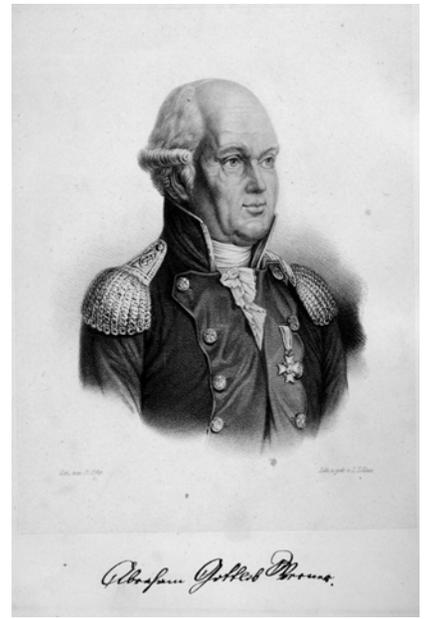
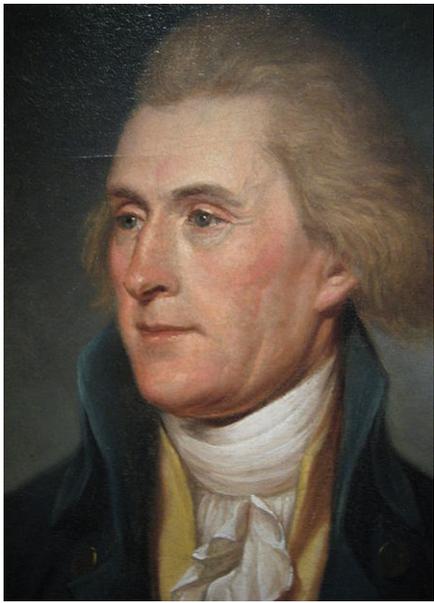
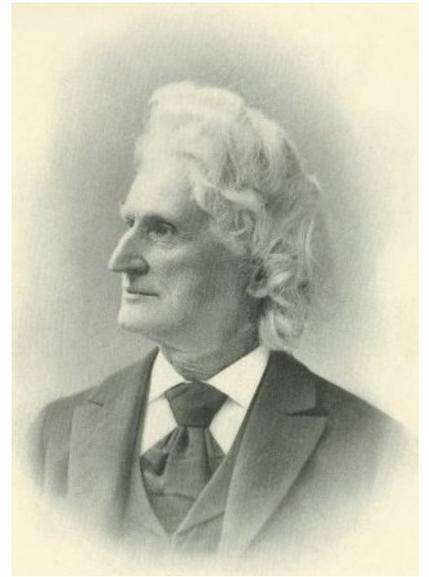
Archaeopteryx

Archaeopteryx is one of the most important fossils ever discovered anywhere in the world. The name comes from two Greek words that mean "ancient wing." It has feathers and wings like a bird. However, the skeleton is much more like a dinosaur. This fossil is believed to be a step in the evolution of dinosaurs into birds. That is why paleontologists call this a "transitional fossil."

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Pliny



James D. Dana

1813 ~ 1895

James Dwight Dana was born in Utica, New York. He was a mineralogist, geologist, volcanologist and zoologist. He studied volcanoes, mountains and natural history for the United States Exploring Expedition. He is best known for his books *System of Mineralogy* and *Manual of Mineralogy*. His *Manual of Mineralogy* was so influential that revised editions are still used in colleges and universities to this very day.

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James Smithson

1764 ~ 1829

James Smithson was born in Paris, France and was named Jacques Louis Macie. He changed his name to James Smithson in 1800. He was a mineralogist and chemist. The mineral *Smithsonite* is named in his honor. Smithson is most famous for his gift to the United States of America which was a large amount of money to start what we know as The Smithsonian Institution. The Smithsonian is the National Museum in Washington, D.C. ©2012 Darryl Powell

Pliny the Elder

23 CE ~ 79 CE

Gaius Plinius Secundus is best known by the name "Pliny the Elder." He lived in ancient Rome. He was a naturalist and an author. He spent a lot of time observing and studying the natural world and writing about it. He wrote *Naturalis Historia* one of the only ancient writings about nature that still exists today. He died from the eruption of Mount Vesuvius in 79. The mineral name *asbestos* was first used by Pliny the Elder. ©2012 Darryl Powell

Abraham G. Werner

1749 ~ 1817

Abraham Gottlob Werner was a geologist from Germany. He is sometimes called "the Father of German geology." Collecting minerals was his passion when he was young. He wrote what is considered the first modern mineral book. It was a description of the mineral species known at the time. Among the many minerals studied and named by Werner are apatite, graphite, olivine, prehnite, and rutile, *to name only a few*.

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George F. Kunz

1856 ~ 1932

George Frederick Kunz was one of the most important gemologists in the world. He was also a serious mineral collector from a young age. By the time he was 20 years old, he had built a collection of over 4,000 specimens. He wrote many books about gems. He was one of the founders of the New York Mineralogical Club. The mineral *kunzite*, a pink gem variety of spodumene, is named in his honor.

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Thomas Jefferson

1743 ~ 1846

Thomas Jefferson was the author of the Declaration of Independence and the third President of the United States. He was one of America's very first naturalists. He collected mineral specimens from the United States, not really to enjoy them as specimens, but to show the world the rich mineral resources of this new nation. He displayed American mineral specimens in his home, Monticello. Monticello still exists; his mineral collection is gone.

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Peter Zodac

1894 ~ 1967

Peter Zodac was born in Peekskill, New York. He was the founder of the magazine *Rocks & Minerals*. He started this important magazine because he felt there was a need for a regular magazine for mineral collectors that was written for the average collector rather than for professors and scientists. He was a mineral collector. He also ran a successful mineral specimen business.

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Friedrich Mohs

1773 ~ 1839

Friedrich Mohs was a German mineralogist and geologist. In 1802 he was hired to identify minerals in a collection. He did so by studying their physical properties. This led him to develop the mineral hardness scale, which is also known as Mohs' Hardness Scale. This scale of 10 minerals from softest (1 - Talc) to hardest (10 - Diamond) is still taught in schools today.

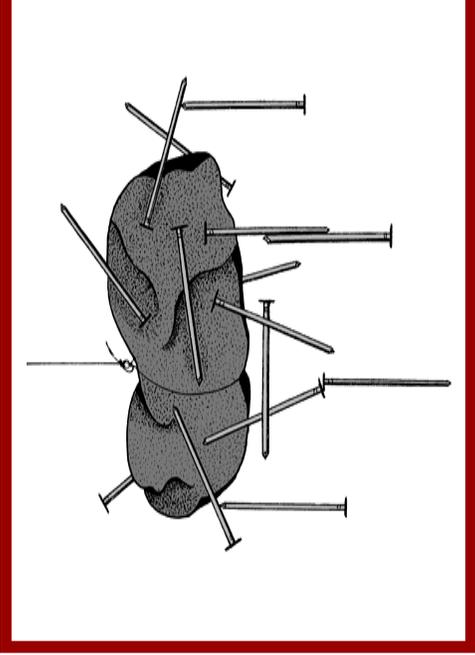
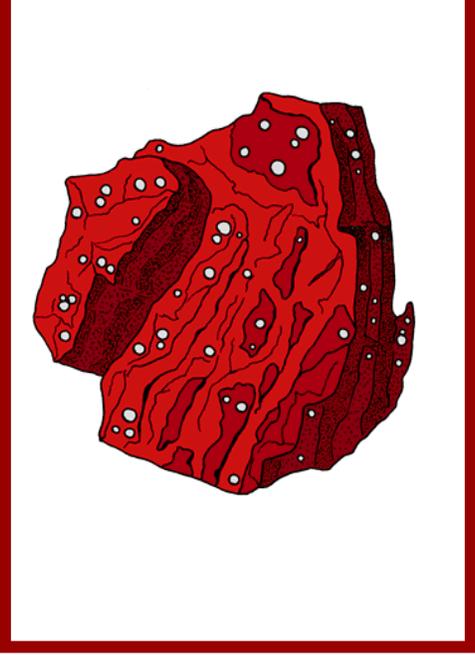
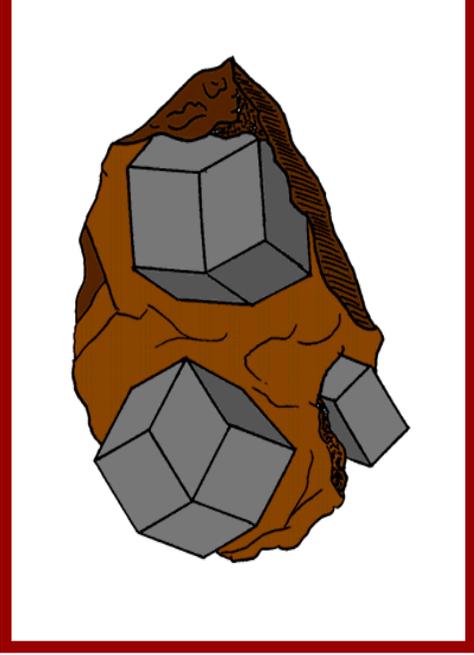
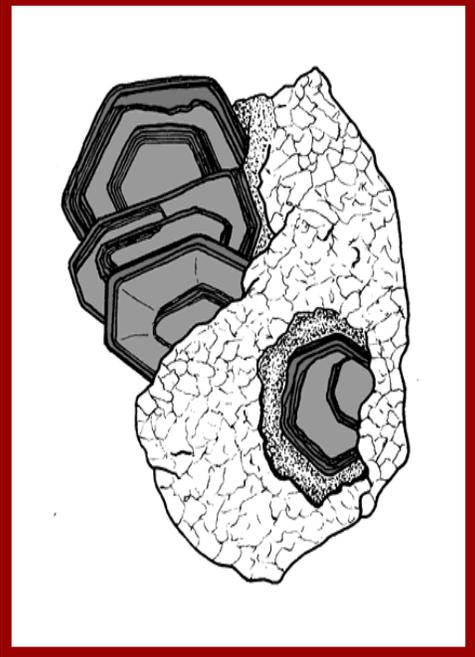
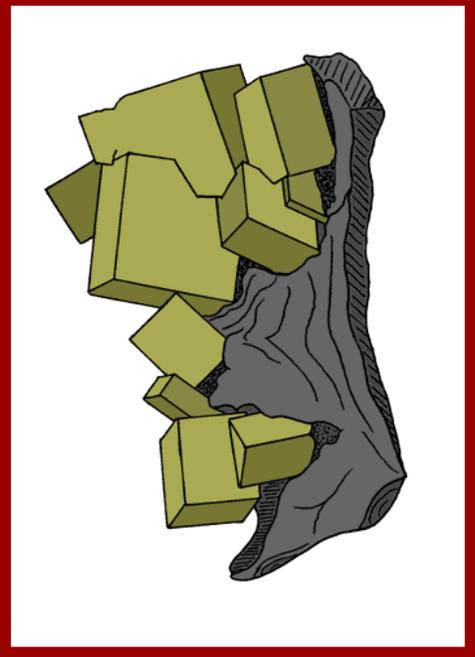
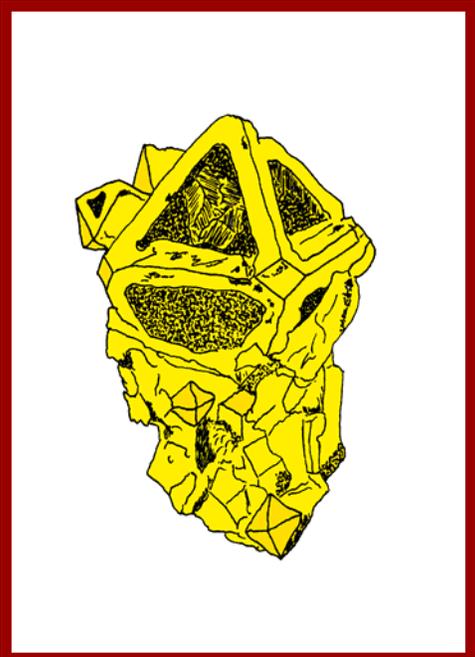
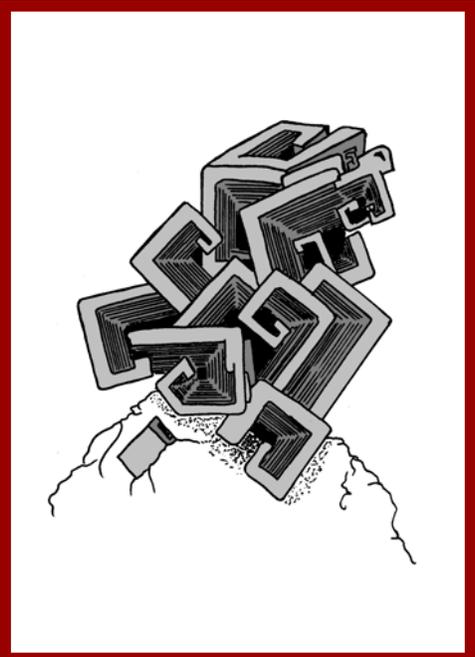
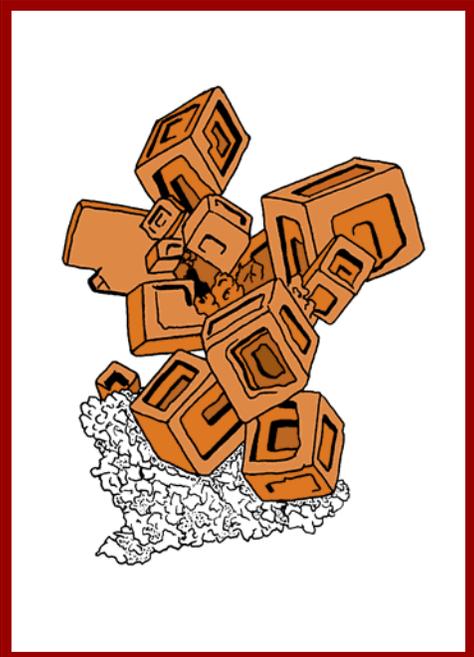
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Johann Wolfgang von Goethe

1749 ~ 1832

Johann von Goethe was a German writer, poet, philosopher and amateur mineralogist. He is considered the most important modern German author. For a time he was in charge of mining affairs for the Grand Duchy of Weimar. The mineral *Goethite* was named in his honor.

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GOLD

Gold is an element.

It is a metal.

Pure gold is very soft, so it is mixed with other metals to make it harder for rings and necklaces.

Gold is VERY valuable.

SILVER

Like gold, silver is an element. It is also a metal. Gold doesn't tarnish, but silver does. Bright, shiny silver tarnishes to dark gray to black. It is used to make jewelry and utensils.

COPPER

Like gold and silver, copper is an element.

It is also a metal.

Copper is very important because it is used to make electrical wires. Important copper ores are azurite, malachite and cuprite.

MOLYBDENITE

Molybdenite is an important ore of the element *molybdenum*. It is mixed with other metals to make them stronger.

PYRITE

Pyrite is known as "Fool's Gold" because it is bright yellow and metallic like real gold. It is made of the elements iron and sulfur. Pyrite can have real gold trapped in its crystals.

GALENA

Galena is lead ore. It is made of the elements lead and sulfur. The lead gives it a silver color. Galena often contains the valuable element, silver.

LODESTONE

Lodestone is massive magnetite. It is made of iron and oxygen.

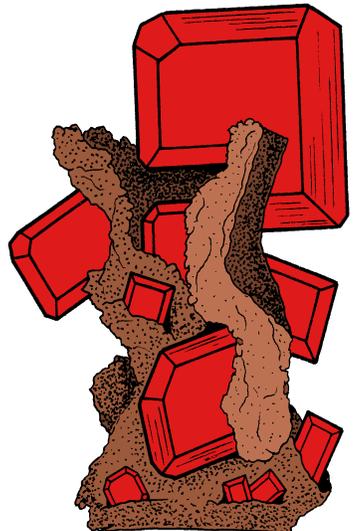
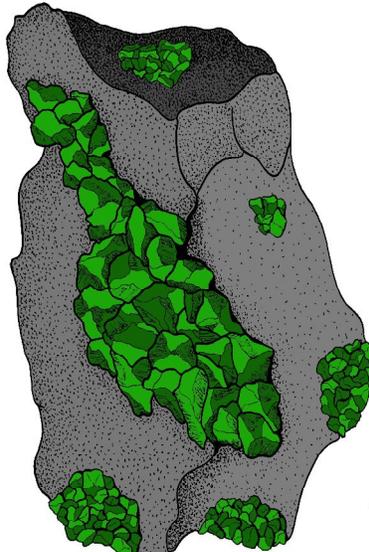
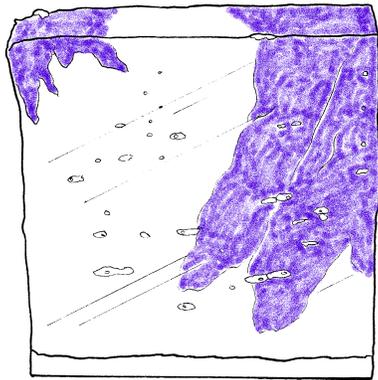
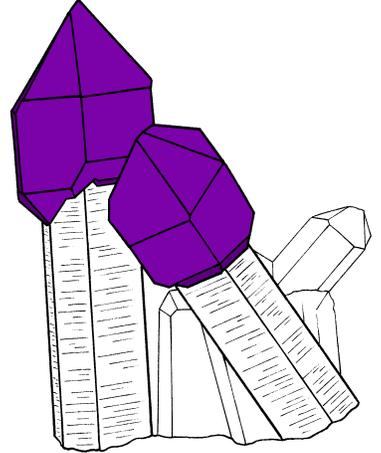
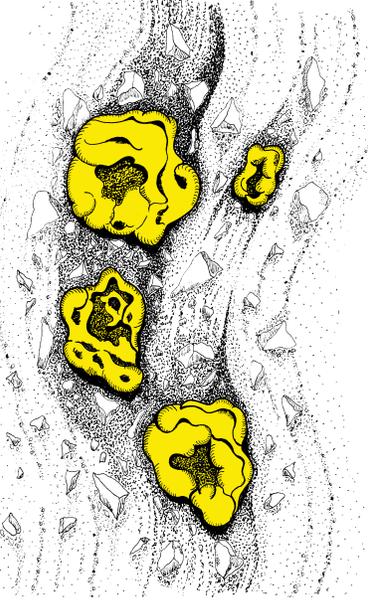
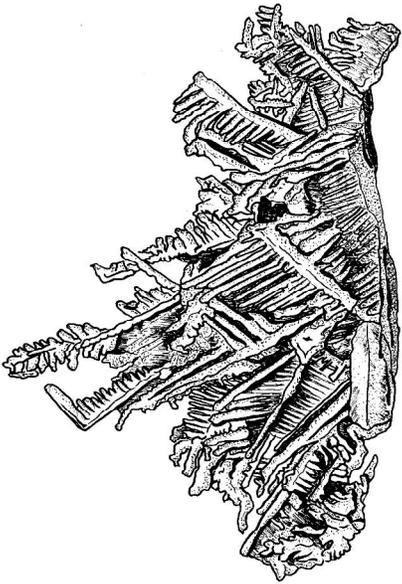
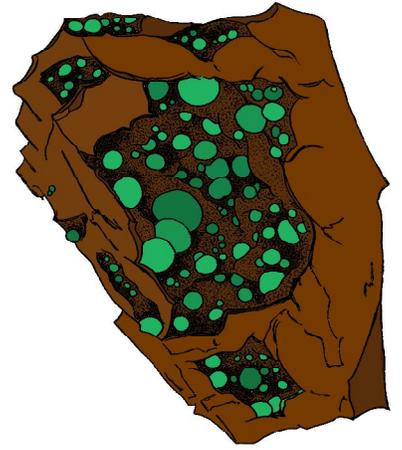
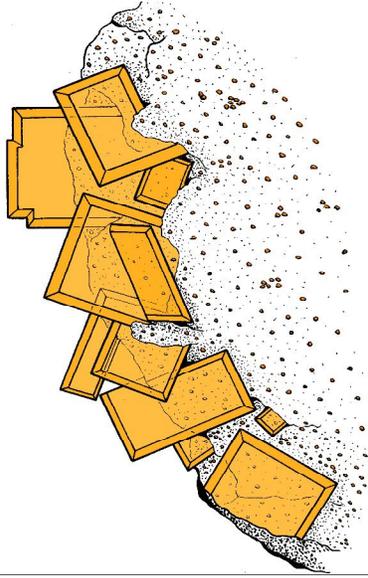
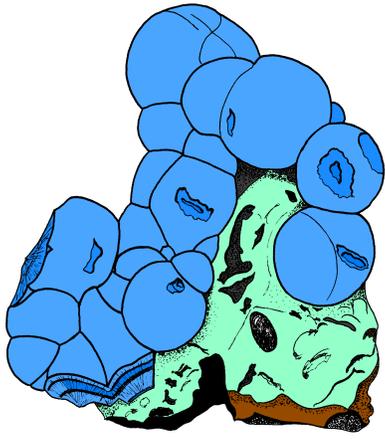
Like magnetite, lodestone is naturally magnetic. It is one of the most important ores of iron.

MERCURY

Mercury is an element. It is a metal. It is the only element (and the only metal) that is a liquid at room temperature. Because it is silvery, metallic and it rolls like a drop of water, it is also called "Quicksilver."

MAGNETITE

Magnetite is a natural magnet. It is made of iron and oxygen. When it crystallizes, it can form dodecahedral crystals like the ones pictured here. It can also form octahedral crystals.



Malachite

Malachite is a copper mineral. In Arizona, it is often associated with azurite. This specimen is from the Copper Queen mine in the great copper mining town of Bisbee. When people hear the name Bisbee, they think of one of the greatest mining regions in the history of the world. The mines of the Bisbee region produced over 200 different mineral species! These malachite "balls" are described as botryoidal which means *grapelike* because they look like little grapes.

Quartz var. Amethyst

This is a beautiful group of scepter crystals of amethyst (purple quartz) on top of white milky quartz shafts. It is from the Fat Jack mine, Lane Mountain, Yavapai County, Arizona. The Fat Jack mine was a gold mine. Gold is often found with milky quartz. Very often, prospectors will discover an outcropping of milky quartz and follow it with the thought that somewhere in the milky quartz vein they will also find precious gold.

Wulfenite

When mineral collectors think of wulfenite and Arizona, they right away think of the Red Cloud mine, Yuma County. Mineral collectors all over the world agree that Red Cloud wulfenites are the best of the best. The crystals are large, well-formed, often complex, glassy and bright red. The Red Cloud mine is at the southern end of the Trigo Mountains, north of Yuma. It was originally mined for its lead ore which contained valuable amounts of lead and silver.

Wulfenite

Pictured here are glass-clear, orange wulfenite crystals from the Mammoth-St. Anthony mine, Tiger, Pinal County, Arizona. The Mammoth mine was originally mined for its gold ore. Notice that these crystals are so thin and clear that you can see right through them. Wulfenite is not mined as an ore. The crystals are so beautiful that they are always favorites of mineral collectors. Some of the best wulfenites in the world come from Arizona.

Gold

Before Europeans arrived in the land now called Arizona, Native American tribes were very aware of the shiny, heavy yellow nuggets that could be found in the streams and valleys. The Apaches at first called them *pesh-klitso* meaning *yellow iron*. When they learned its value, they called it *oro-hay*. The Navajo call gold *oolaa*. It is still possible to find gold in Arizona's streams. Finding a large nugget, though, would be a very rare find.

Olivine var. Peridot

Peridot is a special variety of the mineral *olivine*. It is a beautiful grass-green color. The only deposit of gem-quality peridot in the United States is near San Carlos, Gila County, on what is called Peridot Mesa. This mesa belongs to the Apache Ndeh Nation. The people of the San Carlos Apache Nation use hand tools to break apart the rock and remove the peridot. High quality pieces are cut into gemstones. Lower quality pieces are made into beads.

Azurite

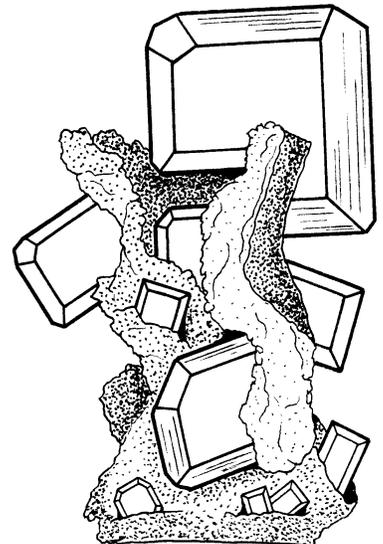
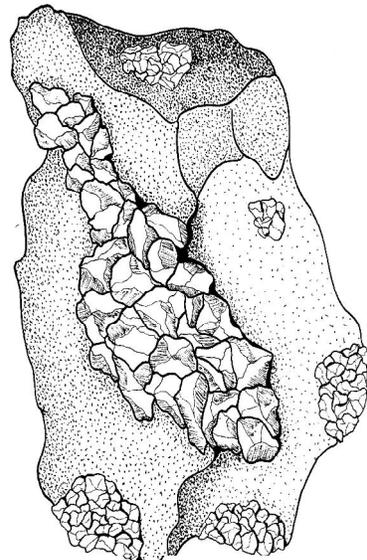
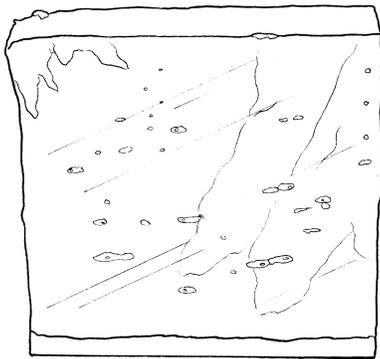
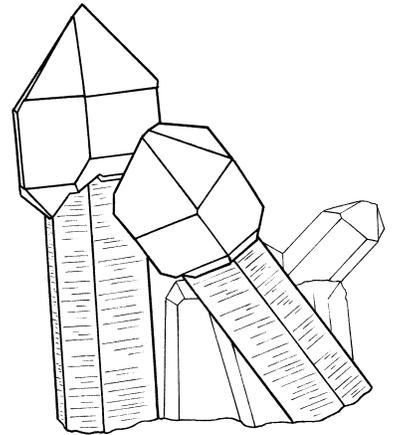
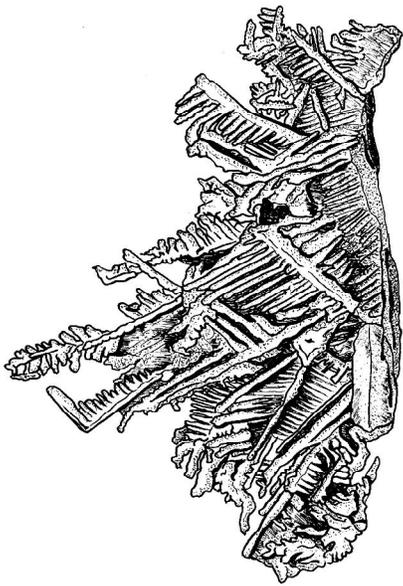
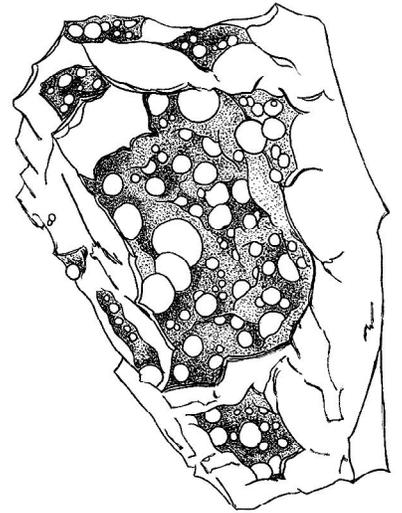
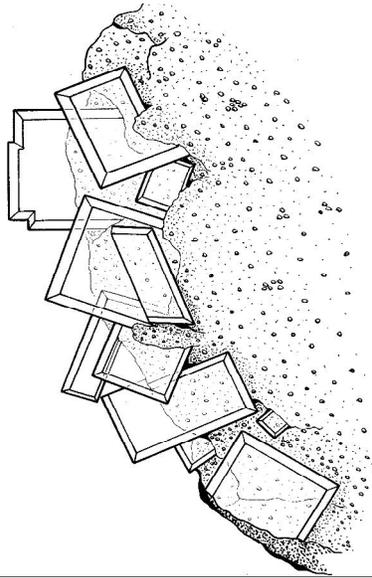
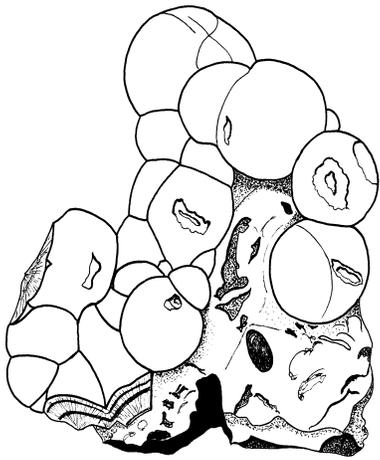
Pictured on this card is one of the most famous mineral specimens ever found. It is a large, powder blue specimen of azurite, an important copper mineral and ore. This specimen is from Bisbee, Arizona. This specimen has been pictured in many mineral books and magazines through the years. The Bisbee district has produced the highest quality azurite specimens from its very beginning. Some are so dark blue they appear to be black!

Silver

The origin of the name "Arizona" is not known for certain. It came from a Native language, but exactly which one is not known. Some think it came from the Aztec Indian word *arizuma* which means *silver-bearing*. Explorers came to Arizona to seek fortunes in silver and gold. A vein of pure, native silver - 1 to 2 inches thick - was discovered in the Stonewall Jackson mine in Gila County. This is just one example of Arizona's silver wealth.

Halite

The mineral that attracted native peoples to the Camp Verde District was salt, which is known by its mineral name, halite. The halite is found mostly on the walls of the Camp Verde mine where it occurs in large masses. Occasionally clear cubes of halite from Camp Verde have what looks like purple smoke trapped inside. You may also see small bubbles trapped inside as well. Mineralogists believe the purple coloring is caused by the element manganese.



Malachite

Wulfenite

Azurite

Quartz var. Amethyst

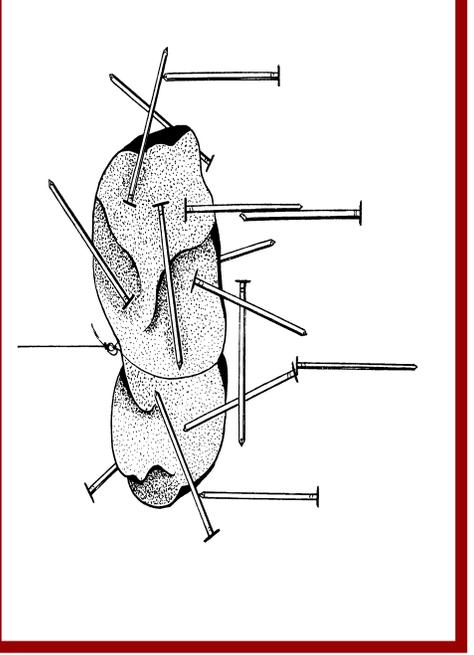
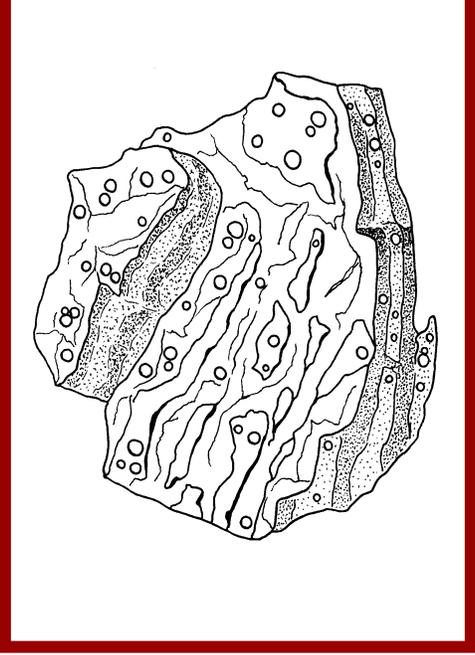
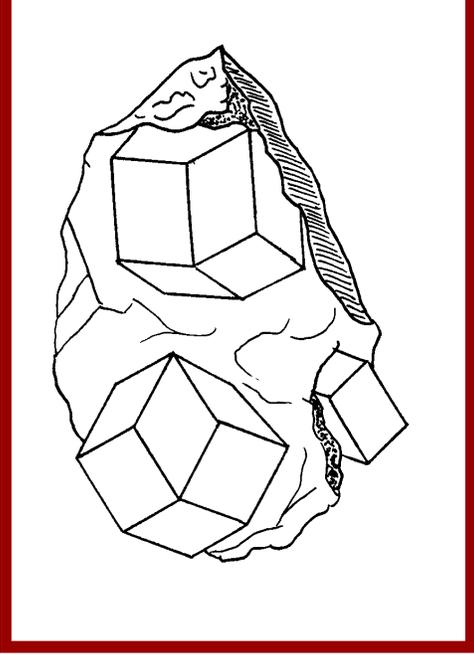
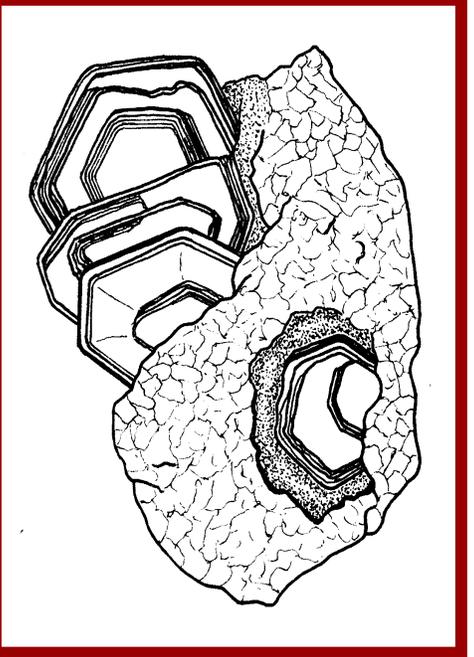
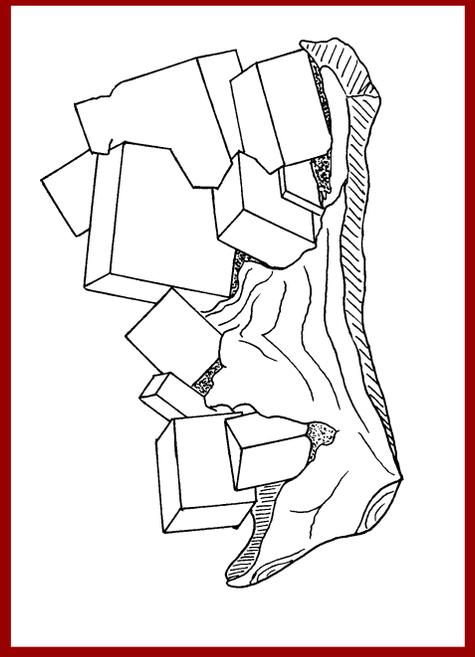
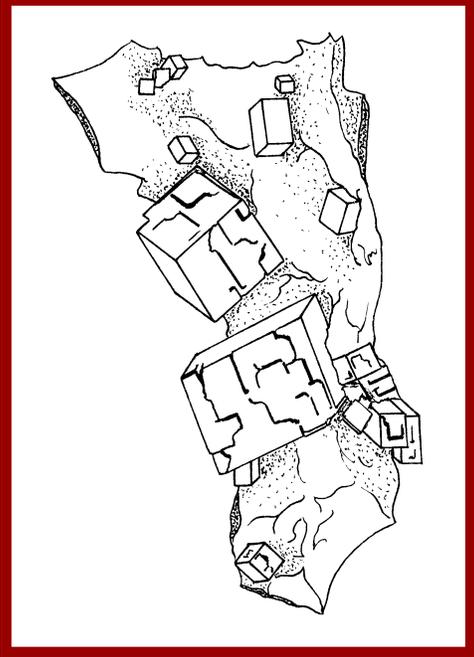
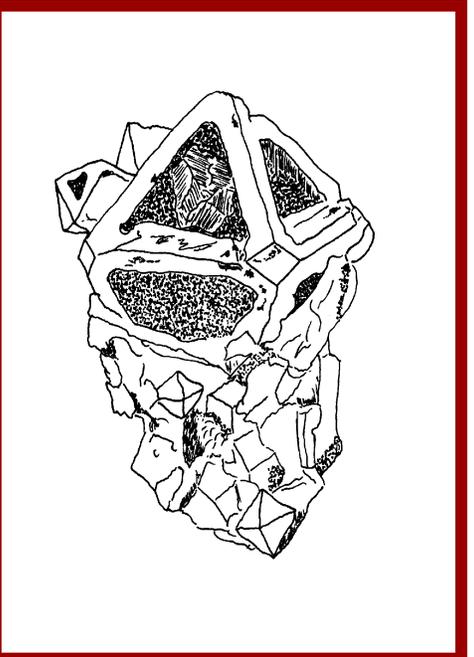
Gold

Silver

Wulfenite

Olivine var. Peridot

Halite



GOLD

SILVER

COPPER

MOLYBDENITE

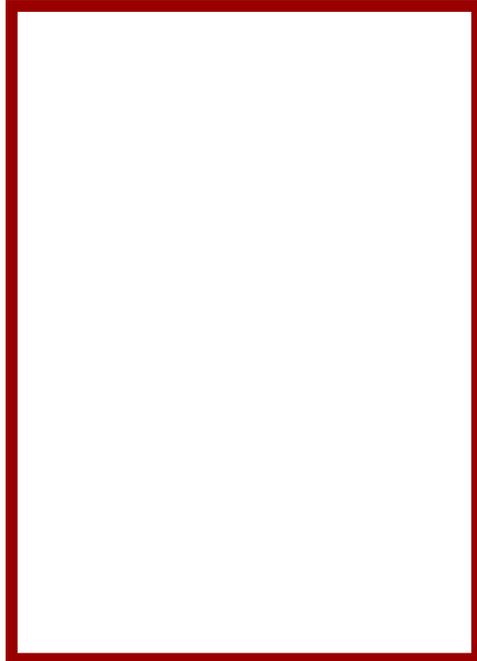
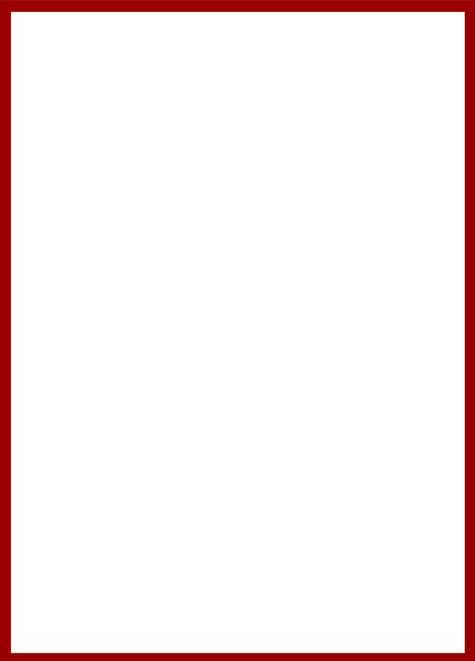
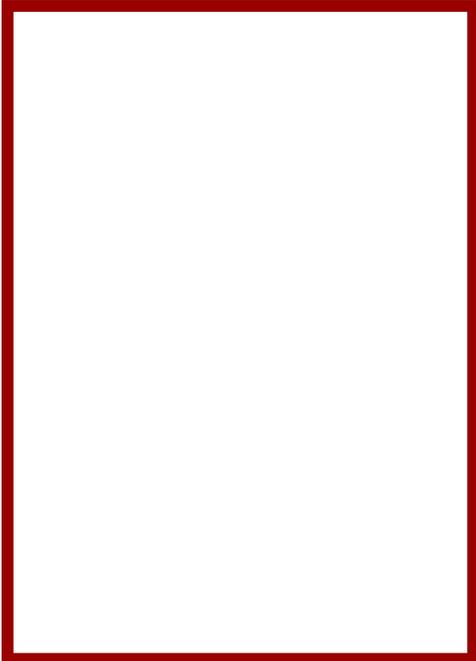
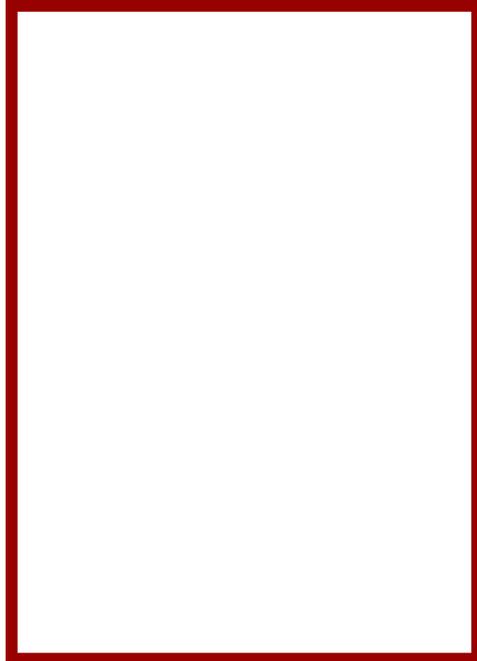
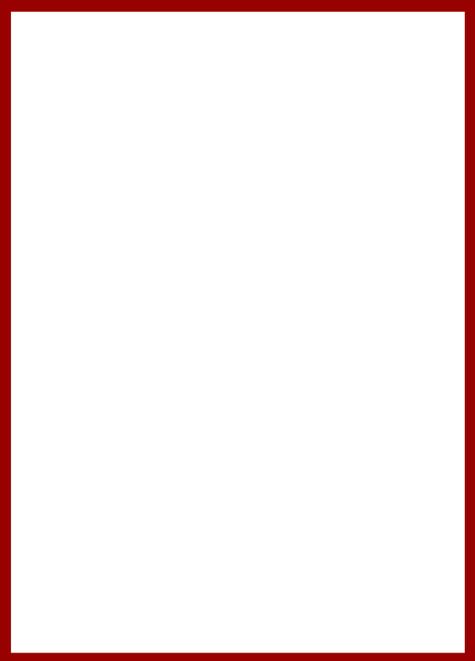
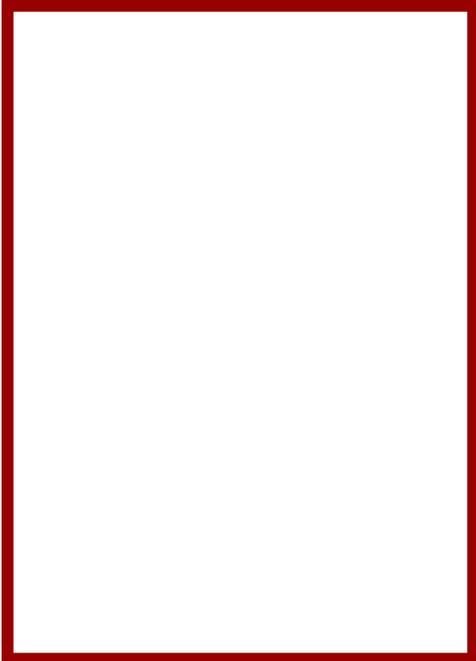
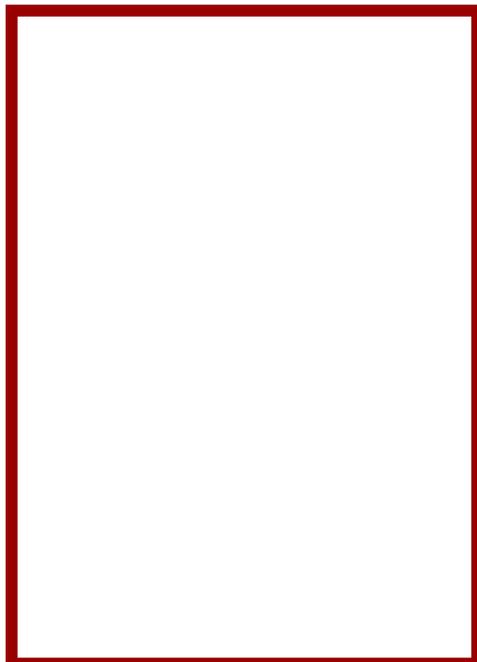
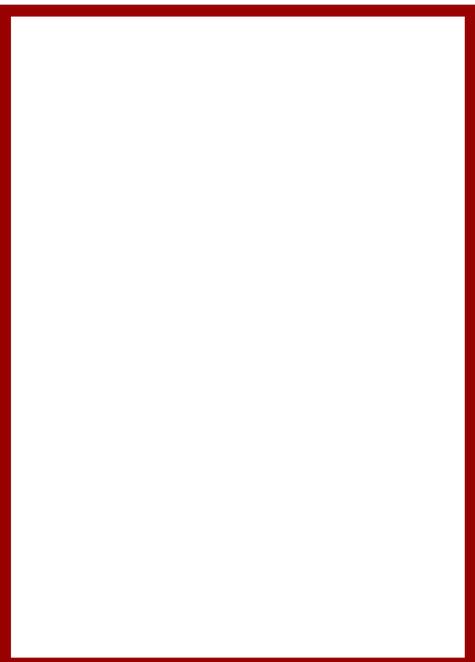
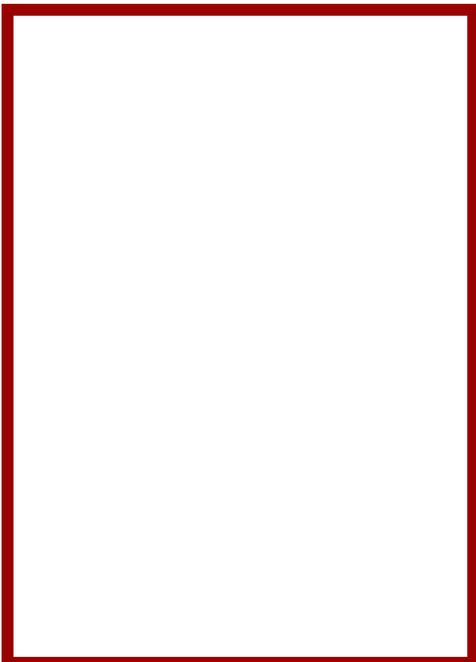
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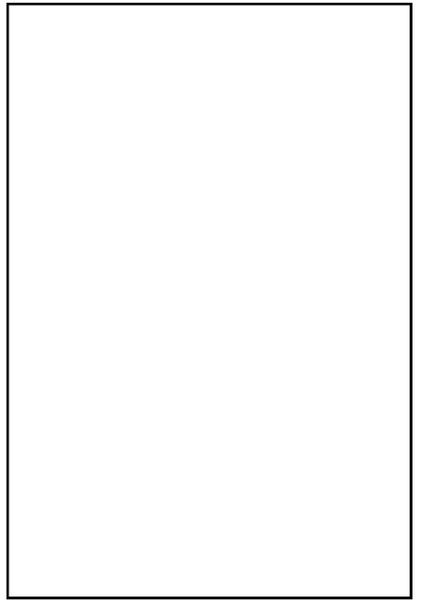
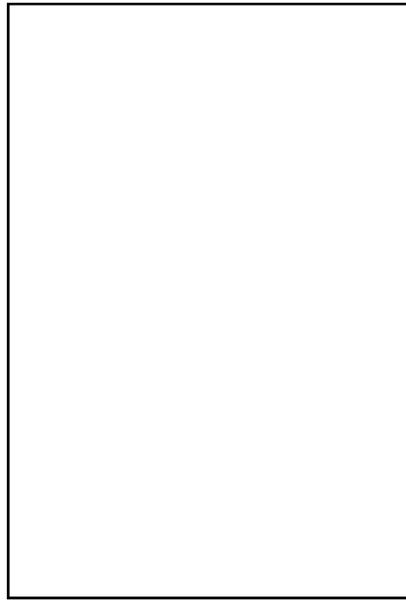
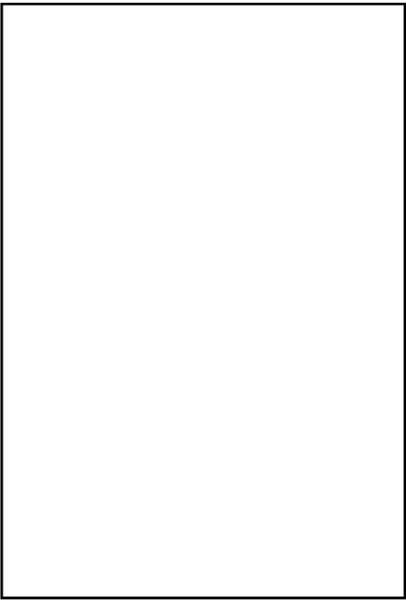
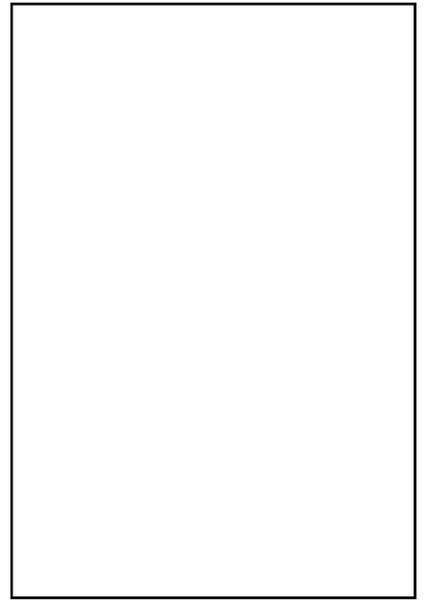
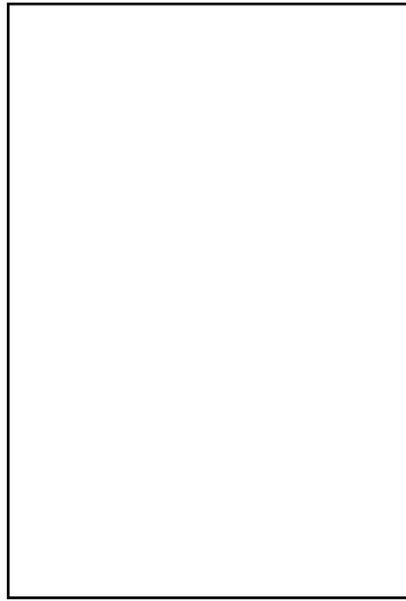
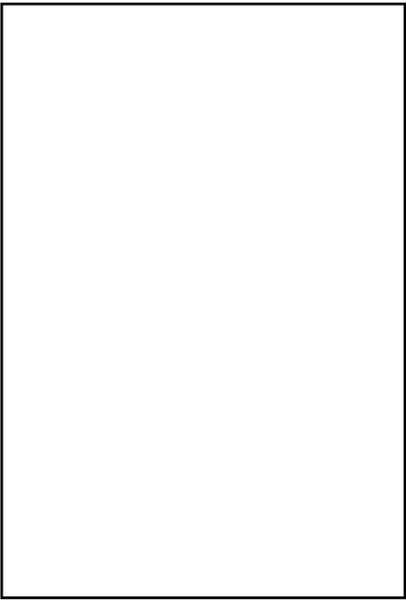
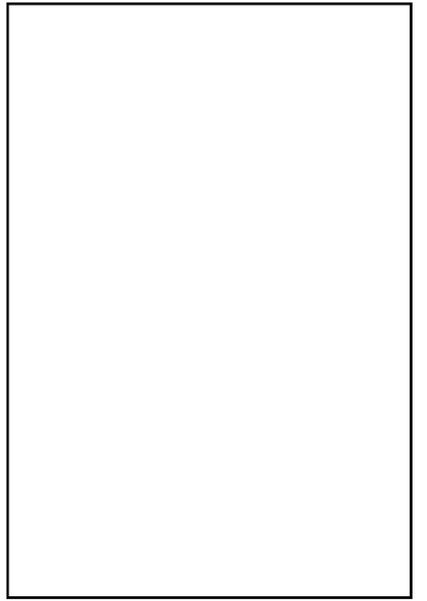
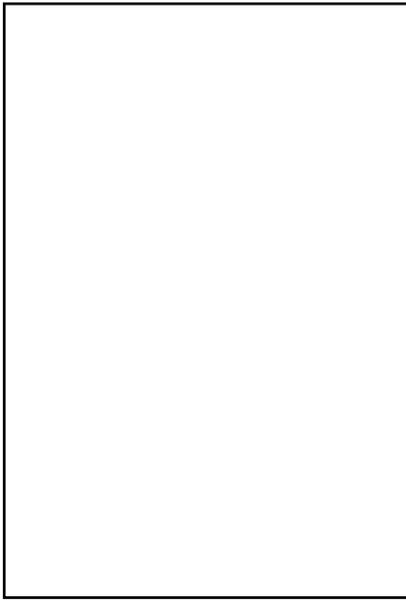
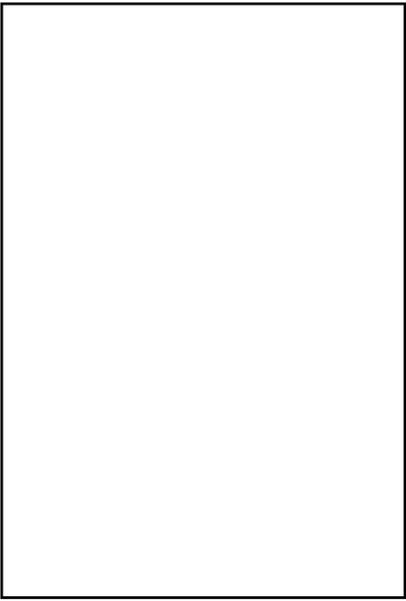
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LODESTONE

MERCURY

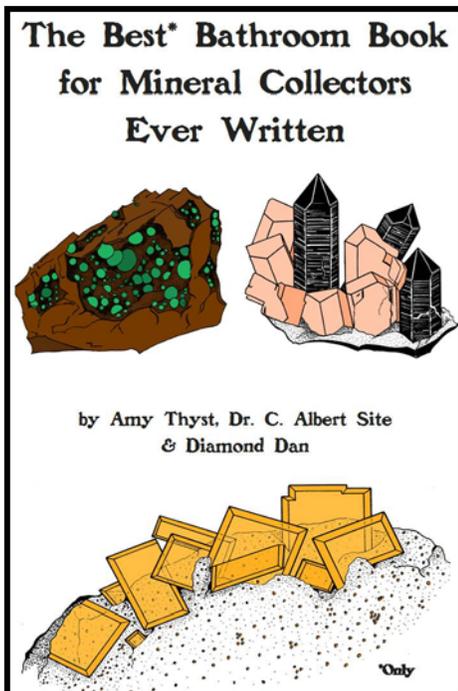
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