

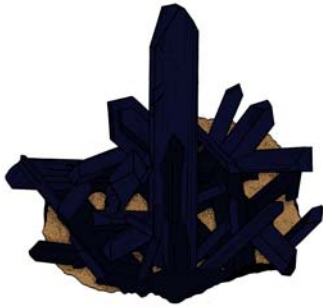
MINI MINERS MONTHLY

A MONTHLY PUBLICATION FOR YOUNG MINERAL COLLECTORS

VOL. 12 NO. 5

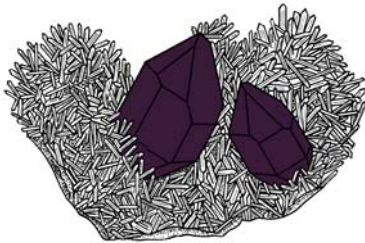
MAY 2020

What To Do When We're All Stuck At Home?



Well, Mini Miners, it's a month later and we're still at home, waiting for the a chance to go out and live life again! So here is another extended Mini Miners Monthly for you to enjoy. Another full coloring book to print out and share. And, yes, feel free to share this issue with anyone you want. Let's get through this time together doing something we enjoy...minerals!

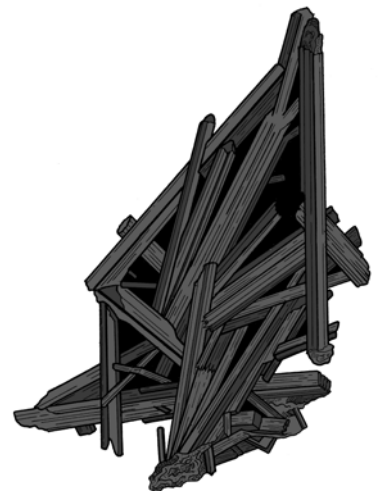
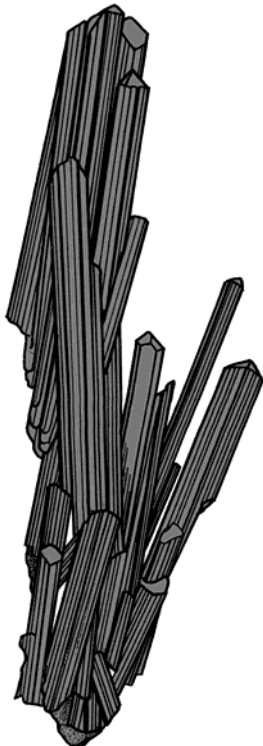
Diamond Dan Publications has just published three new books. As a teaser I have included some sample pages here for you to read, color, enjoy. The books will be ready for sale when we can move around again (and Diamond Dan can get back to Florida to get the books from the printer!) They will be available for sale starting June 1. Check our website for more information.



Enjoy this issue. Stay healthy. Be careful. This won't go on forever and sooner than later we'll be able to go into the field to dig for crystals, attend mineral shows and have our meetings.

What Mineral Am I?

I am a shiny, metallic and gray mineral. I often form very long and straight crystals. My crystals can be bent if you try carefully. But they cannot be bent back to their original shape. Sometimes you can find crystals that were bent in nature. I am an important ore of the element called Antimony which has the chemical symbol of Sb. I am fairly soft and can be scratched easily. Some of my very best crystals were found in Japan in the late 1800's (left). They are still classics today. However, some excellent crystals are coming from China now (right).

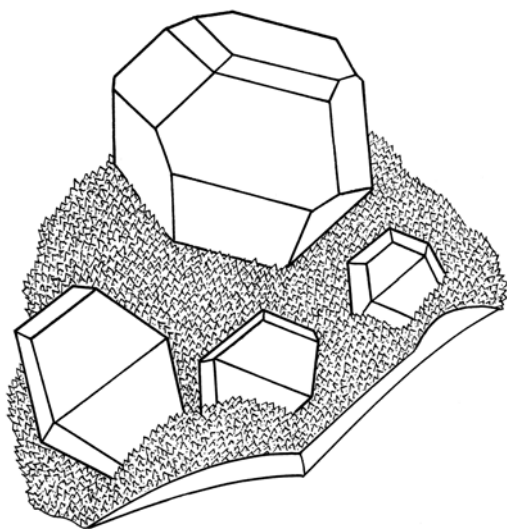
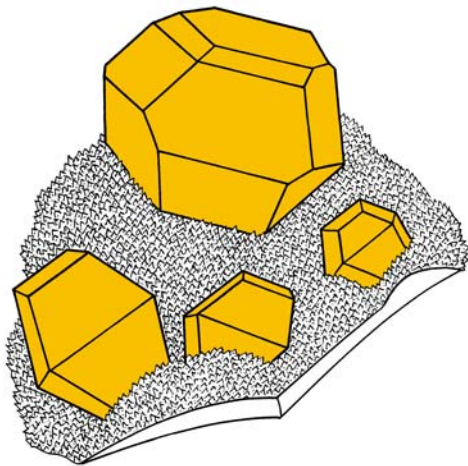


My mineral name is _____.

Check your answer on the next page.

Mineral of the Month

Sulfur



Chemical Formula: S ; **Crystal System:** Orthorhombic;
Color: Lemon Yellow; **Hardness:** 1.5 to 2.5; **Luster:** Resinous
to Greasy; **Streak:** Lemon Yellow;
Specific Gravity: 2.07; **Fracture:** Irregular to Conchoidal

Sulfur is one of the most common elements on earth. It usually combines with other elements to form different minerals. There are sulfide minerals. These are usually ore minerals that are combinations of a metal or two with sulfur. Like galena (lead sulfide), stibnite (antimony sulfide), pyrite (iron sulfide), chalcocite (copper sulfide), and sphalerite (zinc sulfide), to name a few.

There is another group of minerals that also has sulfur in it. This group is called the sulfates. Sulfates have a molecule that is made up of sulfur and oxygen attached to each other. This molecule then attaches to other elements. Some of the common sulfates you probably know are gypsum, barite, celestine, anglesite, anhydrite and hanksite. And there are many, many more.

Even though sulfur usually connects with other elements, it can be found as a native element in nature. Some of the finest sulfur crystals found anywhere, ever, are the crystals from Sicily, Italy, like the ones pictured here. They are large, with well-formed faces and edges. They are bright lemon yellow and sit on nice white aragonite crystals.

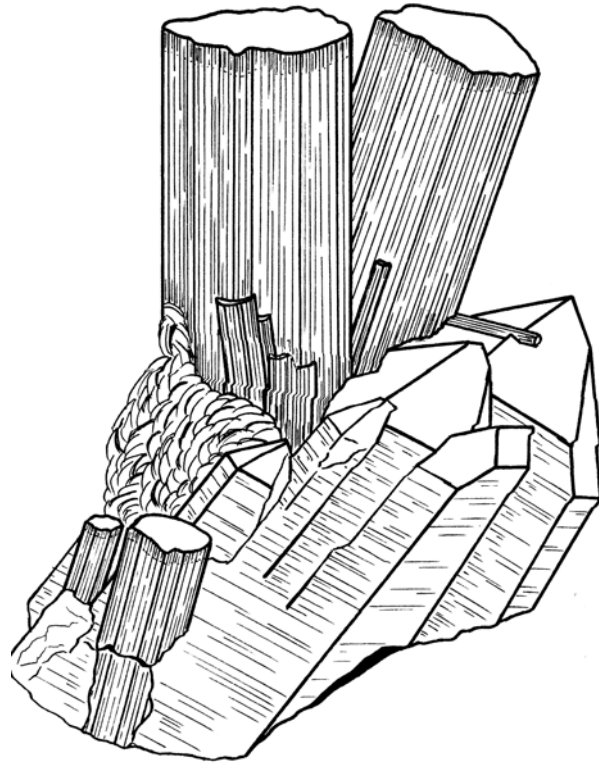
Sulfur burns in a match flame. When it burns, it smells like rotten eggs. This is the sulfur gas that is given off as it burns.

What mineral am I? Answer: Stibnite



©2020 Diamond Dan Publications. All pictures and articles in this newsletter are property of Diamond Dan Publications and cannot be copied or reused in any format (printed or electronic) without written permission of Diamond Dan Publications, 278 Howland Avenue, Rochester, NY 14620. www.diamonddanpublications.net ~ powellpublicationsgroup@gmail.com

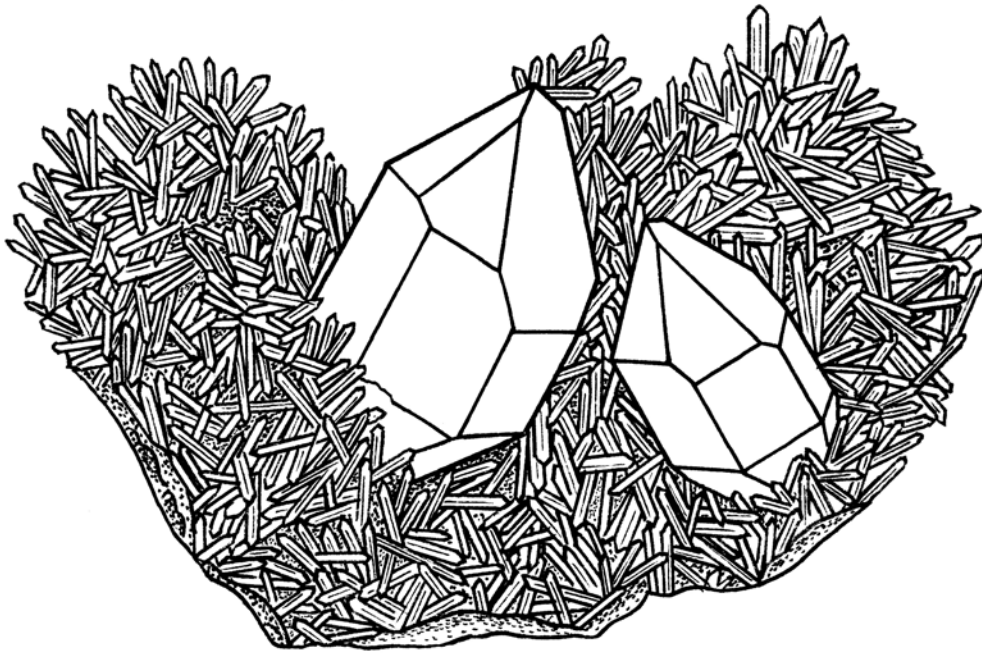
MINERALS & CRYSTALS TO COLOR, VOL. 2



**MORE COLORING FUN
WHILE WE'RE ALL STUCK
AT HOME**

THIS IS A GIFT TO YOU

from Diamond Dan Publications. While we are all stuck inside because of the Corona Virus illness, we may as well be enjoying some fun activities! You have permission from Darryl Powell and Diamond Dan Publications to print and share this booklet any way you wish. Send it to your friends and neighbors. Email it to your teachers. Give it away any way you wish. (The only thing you can't do with it is sell it!)



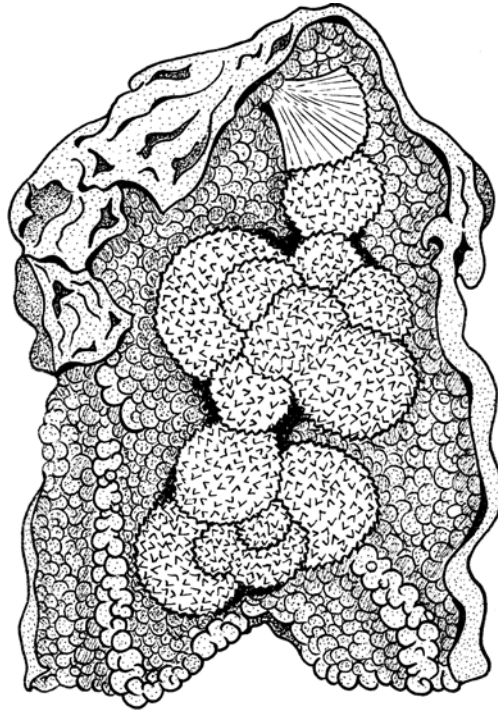
Two deep purple Amethyst crystals (Quartz) on a bed of white quartz needles. From Georgia.



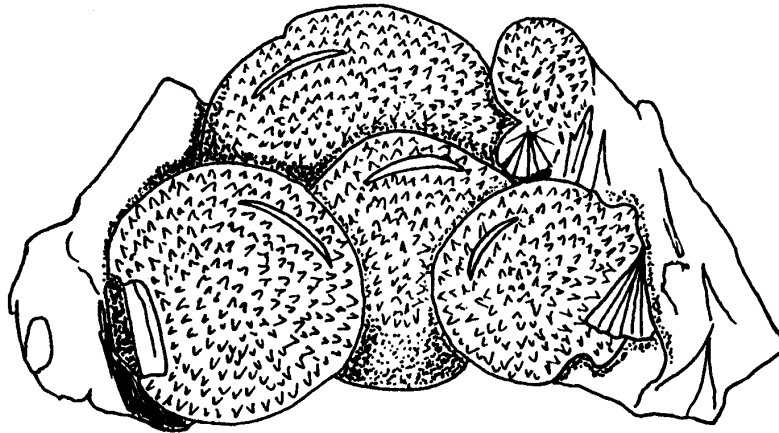
©2020 Darryl Powell

This book (drawings and text) was created by Darryl Powell at
Diamond Dan Publications ~ www.diamonddanpublications.net

A IS FOR ADAMITE

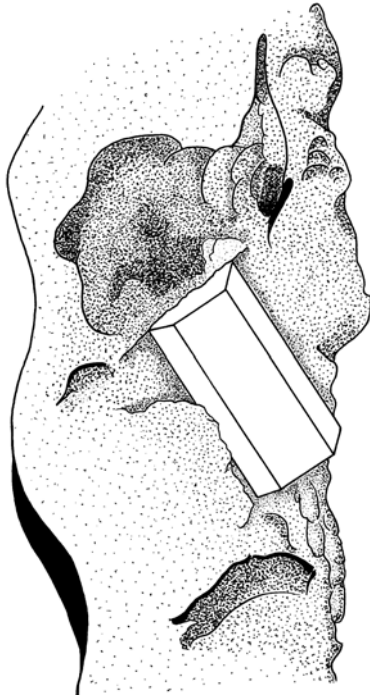


Apple Green balls of Adamite on Rust Red Limonite Matrix
From the Ojuela Mine, Mapimi, Durango, Mexico

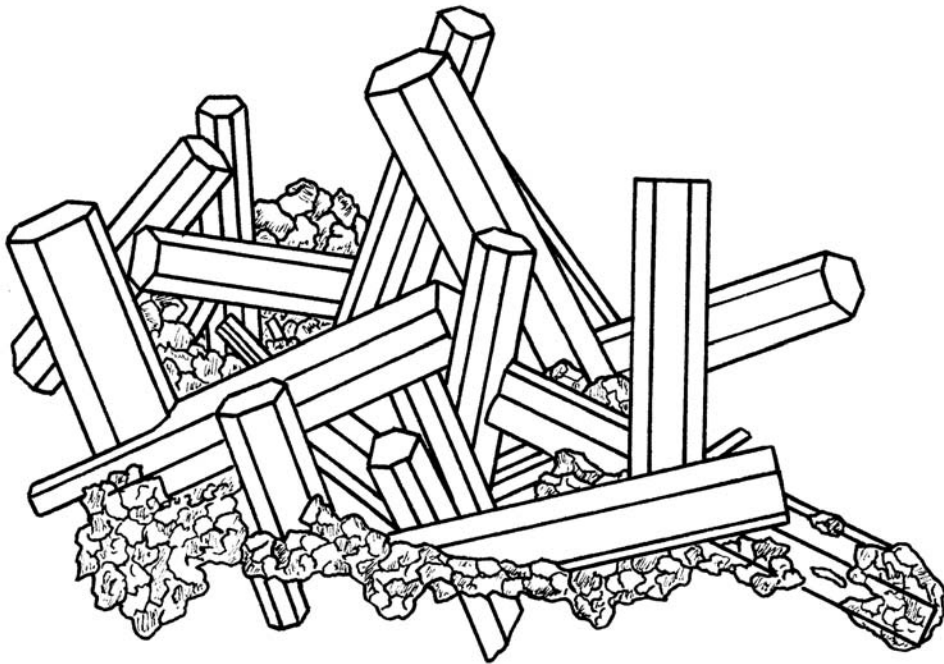


Another Adamite group. Some rare specimens are purple. They are usually yellow to green-yellow.

B IS FOR BERYL

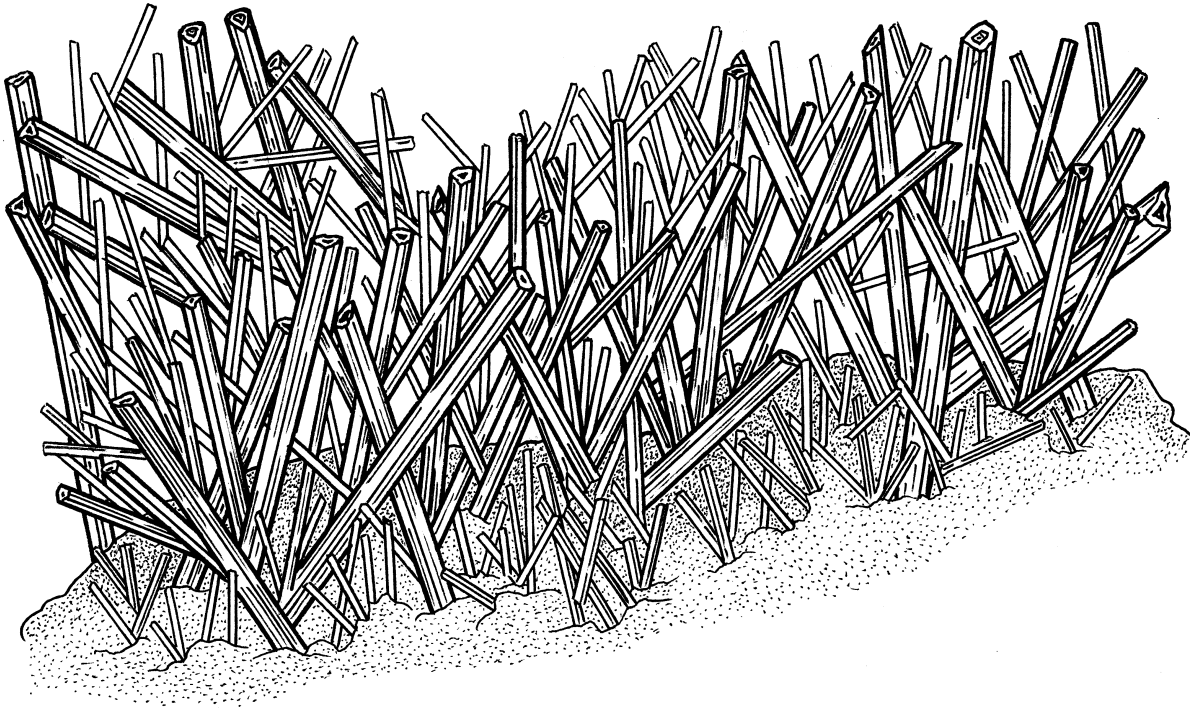


Very rare Red Beryl from the Wah Wah Mountains in Utah.

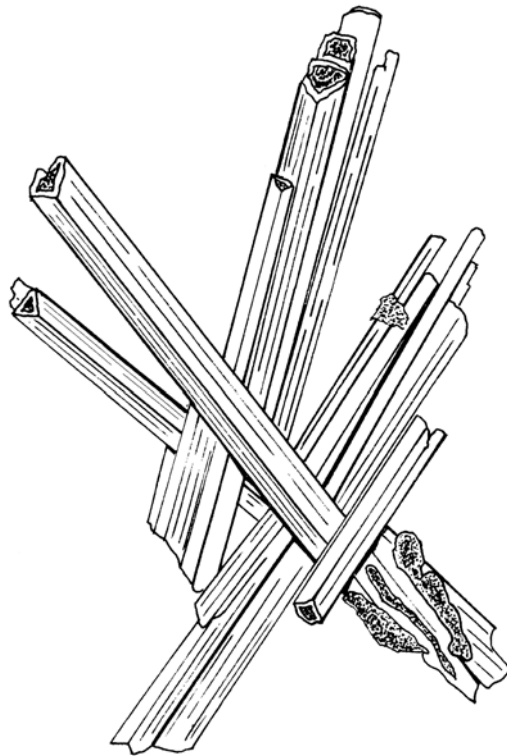


Blue to Green Blue Beryl is called Aquamarine.
These crystals are from Namibia, Africa

C IS FOR CROCOITE

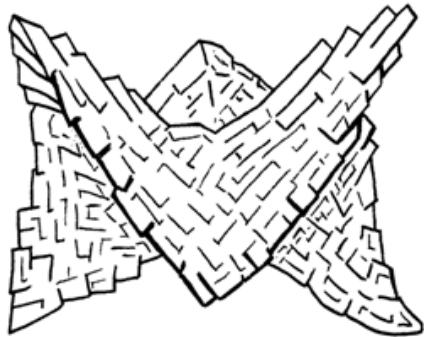
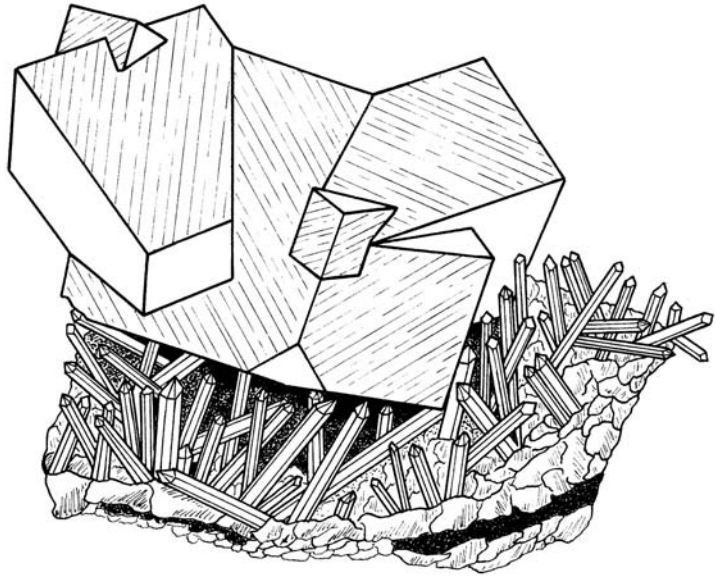


Bright Orange Red Crocoite crystals from Dundas, Tasmania

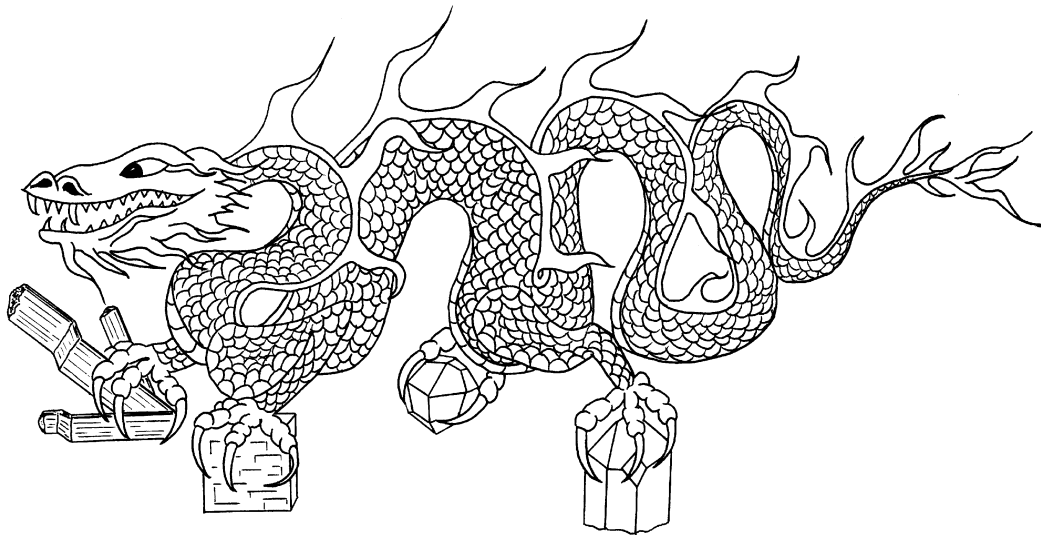


D IS FOR DOLOMITE

Dolomite on Quartz crystals.
Dolomite is usually white. So
you can color it any color you
wish!

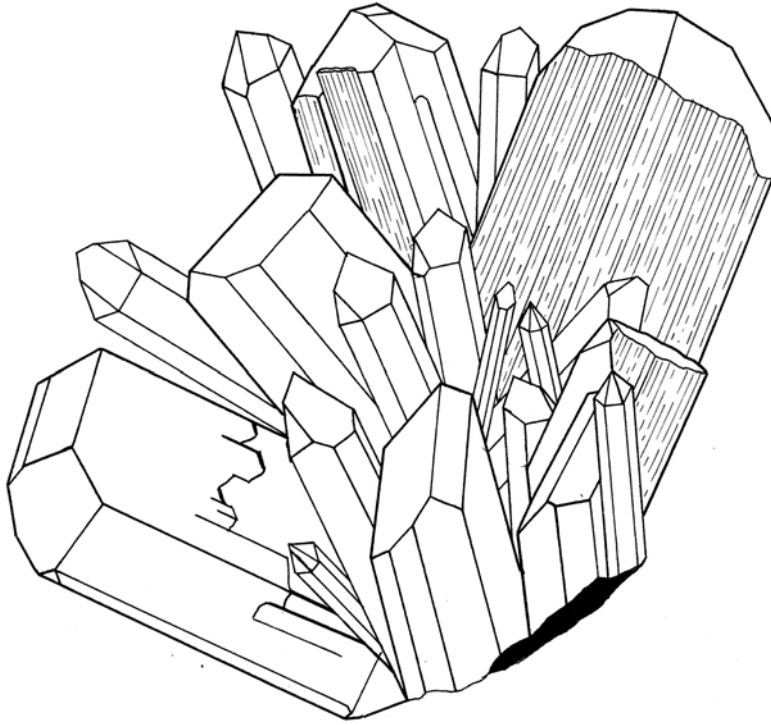


Pink Saddle-Shaped Dolomite crystals.

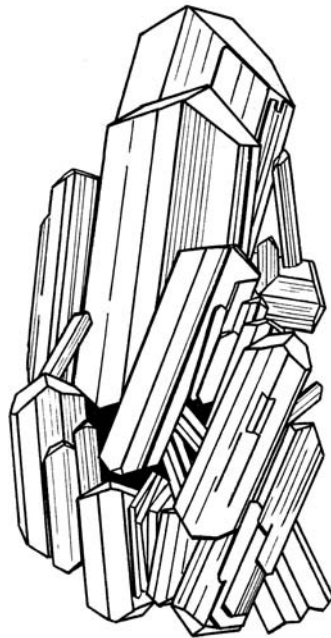


And a mineral dragon...for the fun of it!

E IS FOR EPIDOTE

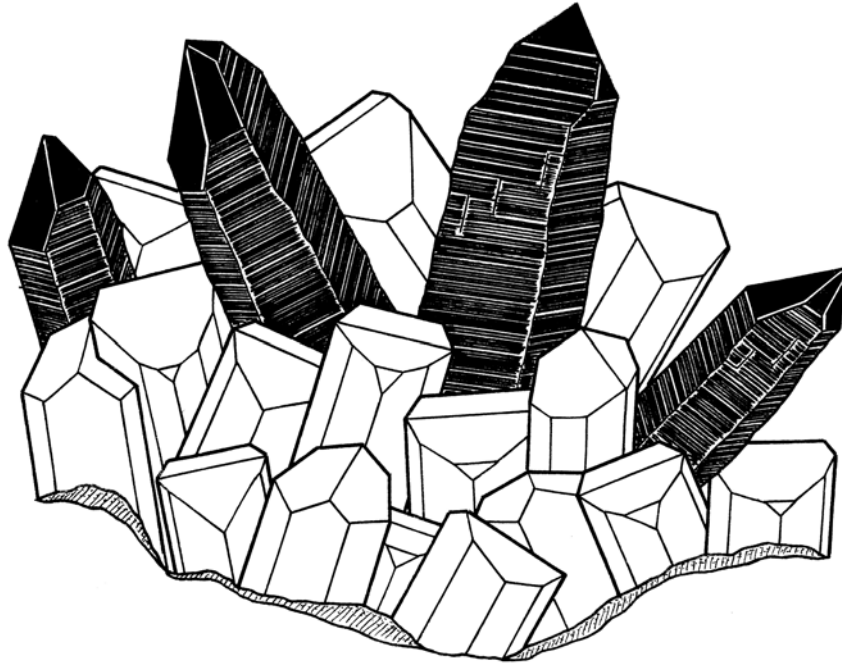


Dark Green Epidote from Alaska. With colorless Quartz.

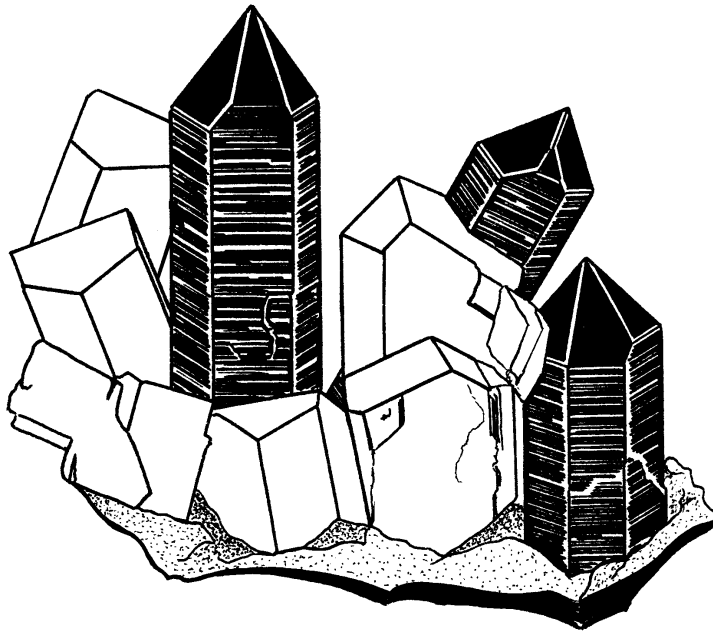


Dark Green Epidote crystal group from Austria.

F IS FOR FELDSPAR

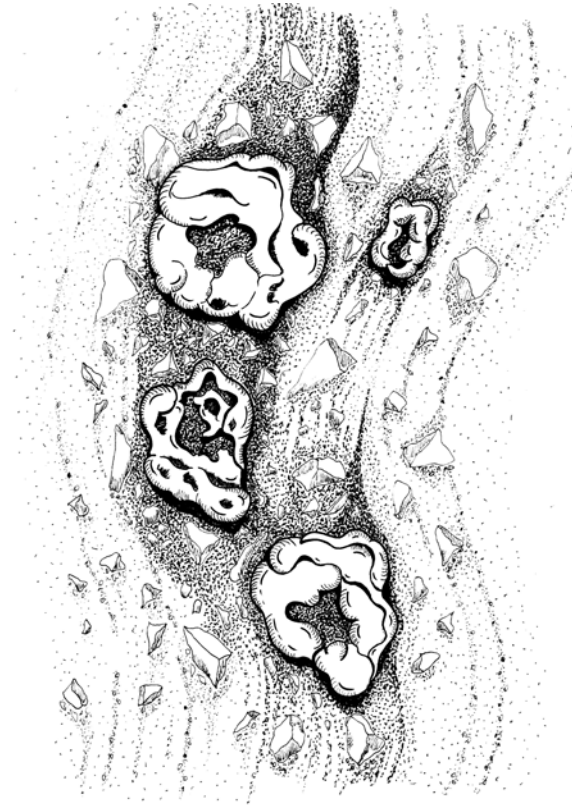


Green Amazonite is a variety of Feldspar.
These crystals are from Colorado.



Pink Feldspar with Smoky Quartz from New Hampshire.

G IS FOR GOLD

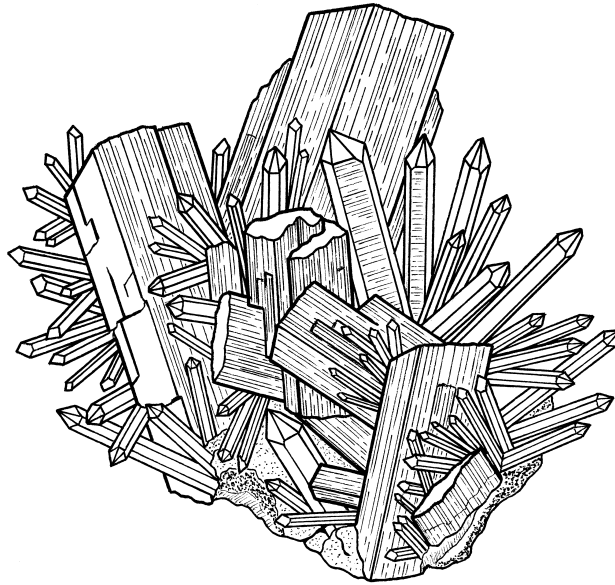


Gold nuggets in a stream. From Arizona.



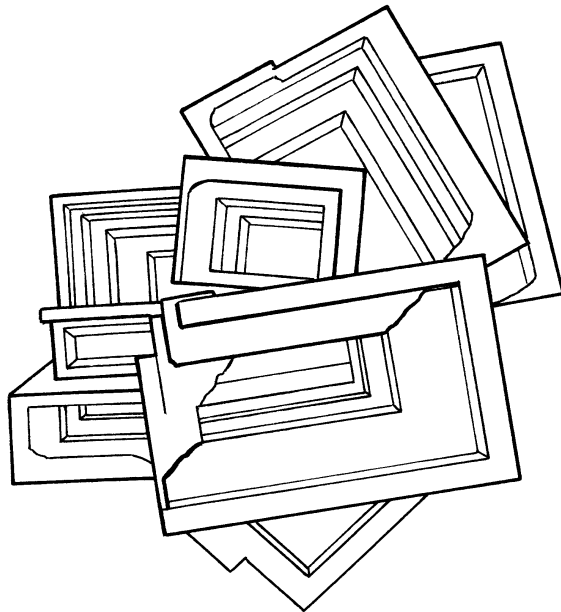
Gold on Milky Quartz from California.

H IS FOR HUBNERITE



Deep red Hubnerite on Quartz from Peru.

H IS FOR HALITE

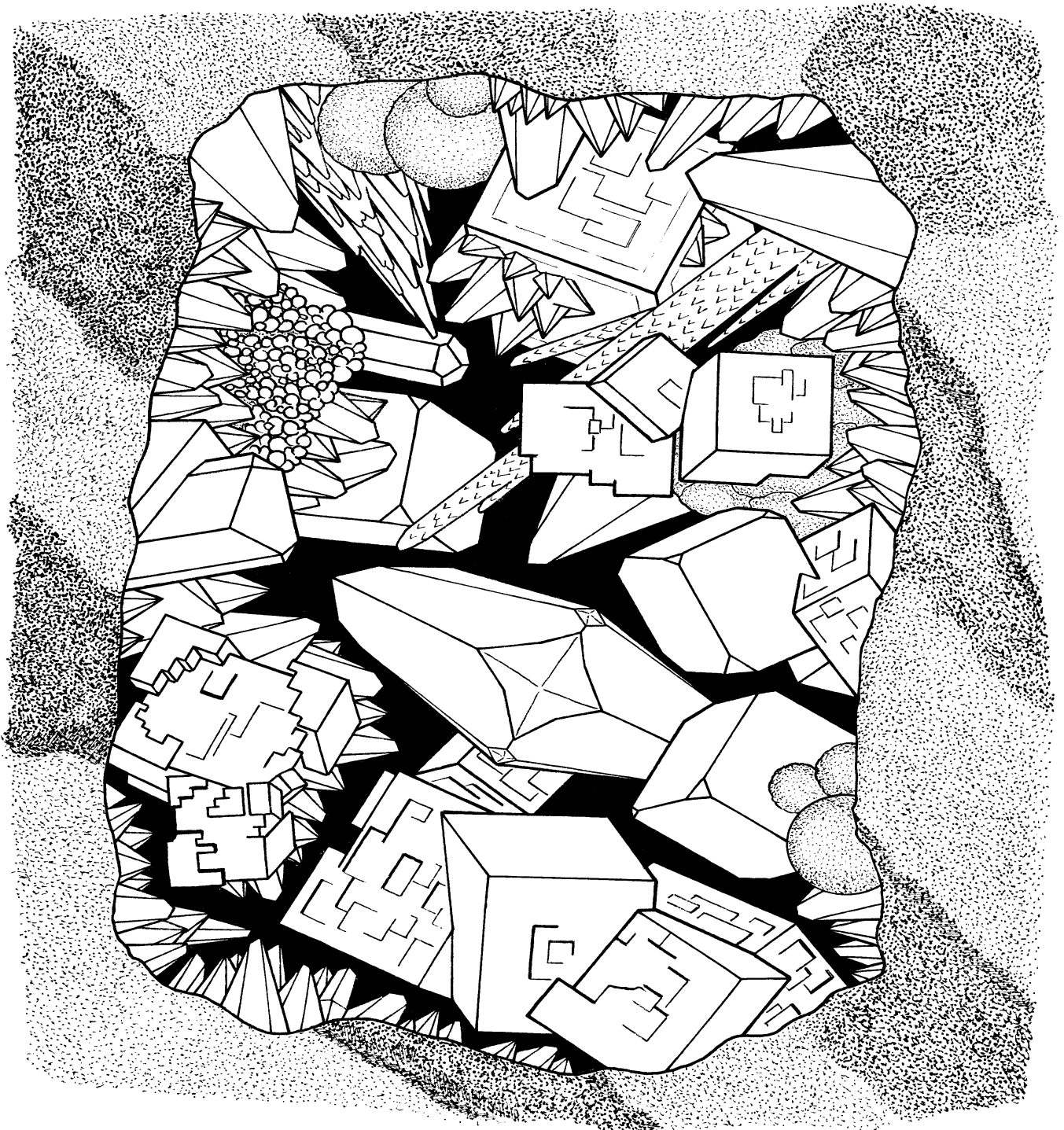


Reddish-pink Halite from Searles Lake, California.

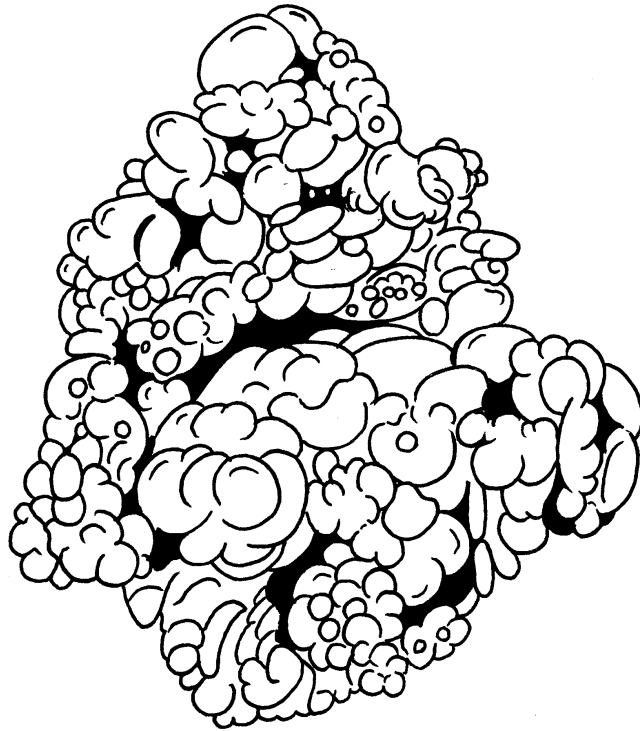
I IS FOR ...

There are some minerals that start with I. Idocrase is one. Iceland Spar is a variety of colorless calcite, but that doesn't sound like fun for a coloring book. So, here is a collection of minerals from ...**Illinois!**

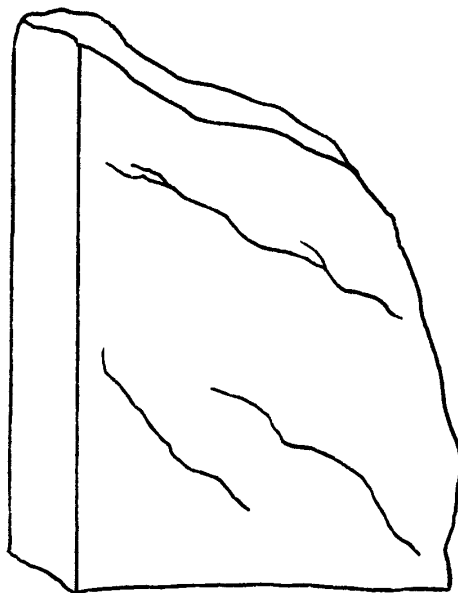
Yellow Calcite, Purple Fluorite, Brass-yellow Pyrite balls.



J IS FOR JADE

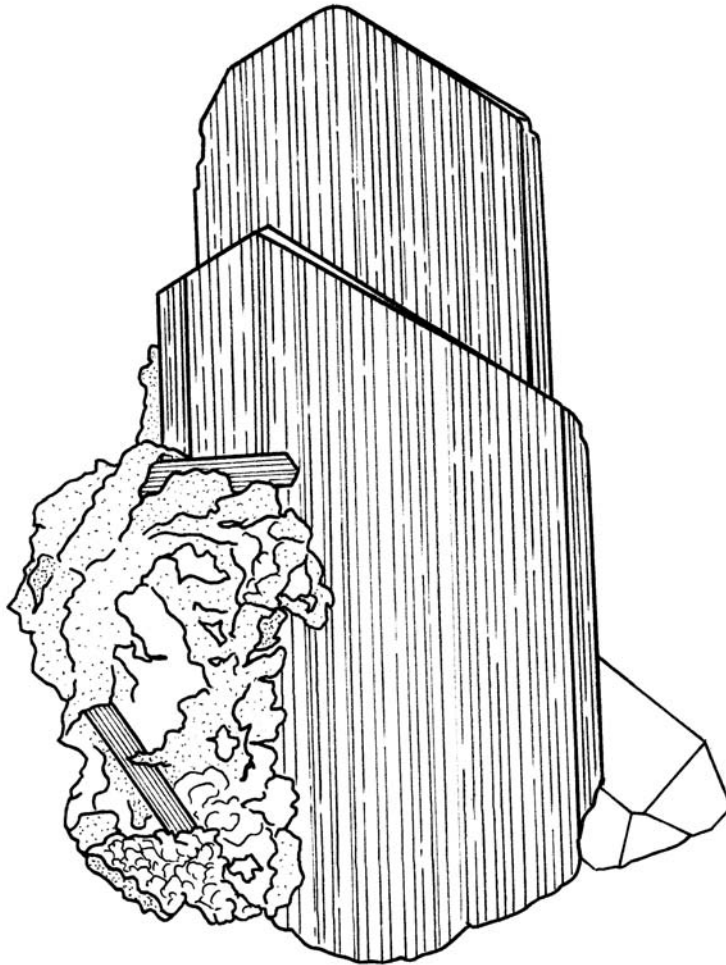


Dark Green Nephrite Jade from California.

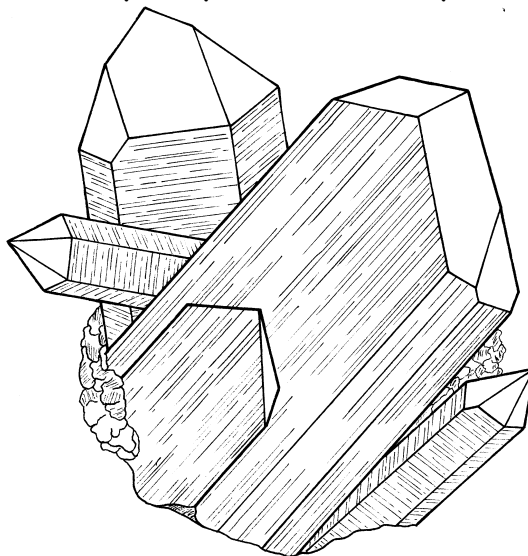


A Slice of massive Jade. Can be light to dark green.

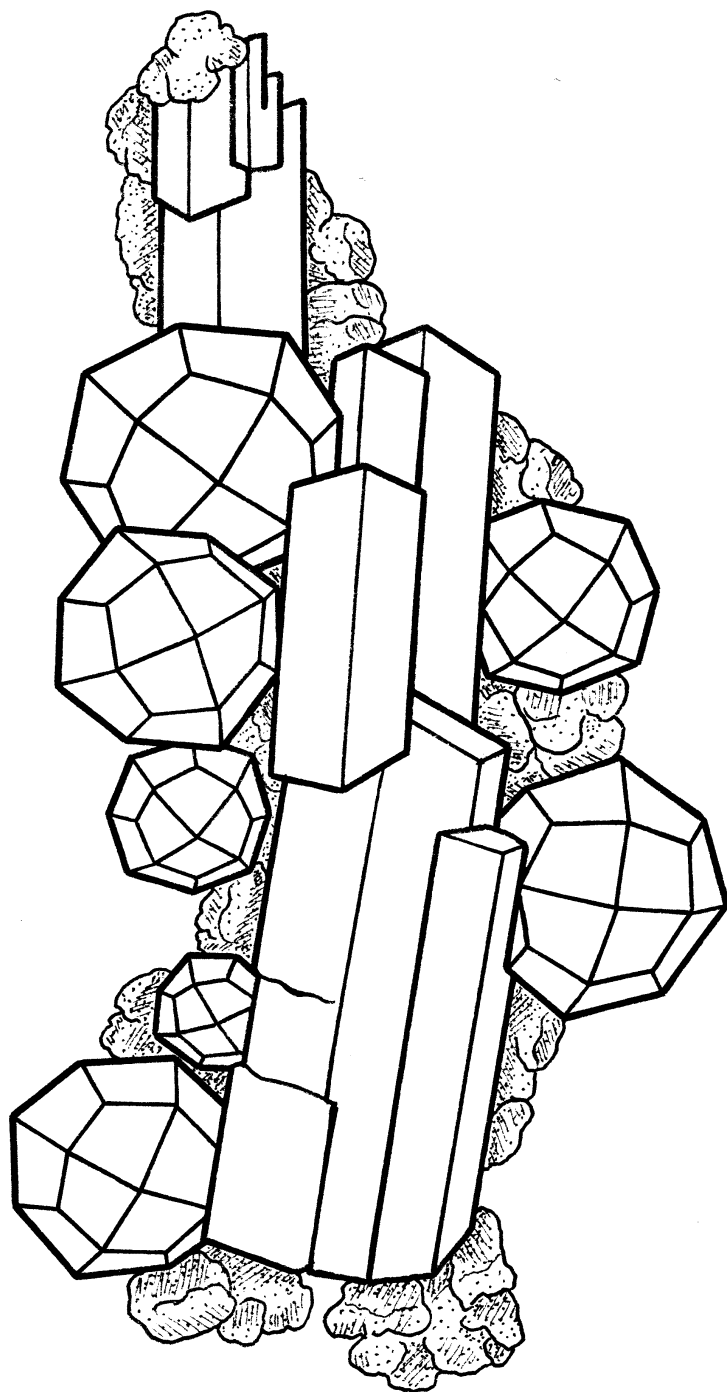
K IS FOR KUNZITE



Kunzite is a light purple variety of the mineral Spodumene.
Here are a couple specimens for you to color.

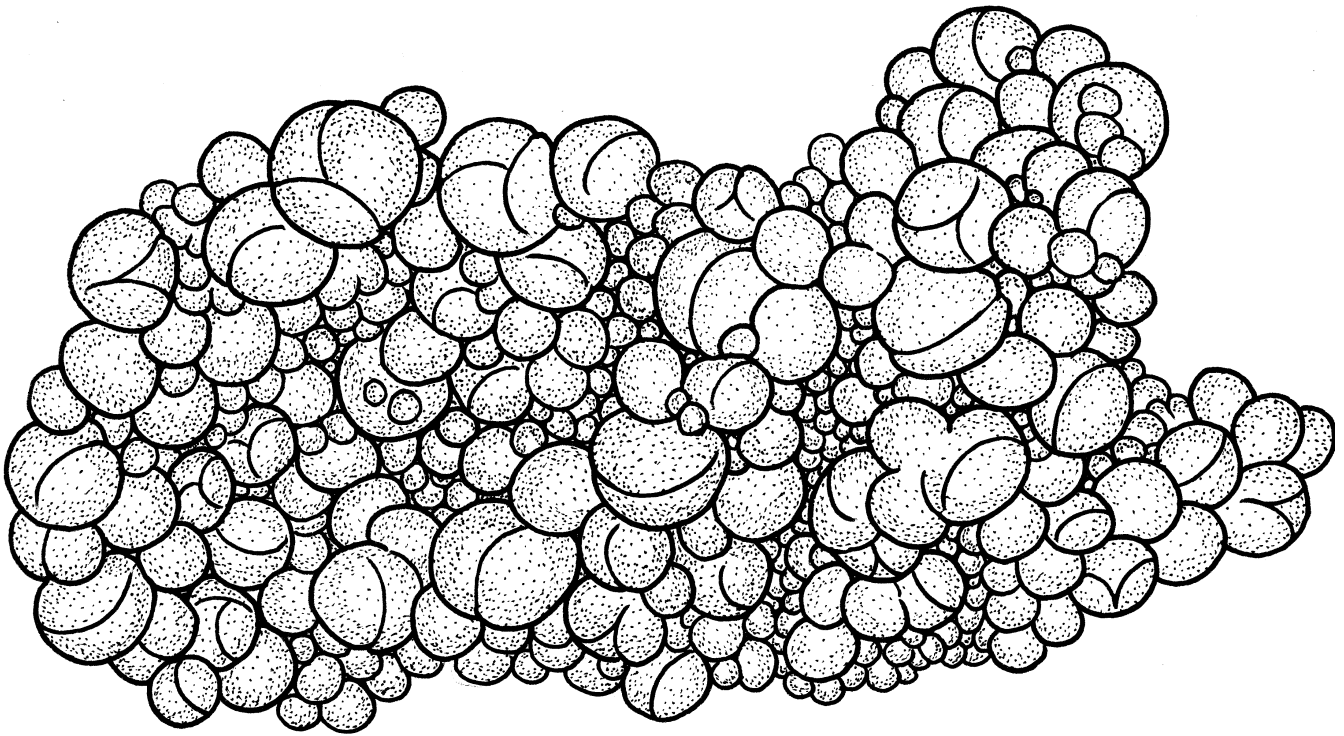


L IS FOR LEUCITE

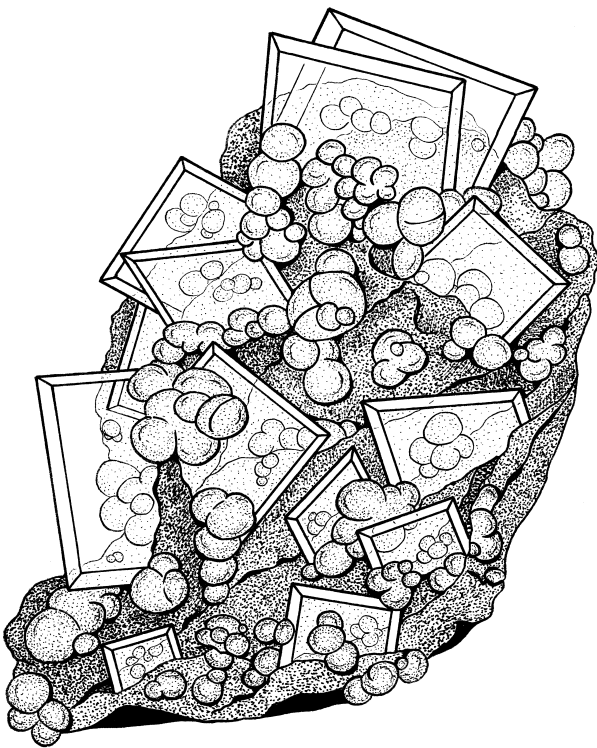


White Leucite crystals on orange-pink Serandite crystals.
From Mont Saint Hilaire, Quebec, Canada

M IS FOR MIMETITE

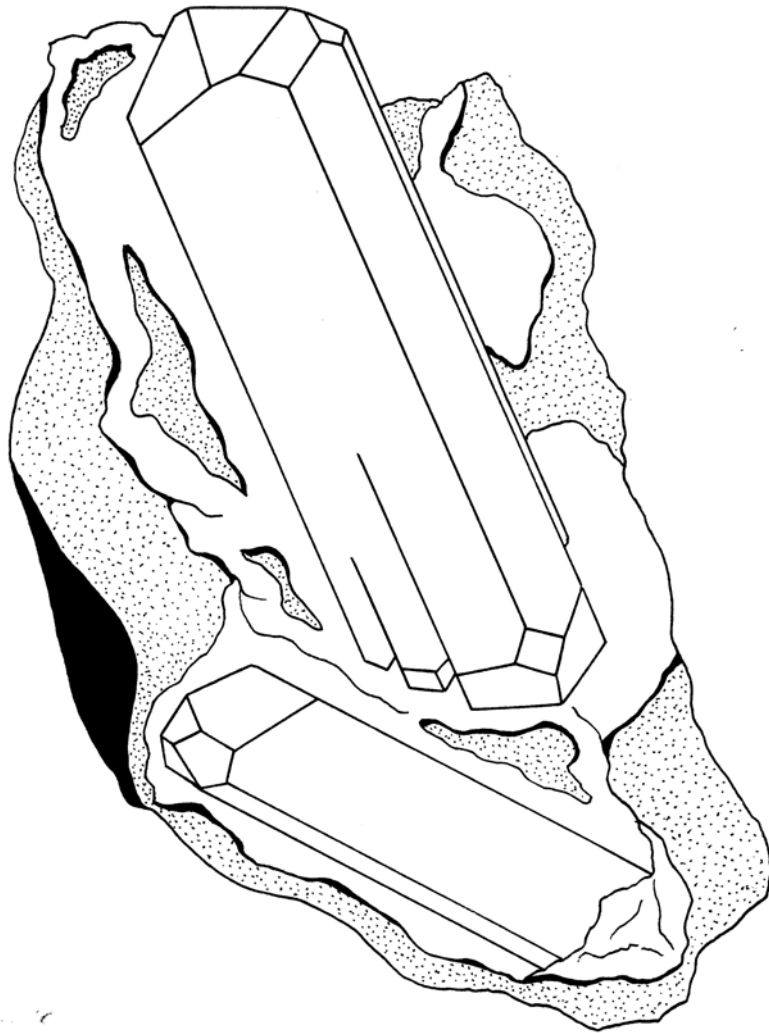


Bright yellow Mimetite from Mexico.

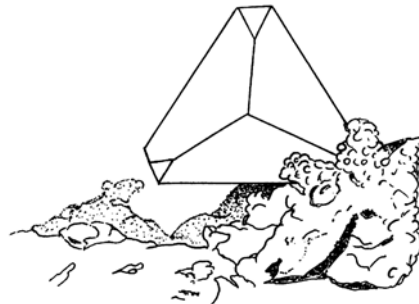
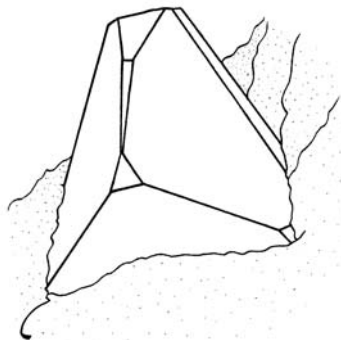


Green balls of Mimetite with yellow Wulfenite crystals on red matrix from Arizona.

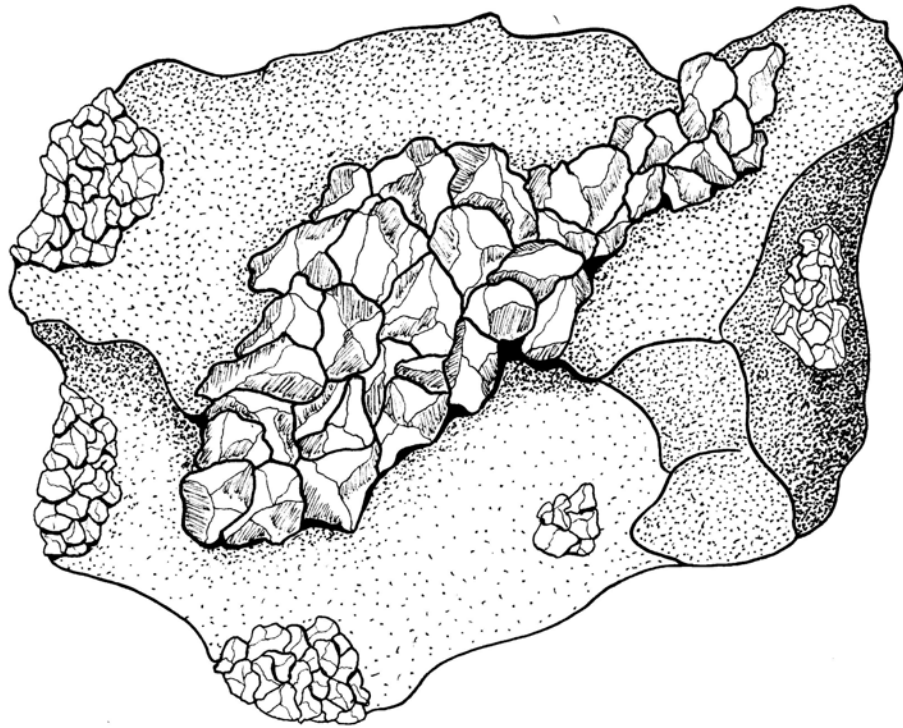
N IS FOR NEPTUNITE



Deep red Neptunite on white Natrolite from San Benito County, California.
Neptunite at this locality is always found with blue Benitoite (below).

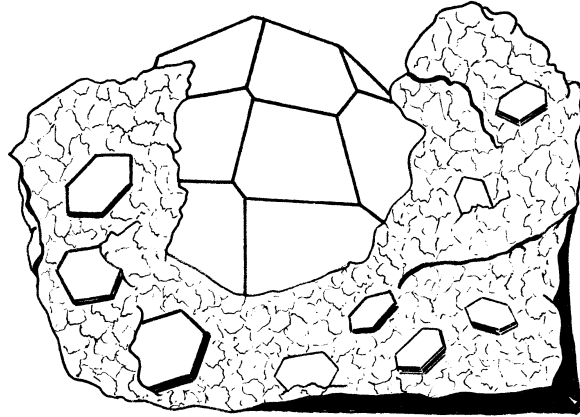


O IS FOR OLIVINE



Grass green Olivine grains from Arizona.
This variety is called Peridot. Draw your own Olivine below.

P IS FOR PYROPE

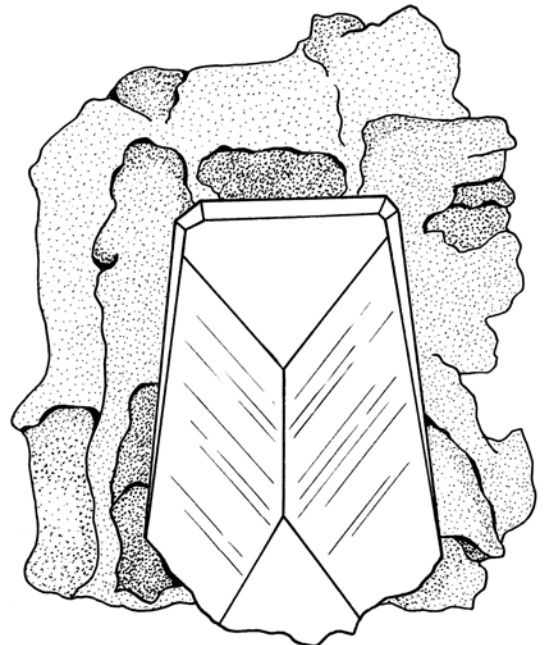


A purple-red Pyrope crystal from Maine.
Pyrope is a variety of Garnet.

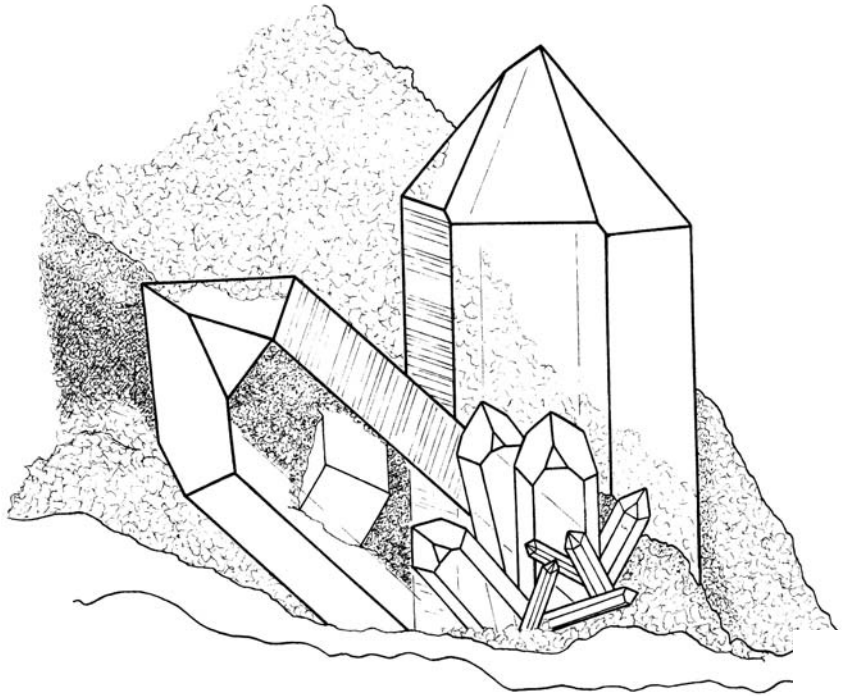
P IS FOR PHOSPHOPHYLLITE

Greenish blue Phosphophyllite crystal from
Peru.

This is a very rare mineral species. The
best crystals came from Peru.



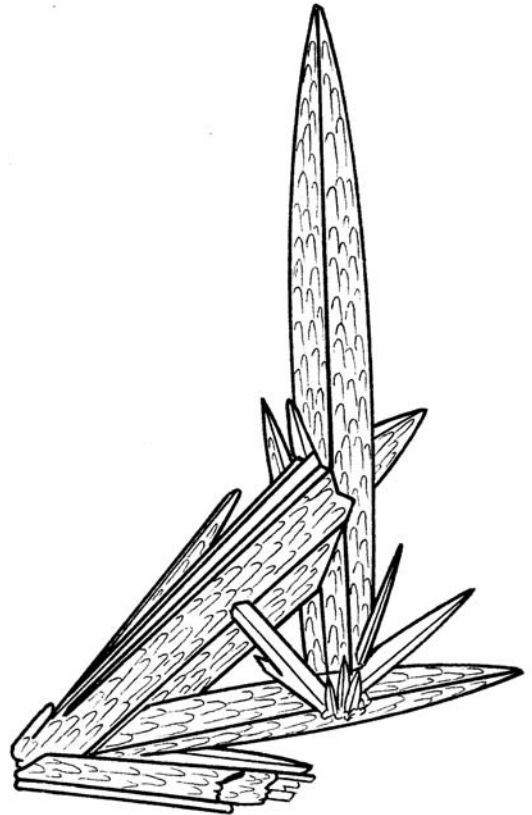
Q IS FOR QUARTZ



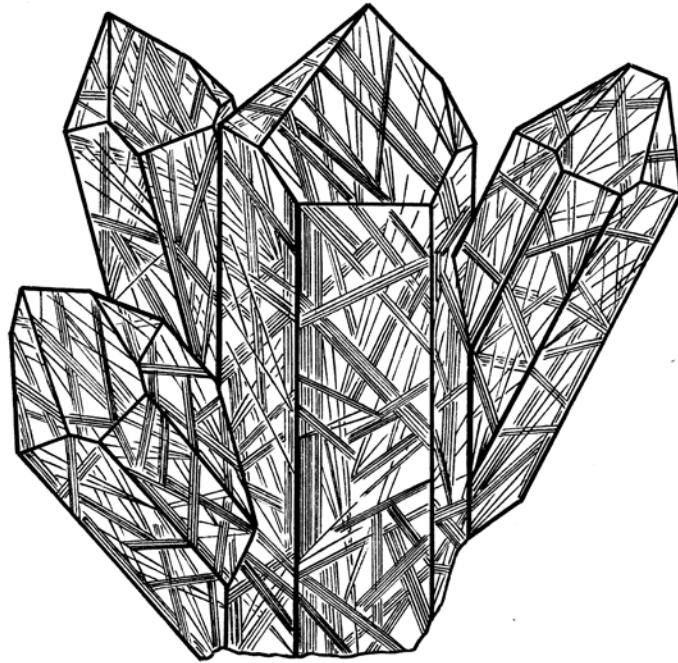
Colorless Quartz from
Switzerland.
Be creative! Color these
crystals any color that you
like. Or many colors!

Green Quartz from Greece.

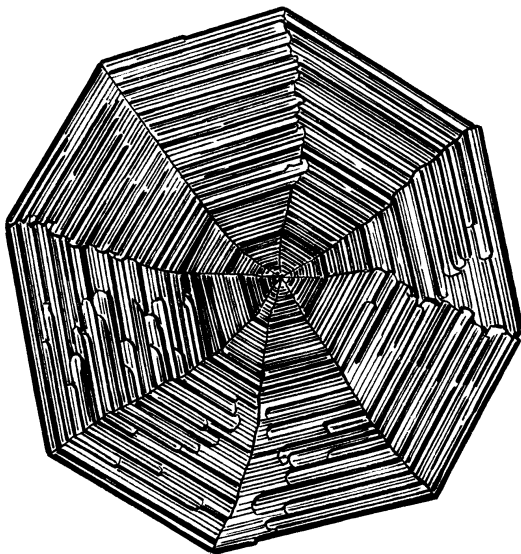
(Quartz can also be Green, Black, Brown and
Pink.)



R IS FOR RUTILE

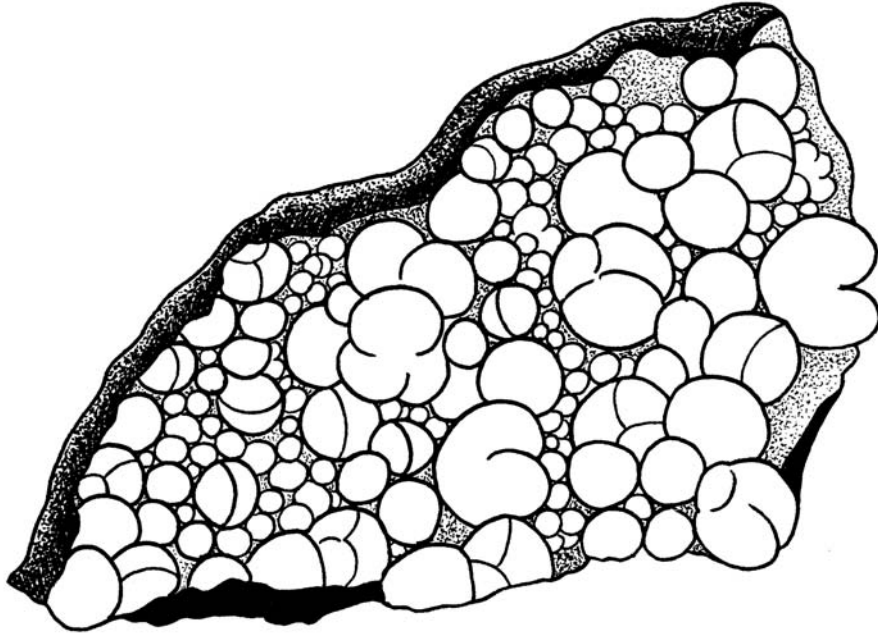


Golden Rutile crystals (like hairs) inside Quartz from Brazil.
This is called "Rutilated Quartz."



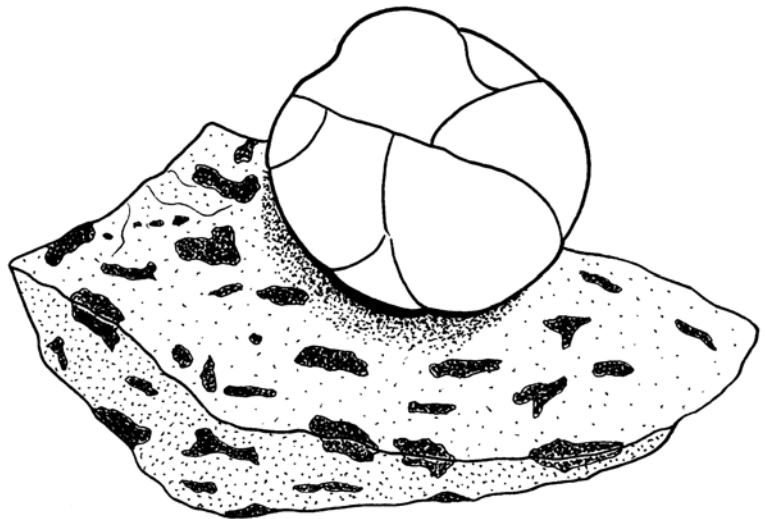
A "Twinned" Rutile Crystal. This specimen is black. But go ahead, make it more colorful if you want to.

S IS FOR SMITHSONITE

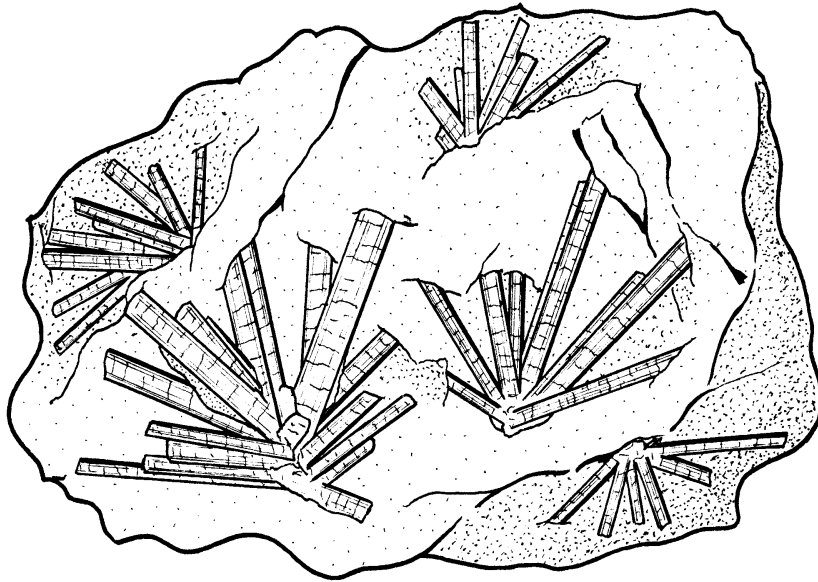


Green-blue Smithsonite from New Mexico.

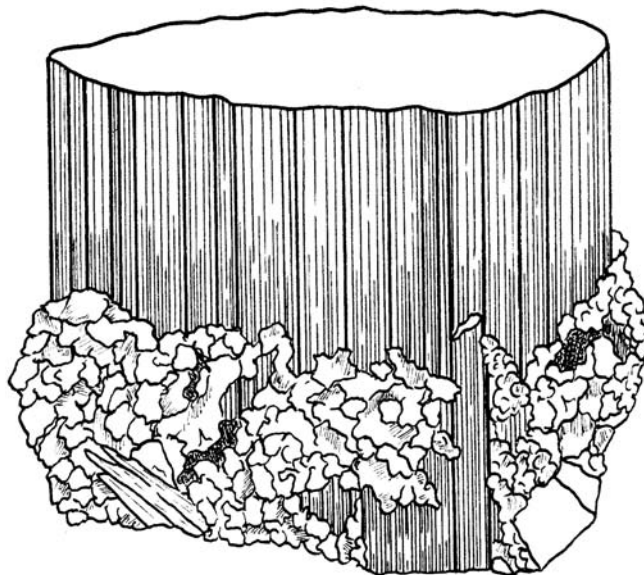
Green Smithsonite on dark brown matrix from Arizona.



T IS FOR TOURMALINE

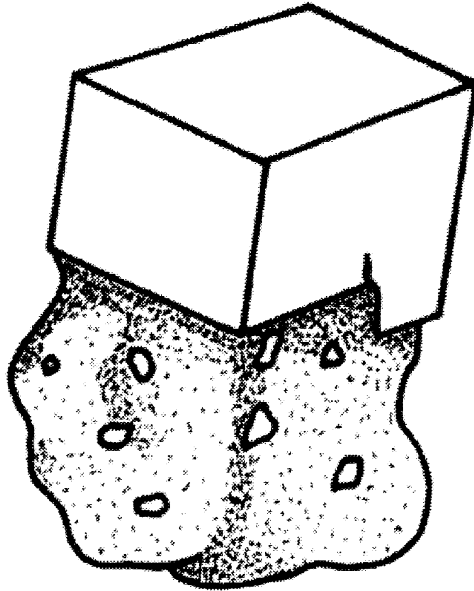


Pink Tourmaline (Rubellite) on purple-pink Lepidolite matrix from California.

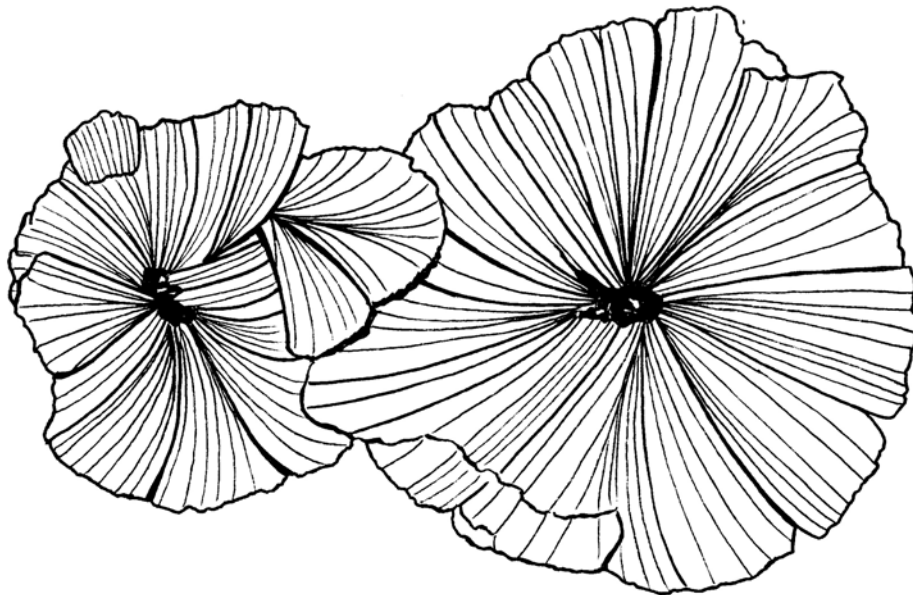


Dark blue Tourmaline (Indicolite) with pink Lepidolite from Brazil.

U IS FOR URANINITE

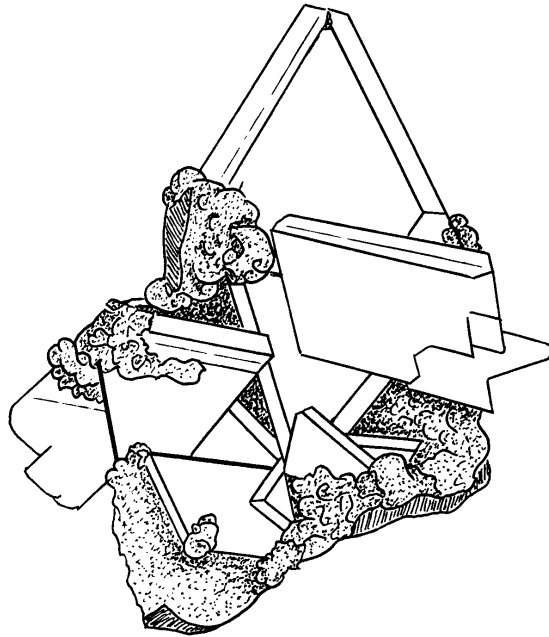


Dark gray Uraninite crystal on Matrix from Canada.



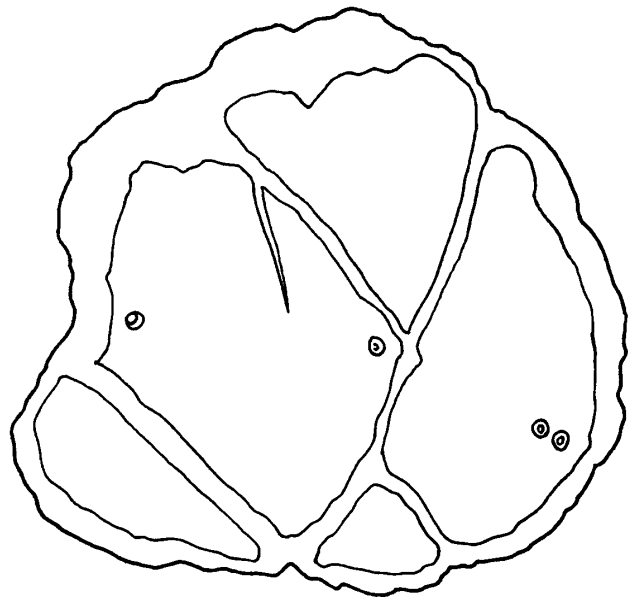
There aren't a lot of minerals that start with U. So, here's Ulexite, again, from last month. It's grayish-white in nature. So make it colorful any way you like!

V IS FOR VIVIANITE



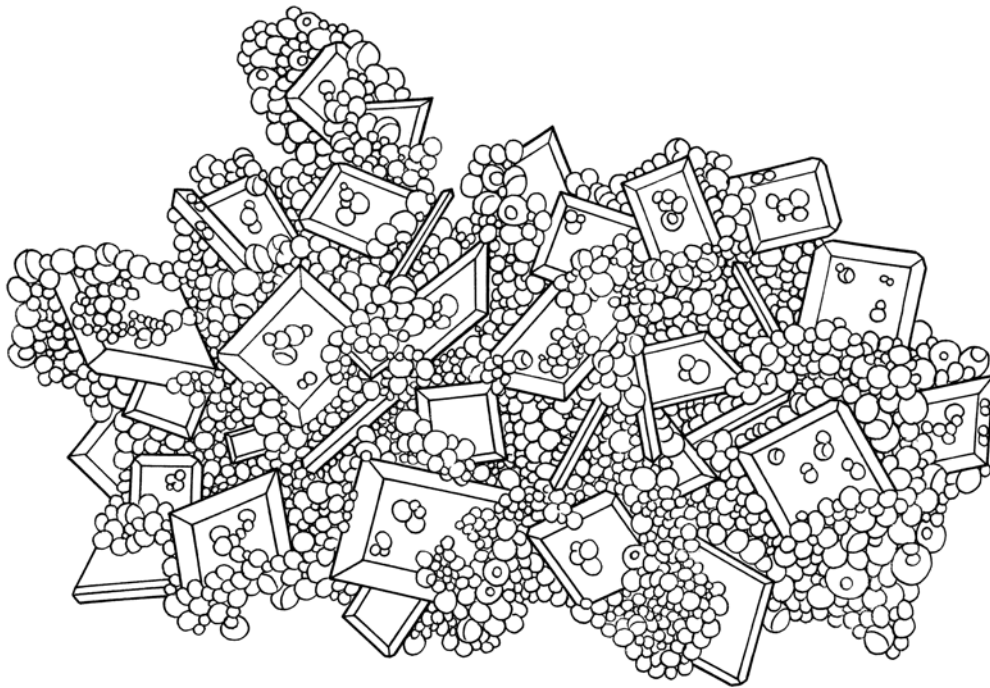
Dark green Vivianite crystals on rust red matrix from Bolivia.

V IS FOR VARISCITE

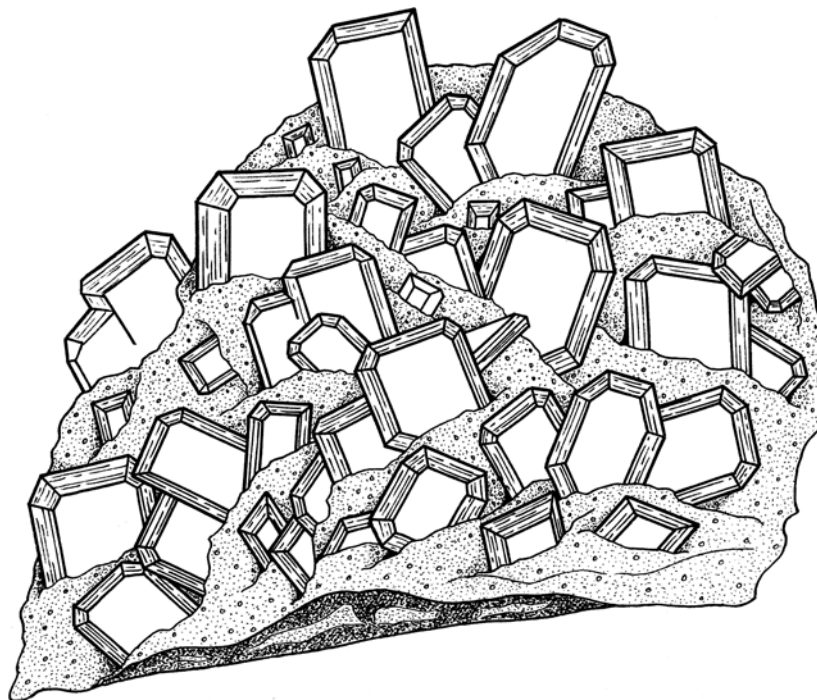


Light green Variscite from Utah.

W IS FOR WULFENITE



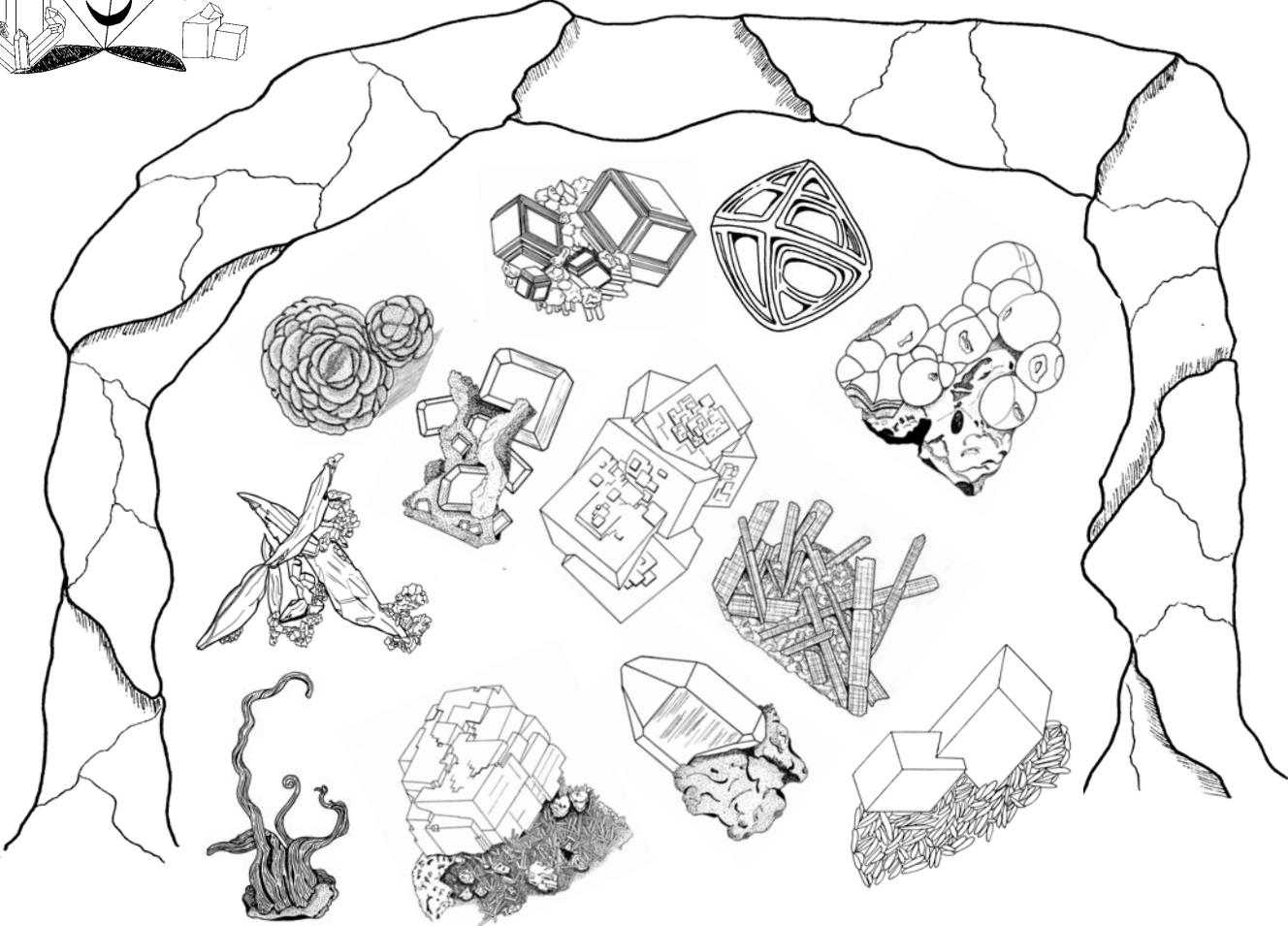
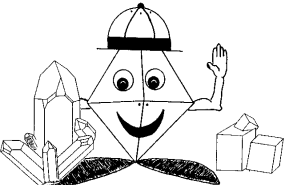
White Wulfenite with dark green Duftite spheres from Tsumeb, Namibia.



Red Wulfenite on brown matrix from the Red Cloud Mine, Arizona.

X MARKS THE SPOT

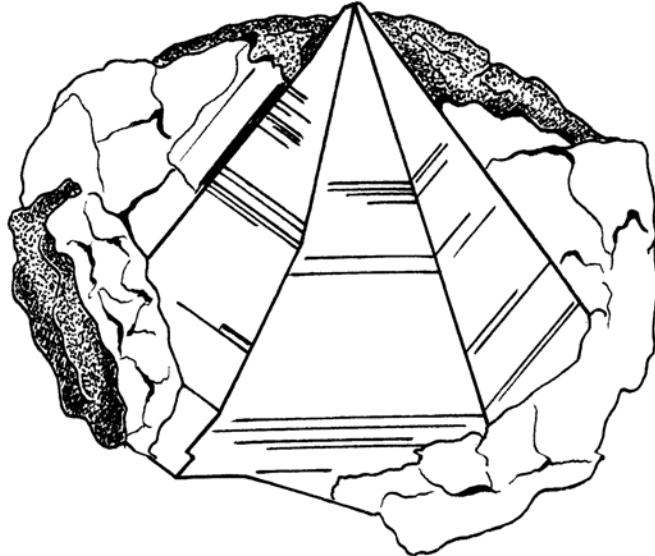
Diamond Dan is digging for minerals. Color the minerals in the mine.



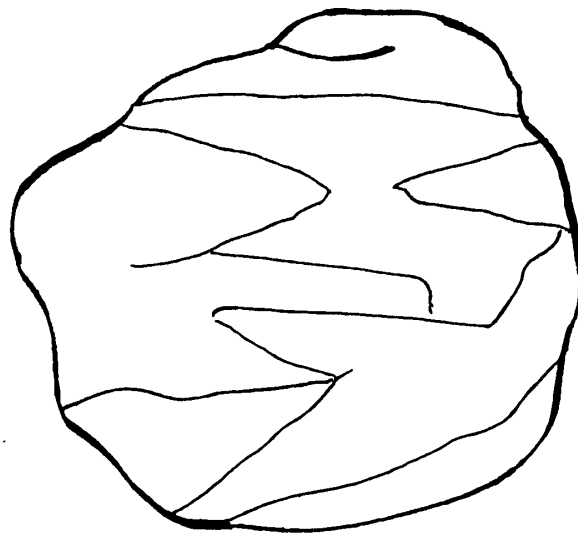
Y IS FOR . . .

There aren't any fun minerals with bright colors that start with Y. So "Y" don't you draw your own crystals? Copy any of the pictures you find in this booklet. Or, go to the internet and draw a picture of a mineral you find there!

Z IS FOR ZINCITE



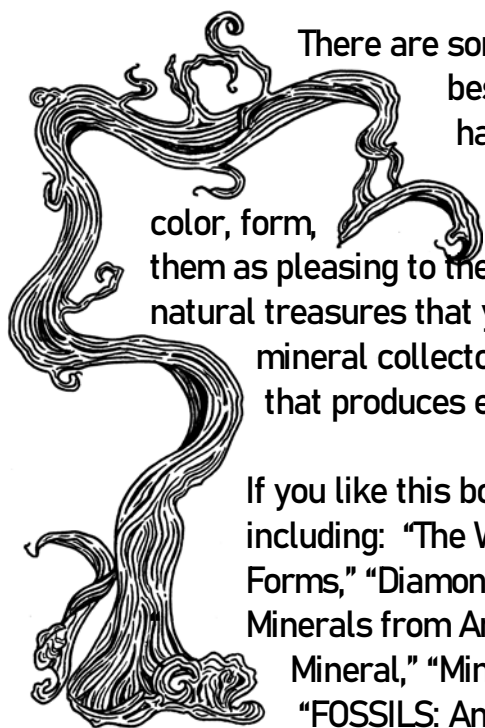
Deep red Zincite crystal.



Very rough, large, dark red Zincite crystals. They look like fingers. In white Calcite from New Jersey.

Diamond Dan Publications presents...

WORLD CLASS MINERALS



There are some mineral localities that have produced the best of the best mineral specimens ever recovered. These specimens have very special qualities that nearly every serious mineral collector recognizes...an artistic combination of color, form, size, proportion and mineral associations that makes them as pleasing to the eye as fine art. We hope you will be so inspired by these natural treasures that you will develop an eye for their beauty and become a mineral collector yourself. And maybe, some day, you will find a locality that produces even more world class minerals!

If you like this book, be sure to check out Diamond Dan's other books, including: "The World of Minerals and Crystals," "Crystals & Crystal Forms," "Diamond Dan's Mineralogical Dictionary," "The Power of Crystals," "Minerals from Arizona," "Minerals from California," "Fluorite: The Rainbow Mineral," "Minerals of the Bible," "Silver, Gold & Gemstones," and "FOSSILS: Ancient Life from the Sea and from the Land."

ISBN: 978-164826750-5

www.diamonddanpublications.net



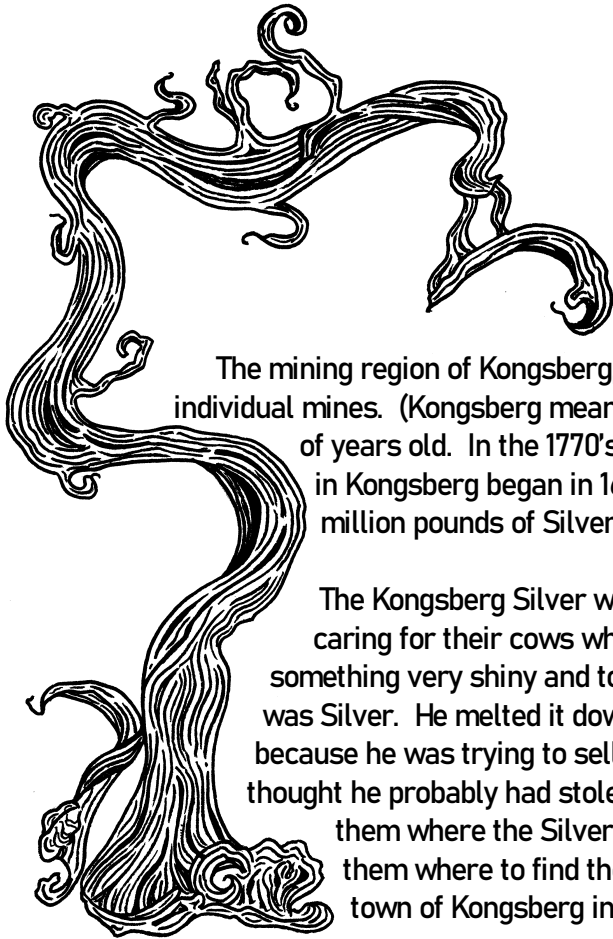
©2020 Darryl Powell

This book (drawings and text) was created by Darryl Powell at Diamond Dan Publications
www.diamonddanpublications.net

No part of this book may be reproduced or copied in any form, printed or electronic, without written permission from Darryl Powell and Diamond Dan Publications.

Produced and printed in the U.S.A.

WORLD CLASS MINERALS: HISTORICAL SILVER



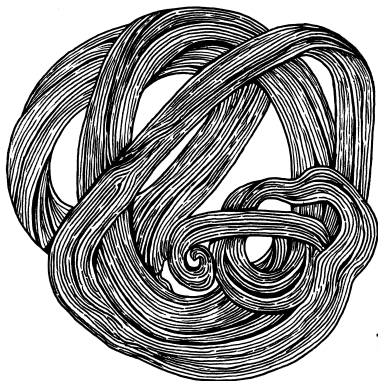
Kongsberg, Norway (left)

Himmelsfurst Mine, Freiberg District, Saxony,
Germany (below)

The mining region of Kongsberg, Norway is the largest in Norway: it includes more than 80 individual mines. (Kongsberg means "The Mountain of the King.") These mines are hundreds of years old. In the 1770's over 4,000 workers worked for the mines. Silver mining in Kongsberg began in 1623 and it continued until 1958. It is estimated that 2.86 million pounds of Silver were mined at Kongsberg.

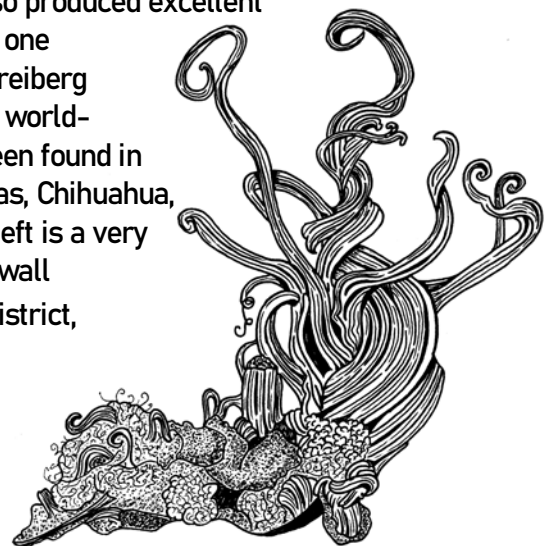
The Kongsberg Silver was discovered by children, Helga and Jacob. They were caring for their cows when an ox scraped against the side of a hill. They saw something very shiny and took a piece home to their father. He knew right away it was Silver. He melted it down and took it to town to sell it. The police arrested him because he was trying to sell something valuable for very little money, and they thought he probably had stolen it from someone. The police gave him a choice: tell them where the Silver was found or be arrested and forced to hard work. He told them where to find the silver in the hills. King Christian IV then founded the town of Kongsberg in 1624, and the search for Silver began.

For mineral collectors, the Wire Silver specimens from Kongsberg are classics. They are among the most famous mineral specimens ever discovered in the history of mineralogy and mineral collecting. Two Kongsberg Silver specimens are pictured here, above and to the left.



Other localities have also produced excellent Wire Silver specimens, like the one pictured to the right from the Freiberg District of Germany. Excellent world-class Silver specimens have been found in La Nueva Nevada Mine, Batopilas, Chihuahua, Mexico. Pictured below, to the left is a very fine Silver specimen from Stonewall

Jackson Mine, Globe, Miami District,
Arizona.



STIBNITE

Ichinokawa Mine, Iyo, Japan

Stibnite crystal groups from the Ichinokawa Mine, Japan are found in mineral museums all over the world. The crystals are large, sharp, bright metallic gray, strongly striated and very well-formed. The best specimens from this mine were found in the 1880's. The mine closed in the 1950's, so if a mineral collector wants to own a Japanese Stibnite, it will only come from an old collection.

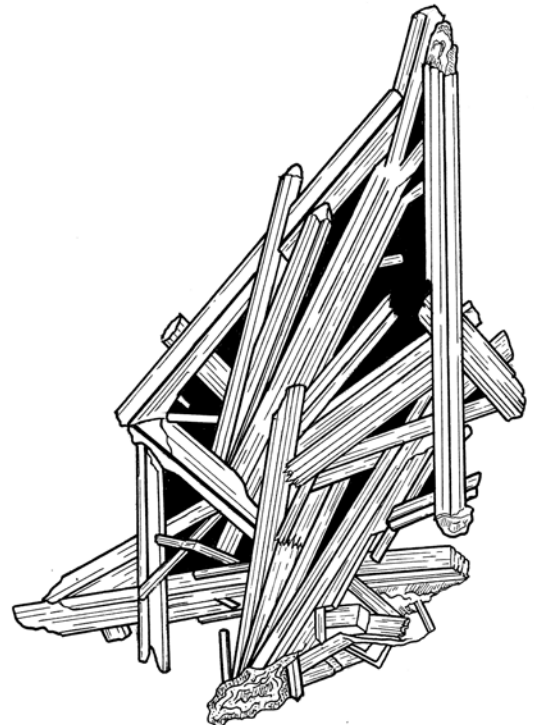
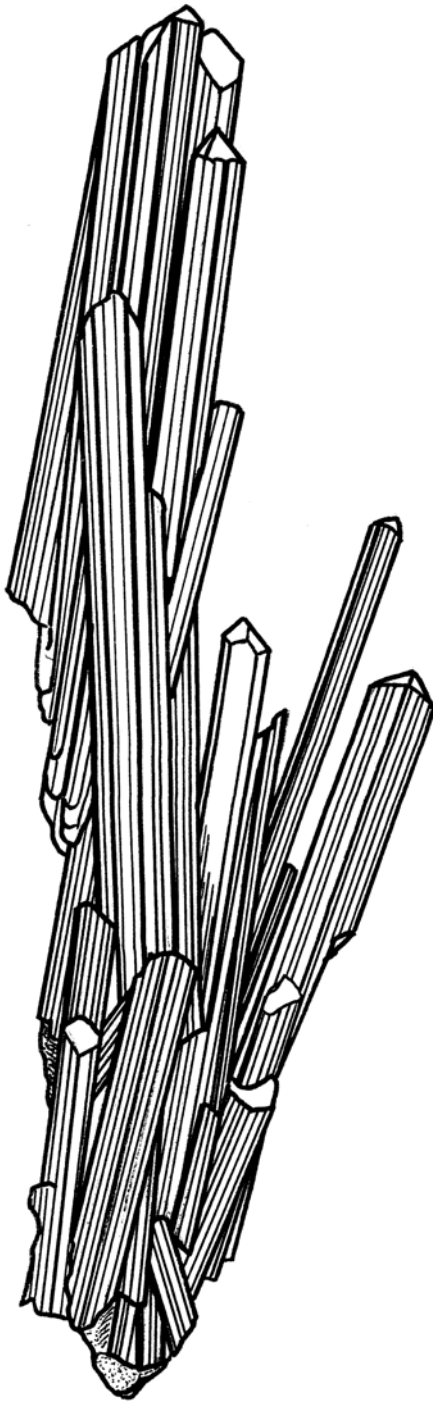
Stibnite is an ore of the element *antimony*. The Ichinokawa Mine was only active for 25 years, from 1875 to 1900. However, in that short time, it produced over 16,600 tons of antimony, all of which came from Stibnite. Imagine the tons of wonderful, museum-quality Stibnite specimens that were sent to the crusher and were melted down for their antimony content! We mineral specimen collectors don't want to think about the thousands of high-quality specimens that were destroyed in the process.

The specimen pictured here (left) is one of those spectacular Stibnite specimens found in the late 1800's. It is said that "Stibnite crystals from Japan still set the standard for the species."

The specimen pictured here is considered to be the very best example of Japanese Stibnite in existence. It is the largest and the most damage-free. It is such an important and spectacular specimen that it has been called

"a world mineral heritage specimen." In other words, it is truly the best of the best of Stibnite specimens in the world.

In recent years, excellent Stibnite specimens have been found in China. Individual crystals and crystal groups of bright, shining, metallic-gray Stibnites are now in museums and private collections all over the world. It is still possible to purchase them at mineral shows. To the right is a nice Stibnite group from Hunan Province, China.



Silver, **GOLD** & **GEMSTONES**

Before a gold ring is a gold ring, or a silver necklace is a necklace, or a crown of jewels is a crown covered with rubies and emeralds and diamonds, the gold, silver and gemstones are minerals in the ground. Gold is most often found as native gold, in nuggets and crystals. Silver can be found as native silver, but is also recovered from silver ore. And gemstones are found as crystals in igneous and metamorphic rocks. In this book you will discover where all of these treasures are found, what they look like before they are cut and polished, and what makes them so valuable.

If you like this book, be sure to check out Diamond Dan's other books, including "The World of Minerals and Crystals," "Crystals & Crystal Forms," "Diamond Dan's Mineralogical Dictionary," "The Power of Crystals," "Minerals from Arizona," "Minerals from California," "The Power of Crystals," "Fluorite: The Rainbow Mineral," "Minerals of the Bible," "World Class Minerals," and "FOSSILS: Ancient Life from the Sea and from the Land."

www.diamonddanpublications.net

ISBN: 978-164826734-5



©2020 Darryl Powell

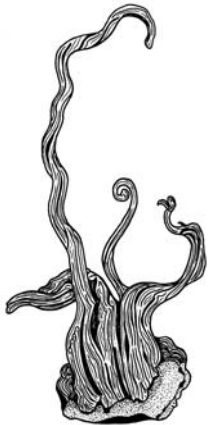
This book (drawings and text) was created by Darryl Powell at
Diamond Dan Publications www.diamonddanpublications.net

*No part of this book may be reproduced or copied in any form, printed or electronic, without
written permission from Darryl Powell and Diamond Dan Publications.*

Produced and printed in the U.S.A.



Silvery Facts



The chemical symbol for silver is Ag which comes from its name in Latin, *Argentum*.



Today most silver comes from the process of refining gold, copper and lead. Yes, there is silver hiding in gold, copper and the lead ore, galena.

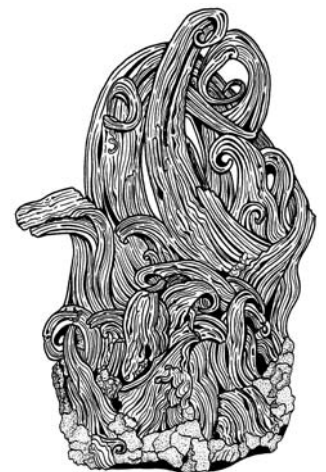
Silver reacts with sulfur compounds in the air. When it does, it tarnishes and turns dark.



Sterling silver, a mixture (called an alloy) of 92.5% silver and 7.5% copper. Sterling silver is mostly used for making jewelry and silverware.

Silver is used to make solar panels, specifically crystalline solar photovoltaic panels, for the generation of electricity.

Before the invention of digital photography, 30% of all silver was used to make photographs.



THE GOLDEN BEAR NUGGET

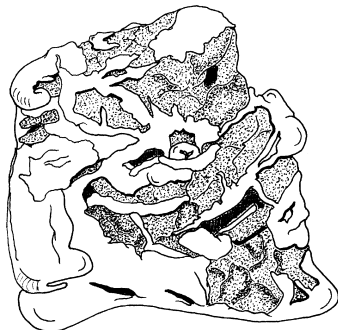
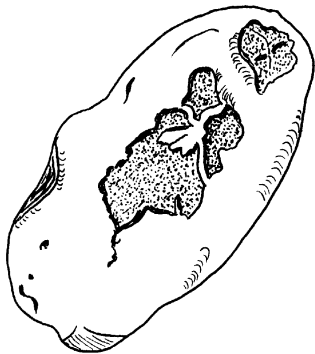
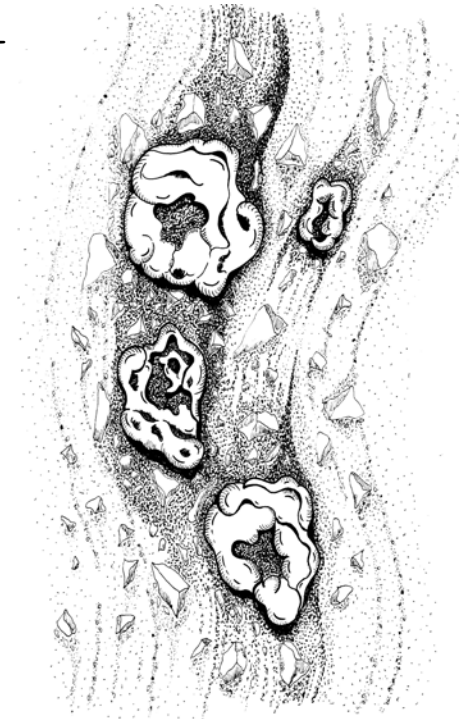


The "Golden Bear Nugget" is a crystallized nugget of native gold that is $2 \frac{1}{4}$ inches high and $1 \frac{5}{16}$ inches wide. It weighs a little over 1 troy ounce. ("Troy" weight is a special system of weighing gems and precious metals. It is universally used all over the world. For our young collectors who know the metric system of measurements, a troy ounce is equal to 31.1 grams.)

The history about this wonderful gold nugget is not exactly clear. The story goes that a 14 year old girl picked it out of a sluice box around 1857 at the Georgia Hills Mine in the California town of Jim. She treasured her interesting gold nugget and took good care of it all her life. She lived to be 75 years old. When she died her brother became the owner of the nugget. He had some money troubles, though, and had to borrow money from a friend. He promised that if he didn't pay the money back, the friend would get the gold nugget. Guess what? He didn't pay the money back. The friend took the gold nugget and decided to sell it; he wanted or needed the money more than he wanted the gold. In 1937

a man named C.D. Woodhouse bought this nugget for \$300. He showed it to people in the California Federation of Mineralogical Societies (the CFMS) and they decided to purchase the nugget. They bought it from Mr. Woodhouse for . . . \$300. Today you can see the Golden Bear Nugget at the Los Angeles County Museum of Natural History. Notice that this wonderful nugget also has many octahedral crystals on its surface.

Thousands of gold nuggets have been discovered in California. Gold nuggets are rounded because they have been carried by rivers and rolled around in river sand for hundreds of years before they were discovered. Even today, gold hunters use pans to sift through the sand of many of California's rivers and streams to find gold nuggets of any size.



WHAT IS A GEM?

There is a difference between a "gem" and a "gemstone." A gem is the final cut and polished object. A gemstone is usually a mineral, but sometimes another natural material, in its untouched, natural form.

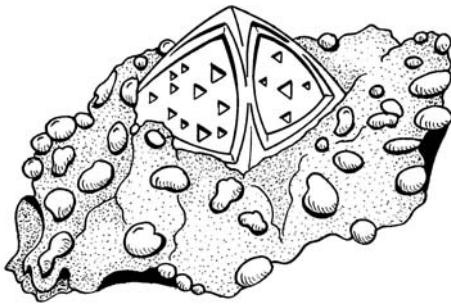
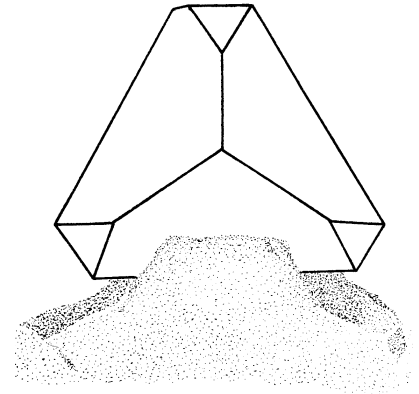
For a mineral to be considered a gemstone, it has to have some basic properties. First, it has to be colorful and beautiful to look at. Second, it has to be hard enough to be able to be shaped, cut or polished. Its hardness is also important because gems are worn in jewelry, so a gemstone has to be hard enough to be worn without being easily scratched, chipped or damaged.

Most gemstones are minerals. A mineral has a very specific, scientific definition. Mineralogists define a mineral as:

a naturally occurring substance that was not created by a living organism and that has a known chemical formula and a regular internal crystal structure. Diamonds, rubies and emeralds are minerals.

There are also some gemstones that are naturally occurring, but were created by living organisms. Well-known examples of this category are amber, red coral and pearl.

For thousands of years, gemstones have been valued for their beauty. Throughout the ages, people believed legends about gemstones special properties. Some of the more interesting legends are included in this section of the book.

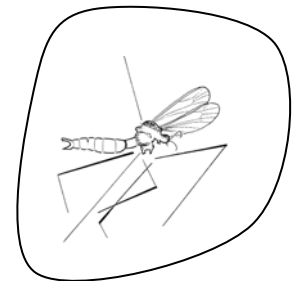
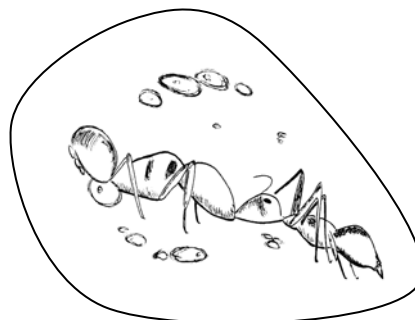
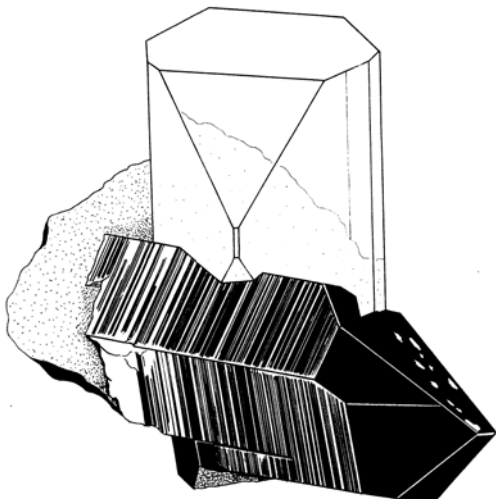


Above Right: A benitoite crystal from San Benito County, California.

Above Left: A diamond crystal in matrix from South Africa.

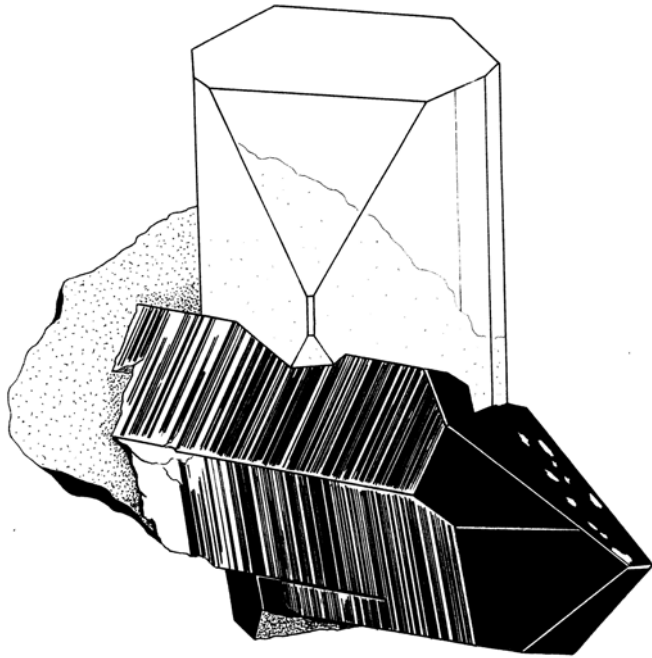
Below Left: An orange topaz crystal on smoky quartz from Pakistan.

Below Right: Specimens of amber from the Baltic Sea region.



Ants and a Crane fly in Amber.

TOPAZ

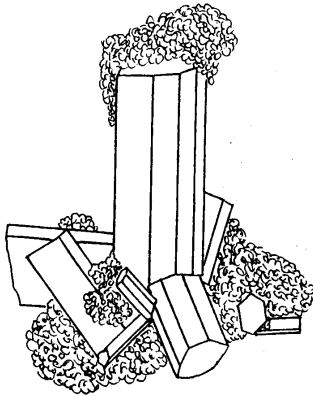


Like quartz, tourmaline and garnet, topaz is a silicate mineral. Its chemical formula is $Al_2[(F,OH)_2SiO_4]$. Silicate minerals are hard (from 6 to 8 on the mineral hardness scale) and therefore have a vitreous or glassy luster and are hard enough to be cut, polished and worn as gems. Topaz is number 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.

Gemologists have discovered that heat treatment and irradiation can change the color

of topaz from light blue or gray to dark blue. Almost all topaz gems are treated to improve their color.

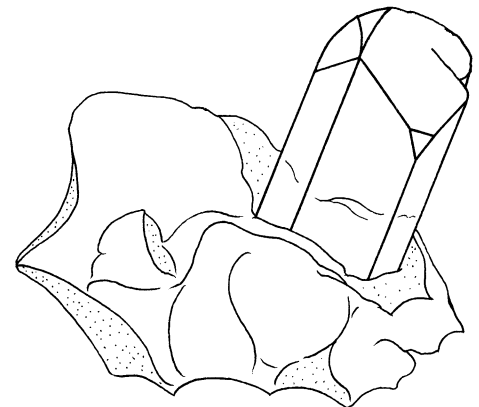
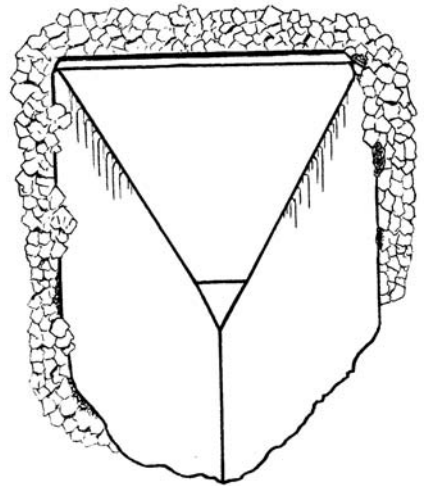
Topaz crystals can be less than an inch long and can be as large as a boulder. The world's largest topaz crystal is from Minas Gerais, Brazil and weighs almost 600 pounds! It is at the American Museum of Natural History in New York City.



Topaz, like the other gemstones highlighted in this book, has had many legends attached to it through the centuries. Hundreds of years ago it was believed that wearing topaz could heal mental illness and make a person wise. Others used it to make a person's eyesight better by placing topaz crystals over the eyelids. The book, "Gems & Crystals from the

American Museum of Natural History" tells this story (page 85) about using topaz to improving the eyesight: "The prescription called for immersing the gem in wine for three days and three nights, followed by application of the topaz to the afflicted eye." The ancient Greeks believed that wearing topaz would make a person exceptionally strong, especially in an emergency.

Above: Orange topaz on smoky quartz from the Skardu District, Pakistan
Right: Sherry-brown topaz from the White Mountains, New Hampshire.

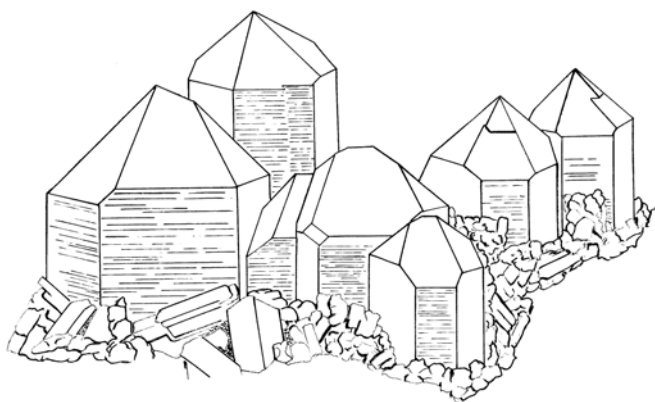


Minerals of the Bible...

is an interesting look at some of the minerals that are named in God's word. As you go through this book you will learn about minerals, their physical properties, their forms, their uses and the meanings of their names.

Most mineral names used in modern mineralogy were created rather recently. Only some of the ancient mineral names that we find in the Bible are still used today. Some of the mineral names in the Bible have changed and we know what the modern names are. On the other hand, some of the mineral names in the Bible are so ancient that we are not really sure which modern mineral names apply today.

This book might get you more interested in the Bible. With your class, your teacher or your family, look up *all* the passages in the Bible that contain mineral names. The easiest



way is to find an on-line version of the Bible that has a search feature. One excellent resource is www.biblehub.com. Type the mineral name into the search box and then look up the passages that it finds. You will find some interesting results. For example, a lot of the mineral names are from the books of Daniel, Ezekiel and Revelation and refer to precious minerals that will be used by God to build the New Jerusalem. You will discover that most of the metals mentioned in the

Bible, like gold, silver, brass, and bronze, are used in the construction of the Temple.

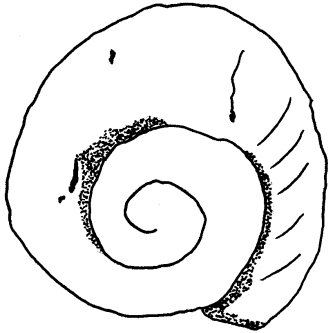
Use this study as a chance to practice your art skills. Based on the descriptions in the scriptures, draw the New Jerusalem or the Temple or Aaron's Breastplate. Also take time to draw pictures of mineral specimens like the ones in this book. If you search for mineral and crystal pictures on the internet, you will discover thousands of beautiful mineral specimens. Who knows . . . this may lead to a passion for mineralogy and science. Or maybe you'll become a gemologist. Or maybe a dealer in mineral in crystal specimens.

Diamond Dan Publications has a long list of books and booklets about minerals, crystals, gems and fossils for you to enjoy. Visit our website to discover more about the fascinating and beautiful world of minerals, crystals, fossils and geology.

ISBN: 978-164871448-1

www.diamonddanpublications.net

Bdellium (Opal... perhaps)



The gold of the land is good; there is *bdellium* and the onyx stone.
(Genesis 2:12)

If you discover a new mineral, you will have the privilege of naming your new discovery. Today, all new mineral names must be approved by a special committee whose task is to verify new mineral discoveries and approve their proposed names. This committee is the International Mineralogical Association's Commission on New Minerals and Mineral Names.

In Biblical days, mineralogy was not a science and naming minerals was done quite often by *describing* the mineral. In the King James Version we discover the mineral *bdellium*. Which modern mineral name should be given to "bdellium"? No one really knows. However, there are some very good guesses. The Hebrew word that is translated as *bdellium* is *bedolach* which probably comes from the root word *badal* which means *to divide* or *to separate*. Many Bible and language scholars have concluded that "bdellium" refers to the mineral we know as opal, because **white opal divides light** into red, blue and green colors. In addition, this variety of opal (which is called *precious opal*) was known from Egypt, Arabia, Cyprus, Galatia and India. The only problem with this thinking is that the idea that light is made up of a spectrum of colors that could be broken or divided into its colors was not known in Biblical times.

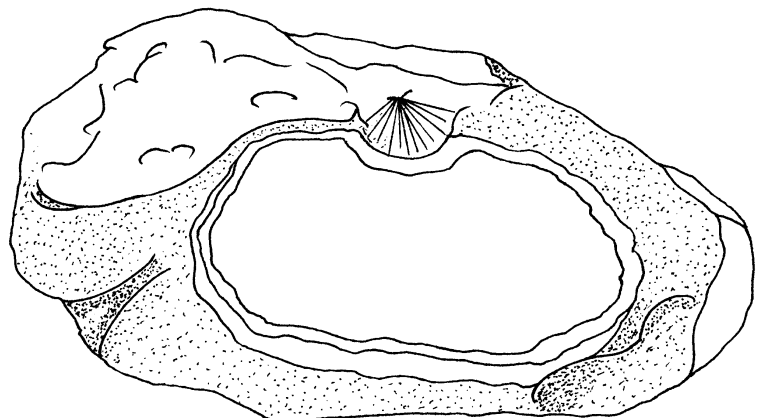
So, bdellium might have been precious opal. . . perhaps. Or, it may have been **pearl**. Or, it may have been a variety of crystal (that is the mineral **quartz**).

No one really knows!

Above: A gastropod (snail) fossil that is now completely precious opal.
From Australia.

Right: A nugget of precious opal in brown matrix. From Australia.

Color both specimens with flecks of green, blue, red, and purple.



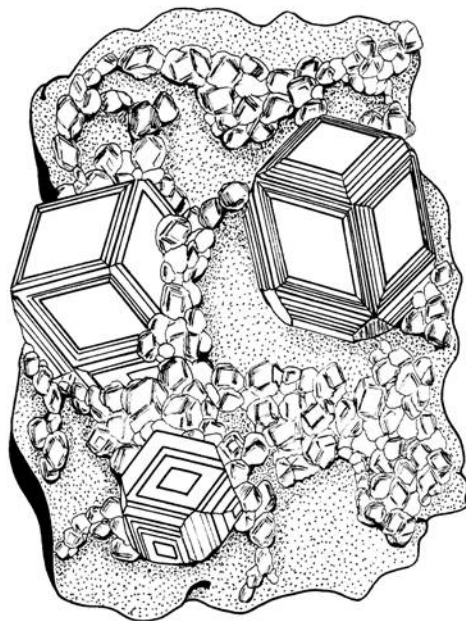
Carbuncle (Garnet)

The first row shall be a sardius, a topaz, and a **CARBUNCLE**.
... the second row shall be an emerald, a sapphire, and a diamond."
(Exodus 28:17&18)

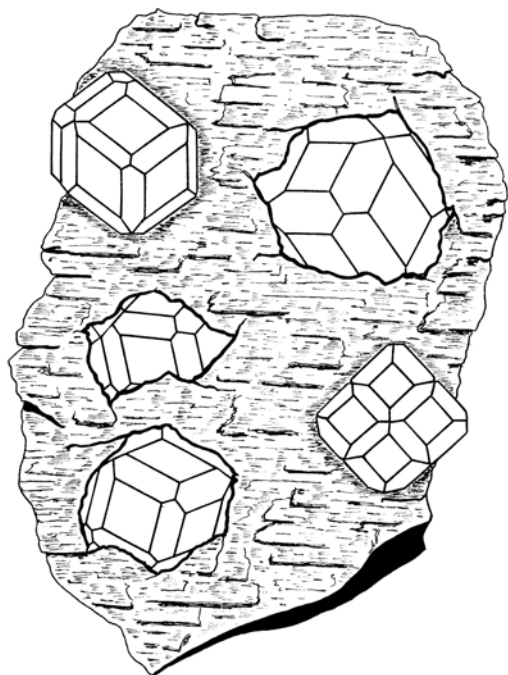
The ability to identify minerals accurately developed over the last two hundred years or so as the science of mineralogy developed. In ancient days, similar-looking minerals were given the same name. Such is the case for "garnet." In Biblical days, all round, red minerals and crystals were called *carbuncle*, a word which came to be associated with the mineral **garnet**. There are other deep red minerals that were probably considered to be "carbuncle" such as zircon, rubies, red tourmalines and spinel.

Carbuncle is not mentioned often in the Bible. In Isaiah 54:12, the Hebrew word *eqdach* is translated as *carbuncle*. It's actual meaning is *a burning, fiery gem*. When high-quality garnets are polished, they can be bright red and create flashes of "fire" as light passes through them. "Carbuncle" is actually the Latin word given to this gemstone. The Greek word is *anthrax* which means *a small, glowing coal*.

The modern word *garnet* comes from the Latin word *granatum* which means *pomegranate seed*. Garnet crystals are often found as groups of small, red crystals that resemble the seeds inside a pomegranate. Cut a pomegranate open and see for yourself!
(Then eat the tasty seeds. They are a real treat.)

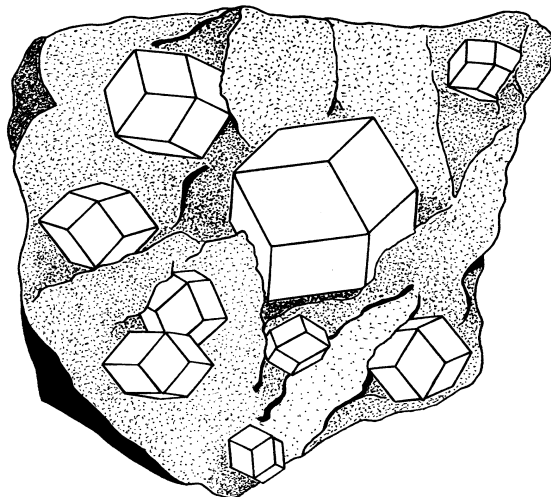


Above: A variety of garnet called "grossular garnet." It is cinnamon-red-orange and comes from Canada.



Left: Deep red almandine garnets from Alaska.

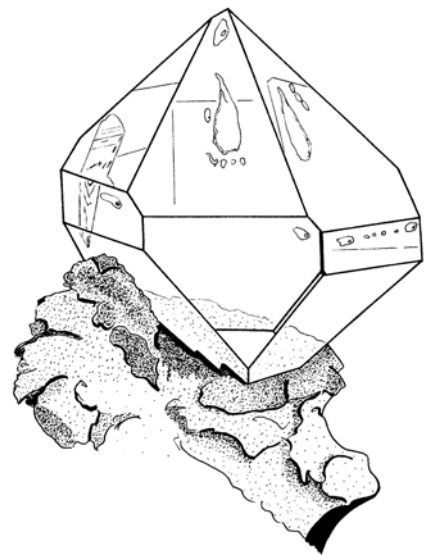
Right: Dark green garnets from Colorado.



Crystal (Quartz)

And he showed me a pure river of water of life, clear as **CRYSTAL**, proceeding out of the throne of God and of the Lamb. (Revelation 22:1)

And before the throne [there was] a sea of glass like unto **CRYSTAL**: and in the midst of the throne, and round about the throne, [were] four beasts full of eyes before and behind. (Revelation 4:6)



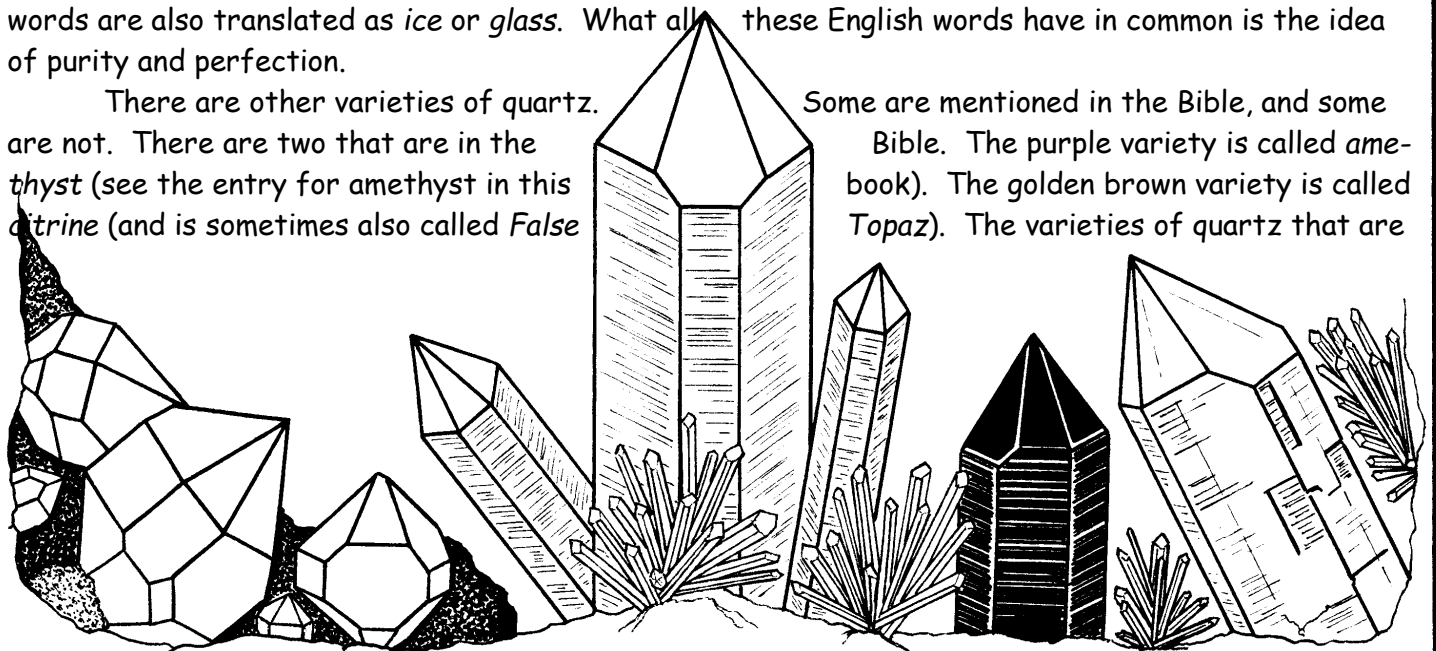
The mineral that we know as **quartz** is not called quartz in the Bible. The word we find in the Bible is **crystal**. As it is used in God's word, "crystal" refers to any hard material that is perfectly clear and colorless. This description is perfect for colorless, clear quartz, which through the centuries has also been called **Rock Crystal**.

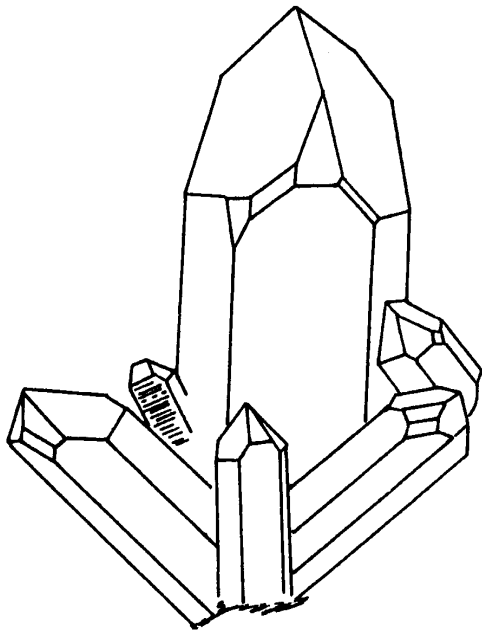
Quartz crystals of this type were known to be found high in the mountains. They also feel cold to the touch because quartz moves heat away from the finger very quickly. It is also clear, like pure ice. When all of these facts are put together, they led people in ancient times to conclude that quartz crystal had to be water that froze so hard that it would never melt. In other words, it was thought to be **petrified water**! Today we know that quartz is the combination of two elements, silicon and oxygen. Specifically, it is silicon dioxide, SiO_2 .

In the book of Revelation, the Greek word that is translated as **crystal** is **krustallos**. The descriptions are to give the image that the river of water of life and the sea before the throne are pure and absolutely clean and clear. They are, therefore, perfect. In the Old Testament, two different Hebrew words are translated as **crystal**. The words are **zekuwkiyth** and **gabiysh**. These words are also translated as **ice** or **glass**. What all these English words have in common is the idea of purity and perfection.

There are other varieties of quartz. Some are mentioned in the Bible, and some are not. There are two that are in the Bible. The purple variety is called **amethyst** (see the entry for amethyst in this book). The golden brown variety is called **Topaz**. The varieties of quartz that are

Some are mentioned in the Bible, and some are not. There are two that are in the Bible. The purple variety is called **amethyst** (see the entry for amethyst in this book). The golden brown variety is called **Topaz**. The varieties of quartz that are





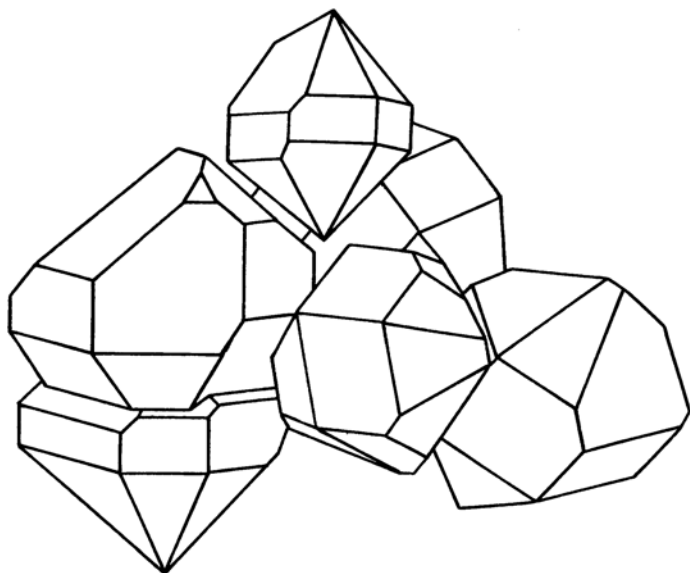
not mentioned in the Bible are the following: black quartz is called *smoky quartz* or *clairngorm*. White quartz is called *milky quartz*. Pink quartz is *rose quartz*.

The most common mineral in the Earth's continental crust is feldspar. The second most common mineral in the Earth's continental crust is quartz. Massive quartz and fine quartz crystals are literally found all over the Earth. It is fair to conclude that many people in Bible times would have seen quartz crystal at some time in their lives and therefore knew what the Biblical writers meant when they wrote of *crystal*.

Previous Page, Top: A perfectly clear quartz crystal from Herkimer County, New York. These water-clear quartz crystals are commonly called

"Herkimer Diamonds." You can see some air bubbles trapped inside this crystal.

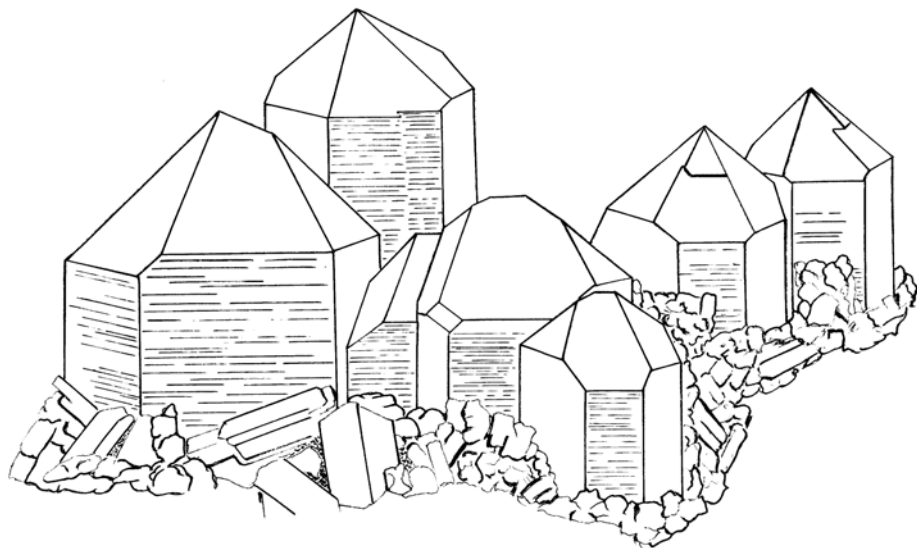
Previous Page, Bottom: A collection of quartz crystals of various shapes and sizes. You can color them purple (amethyst), brown (citrine), white (milky), green (aventurine), black (smoky quartz), or pink (rose quartz).



Above Left: Rock crystal (quartz) from Mt. Ida, Arkansas.

Right: A cluster of quartz crystals from Herkimer, New York.

Below: Parallel smoky quartz crystals from New Hampshire.



How do Fossils Form?



There are different ways that the remains of living organisms become fossils. Here you will learn about one of those processes: cast and mold. You are actually going to make some fossils so you will need the following items: Modeling clay (the kind that doesn't dry out), plaster of Paris or premixed plaster, putty knife, mixing bowl, water, hard objects like sea shells, small plastic toys, etc.

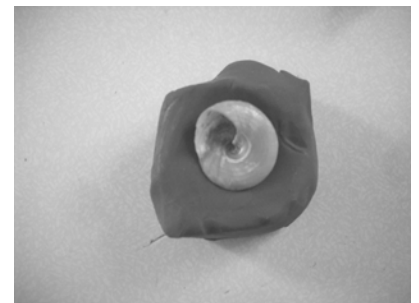
Let's go on a journey in our minds. We are in an ancient Devonian sea. And just over there an old brachiopod has died and is lying on top of the sea floor. The weight of the brachiopod pushes the shell down into the sediment and leaves an impression. The impression looks just like the shell. Over time, the sea floor sediment hardens and more sediment fills in the impression made by the brachiopod shell. This new sediment takes on the shape of the old brachiopod shell. Eventually it hardens, too. We jump ahead now by a few hundred million years. We are no longer in the ancient Devonian sea, but we are standing next to a limestone outcrop in the middle of a field. The limestone is full of fossils. You pick up a hand-sized piece of limestone and give it a whack with your geologist's hammer. It breaks into to pieces. One piece has an indentation that looks just like a brachiopod shell. The other piece sticks out of the rock and looks just like the brachiopod shell. You can easily put the two pieces together like a puzzle. The piece that is the indentation is called the *mold*. It is like a mold for making candies. It has the shape of a brachiopod, but it is not the brachiopod. The other piece, the one that looks like the brachiopod itself, is actually limestone. This piece is called the *cast*.

It may be hard to picture, so you are going to make your own cast and mold fossils now.

Step 1: Take a good sized piece of modeling clay and roll it into a lump about 2 inches around.

Step 2: Take an object that you like. You could use a sea shell. You could use a small plastic toy. Push that object into the clay.

Step 3: Carefully remove the object from the clay. What do you see? You will see an indentation that looks like the object. This is the *mold*.



Step 4: Follow the instructions on the plaster of Paris bag and mix up a small amount of plaster. I chose to use pre-mixed plaster that comes in a small plastic cup. My experience is that mixing it myself is better. It is good for the plaster to be pretty runny so that it completely fills in all the details of the mold.

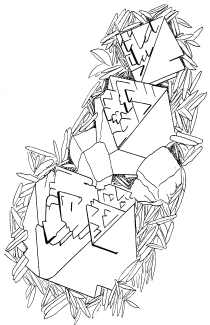
Step 5: Pour the plaster into the indentation that you made in the clay. Set the clay with the plaster aside and let the plaster dry. This will take a few hours.

Step 6: When the plaster is completely dry, carefully remove it from the clay. What do you see in the plaster? You will see a copy of your original object, but now it is made out of plaster. This is the cast of the original object. You have successfully made a fossil! You can now paint your fossil any color you would like.

Step 7: Repeat Steps 1 through 6 as many times as you would like. Make a shelf full of fossils. You can make a "fossil" cast of your finger or toe, of a quarter, of a pen or pencil, of an acorn . . . be creative. You can make a cast of anything you would like.

Minerals & Elements Trivia

On the left you will find the names of minerals. On the right you will find a list of elements that come from these minerals. Can you match the mineral name with its element? Draw a line from one to the other. Use a good mineral handbook or the internet if you need help.



Celestite

An ore of the element *lithium*.

Bauxite

An important ore of the element *uranium*.

Lepidolite

An ore of the element *tungsten*.

Molybdenite

The main ore of the element *strontium*.

Scheelite

The element *zinc* is extracted from this mineral.

Smithsonite

When found in large enough masses, this mineral is a source of the element *manganese*.

Hematite

The main ore of *aluminum* which is used to make pop cans.

Rutile

An important ore of the element *titanium*.

Autunite

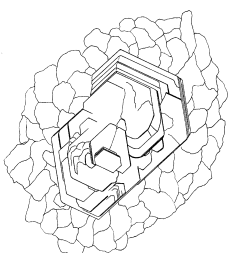
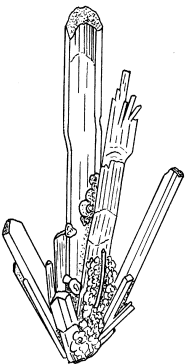
The most important *iron* ore.

Stibnite

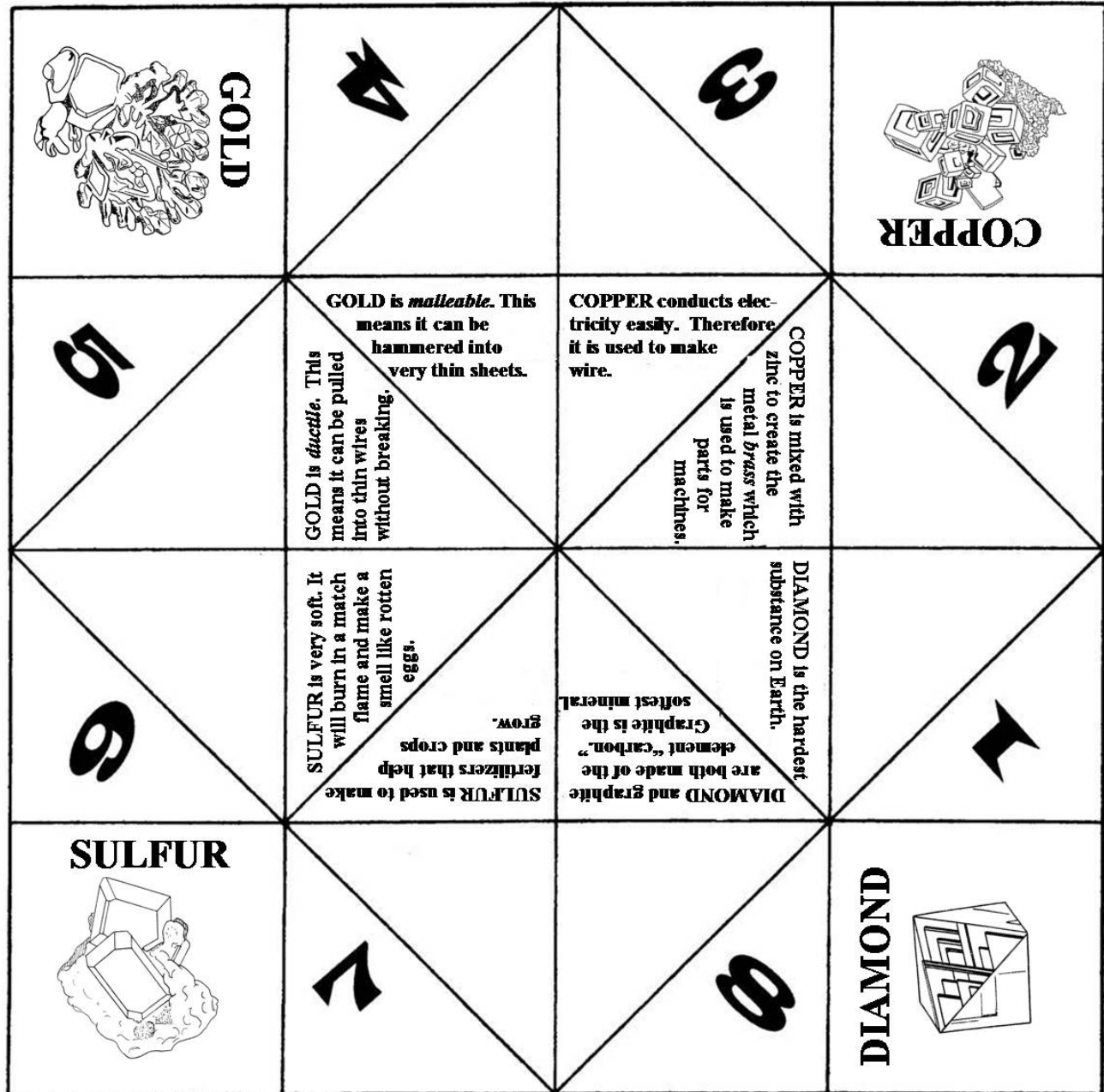
The main ore of the metal *molybdenum*.

Manganite

The main ore of the element *antimony*.



Mineral Cootie Catcher



1. Cut out the cootie catcher and fold it in half from the silver corner to the pyrite corner. You will be folding the pictures of the minerals in half. Every time you make a fold, press hard to make a sharp fold in the paper.
2. Open the paper and fold it in half from the fluorite corner to the emerald corner. Again, you will be folding the pictures of the minerals in half. Unfold so you are back to the square.
3. Next, flip it over so the blank side is facing up and fold the mineral picture corners into the center of the creases in the paper. You will now have a smaller square with the four mineral pictures facing you.
4. Flip it over again so that the facts about the minerals are facing up. Fold all four corner points to the center again.
5. Put your two thumbs and two fingers into each of the four flap pockets. The flap pockets are the spaces under the mineral pictures. Use your fingers to press the center creases so that all four flaps meet at a point in the center.

How to play

Have a player choose one of the top four mineral squares. Spell the mineral they chose while you open and close the Cootie Catcher once for each letter in the mineral they selected. The player then selects one of the four numbers on the inside. Open up and down and side to side as you count the number they picked. When you've stopped counting, look inside and let the player choose again. Open and close the right number of times, then choose once more. Open the panel under the number and read the mineral fact under the panel. Play over and over, again and again.

Create Your Own Mineral Cootie Catcher

Here is a blank cootie catcher for you. Pick four minerals. Draw pictures of those minerals in the corners (or, you can cut pictures out of mineral magazines). Using a mineral field book or the internet, write two facts about each mineral you chose. Use the cootie catcher on the previous page as a model so you know how to do this properly. Then follow the instructions. Ta da! You have made your own cootie catcher. You have permission to copy this blank cootie catcher and make as many as you would like!

