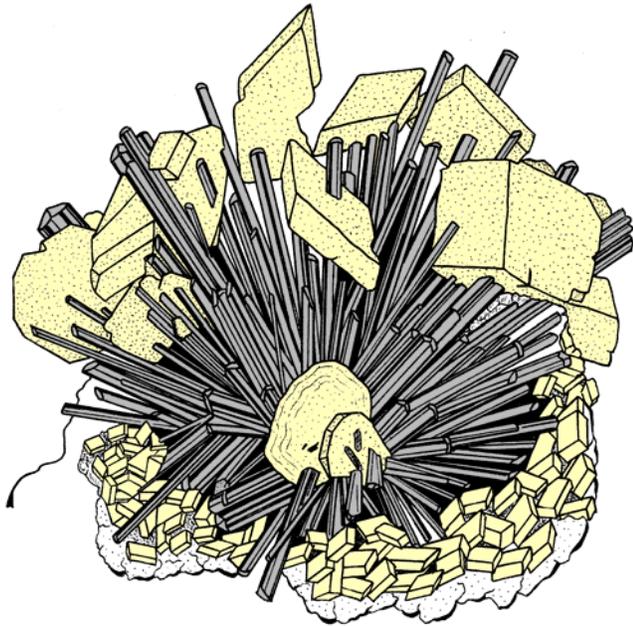


Mini Miners Monthly

A Monthly Publication for Young Mineral Collectors.

March 2015, Vol. 9 No. 3



Mineral Names

Last month we presented the first part of a dictionary of mineral names, what they mean and how they are created. It was our intention to provide for you the second (and final) part of this project. Despite the best of plans, Part II is not complete. Diamond Dan was the victim of a stomach bug that has interfered with a lot of things in life. Also, the need to travel to help his sick parents took away some time that was to be devoted to the mineral name dictionary (we are all well now, thank goodness!).

The second part of the Mineral names dictionary will be sent to you in the April issue of *Mini Miners Monthly*.

This month you are receiving the booklet that Diamond Dan Publications created for the 2015 Tucson Gem and Mineral Show®, *Minerals of Western Europe*. It is packed with interesting information and a lot of great mineral drawings (if we do say so ourselves!) This special issue comes to you with two very special additional features.

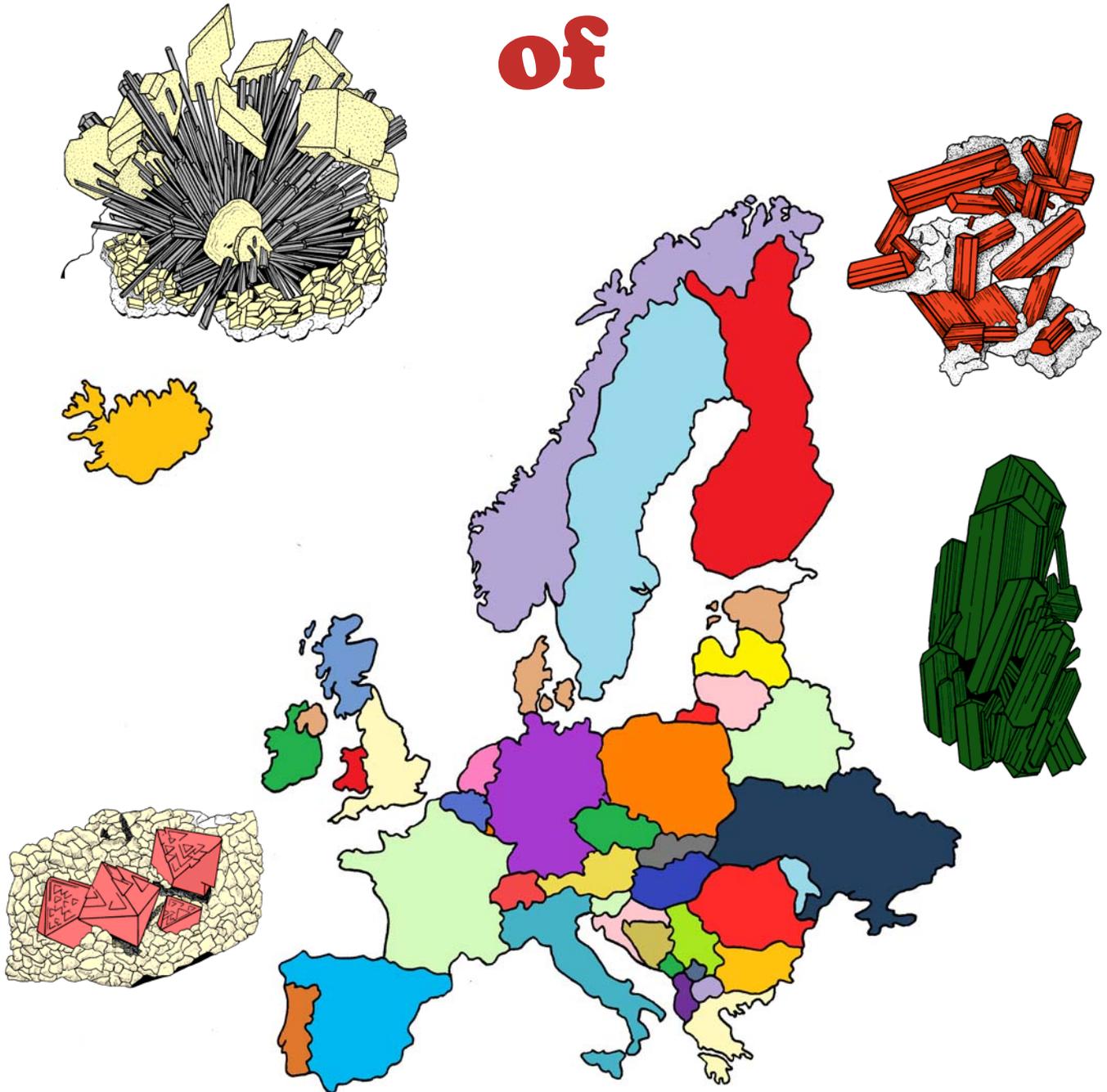
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Second, in a separate email you will receive a file of all of the drawings included in this book. You can use the drawings to create coloring pages or to decorate your own club publications. Again, the only limitation is that you cannot sell these images for any purpose.

Enjoy this special presentation. You will learn. You will have a great resource.

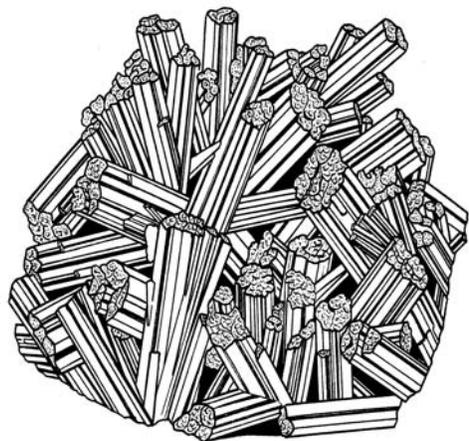
Minerals

of



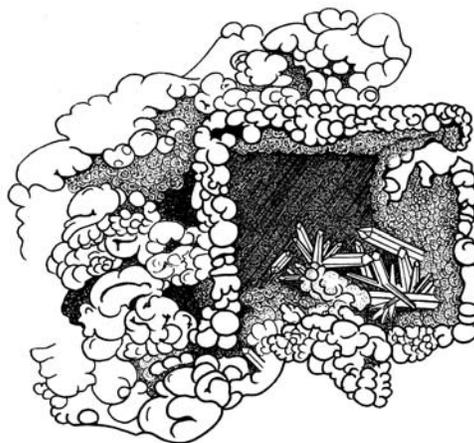
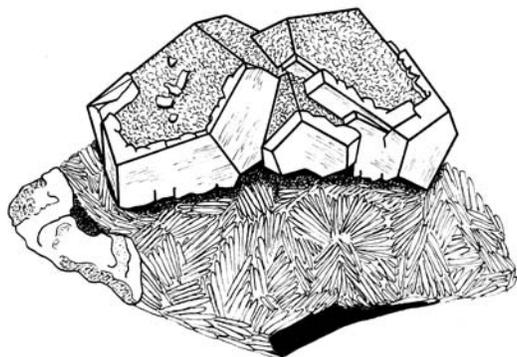
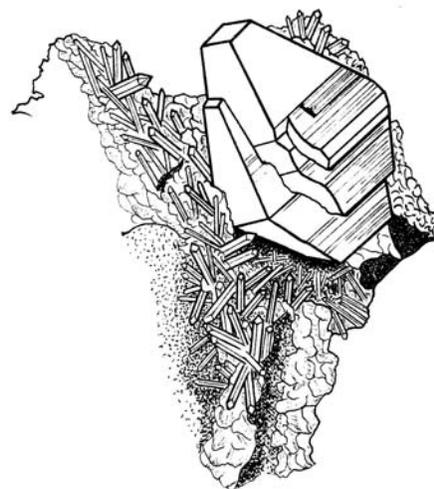
Western Europe

Minerals of Western Europe



Creating this book was a challenge: there are so many wonderful mineral species from Western Europe that it is hard to pick only “the right ones” or “the best ones.” Therefore, this book will introduce

you to some of the most famous mineral species, some of the most rare to rarest, some of the most interesting and some of the most unusual. Think of this book as an introduction to the wonderful mineral specimens that can be found in Western Europe. It would be worth your time and effort to get online and look for even more wonderful mineral specimens from the countries you will discover here. Perhaps you might want to create a new book that features specimens that are not included here. You could call it “Minerals of Western Europe, Part II.”



This book (drawings and text) was created by Darryl Powell at Diamond Dan Publications www.diamonddanpublications.net ~ diamonddan@rochester.rr.com
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Western Europe

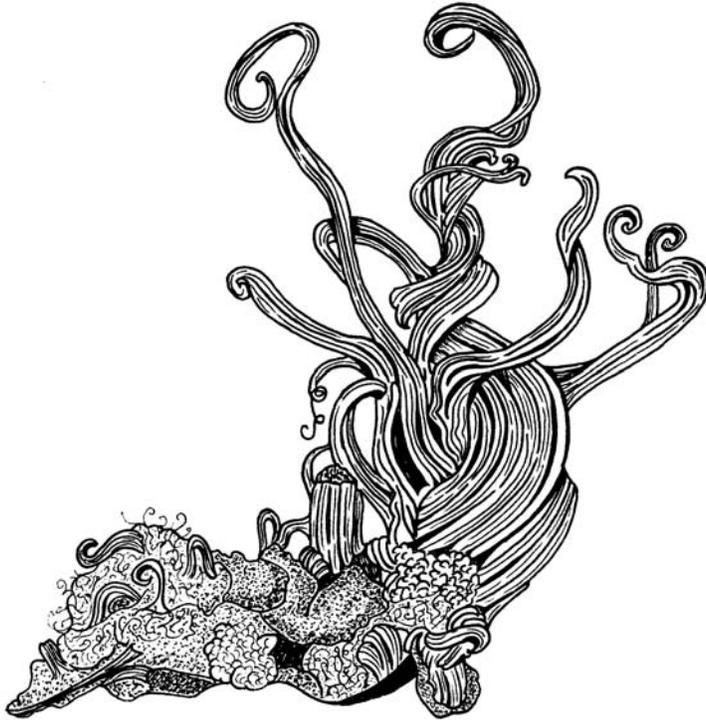
Here is a map of Europe. It will be helpful to you as you discover the different minerals from Western Europe because it can help you picture where the different countries are found. When you discover a mineral from a certain country, locate that country on this map.



Minerals of Germany

Silver

from Freiberg



The town of Freiberg, Germany was established in 1186 and was built around the mining of metal ores from the nearby Ore Mountains which are called Erzgebirge in German. The Ore Mountains are a natural border in central Europe that separates the German state of Saxony and the country of Bohemia.

The first silver ore here was discovered around 1168. Once the mining began they discovered there were enormous quantities of silver

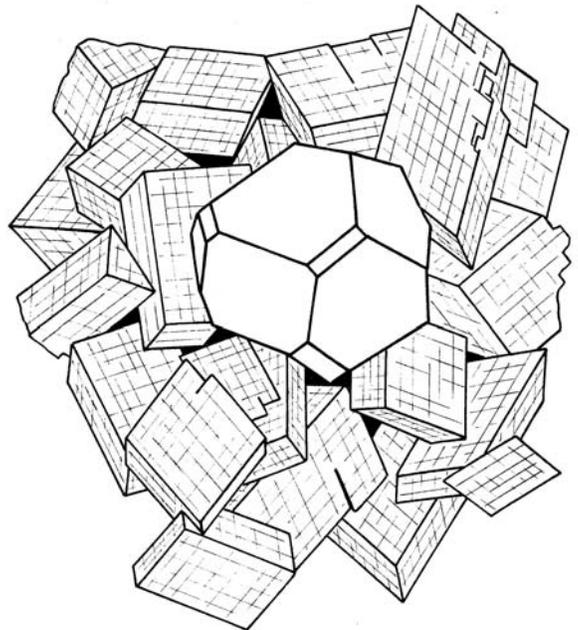
under ground. In the end, the mining was so extensive that the miners dug about 1250 miles of mine tunnels! It is estimated that 8000 tons of silver were mined in the Freiberg district.

Among the ore minerals discovered in the Erzgebirge were large clusters of native silver wires. Thick groupings of silver wires, like the one pictured here, are among the best that have ever been found anywhere in the world.

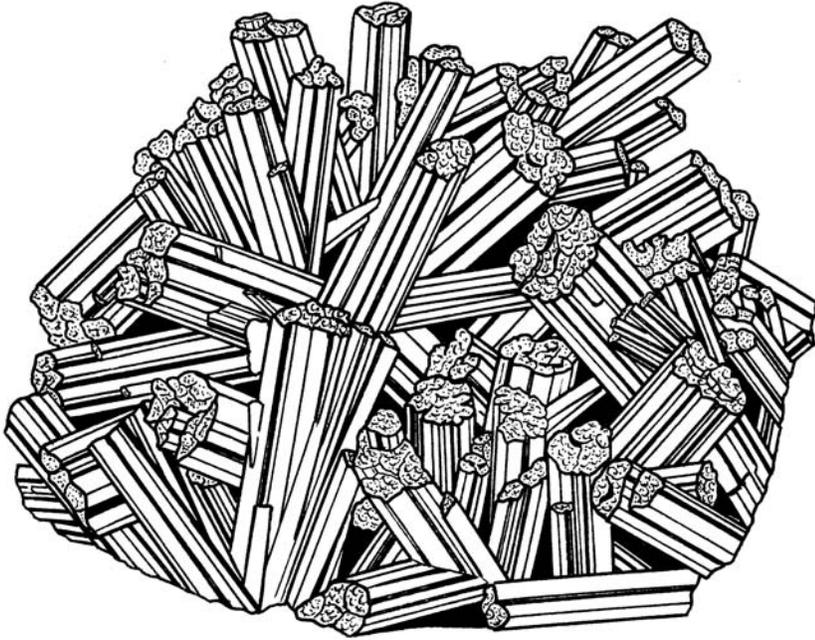
Galena on Siderite

from Neudorf, Saxony-Anhalt
Harz Mountains

The metallic galena crystals from this famous locality are a combination of the octahedral form (8-sided, diamond-shaped) and cubes. They sit on silky, light yellow-brown siderite crystals. The siderite crystals display a sharp rhombohedral shape.



More Minerals of Germany



Manganite from Ilfeld in the Harz Mountains

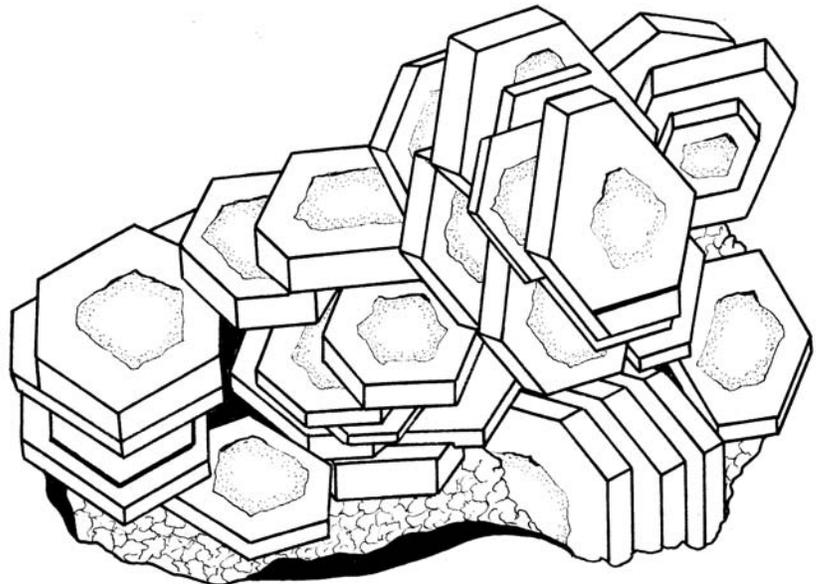
This bundle of dark, steel-gray manganite crystals is a fine example of these famous specimens from the Harz Mountains near the village of Ilfeld. The Harz mountains are the highest mountain range in northern Germany.

The Harz region has been mined for ores that contained silver, lead, iron and zinc. The region was also mined for copper, barite and coal.

Calcite

Sankt Andreasberg District, Harz Mountains

Pictured here is a grouping of pure white calcite crystals. Each individual crystal has a light gray section in the middle. Notice that they all have six sides which should be expected because calcite crystallizes in the hexagonal crystal system. This is one of the simplest crystal forms of calcite. Mineralogists have discovered that calcite crystallizes in over 600 different forms. You can see a dramatically different crystal shape for calcite on the pages of minerals from England.

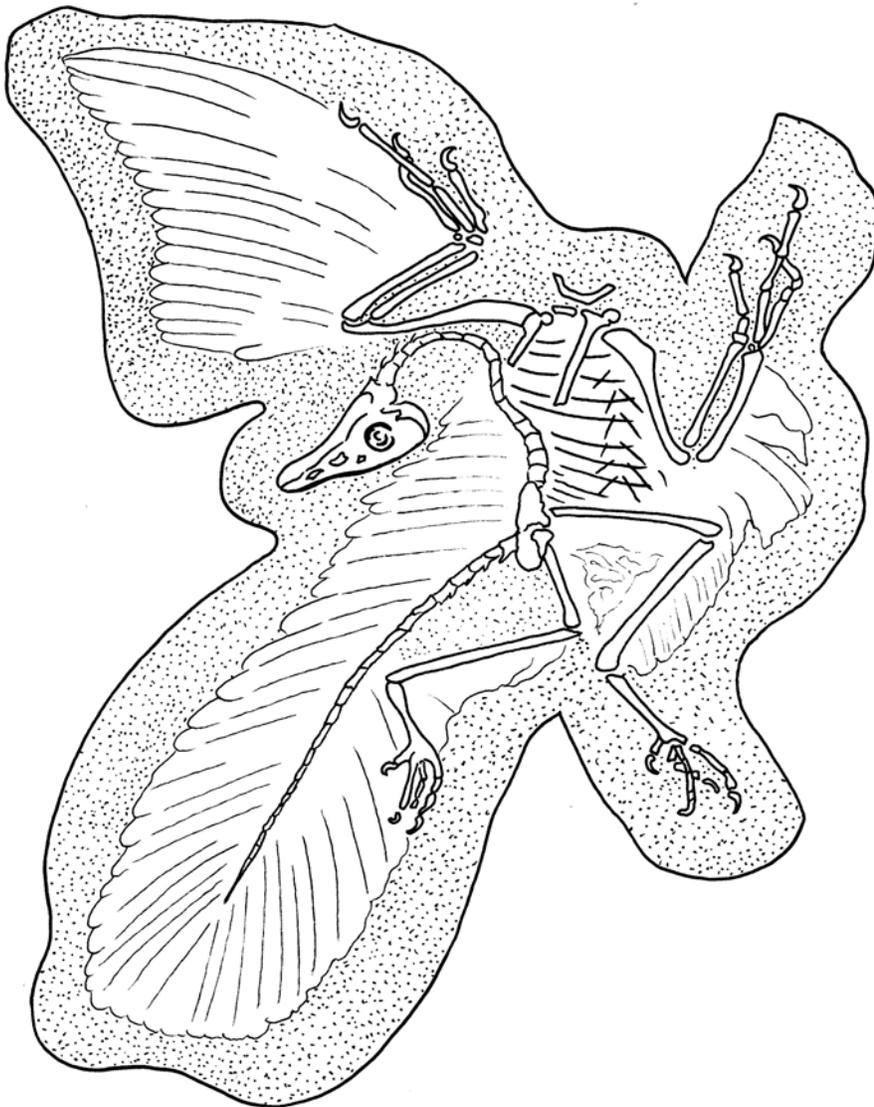


And One Famous Fossil from Germany

Archaeopteryx

Archaeopteryx is one of the most important fossils ever discovered anywhere in the world. The first - and most famous - complete archaeopteryx was discovered in 1860 in southern Germany. The name *archaeopteryx* comes from two Greek words that mean *ancient wing* (some say *feather* instead of *wing*). It could grow to be just over 1 1/2 feet long. Scientists believe that even though it had feathers and wings like a bird, it probably didn't fly like modern birds but rather glided through the air.

Even though it has feathers and wings like a bird, the archaeopteryx skeleton is actually more like a dinosaur! Its dinosaur-like features include its three fingers that have claws on them, including a "killing claw" used to dig into prey to kill it. Also, it has sharp teeth, and a long bony tail.

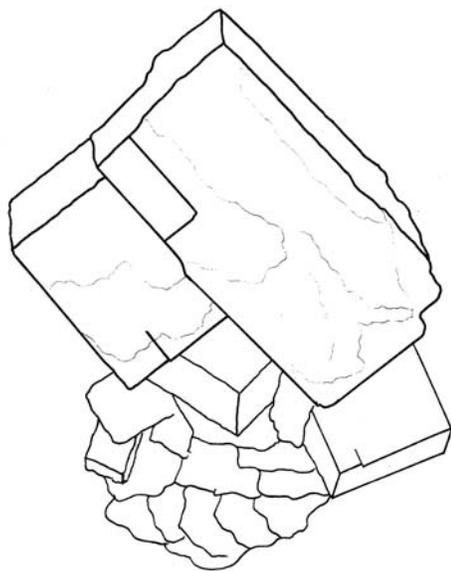


What makes this fossil so important is that it is believed to be a step in the evolution of dinosaurs into birds. That is why paleontologists called it a *transitional fossil*.

The first discovery was not of the entire fossil. It was of a single feather, found in 1860 by Christian Erich Hermann von Meyer in the world famous Solnhofen Limestone. There is now a total of eleven archaeopteryx fossil specimens. Some are complete and others are not.

Archaeopteryx lived in the Jurassic Period, approximately 150 million years ago.

HALITE



Salt. Without it, living organisms die. It is so important, and valuable, that the ancient Romans paid soldiers' wages with salt. It was called *sal* in Latin, the language of the Roman world. "Sal" is the root of our English word "salary." When you are paid for your work, you are receiving your salary. In other words, you are receiving valuable "salt" for the effort you gave. This is the origin of the phrase, "He is worth his salt!"

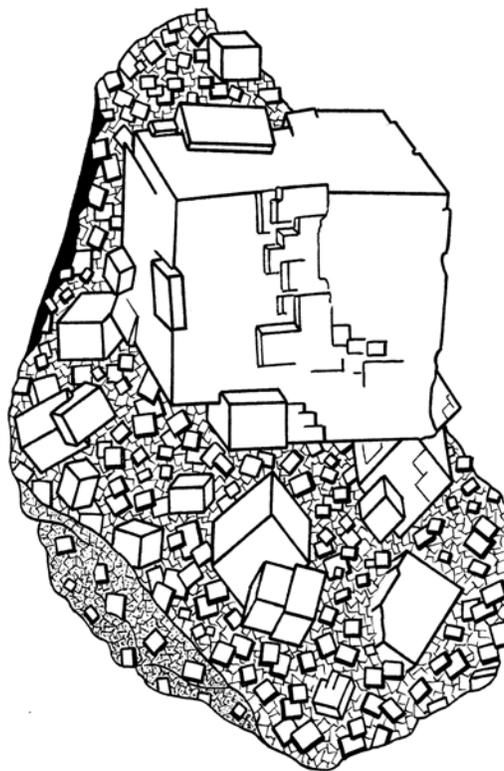
The Greek word for salt is *hals*. This is the origin of the mineral name for salt, *halite*.

Salt was very valuable for preserving food. It was so valuable that it was sometimes called "white gold."

Western Europe has a number of large, and very important salt mines which were mined for centuries for their "white gold" treasure.

Salzburg (in Austria) literally means "salt castle" or "salt fortress." Its name came from the fact that as salt was transported down the Salzach River, the barges would have to stop and pay a toll at Salzburg. Salt was mined in the town of Hallstatt, Austria. The sale of salt made Hallstatt's nobility very rich. Some historians believe that the very first salt mine was located near Hallstatt. In northern Germany, a region rich in salt deposits, there is a very old road that is known as "The Old Salt Route." In the Middle Ages, salt was transported by horse-drawn carts on this ancient road.

The specimen above (left) is a unique halite crystal. Pure halite, like the specimen to the right, is colorless. But this specimen has areas of dark blue in it. Scientists aren't sure what causes the blue color. Some believe the blue color comes from manganese. Others say natural radiation causes defects in the crystal lattice. Some even think it might be caused by gold.



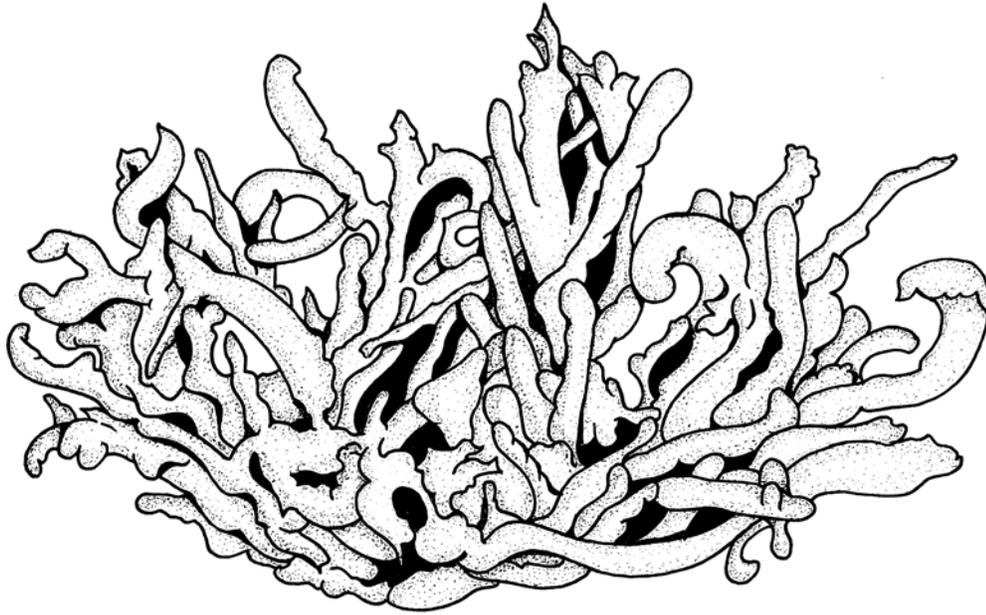
Above from Hattorf Potash Works, Phillipsthal, Hesse, Germany
Right from Hallstatt, Austria

Minerals of Austria

Aragonite ~ “Flos Ferri”

from Erzberg, Eisenerz, Styria

This specimen may look like coral. It is, however, the mineral aragonite. Aragonite has the same chemical formula as calcite, CaCO_3 . Minerals that have the same chemical



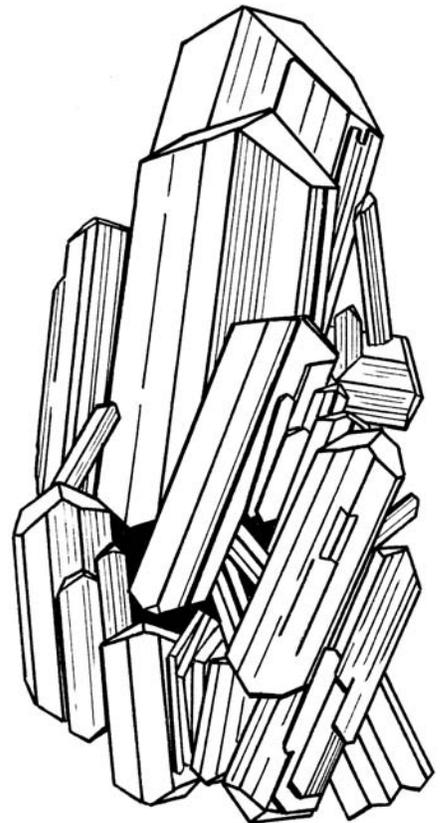
formula, but different crystal forms are called *polymorphs*. The specimen of aragonite pictured below is called Flos Ferri which literally means *Flowers of Iron*. This form was discovered and described for the first time in Styrian Erzberg, Eisenerz, Styria, Austria .

It was named “Flowers of Iron” because these aragonite specimens were commonly found in beds of iron ore. In Europe aragonite has also been discovered in Germany, France, Greece, Italy, Spain, Switzerland and England.

Epidote

from Knappenwand, Untersulzbachtal,
Salzburg

Sharp, glassy, dark grass-green, epidote crystals from the Alps in Austria can be found in important mineral museums all over the world. The Alps were created by the collisions of sections of the earth’s crust, called *tectonic plates*. The very high pressures and temperature of the collisions created metamorphic rocks and many wonderful mineral specimens like the epidote cluster seen here.



More Minerals of Austria



Wulfenite from the Bleiberg District, Karnische Alpen, Carinthia

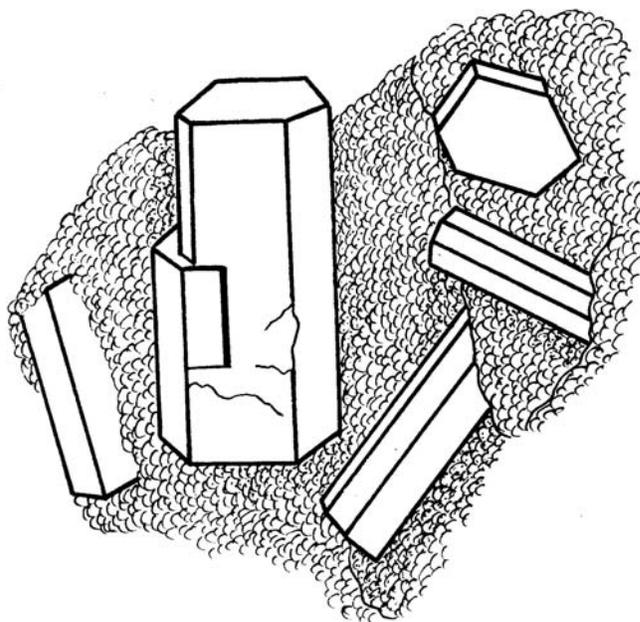
In 1845, wulfenite was described and named after the Austrian botanist, zoologist, and mineralogist Franz Xaver von Wulfen (1728-1805). Wulfen had written a small book about the lead ores that were found in Bleiberg, Austria. Wulfenite as a lead mineral was

an important part of his book. Pictured here is a cluster of very thin, yellow wulfenite crystals from the area that Wulfen himself studied.

Emerald on Biotite Schist from the Habach Valley, Salzburg

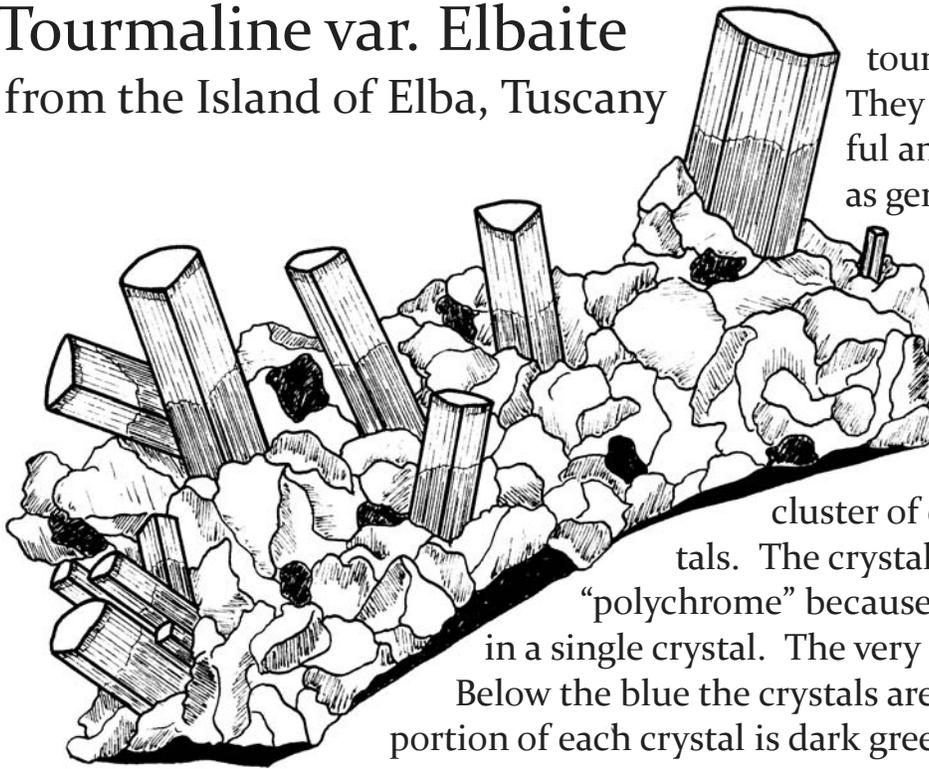
Today many of the finest emeralds come from Colombia. There was a time, though, that Salzburg, Austria was one of the world's more important emerald sources. The emeralds occur in a metamorphic rock called *biotite schist*. A *schist* is a rock that is composed of very small mica flakes. The location where these emeralds can be found is high in the Alps, over 2,000 meters above sea level.

Scientists have concluded that Salzburg emeralds were collected by the Celtic people as far back as 200 BCE (Before the Common Era). The emeralds were most likely used for trading with neighboring groups for goods they needed. Throughout the centuries, various peoples have collected and mined emeralds in the Habach Valley to make gemstones and jewelry. Today the mining area is owned by a family that mines emeralds for cutting rough.



Minerals of Italy

Tourmaline var. Elbaite from the Island of Elba, Tuscany



Elbaite belongs to the tourmaline group of minerals. They are hard, glassy and colorful and, therefore, are often cut as gemstones.

Colorful tourmaline crystals are known as elbaite because the first colorful tourmalines came from the Island of Elba. Pictured here is a

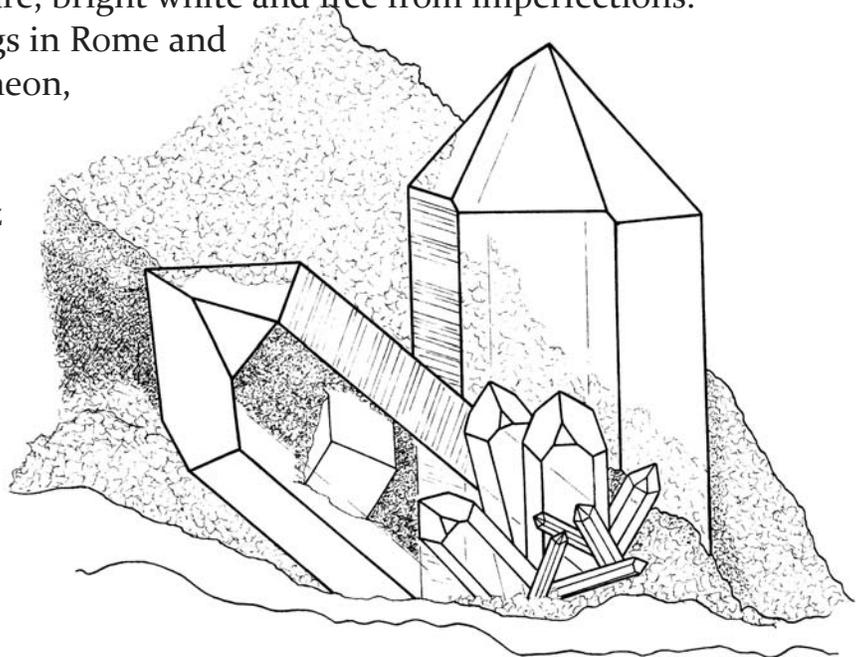
cluster of classic tourmaline crystals. The crystals are described as “polychrome” because they have “many colors” in a single crystal. The very top of each crystal is blue. Below the blue the crystals are pink. The darker, bottom portion of each crystal is dark green.

Quartz

from Carrara, Tuscany

Italy has some of the world’s most famous marble quarries. Carrara marble, from Carrara, Tuscany, is hard, pure, bright white and free from imperfections. Some of the most famous buildings in Rome and other famous cities, like the Pantheon, were built using Carrara marble.

It is possible to find perfectly clear, undamaged quartz crystals in Carrara marble. Here you can see a small quartz cluster in Carrara marble. Notice that you can see the marble right through the upright crystal. You can even see a dolomite crystal behind the tilted quartz crystal. These quartz crystals are as clear as window glass.

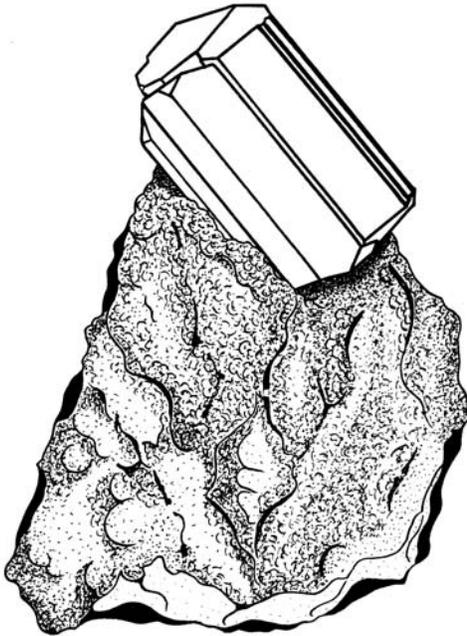


More Minerals of Italy

Vesuvianite

from Bellecombe, Aosta Valley

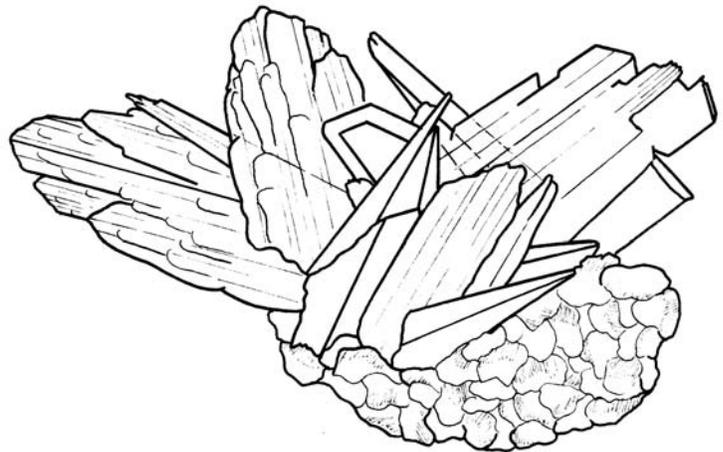
One of the most famous volcanoes in the world is Mt. Vesuvius near the town of Naples in the province of Campania. In the year 79 CE, Mt. Vesuvius violently erupted and destroyed the cities of Pompeii and Herculaneum. The mineral pictured to the left is called *vesuvianite*. It is named after Mt. Vesuvius where it was first discovered. It can be green, brown, yellow or blue. This specimen is actually two complex crystals that have grown together. This particular crystal cluster is very dark - nearly black.



Gypsum on Sulfur

from Agrigento, Sicily

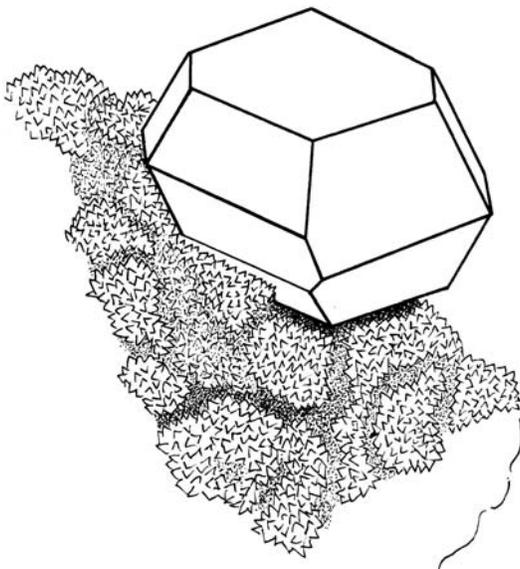
Excellent specimens of sulfur and other minerals can be found on the Italian island of Sicily. Pictured here is a wonderful specimen of perfectly clear gypsum crystals on bright yellow massive sulfur. It was discovered at the Cozzodisi Mine, Casteltermini, Agrigento, Sicily.



Sulfur on Aragonite

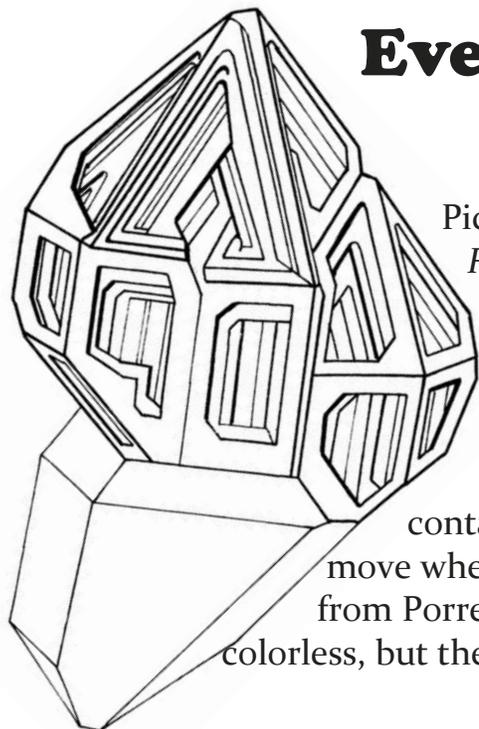
from Sicily

Pictured to the left is an excellent sulfur crystal on drusy aragonite crystals. "Drusy" refers to a matrix or bed of hundreds of very small crystals. Fine, undamaged sulfur crystals are very special. It is a very soft mineral. It also is easily damaged by heat. In fact the heat from your finger is enough to make the surface of a sulfur crystal crack! Fine sulfur crystals, like these from Sicily, are very special because they have survived.



Even More Minerals of Italy

Quartz from Bologna



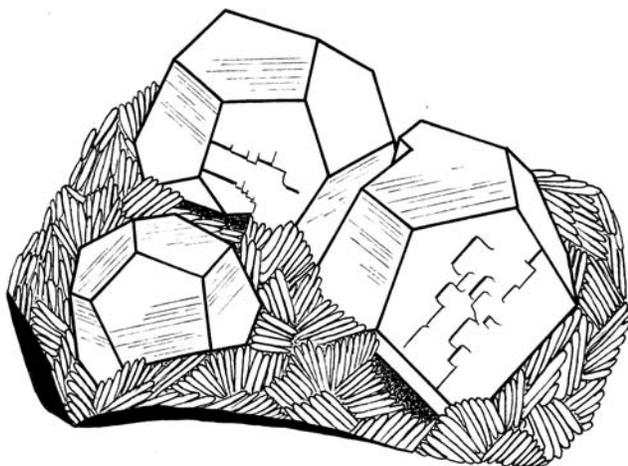
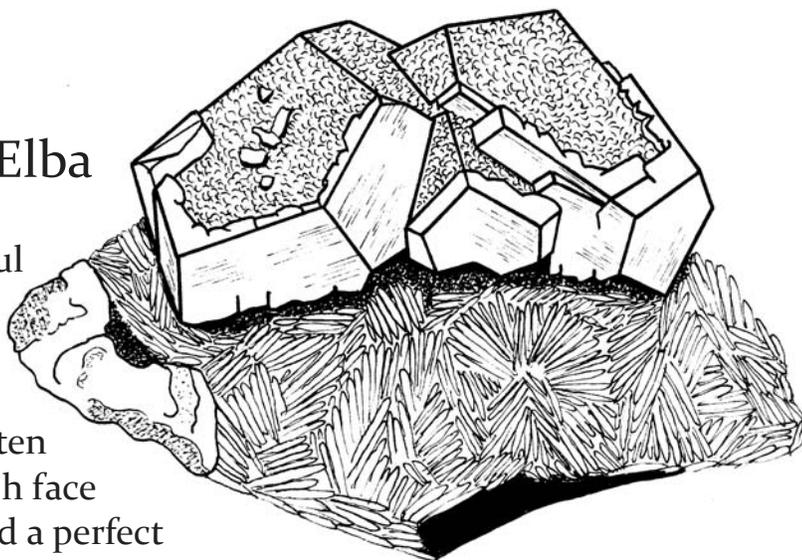
Pictured here is a very interesting mineral form known as *Fenster Quartz*. “Fenster” is the German word for “window.” It is also known as “skeletal quartz.” It forms when the edges of the crystal faces grow at different rates than the faces. The result is that each face has overgrown edges and flat faces which create windows within the crystal. These windows can contain trapped water which can be seen as bubbles that move when the crystal is tipped back and forth. This specimen is from Porretta Terme, Bologna, Emilia-Romagna, Italy. It is mostly colorless, but the flat edges contain inclusions of light tan clay.

Pyrite

from the Island of Elba

The Island of Elba has many beautiful mineral species. Pictured here is a cluster of bright, metallic pyrite crystals sitting on a matrix of black hematite. The pyrite from Elba is often found in the *pyritohedron* form. Each face of the pyritohedron has five sides and a perfect crystal has 12 faces (like the specimen pictured below).

The long proper name for the pyritohedron is the *pentagonal dodecahedron*.

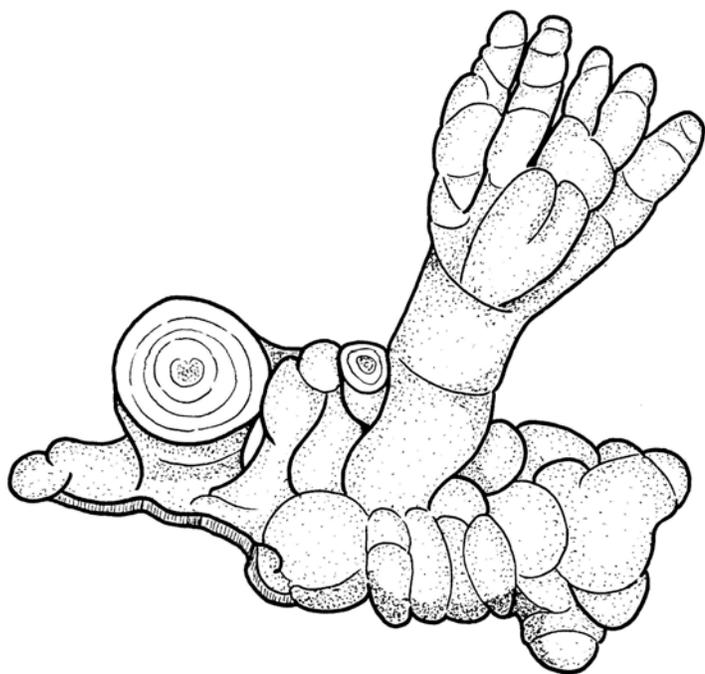


The specimen above has an interesting history. It started with pyritohedral crystals that were later covered with a layer of massive pyrite. Then, the front edges and faces were covered with another layer of bright, smooth pyrite. The matrix is a bed of intergrown hematite blades. Hematite was the most important mineral mined on the Island of Elba.

Yet More Minerals of Italy

Aragonite

from the Malfidano Mine,
Sardinia



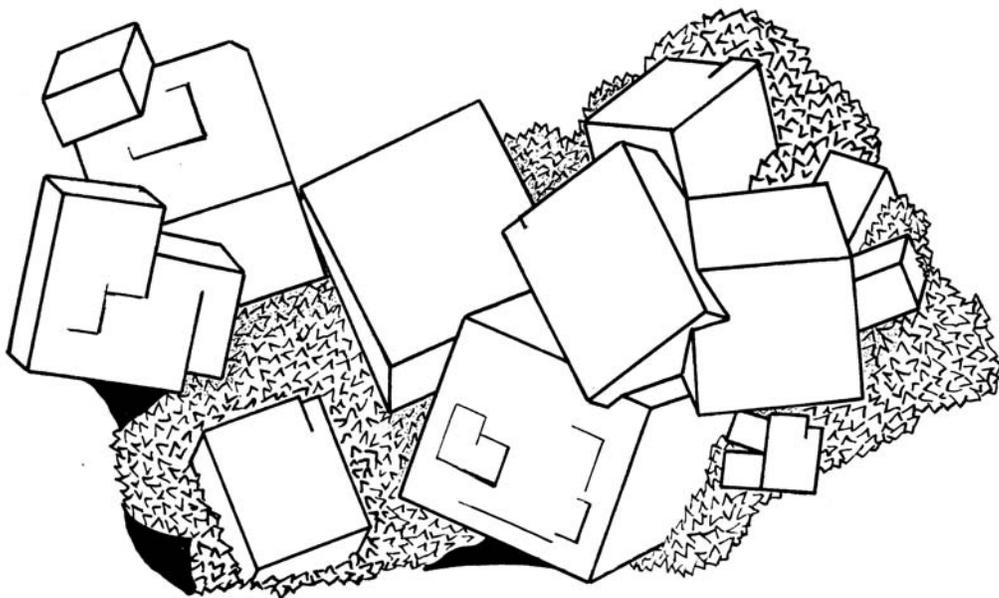
It's not often that you find a mineral in the shape of a hand. This specimen is included here because of its odd shape. It is white and shows the common botryoidal form of massive aragonite. "Botryoidal" means "grape-shaped."

If you want to collect minerals, raise your hand!

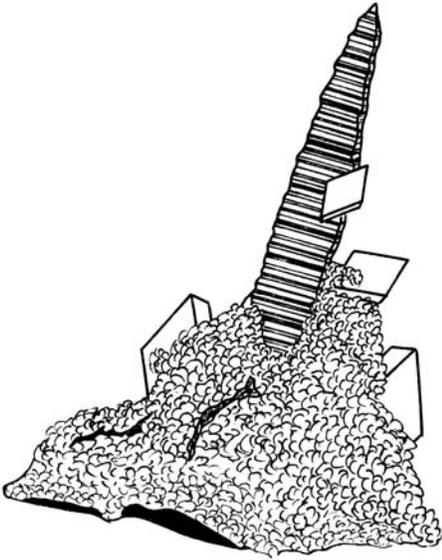
Fluorite

Beautiful, colorful specimens of fluorite can be found in many localities in Western Europe. You will discover some of them in this book and throughout the show. And the colors that can be found are like the colors of the rainbow. In Western Europe, fluorite can be colorless, pink, red, blue, purple, yellow, green and even a mixture of colors.

Pictured here is a grouping of gray-blue fluorite cubes on orange calcite. The orange color is a stain of iron oxide on the surface of the small calcite crystals. Octahedral crystals of light pink fluorite have also been found in Italy.



Minerals of France



Anatase

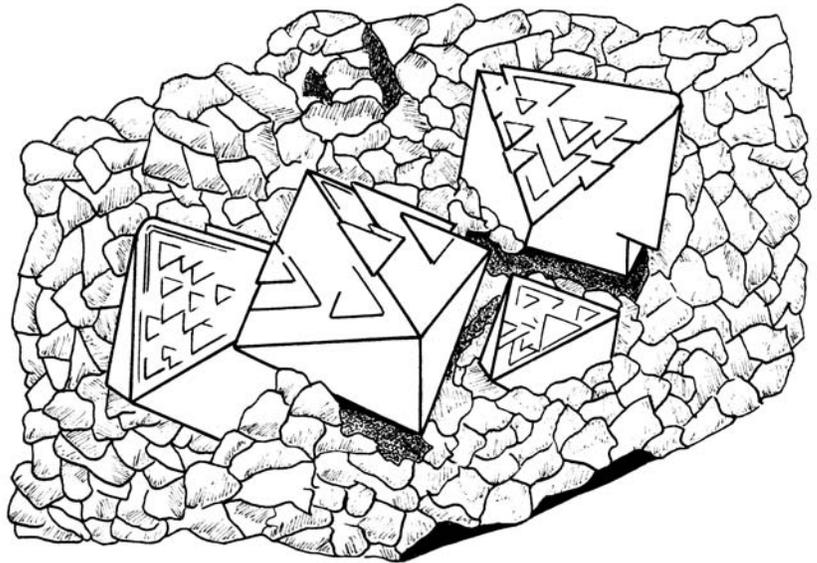
from La Lauzière Massif, Savoie,
Rhône-Alpes

Anatase is what mineralogists call a *secondary mineral*. In the case of anatase, minerals that contain titanium were deposited. Very hot waters dissolved these early minerals. The titanium and other elements in the hot waters then combined to form anatase. Anatase is indigo blue to black and has a steely luster.

Fluorite

from Pointe Kurz,
Haute-Savoie

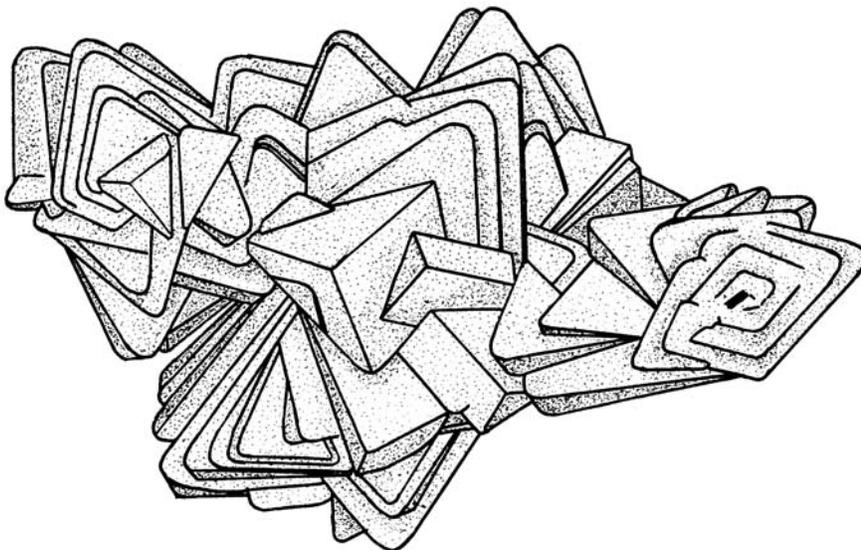
Fluorite is one of the most common minerals. Yellow, blue, and purple specimens are common. Pink fluorite, however, is very rare. To the right is a small cluster of pink fluorite crystals on white albite.



Sand Calcite

from Fontainebleau

There are two world-famous localities for sand calcite crystals. The Badlands of South Dakota and Fontainebleau, France. To the left is a fine, large cluster of sand calcite crystals. The sand grains were included in the calcite as the crystals grew. They are grayish-tan.



More Minerals of France

Siderite

from Allevard, Dauphine Region

Pictured here is a fine specimen of brown-green siderite crystals covered with “needles” of colorless quartz crystals. Siderite belongs to the calcite group of minerals. The other minerals in the calcite group include calcite, rhodochrosite, smithsonite, and magnesite. All calcite group minerals crystallize in the *trigonal* crystal system (which is a category of the *hexagonal* crystal system). They all have rhombohedral cleavage and all have

similar chemical formulas.

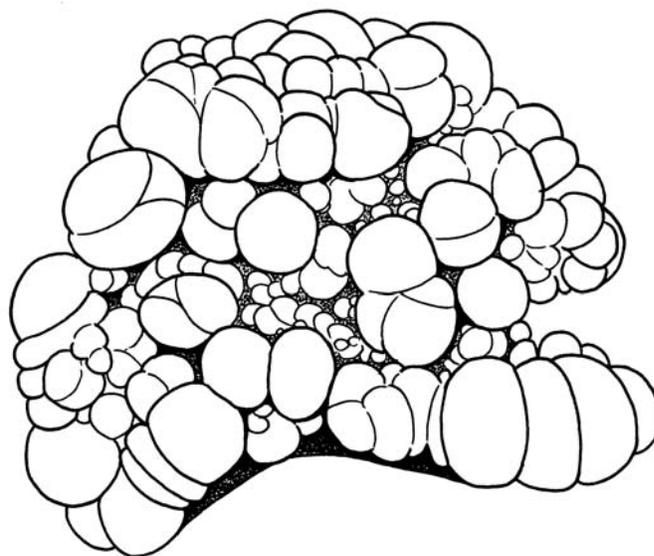
For the chemists out there, here is a comparison of the chemical formulas of the different Calcite Group minerals. Right away you will see why they are so similar.

Calcite	CaCO_3
Rhodochrosite	MnCO_3
Smithsonite	ZnCO_3
Magnesite	MgCO_3
Siderite	FeCO_3

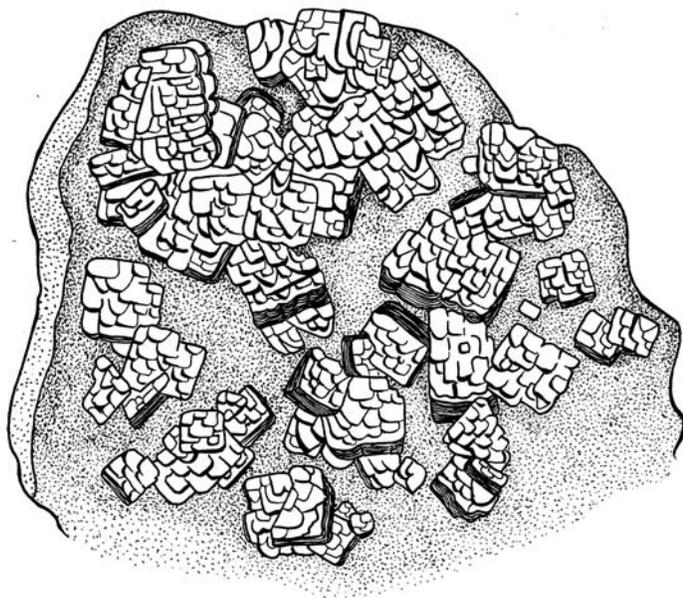
Goethite

from La Kaymar, Lunel, Aveyron

The name siderite comes from the Greek word for iron, *sideros*. When siderite is chemically altered it turns into iron oxide minerals. One of these minerals, goethite, is pictured here. It is purple-gray and has a dull luster. Siderite can also undergo a chemical change into *limonite*. Limonite is technically not a mineral. It is a mixture of iron oxides and does not form crystals.



Yet More Minerals of France



Autunite

from Autun, Saône-et-Loire, Burgundy

Autunite was first discovered in 1852 near Autun, France, after which it was obviously named. It is a yellow-green mineral that contains the radioactive element, uranium. As a result, autunite specimens are also radioactive. When found in very large quantities, autunite can be an ore of uranium.

Autunite is often found in small “books” or layers of crystals, like the ones pictured here. The crystals can be very fragile and are easily broken.

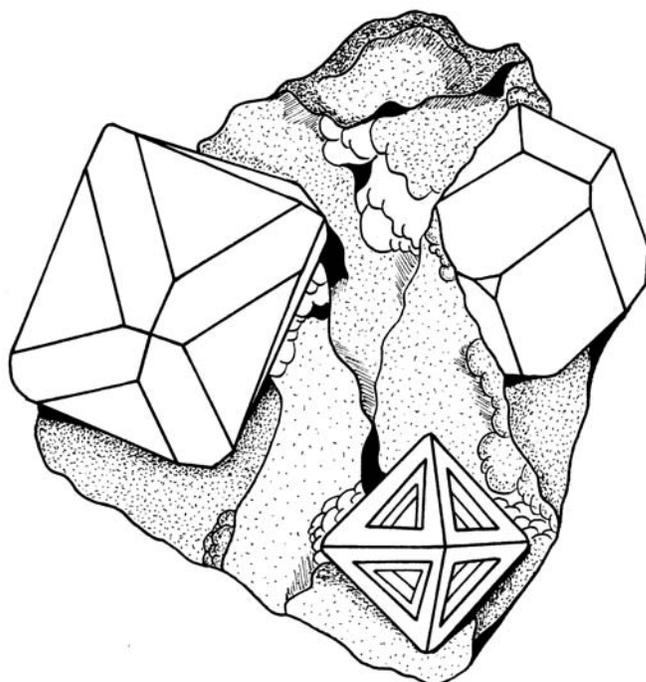
Azurite & Malachite after Cuprite

from Chessy-les-Mines, near Lyon

The copper deposits in Chessy-les-Mines were first mined in the Middle Ages. They were mined until 1875. In 1811 miners opened up a section of the mine that they called “The Blue Mine.” In this section were vugs filled with azurite that were so big a miner could actually walk into them!

Many copper minerals have been recovered from this famous mine. Azurite, cuprite, malachite, chrysocolla, cuprite, covellite and bornite are some of the copper minerals discovered here.

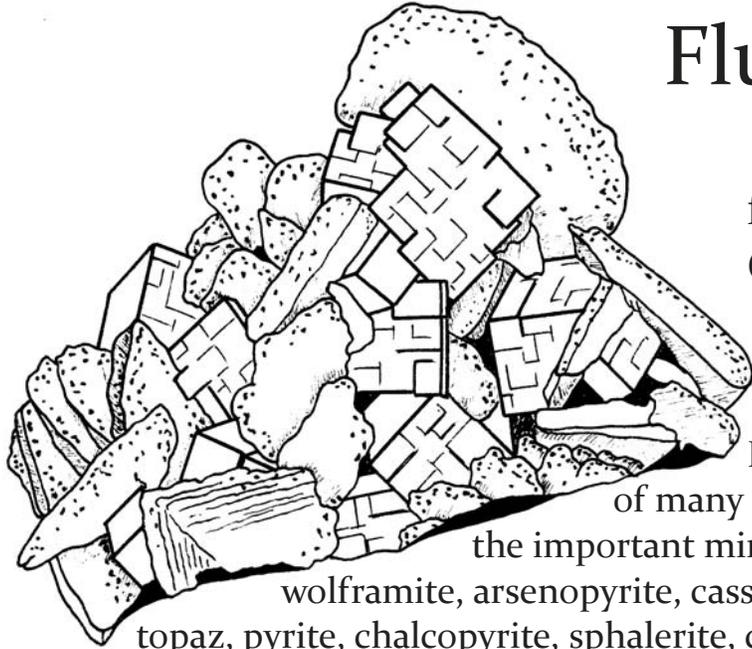
Pictured here are green crystals in blue azurite matrix. The crystals are *pseudomorphs* which means *false forms*. They were originally cuprite, and they still have the shape of cuprite crystals. But, their composition has changed and they are now malachite!



Minerals of Portugal

Fluorite on Siderite

with Arsenopyrite
from the Panasqueira Mine,
Covilhã, Castelo Branco



The Panasqueira Mine is one of the largest tungsten mines in the world. It has produced excellent specimens of many different mineral species. Among

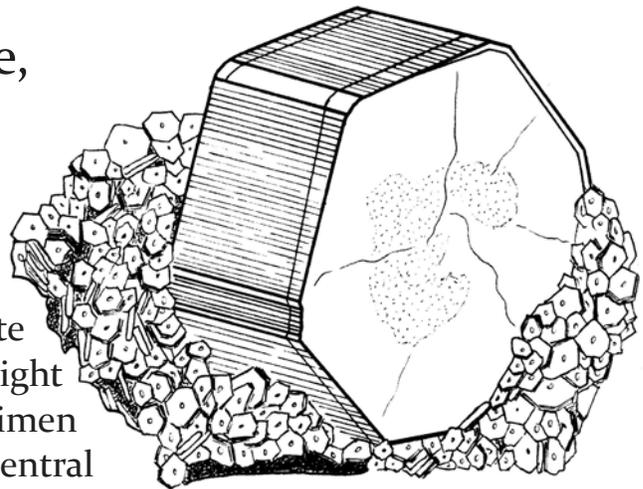
the important minerals found in this mine are

wolframite, arsenopyrite, cassiterite, tourmaline, muscovite, topaz, pyrite, chalcopyrite, sphalerite, calcite and fluorapatite (featured below). Pictured here is a colorful and beautiful specimen with deep purple fluorite cubes sitting on yellow-brown siderite “blades.” The siderite is sprinkled with tiny crystals of arsenopyrite.

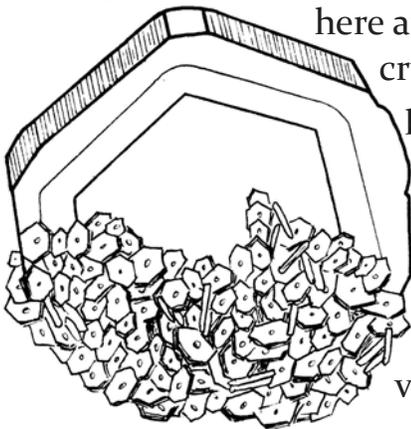
Fluorapatite

from the Panasqueira Mine,
Covilhã, Castelo Branco

One of the most famous, and most colorful, mineral species found at the Panasqueira Mine is fluorapatite. Pictured here are two fluorapatite crystals. They are light purple. The specimen to the left has a central area that is light yellow with a purple edge!



The name *fluorapatite* is a special name for a mineral that used to be known simply as *apatite*. The “fluor-” portion (which is called a *prefix*) means that this is the variety of apatite that has the element fluorine in it.



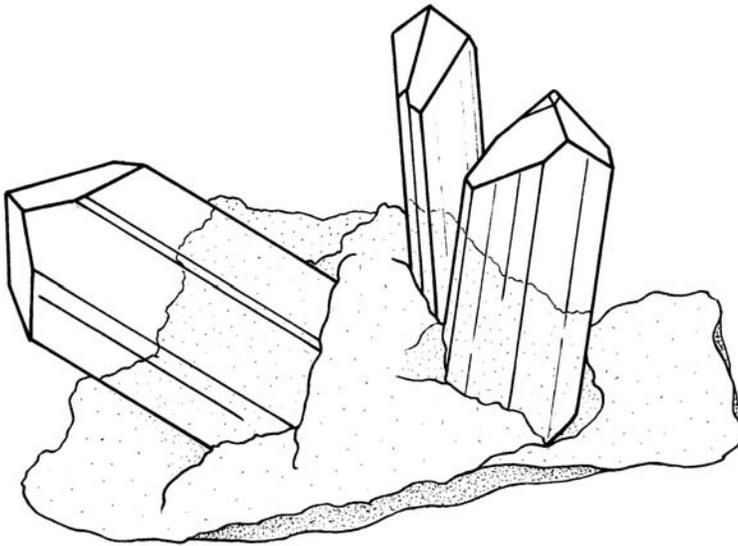
Minerals of Spain

Gypsum

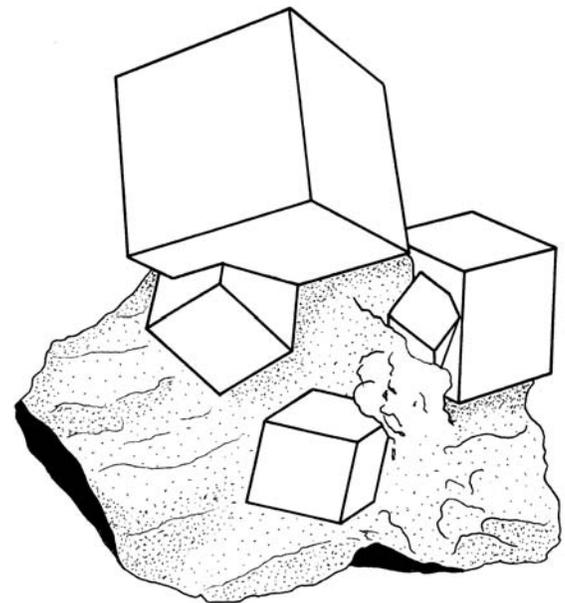
from Fuentes de Ebro,
Zaragoza

Pictured to the left is a small cluster of the perfectly water-clear gypsum crystals. The crystals sit on pure white, sparkling alabaster.

Alabaster is a fine-grained, translucent variety of gypsum. This specimen teaches about the words



used to describe the ability for light to travel through a mineral. When you can see through a mineral, it is described as *transparent*. When you can see through a mineral, but it is like looking through fog, it is described as *translucent*. When you can't see through a mineral at all, it is described as *opaque*. This one specimen is both transparent and translucent.

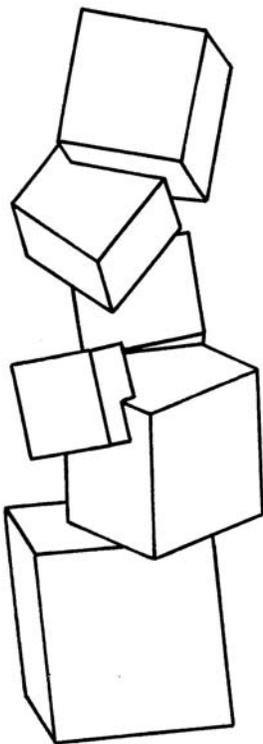


Pyrite

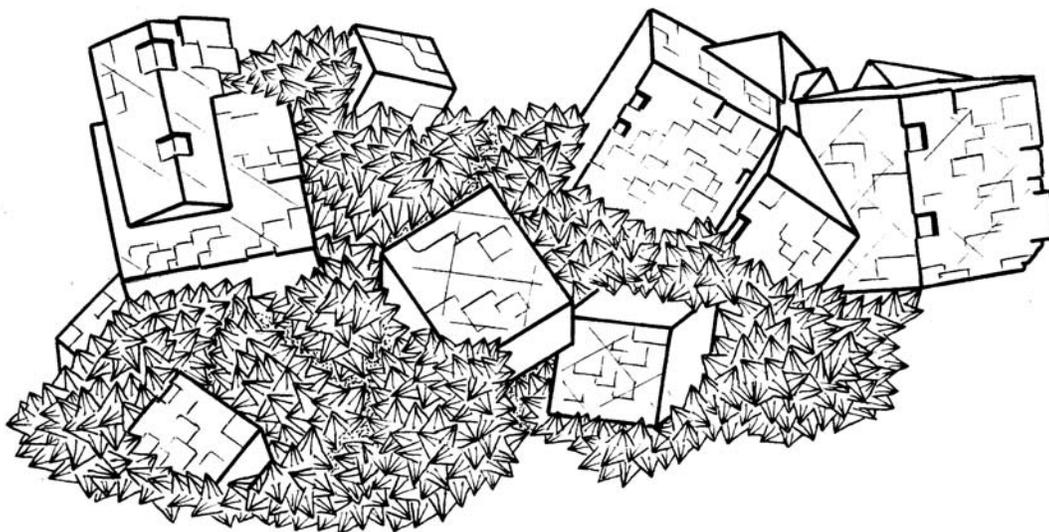
from Navajún,
La Rioja, Logroño Province

The two specimens pictured here are pyrite cubes. Of course they are opaque: you cannot see through them. However, light reflects from them very easily.

These specimens are world-famous for their spectacular shape and beauty. They are perfect cubes. They are also perfectly flawless. The best specimens have smooth faces that shine like mirrors. Large crystal clusters from this famous locality (like the specimen pictured to the left) can look like a stack of shiny, brass-yellow mirrors. Many visitors to mineral shows see these fantastic specimens and say, "These aren't natural, are they?" Yes, indeed, they are very natural.



More Minerals of Spain



Fluorite on Quartz

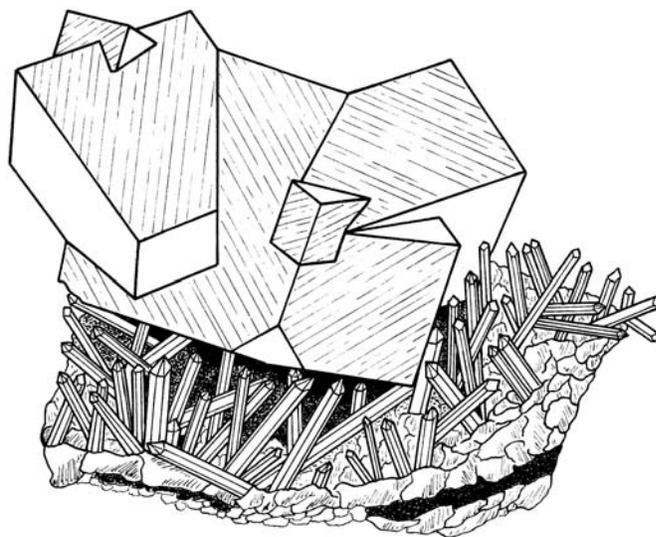
from the La Viesca Mine, Asturias

Pictured above is a beautiful specimen of bright, light blue fluorite crystals sitting on white quartz crystals. At the La Viesca Mine where it was found, the fluorite crystals can be colorless, shades of blue through purple, and sometimes even black. The specimens are usually cubes, but sometimes they form more complex crystals. Look at the cubes pictured above. Notice that small cube faces have formed on the larger cube faces. The fluorite cubes from La Viesca Mine can be as large as one foot across! Other minerals are also found at La Viesca Mine. In addition to fluorite and quartz, crystals of calcite, dolomite, sphalerite, pyrite, galena, and chalcopyrite are often seen.

Dolomite on Quartz

from Eugui, Navarra

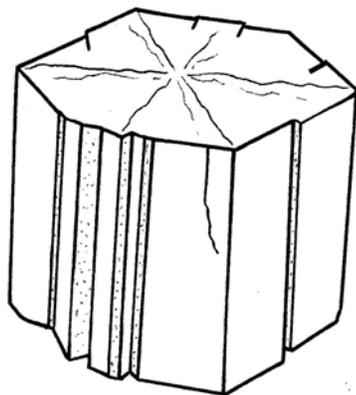
This special locality in Spain has produced some of the best dolomite crystals and crystal clusters found anywhere in the world. These crystals are unique because many of them are colorless! Usually dolomite is white or pink. It can also be brown or red.



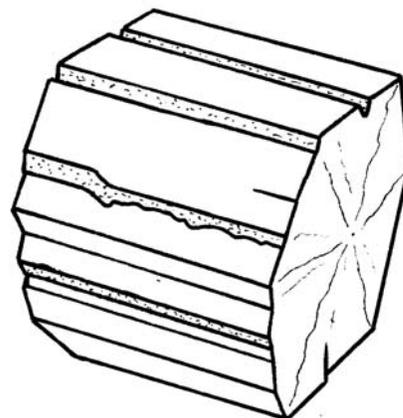
More Minerals of Spain

Aragonite

from Molina de Aragon, Castilla-Leon

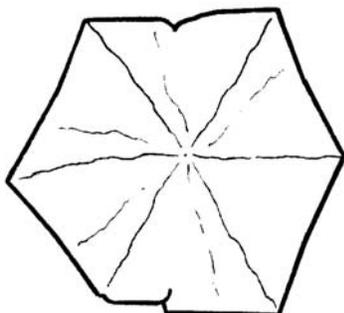


The mineral aragonite was named after the Aragon region of Spain where thousands of unique, twinned aragonite crystals have been found. (Do you remember seeing other forms of aragonite in this book?)



Aragonite crystallizes in the *orthorhombic* crystal system. Looking at these pictures, though, you might think that aragonite crystallizes in the *hexagonal* crystal system because of the six-sided crystals. Mineralogists call these *pseudohexagonal* meaning *false hexagonal*. What

has actually happened is that three individual crystals have grown together into this single form. Mineralogists call them *trillings*.



Many of these crystals are white or gray from inclusions in the crystal. Sometimes they can also be a light purple or even rust-red.

Minerals of Finland

Beryl var. Heliodor

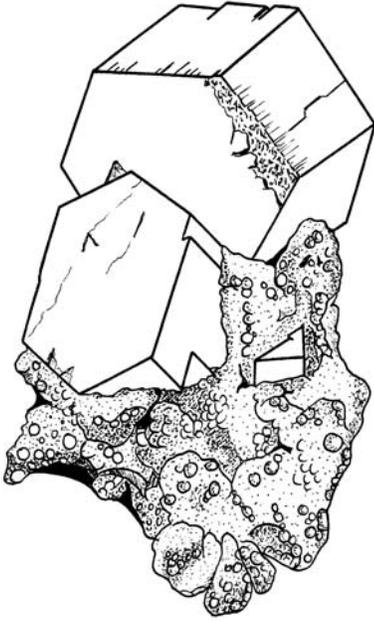
from the Karelia Beryl Mine, Luumäki

Heliodor is the yellow variety of beryl. Like all beryls, heliodor usually forms six-sided (*hexagonal*) crystals, like the emeralds from Austria that you can find elsewhere in this book. The heliodor crystal pictured here is gem-quality, light yellow, glassy and clear.



Minerals of Sweden & Norway

Pyrosmalite from Nordmark, Sweden



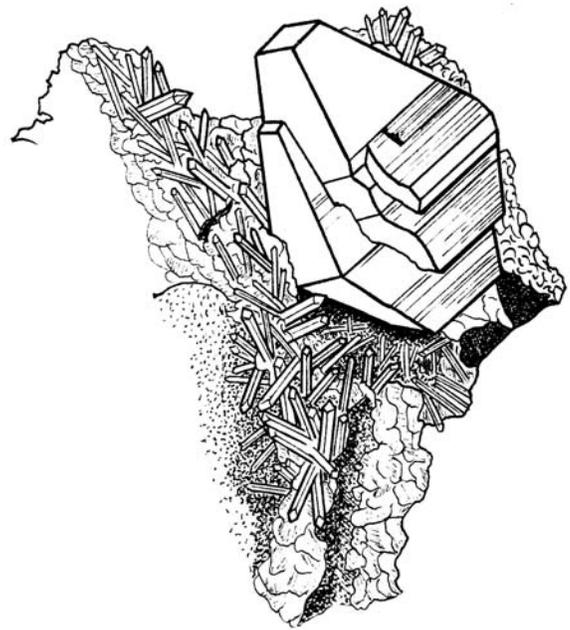
To the left is a crystal cluster of the rare mineral pyrosmalite. This species was first discovered at the Sterling Mine, Sterling Hill, Ogdensburg, New Jersey. However, some of the best crystallized specimens come from Sweden. Its color is pale brown to tan. It can also be green to nearly black.

Anatase

from Hordaland, Norway

To the right is an excellent specimen of anatase on small quartz crystals. This specimen is presented as a rather large crystal here. The actual specimen after which this picture was created is only 1.7 centimeters tall. That is less than one inch!

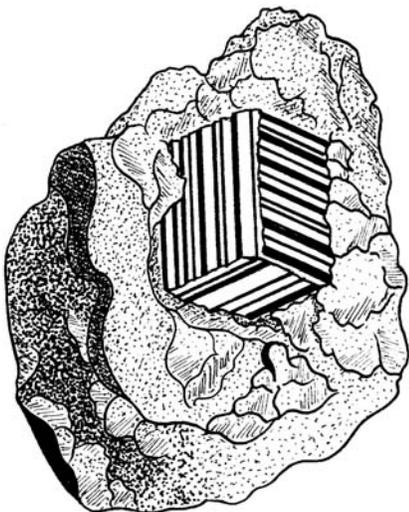
Anatase is a rare, titanium mineral. Three different minerals have the same formula, TiO_2 (titanium dioxide). The other two are brookite and rutile. When two or more minerals have the same chemical formula but different crystal forms, mineralogists call them *polymorphs*. The color of this specimen is purple-blue to black.



Smaltite

from Tunabergs, Sodermanland, Sweden

Smaltite is a variety of the rare mineral skutterudite. It is found in veins with ore minerals of silver, copper, cobalt and nickel. Its color is steel gray. Smaltite is nickel and cobalt ore. Usually it is massive but also form crystals. Some excellent smaltite crystals have been found in Sweden. Pictured here is one of the largest, best-formed smaltite crystals ever found anywhere in the world.



More Minerals of Norway

Silver

from Kongsberg, Norway

One of the most famous localities for silver in Europe is Kongsberg, Norway. For over 330 years, the mines of Kongsberg produced some of the most spectacular native silver specimens found anywhere in the world at any time. Pictured here is one of those world-class specimens. Notice that it is a cluster of thick, intergrown, curling bundles of individual silver wires.

The Kongsberg mines first opened in 1623 and remained in operation until 1958. There is a story (probably it is a legend) that in July of 1623, two young children, Helga and Jacob, were caring for their cattle on a local hill. An ox kicked at the ground which revealed something metallic and shiny. They took the “rock” home to their father who knew immediately that they had discovered silver. In time the King of Norway, Christian IV, got word of this important discovery and founded the town of Kongsberg (which means *King’s Mountain*) in order to mine the silver discovered there.

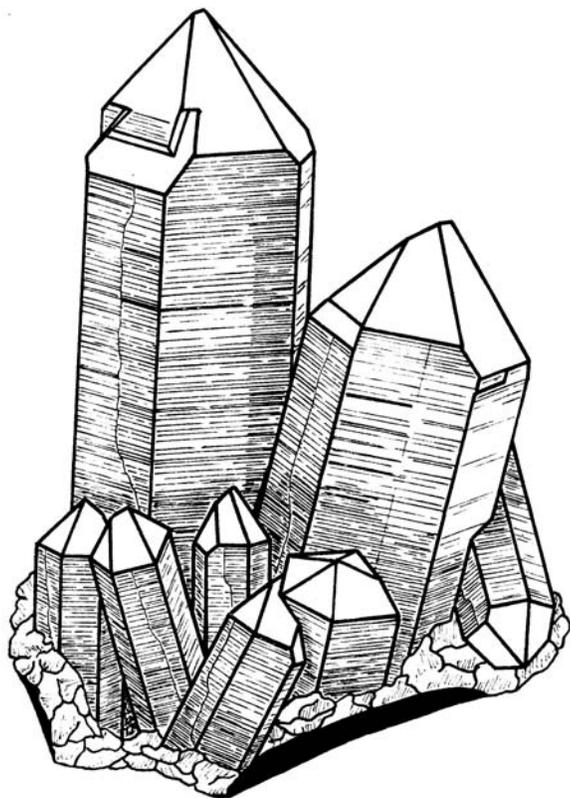
There are over 80 different mines in the Kongsberg mining district. Thousands of feet of tunnels were dug in the mines over its history. The King’s Mine is the largest of the silver mines. The bottom of the mine is 3510 feet below the surface. In their 330 year history, the silver mines of Kongsberg produced 2.8 million pounds of silver. That is 1400 TONS of silver! What makes this mining district even more interesting is that the silver mined there was mostly *native silver* and not silver ores. Late in the 1700s, over 4000 miners worked in the Kongsberg mines.



Minerals of Switzerland

Quartz

from Galmihorn, Wallis



The country of Switzerland (which is officially called the Swiss Federation) is a small country in the middle of Western Europe. The most important geographic feature of Switzerland is the beautiful mountain range called the Alps. In vugs and cracks high in these beautiful mountains, strahler seek and remove fine mineral specimens. Strahler are mineral collectors that specializes in finding and removing mineral specimens in the Alps. On the

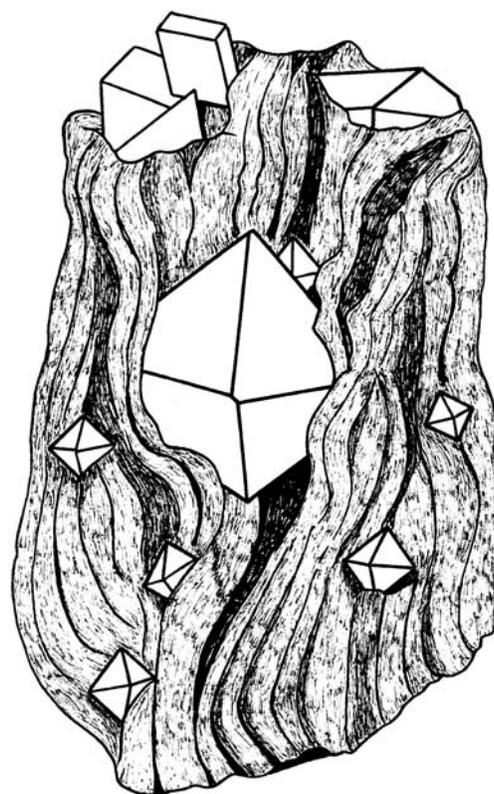
following pages you will discover only a few of the amazing crystallized minerals that can be found in the Alps of Switzerland.

Above is a crystal cluster of smoky quartz crystals. Some smoky quartz crystals are black. These crystals, however, are a deep chocolate-brown! They are also perfectly transparent. These gemmy, clear quartz crystals have long been found in the Alps and are a favorite of collectors.

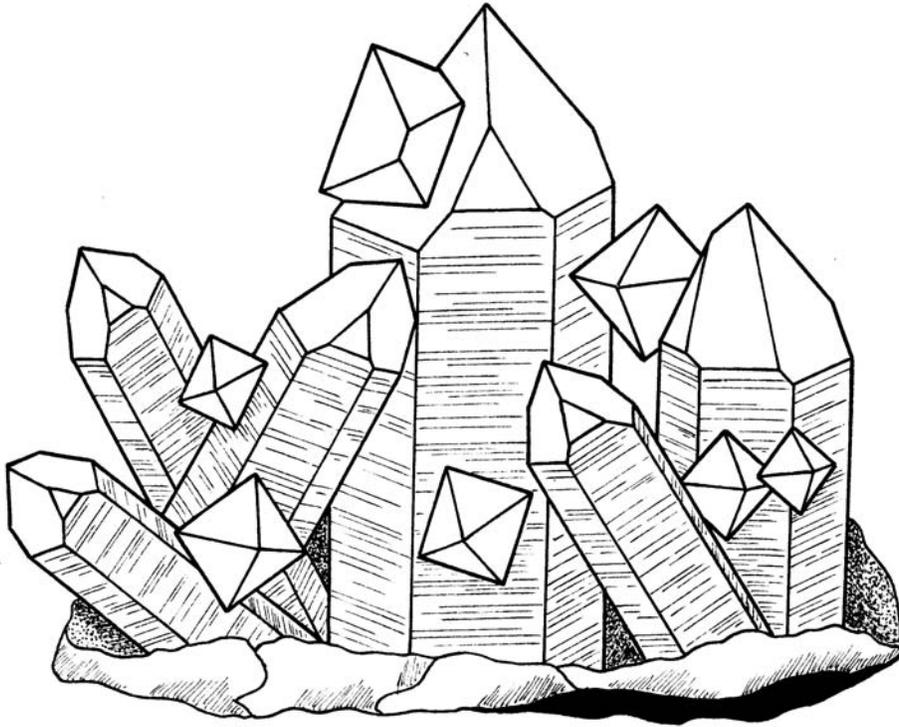
Magnetite

from St. Gotthard

To the right is a specimen with magnetite crystals in mica schist. Mica schist is a metamorphic rock that is composed of small flakes of mica. (“Metamorphic” rock is the category of rock that has been formed by great heat and pressure deep in the earth’s crust.) The flakes of mica, as you can see in this drawing, are lined up and form foliation. Magnetite is iron oxide. It is naturally magnetic. At the top of the specimen you can see white dolomite crystals to the left and smoky quartz to the right.



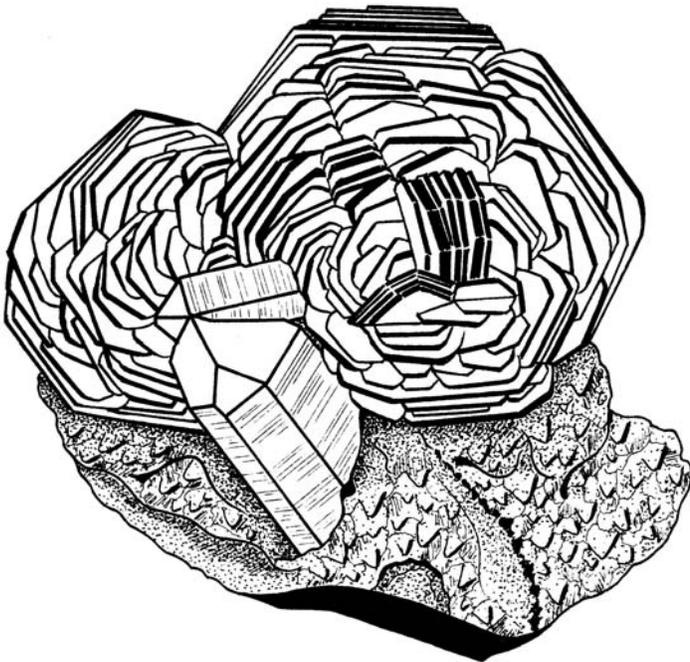
More Minerals of Switzerland



Fluorite on Quartz

from Goscheneralp, Canton Uri

One of the rarest and most desired species is pink fluorite from Switzerland and France. Many world-class specimens of octahedral pink fluorite crystals sitting on black smoky quartz have been found in Switzerland. Pictured above is a “dream” specimen of a cluster of many perfect smoky quartz crystals sprinkled with pink fluorite octahedra.



Hematite

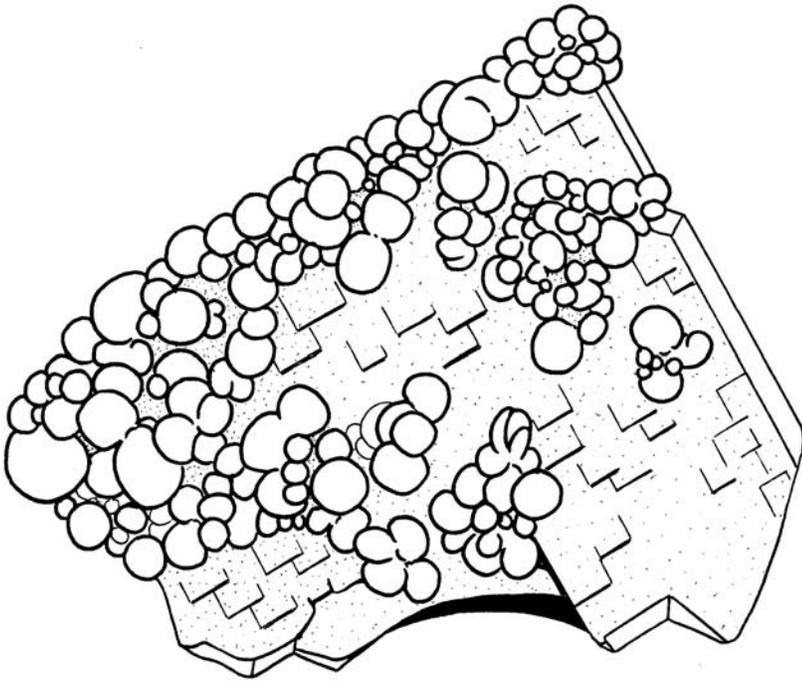
from Fibbia, Tessin

Here are two clusters of hematite crystals that have grown in a form that resembles two flowers, side by side. In German this form is called *Eisenrose* which means “Iron Rose.” English-speaking mineral collectors also call these crystal forms “Hematite Roses.” This specimen also has two quartz crystals.

Minerals of Greece

Smithsonite on Fluorite

from the Agia Varvara Mines, Lavrion, Attiki



The specimen pictured to the left is botryoidal (grape-shaped) light green smithsonite on grayish-white fluorite.

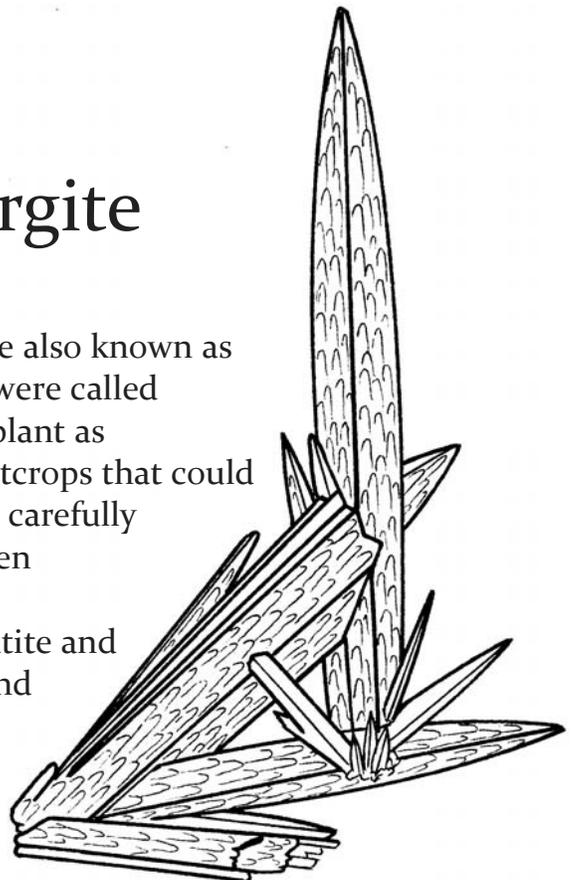
The Lavrion mining district (also known as Laurium) was mined for silver in ancient Greece. Throughout the centuries, many important mineral

deposits have been discovered and mined in the Laurium District. Over 300 different minerals have been discovered in Laurium including common minerals like fluorite, adamite, silver, malachite, azurite, aragonite, magnetite, and galena. Many very unusual minerals have also been found at Laurium including mawbyite, austenite, duftite, and takovite, to name only a few.

Quartz with Hedenbergite from Seriphos Island

Green quartz crystals from Seriphos Island are also known as *prasem quartz* or simply *prasem*. At one time they were called *leek quartz* because they look as much like a green plant as they do a mineral. They were recovered in small outcrops that could be found at low tide. Crystal collectors had to work carefully and quickly in order to collect the crystals. The green coloring comes from inclusions of hedenbergite.

Serifos Island was mined for iron ores. Hematite and goethite are two of the important iron minerals found on Serifos. Other collectible minerals are garnet, copper, hedenbergite, calcite, barite and fluorite.



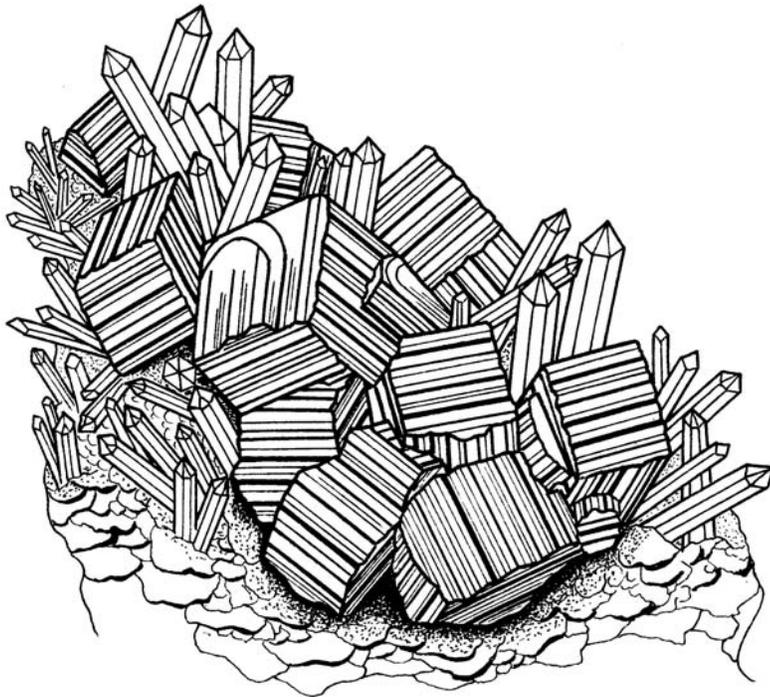
More Minerals of Greece

Pyrite

from the Maddem-Lakkos
Mine, Macedonia

You have seen different pyrite specimens from Europe in this book. The bright, shiny cubes from Spain are nearly flawless and mirror-like. The pyrites from the island of Elba in Italy crystallize in the pentagonal dodecahedral form. In the case of pyrite, crystals can form in a combination of two or more forms. You can see the deep lines (called *striations*) in these pyrite crystals. As these crystals

formed, there was an alternation between the formation of a cube and then a pentagonal dodecahedron and then the cube and then the pentagonal dodecahedron. When this alternation happens over and over and over again, the crystals develop the striations that you see in this excellent specimen.



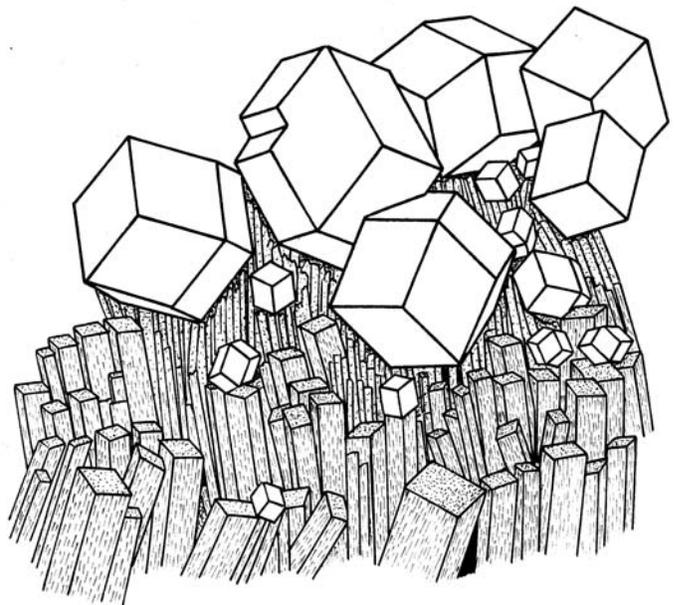
Garnet with Hedenbergite

from Seriphos Island

On the previous page you learned about the many minerals found on Seriphos Island. Pictured here are some superb orange-red andradite garnets sitting on green hedenbergite crystals.

Mineralogists call these 12-sided crystals *dodecahedral* which means *12 faces*.

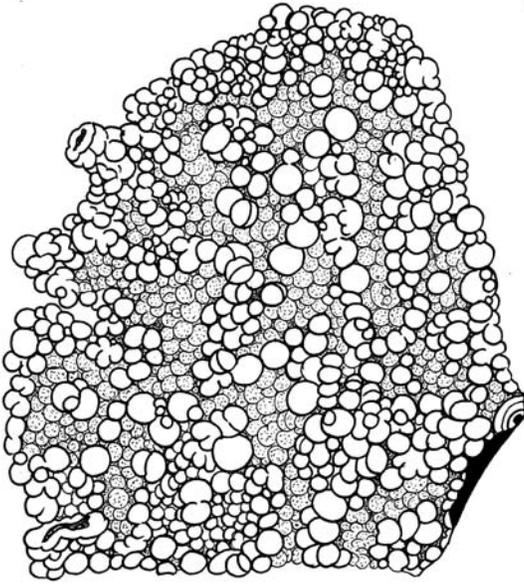
Minerals were mined on Seriphos Island by the ancient Romans. The mines closed for many centuries, but were eventually reopened by a company from Germany in the early 1800s.



More Minerals of Greece

Glaucocerinite

from Lavrion



The mining region known as Lavrion (also, Laurion) has produced minerals and mineral specimens for centuries. It is near the city of Athens. Rich deposits of silver were mined there. The silver deposits were first discovered in 483 BCE. The silver was used to mint coins. The revenues from these mines made Athens one of the wealthiest cities in the world at that time.

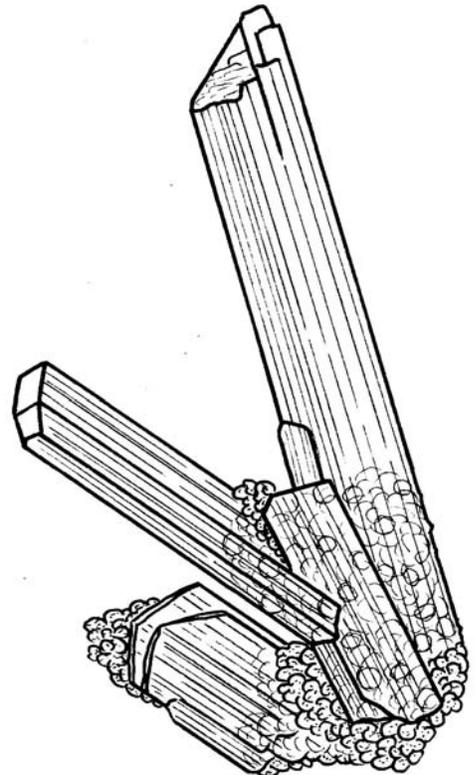
The mines of Lavrion were closed over 1500 years ago. In 1859 they were worked again, this time for other metals like lead, cadmium and manganese. In 1982, the mines were closed because all of the valuable ores had been removed.

Literally hundreds of different mineral species have been found at Lavrion. Pictured above is a rare mineral called glaucocerinite from the Serpieri Mine. Glaucocerinite is a turquoise blue-green mineral that forms in small bubbles. Its name combines two Greek words: *glaukos* which means *sky-blue* and *kerinos* which means *wax-like* because it has a waxy luster. The list of minerals found at Laurion includes very common minerals (like wulfenite, azurite, malachite, gypsum, vanadinite, calcite, quartz, and smithsonite) and many rare mineral species (like native arsenic, austinite, olivenite, annabergite, and adamite).

Gypsum

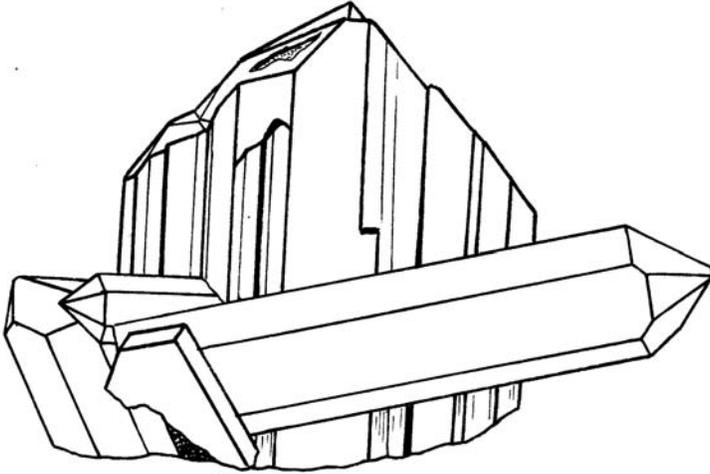
from Lavrion

In addition to many rare and colorful minerals, the Lavrion mining region of Greece has also given us excellent specimens of some very common minerals. Here is a picture of colorless, clear (transparent) gypsum. It is sitting on rust-red matrix. Notice that the gypsum crystals also have the rust-red matrix material trapped inside the crystals. When something is trapped inside a mineral or crystal, it is called an *inclusion*.



Minerals of Wales

Over 400 different mineral species have been found in Wales. Here are only a few of them.



Brookite

from Tremadoc,
Caernarvonshire

Brookite contains the element titanium. It is not a rare mineral, however, fine brookite crystals are very rare. It can be light brown, dark brown, reddish-brown and even black. The brookite

crystal pictured here grew with quartz crystals. It is a small crystal, only 1 inch x 1 inch in size. Mineral collectors refer to this size as a “miniature” specimen. It is one of the largest and finest brookite crystals ever collected. Brookite was named after the English mineralogist, Henry James Brooke (1771-1857).



Millerite

from Coed-Ely Mine, Llantrissant,
mid Glamorgan

Millerite has a brassy-yellow color with a bright, metallic luster. It usually occurs in long, thin needle-shaped crystals like the ones pictured here. The crystals are thin and fragile. When a mineral grows in this form, it is described as *acicular*. Because of its brassy color and hair-like form, it has also been called *hair pyrites*. Millerite was named after the English mineralogist, William Hallows Miller (1801-1880).

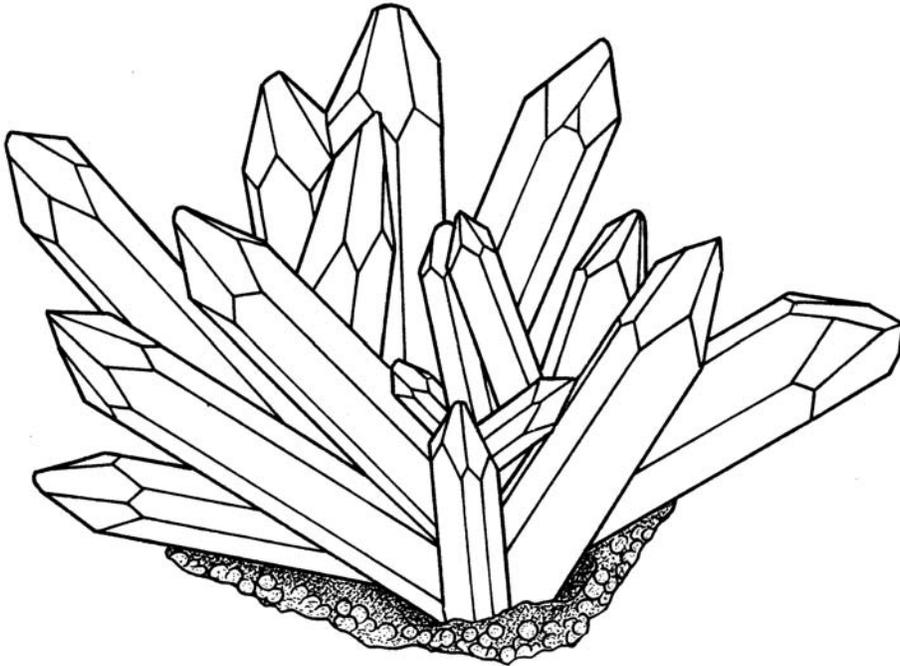


Gold

from Afon Wen, Gwynedd

In 2001 very heavy rains created flash floods on the river Afon Wen in Gwynedd. The flooding washed away soil and revealed nuggets of native gold. Large gold nuggets are very rare in North Wales.

Minerals of England



Calcite and Hematite from Egremont, Cumberland

The mines of Cumbria have produced some of the most attractive and perfect calcite crystals found anywhere. These long, perfectly clear, colorless, sharply-terminated crystals show another of the many

crystal forms of calcite. The beautiful crystal cluster pictured here was mined at the Egremont, West Cumberland Iron Field, in Cumbria. Iron minerals, like the botryoidal hematite specimen pictured below, is the important ore of the region. However, other “extra” minerals, like calcite, can also be found there. Every mine has minerals that are not important ore minerals. When they are mined, they are separated from the ores and thrown on a dump, because they have no value. These minerals, like the calcite here, are called *gangue* (pronounced “gang”) minerals. Can you imagine how many hundreds, if not thousands, of awesome calcite crystal specimens were thrown away and destroyed in the process of mining for iron ore? Fortunately, miners and collectors have been able to save many wonderful specimens for mineral collectors, scientists and the general public to enjoy.

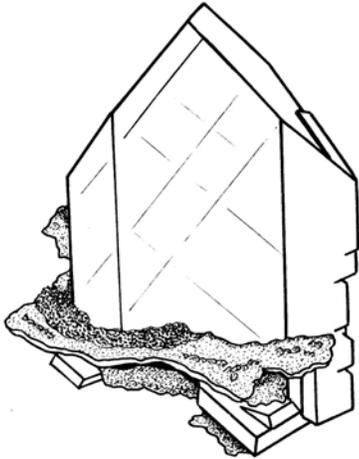
The hematite pictured here is also from Cumberland, England. The miners noticed that these hematite specimens have the shape and blood-red color of a kidney. Therefore, they called these specimens kidney ore. This is an old term you will still see today.



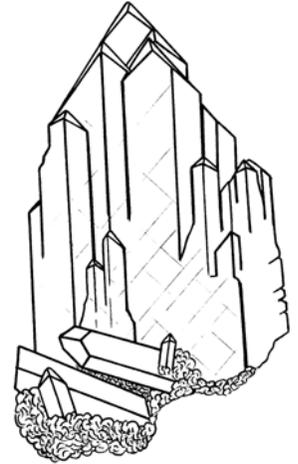
More Minerals of England

Barite

from Frizington, Cumbria

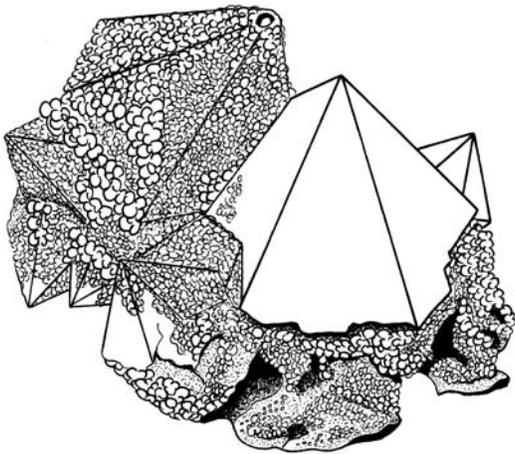


In addition to hematite and calcite, the West Cumbria Iron Field has given us other colorful and interesting minerals. Anglesite, barite, chalcopyrite, dolomite, fluorite, pyrite and quartz are some of the other gangue minerals found in West Cumbria.



Pictured here are two barite specimens that are typical of the region. The barite crystals from this region are tall and thick. Other localities around the world have produced barite crystals that are so

thin and clear that you can see right through them! These English barite crystals are gray-blue with red staining around the edges of the crystals. The red staining is iron oxide - also known as hematite.

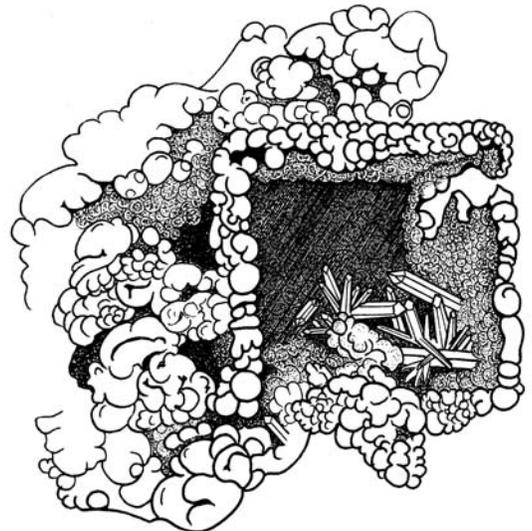


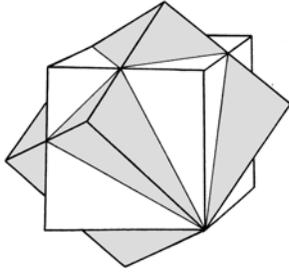
Pyromorphite on Quartz from Cumbria

Pictured here is yellow pyromorphite covering quartz crystals. When a layer of one mineral coats an earlier mineral, mineralogists call this an *epimorph*. “Epimorph” literally means “a form on top of” something else. Pyromorphite is a lead mineral which is sometimes mined as a lead ore. Pyromorphite crystals are common. High quality crystals have been found in England as well as many other localities around the world.

Siderite with Quartz from Devon

This wonderful English specimen has an interesting story. What you see is botryoidal siderite. How did it get to be in the shape of an empty square? Originally there was a fluorite crystal. The siderite grew around the fluorite cube. After the siderite formed, the fluorite dissolved, leaving the empty square-shaped cavity. Later, quartz crystals grew in the empty space. Specimens like this one were discovered in the Virtuous Lady Mine.

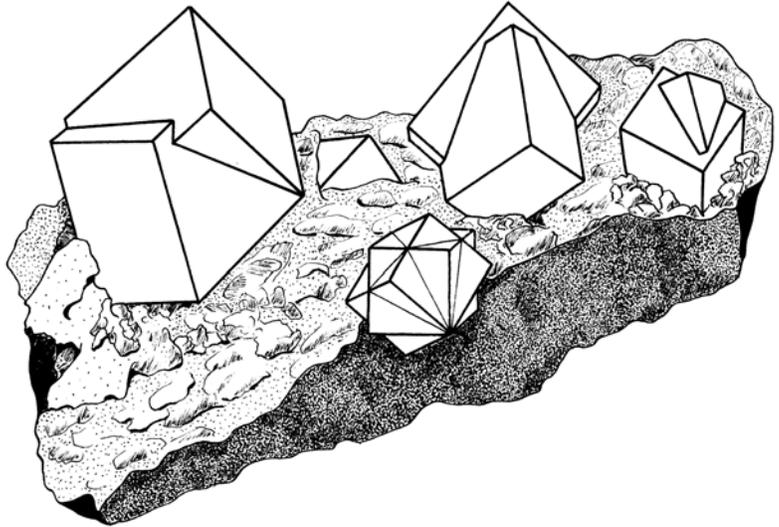




More Minerals of England

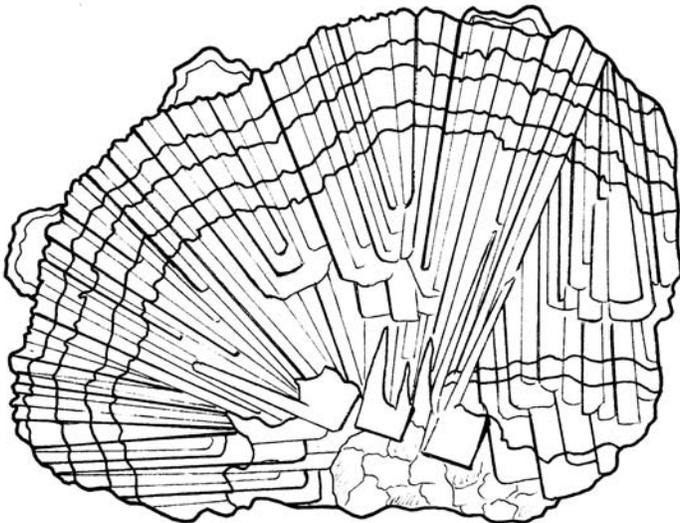
Fluorite from Weardale

Some of the most famous fluorite specimens in the world have come from England. The glassy, deep green, purple and yellow cubes from places like Weardale, County Durham, display a special feature of fluorite cubes. These specimens are often twinned crystals. This means that two crystals have grown together in a way that is determined by their crystal form, in this case forming a penetration twin. Above left is a picture of a perfect penetration twin. One of the crystals has been shaded so you can more easily see the two individual crystals.



Above right is a specimen of fluorite on matrix. Can you identify the penetration twin in the specimen? This specimen is from the Heights Mine, Weardale. You can color the crystals deep green, purple or yellow.

Almost 2000 years ago the Romans discovered a fluorite deposit that is now world-famous. Perhaps they were searching for other ore minerals like galena; no one really knows. But what they did find were veins of banded fluorite. This deposit is in an area



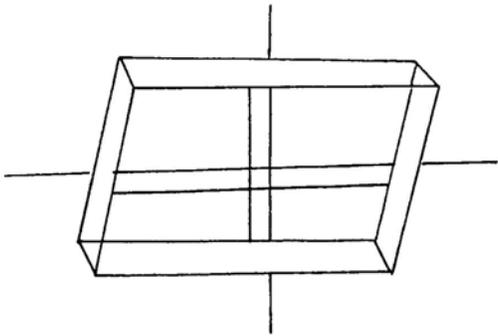
known today as Castleton, Hope Valley, Derbyshire. It is the only deposit of fluorite of its kind anywhere in the world. Items carved from this fluorite were found at the ruins of Pompeii in Italy. This tells us that the Romans used their fluorite discovery to create decorative items.

This banded, massive fluorite is known as Blue John. It is also called Derbyshire Spar. It has bands of purple and white (and sometimes yellow).

Minerals of Iceland

Calcite

from the Helgustadir Mine,
Reyoarfjörour



Say “Iceland” to any mineral collector and the first thing she or he will think of is “Iceland Spar.” Iceland Spar is perfectly clear calcite that has been broken into rhombohedra, like the one pictured here. What is special about Iceland Spar is that when light passes through it, a single ray of light is broken into two separate rays. Place a piece of Iceland Spar on a single line and you will see *two lines* through the crystal. This is called *double refraction*. Not only does it split the light into two rays, but each ray vibrates in a different direction from the other. This is called *polarized light*. Scientists discovered that this special property could be used in scientific equipment. (The young scientists reading this may want to do some more research on light and polarization.) Iceland Spar has been found in many places around the world. The calcite from Iceland, however, is the purest that has been found.

Very old writings claimed that the Vikings used a special stone to navigate their ships on cloudy days. This special stone became known as the *Viking Sunstone*. For centuries no one has been really sure of what mineral the Vikings used. Recent discoveries and studies have concluded that it is very possible that the mysterious Viking Stone was clear calcite from Iceland and so is called Iceland Spar.

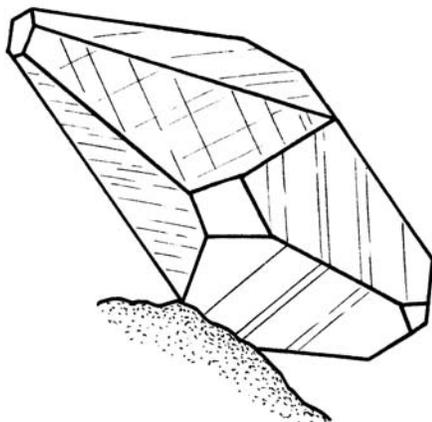
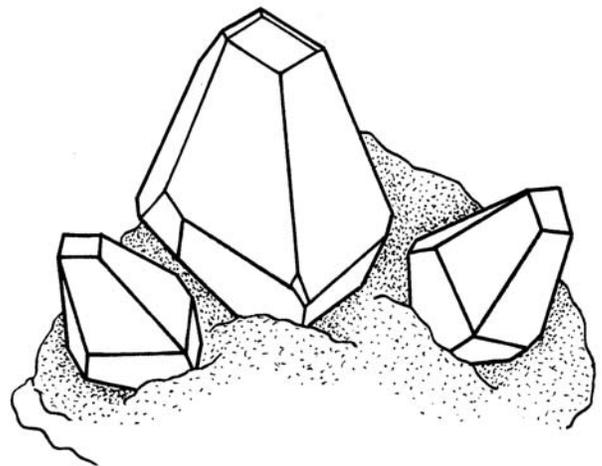
In addition to Iceland Spar, many fine calcite crystals have been found in Iceland. Pictured here are some colorless to white calcite

specimens.

Compare them to the calcite crystals

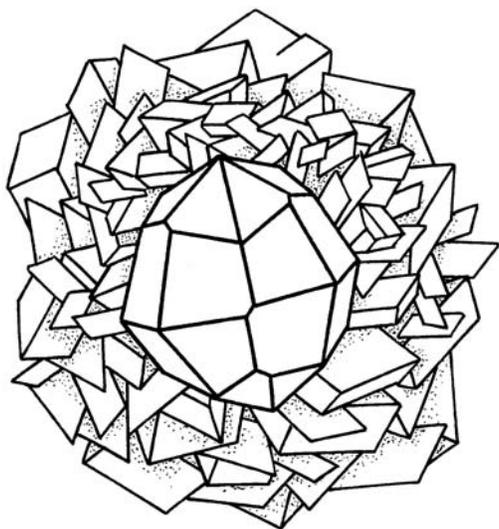
from Germany and England. You will easily see how different calcite crystal forms can be (and there are over 600 different forms which is more than any other mineral species).

To the left is a *twinned* calcite crystal. When two crystals grow together, at a specific angle, a twinned crystal is formed. The diamond-shaped portion in the center indicates where the two individual crystals connect to each other.



More Minerals of Iceland

Analcime on Chabazite from Heidarrath, Breiddalsheidi



To mineral collectors, Iceland is famous for its excellent zeolite mineral specimens. Zeolites are a group of minerals that have a similar structure. There are over 40 different zeolite minerals found in nature. The name *zeolite* was created in 1756 by a Swedish mineralogist named Axel Fredrik Cronstedt (1722–1765). He heated a specimen of the zeolite mineral, stilbite, and observed that when it was heated, it gave off steam from water that had been trapped in the

stilbite. The name was created from two Greek words: *zeo* which means *to boil* and *lithos* which means *stone*. Zeolites are “the stones that boil.”

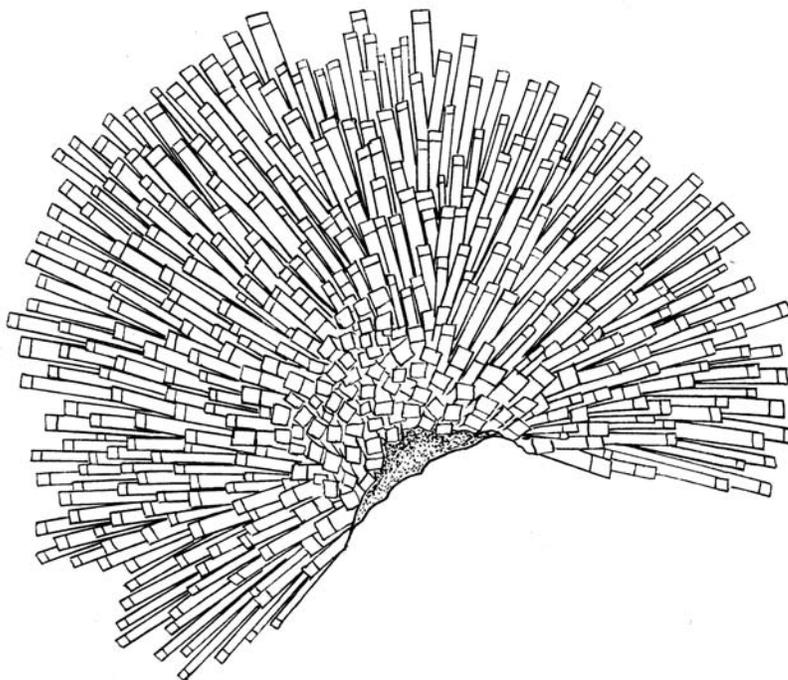
Pictured above is a fine specimen of analcime on chabazite. Both of these minerals are zeolite minerals. The bright white analcime crystal is in the form that mineralogists call a *trapezohedron*. It is sitting on a “bed” of light pink chabazite crystals.

Mesolite from Hvalfjordeur

Pictured to the right is an amazing cluster of another zeolite mineral known as *mesolite*. These colorless crystals are very glassy and very fragile.

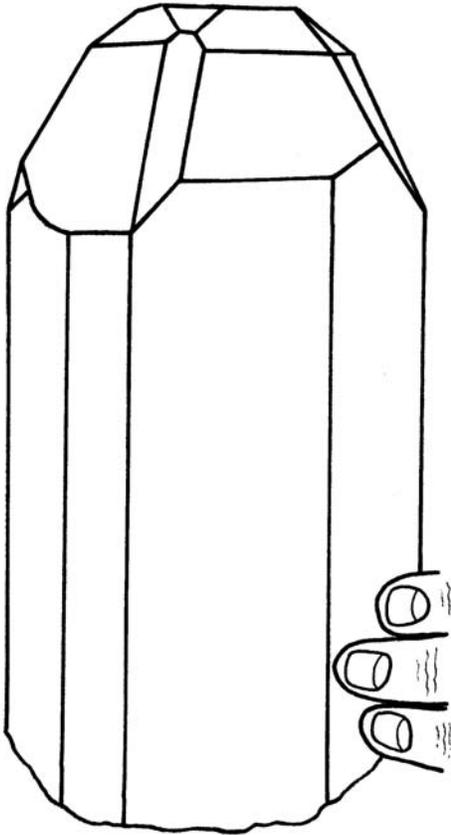
Other zeolite minerals found in Iceland are heulandite, laumontite, natrolite, stilbite, thomsonite, levyne, and phillipsite. This is only a partial list.

Because of their unique properties, zeolites are used in cat litter, laundry detergent, for soil treatment, aquarium filters, and even in the nuclear industry.



Minerals of Ukraine

Beryl var. Aquamarine from Volodarsk-Volynskii



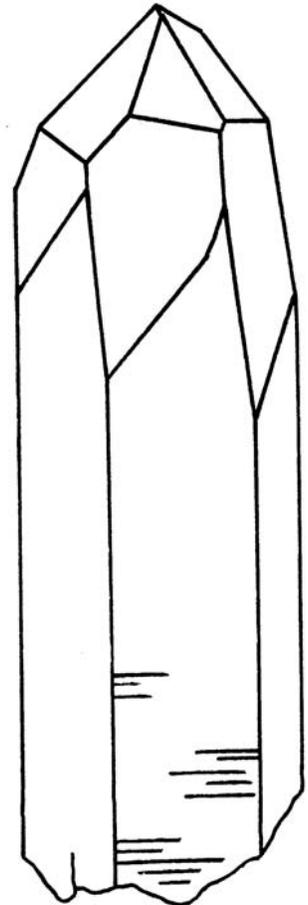
When molten rock is trapped under the Earth's crust it is called *magma*. In special geologic situations, large amounts of magma can be trapped in the crust and cool very, very slowly. This can allow very large crystals to form. Such deposits are called *pegmatites*. The Volodarsk-Volynskii is a pegmatite district in the Ukraine that has produced very large gem crystals. One species is beryl. It has produced very nice yellow beryl, which is also known as *heliodor*. Also, blue beryl, like the specimen pictured to the left, are also common there. The fingers are drawn so that you can picture just how large this single crystal is.

Quartz var. Smoky Quartz

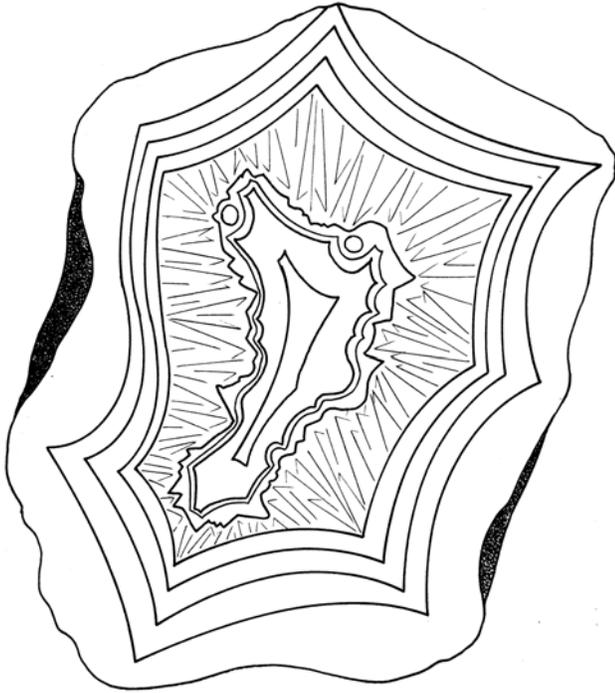
Dauphiné Twinning from Volodarsk-Volynskii

Another mineral common in pegmatites is quartz. Pictured here is a large (one foot long!) smoky quartz crystal. It is a special crystal because it is a *twinned* crystal. A twinned crystal is one in which two individual crystals have grown together in a way that is controlled by the mineral's crystal structure. Quartz can be twinned as a *Japan Law Twin*, a *Brazil Law Twin*, or a *Dauphiné Law Twin*. This is a picture of a Dauphiné Law Twin. You can identify it by the repetition of the V-shape that you see near the termination (or top) of the crystal.

The study of crystallography can be very challenging. It can also be very rewarding. Use good books and the Internet and learn more about crystallography.



Minerals of Scotland



Agate

from Dunure, Ayrshire

Many fine, colorful and interesting agates have been found in Scotland. They are very common and are frequently called "Scotch Pebbles." Pictured here is a simple banded agate pebble with red, gray and white bands.

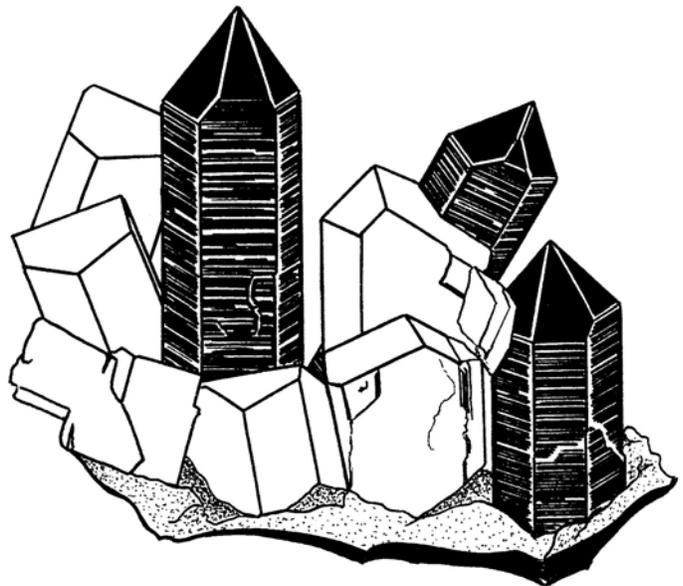
Mineral collectors who are familiar with the very large agates from Brazil might be disappointed with Scottish agates because they are not very large. However, the beautiful colors and interesting banding sets Scottish agates apart as some of the most colorful and beautiful in the world.

Quartz var. Cairngorm

from Cairngorm Mountains

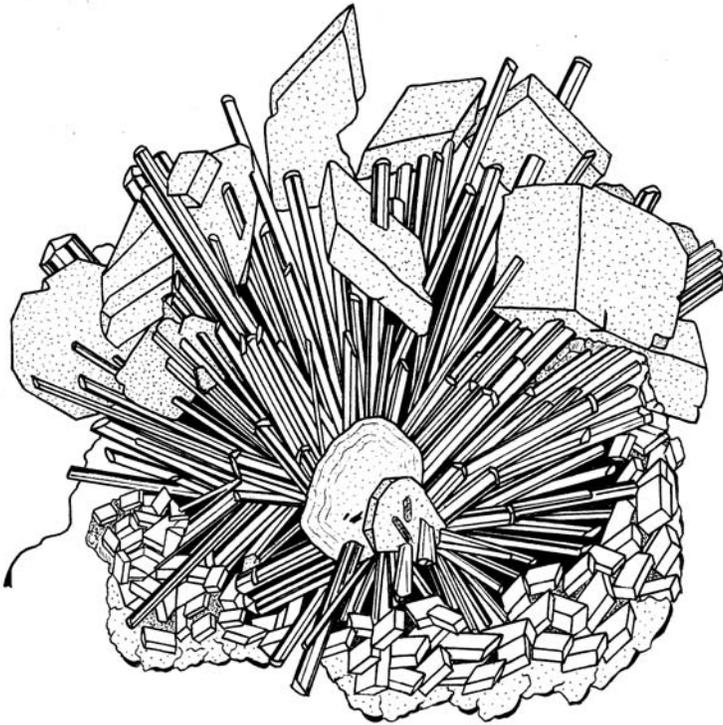
The smoky quartz found in the Northeast region of Scotland occurs in the Cairngorm Mountains. Brown to black quartz is usually called *smoky quartz*. However, the yellow-brown quartz from this region was called "Cairngorm" and even today, you can find specimens labeled as "Cairngorm" or "Cairngorm Stone." The quartz crystals formed in association with white feldspar crystals, like the specimen pictured here.

In Scotland cairngorm is traditionally used as a jewel to decorate kilt pins. There is a 52 pound cairngorm crystal at Braemar Castle in Aberdeenshire, Scotland.



Minerals of Romania

Stibnite and Calcite from the Herja Mine, Baia Mare, Maramures County



For over 100 years, the Herja Mine has produced an array of beautiful and interesting minerals.

One of the mineral species for which the Herja Mine is famous is stibnite. Stibnite is an ore of the metal *antimony*. Pictured to the left is a specimen of long, silver-gray antimony crystals that have grown like a spray from the center. Attached to the stibnite crystals are light yellow calcite crystals.

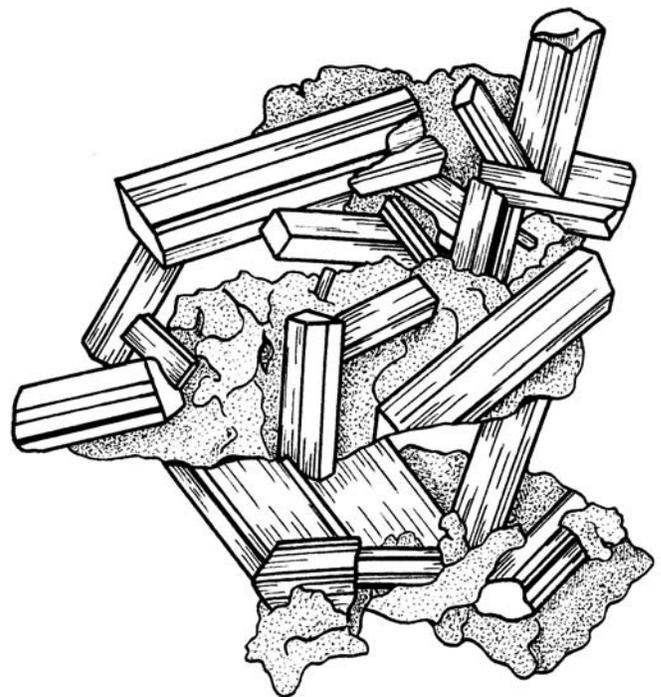
Stibnite is not the only mineral species found here. In fact, over 60 different mineral species have been found in this important locality including gypsum, galena, fluorite, gold, pyrite and quartz. Rare species have been found here, too, like jamesonite, boulangerite, semseyite, and cronstedtite.

Realgar

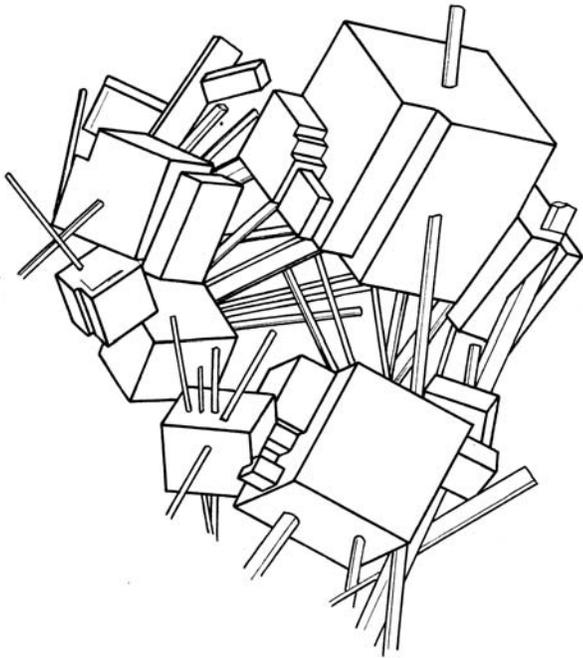
from the No. 5 Mine, Baia Sprie, Maramures County

For hundreds of years the Baia Sprie region of northwestern Romania has been mined for gold and silver, lead and zinc, and copper. One fine example of the many excellent mineral species found here is realgar. The realgar specimens from the No. 5 Mine are deep red-orange, well-crystallized and sit on a light gray limestone matrix.

Realgar is a *photosensitive* mineral. This means that when it is exposed to light, it deteriorates. It becomes another mineral, *pararealgar*, which eventually crumbles into a yellow powder.



Minerals of Poland



Halite on Gypsum

from the Solno mine, Inowrocław,
Kujawsko-Pomorskie

Earlier in this book you read about the important deposits of halite crystals of Germany and Austria. Poland also has some of the most important halite deposits in western Europe, some would say, in the whole world.

The famous Wieliczka Salt Mine was mined for table salt for over 800 years. This huge underground mine has shafts that are 1,073 ft below the surface. The total length of all its tunnels is 178 miles! In addition to table

salt, it has also produced crystallized halite specimens that can be seen in mineral museums all over the world. These crystals and crystal clusters are very large. Fine halite crystals have also been found in the Solno Mine. For about 35 years this mine produced many excellent halite specimens, like the one pictured here. The colorless, thin gypsum crystals grew first. Later, the colorless halite cubes formed on and around them.

Barite

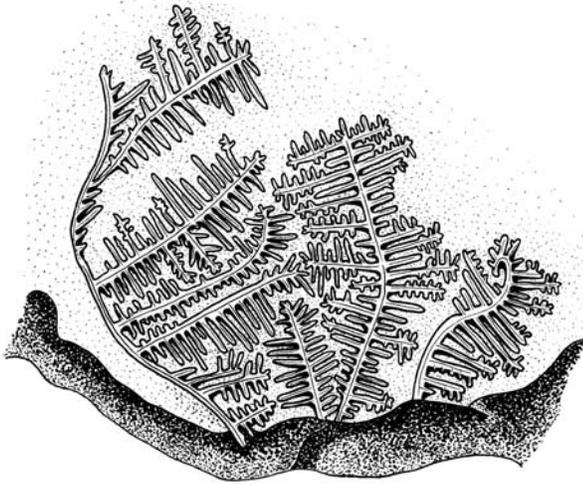
from the Machów Mine,
Tarnobrzeg, Podkarpackie

Poland is famous for many other mineral specimen deposits as well. The Machów Mine is only one example. It is mined for sulfur. But it has also produced specimens of quartz, gypsum, calcite, celestite and barite. Pictured here is a cluster of golden brown, glassy barite crystals.



Gold of Western Europe

Excellent specimens of native gold have been discovered across Europe, from Ireland to Romania. Here are just a few for you to enjoy.



from Hopes Nose, Torquay, Devon, England

In 1922, geology professor W. T. Gordon took a group of students to the geologic formation called Hope's Nose. There they looked at white calcite and hit it with a hammer. But the calcite didn't break away as easily as they expected. They quickly discovered that the calcite had dendrites of gold in it! In 1927 Professor Gordon returned with others to research the area more

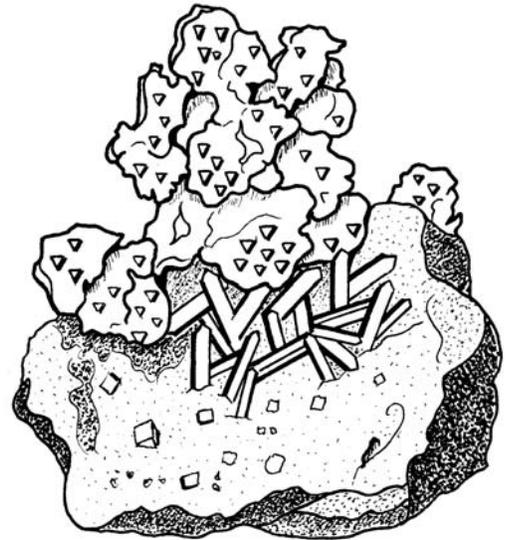
carefully. They discovered five different calcite veins that contained gold.

The form of the gold, pictured to the left, is described by mineralogists as *dendritic* which is from the Greek word *dendron* which means *tree*. As you can see this specimen of gold looks like small branches.

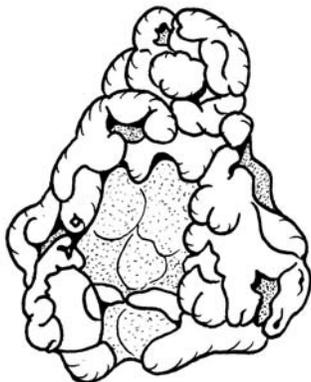
from Transylvania

(a new picture based on a watercolor painting by Swebach Desfontaines around 1792)

The largest gold occurrence in Europe is in the Transylvania region of Romania, near the town of Rosia Montana. For over 2,000 years gold has been mined in this region. Many specimens of gold have been recovered over the centuries. Pictured to the right is leaf gold on matrix with some small quartz crystals. Leaf gold refers to the fact that the gold occurs here as very thin sheets or leaves.

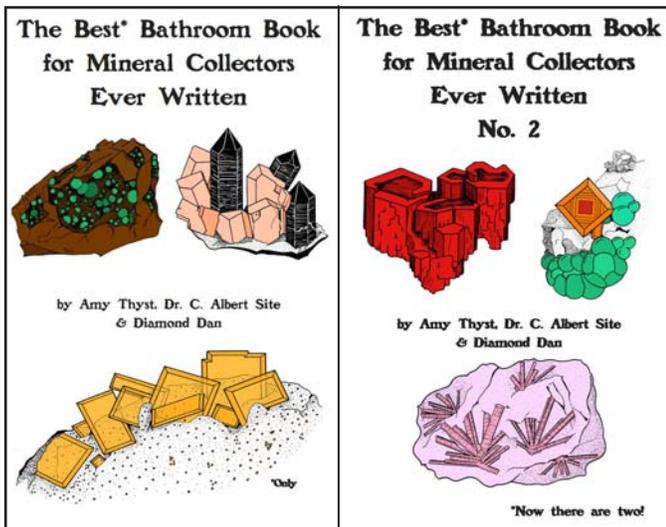


from Ireland



Gold can be found in many places in Ireland. It is usually found as rounded nuggets of pure gold or gold on quartz. Exact localities of gold occurrences have been forgotten over the centuries, but the names of places in Ireland reveal where gold was probably once found. For example, Slieve-an-ore near Feakle, Clare County means "Mountain of Gold." Tullynora (Tully-an-ore), Down, means "Little Hill of Gold." Coom-an-ore, between Bantry and Dunmanway, Cork County, means "Hollow of the Gold." Pictured to the left is a nugget of gold from the collection of the famous English mineral collector Philip Rashleigh (1729-1811). It can be seen today in the Royal Cornwall Museum in Truro, England.

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