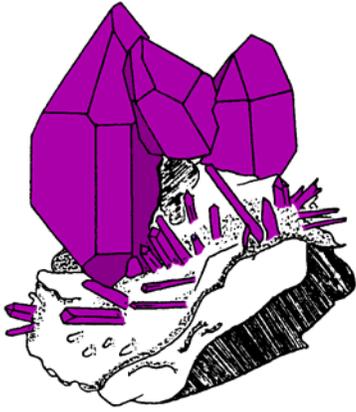


# MINI MINERS MONTHLY

A MONTHLY PUBLICATION FOR YOUNG MINERAL COLLECTORS

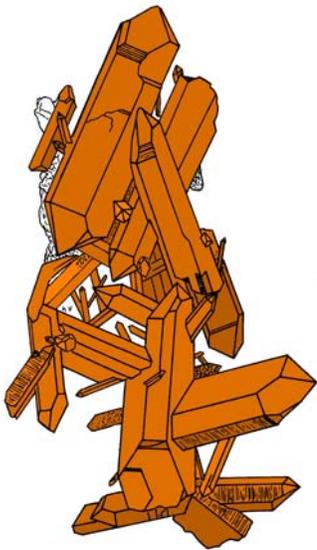
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This month we continue our journey through the world of silicate minerals. Sounds scientific, doesn't it? Diamond Dan knows this might seem complicated, but he is trying very hard to make it interesting and fun for all ages. Remember that the more you know about minerals, the more successful you will be as a mineral collector. The silicate minerals are the biggest group of minerals. In other words, there are more of them than any other group. That's why we've spent so many months telling you about them.

This will be the last issue that features the different groups of silicate minerals. Pretty soon we will put it all together into one publication and send it to you as a special edition with all the silicate mineral groups in one handy book (you will receive it as a PDF file).



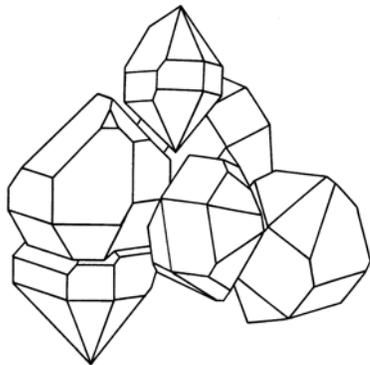
## Rock Swap

You have to check out the page about a Facebook group called "Rock Swap." It is designed for young mineral collectors and their families to connect with other mineral collectors to trade specimens and learn from each other. One

very nice feature: there are NO advertisements. This rapidly growing Facebook group invites you to join!

## Minerals Made Out of Grapes?!

All this talk about silicate minerals is very scientific. Diamond Dan admits it is for the very, very, very serious mineral collectors. So, he decided to try to help you picture how molecules of oxygen and silicon connect together to make up silicate minerals. Go to the refrigerator, grab some grapes and a box of toothpicks and get ready to make molecules! (And you can eat them when you are done, too.)



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100+ items for auction weekly starting at \$10!

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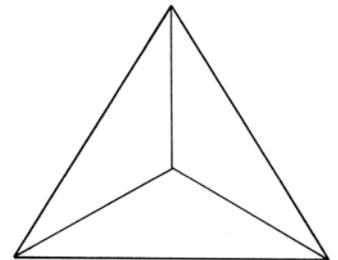
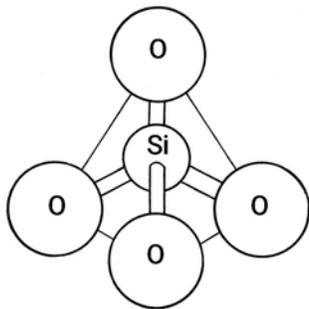


**100+ items for auction weekly starting at \$10!  
No buyer's premium, ever!**

## More Silicate Minerals

For a few months we have been learning about a big group of minerals that are called

**silicate minerals**. Remember that silicate minerals are minerals that have silica molecules in their formulas. A silica molecule is made up of one silicon atom and four oxygen atoms (see the picture to the left). When put together they form a three-sided pyramid, like this picture, to the right. This pyramid has four sides (the bottom side you can't see in this picture). Because they have a total of four sides, they are called *tetrahedra*. Get to know this word. To understand silicate minerals, you have to know how



their tetrahedra connect with each other.

This month we're going to talk about a group of silicate minerals that are called

**Tectosilicates**. Last month we discovered **Phyllosilicate** minerals. They have tetrahedra (remember that a tetrahedron is like a 4-sided molecule) that attach to each other to form sheets. Tectosilicate minerals have silica tetrahedra that attach to each other in 3 dimen-

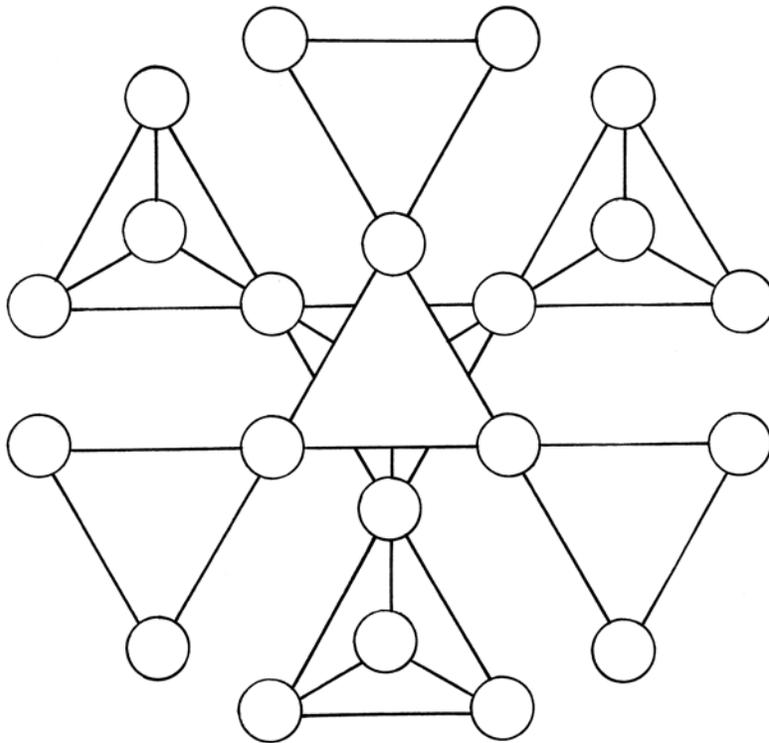


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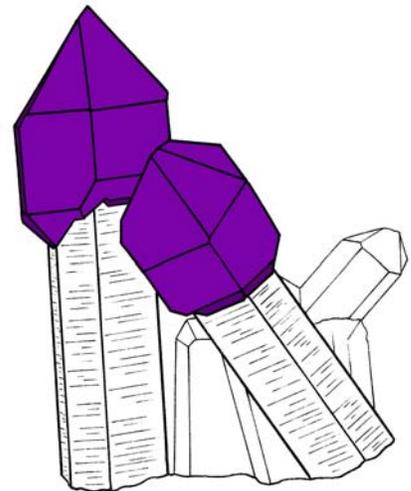
sions. The fancy phrase for this is “3-dimensional framework.”



You can't see the silicon (Si) atoms because they are hiding behind the two oxygen atoms in the middle of each group.

The circles are oxygen atoms.

Examples of **tectosilicate** minerals are quartz, opal, cristobalite, feldspar group minerals (microcline, orthoclase, albite), danburite, leucite, sodalite, lazurite, analcime, scapolite, zeolite group minerals (natrolite, chabazite, heulandite, stilbite).

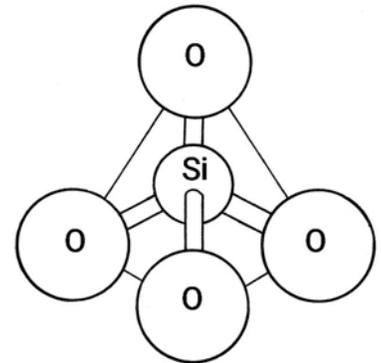


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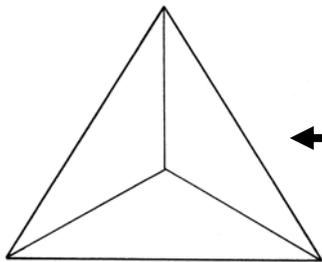
## Tectosilicate Minerals: The Simple Version

There is a group of minerals called *silicate minerals*.

Silicate minerals have molecules that are made up of one silicon atom (Si) and four oxygen atoms (O).



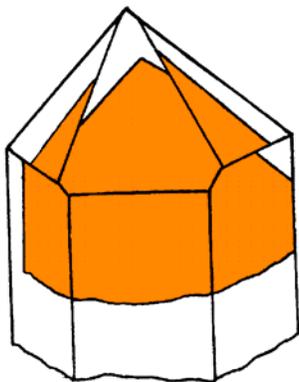
The atoms connect together in a 4-sided shape. →



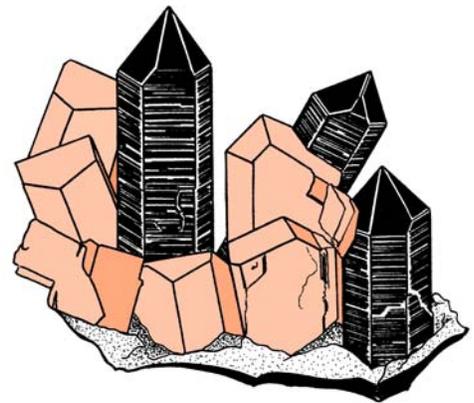
← This 4-sided shape is called a tetrahedron. The tetrahedron is the picture to the left. You can see three sides because you are looking down on it. The fourth side is underneath.

In tectosilicate minerals, tetrahedra attach to each other in a framework, in 3 dimensions.

Tectosilicate minerals that you probably know and have in your collection are common and often colorful minerals. Here is a list of tectosilicate minerals that can be found as fine mineral specimens...



Quartz, Opal, Cristobalite, Feldspar group minerals (Microcline, Orthoclase, Albite), Danburite, Leucite, Sodalite, Lazurite, Analcime, Scapolite, zeolite group minerals (Natrolite, Chabazite, Heulandite, Stilbite).



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## Making Silica Tetrahedra with Grapes

Are you tired of trying to figure out how the triangles with the circles are silica tetrahedra (if you have to, go back to the second page to know what tetrahedra are).

Here's a fun activity you can do at your dining room table.

### Make silica tetrahedra with grapes and toothpicks.

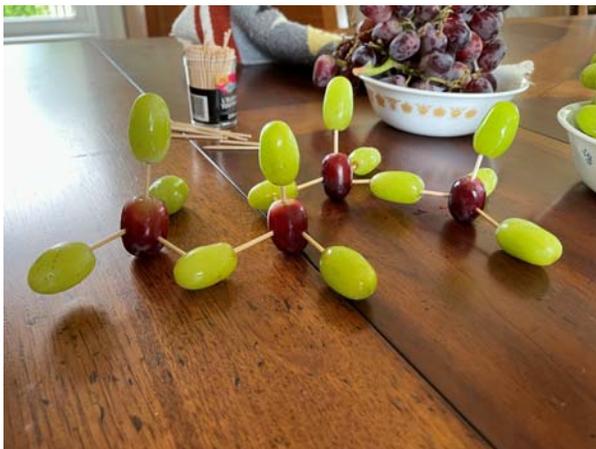
**What You Need:** A bunch of green grapes; a bunch of red grapes; a package of toothpicks.



Let's start by making one individual tetrahedron. The green grapes are oxygen molecules. The red grapes are silicon molecules. Attach four oxygens to one silicon. Like this! There you have it. You have made one (delicious) silica molecule!



Now make more and then attach them to the first one, like this. Do you know what you have created? A model of a single chain silicate mineral!! Ta Da!!



Now turn the page and see how they can all attach to make cyclosilicate minerals! (Isn't this so much fun?!)

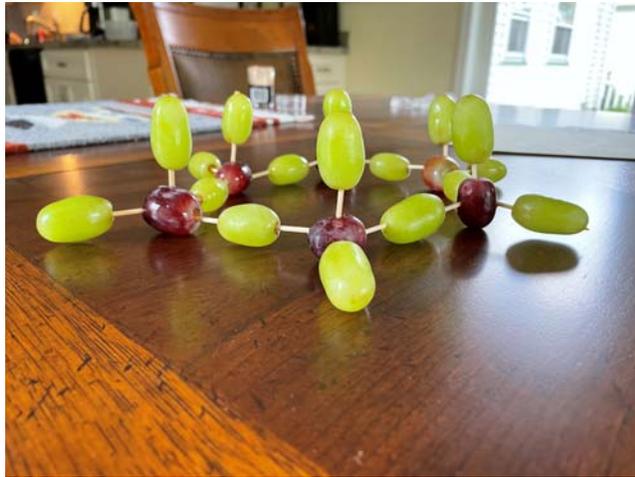
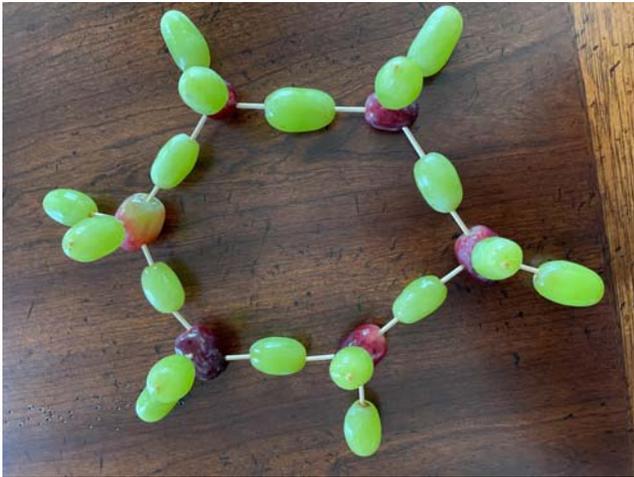


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Make more and attach them in circles like this. You now have a ring silicate.



Can you make grape models of chain silicate, ring silicate, sheet silicate and tectosilicate minerals? Have a lot of fun giving it a try.

Hopefully this has helped you better understand the “insides” of silicate minerals and see how all the molecules connect together.

If it still doesn't make any sense, that's perfectly OK. Because when you are done, you can eat the grapes, like Diamond Dan.

Enjoy!

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## Mineral Swap Group on Facebook



There is a really fun and well-organized special group on Facebook. **It is called “Rock Swap.”** The Facebook page heading has a quote, “Friendship: It’s not a big thing. It’s a million little things.” “Rock Swap” was started by Stephen Eskes, a mineral collector from South Branch, Michigan. (He is also a fireman.) He wanted to give kids a chance to meet other mineral collectors and be able to trade specimens with each other.

There are right now about 4,100 members! This Facebook group has grown much faster than he ever expected. It is now so big that he has other people helping to watch over (moderate) the page.

How can you join “Rock Swap”? It’s very easy. Search for the group on Facebook. You will ask to join the group. Before you join you will have to answer some questions. Then one of the moderators will add you to the group (as long as you promise to follow the rules! That’s one of the questions.)

**One of the things that Diamond Dan loves about the group is that it does not allow advertising!** It is a group for young mineral collectors who want to trade specimens, make friend connections, and enjoy the mineral hobby. In a world where every website and every TV program has a lot of advertising, it is so great to have a place you can go and know that you will NOT be hounded with advertisements.

One of their special events every year is a “Secret Santa” experience in December. Mr. Eskes and his friends randomly match up the group’s members in pairs. If you want to do this, they will give you the name and address of another member and you can send a mineral specimen to that person. Another person will send you a mineral specimen. It’s a lot of fun. You will make a new friend, or two, in the process.



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## Why Is Quartz So Cold?

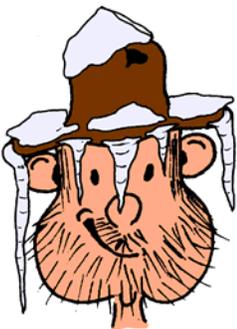


Brrrrr. On a warm day, put your hand on a big piece of quartz that hasn't been sitting out in the sun. Do you know what you will feel? Will it feel warm or cold?

Surprise, it will feel COLD!

The ancient Roman naturalist, Pliny the Elder, concluded that quartz is water that froze so hard that it would never melt. In other words, quartz is petrified ice. Why did he think this? First, he noted that quartz crystals were found near glaciers in the Alp mountains, where it is very cold in the winter, and at least cool in the summer. Second, he

also noted that quartz crystals are not found on volcanic mountains. Third, he pointed out that when large quartz crystals are held, they will cool the skin on his hand. Therefore, quartz crystals must be petrified ice.



### So, why does it feel cold?

Heat is energy. Energy moves from hot objects to cooler objects, until both objects are the same temperature. The ability of an object to absorb heat is called its "thermal conductivity." Sounds scientific, doesn't it? What it means is that solid objects have the ability to take heat (energy) from the world around them and move that heat into the object itself. Hold an ice cube in your hand.

Feel how very cold it is? It *feels* cold because the block of ice is taking heat away from your hand.

This is what happens with quartz. Quartz has a very high thermal conductivity. This means that it can move heat very easily and quickly away from your hand. When it does this, your brain tells you that the quartz feels cool and that your hand is feeling cool as well.



(Above: Iceberg, Public Domain. Right: Hand holding quartz, Robert Lavinsky photo, used with permission according to Creative Commons Share-Alike 3.0).



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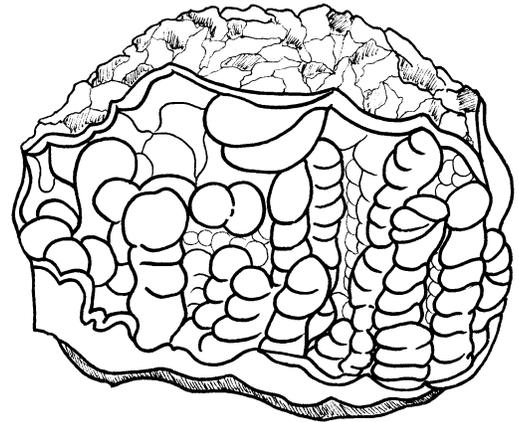
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## All The Different Kinds of Quartz

The chemical formula for quartz is  $\text{SiO}_2$ , silicon dioxide.

In this issue we have talked about quartz that crystallizes in crystals that we can see and hold. There are other minerals that are also silicon dioxide.

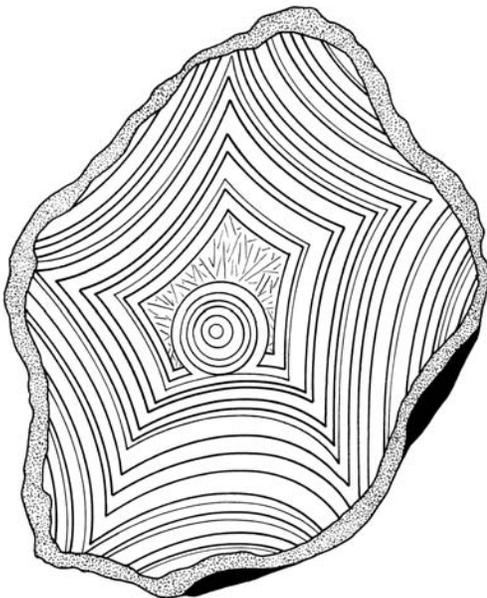


### Cristobalite

Cristobalite forms at very high temperatures. You can find cristobalite as white balls and "snowflakes" in black obsidian. Obsidian is volcanic glass.

### Opal

Opal is a variety of silicon dioxide that doesn't crystallize. It is often formed of microscopic balls of silica that are stacked on each other. Common opal is white or tan. Precious opal shows all sorts of bright colors, like flashes of fire. The colors are blue, green, yellow, red, orange.



### Chalcedony

There is a whole group of quartz minerals that form crystals so tiny that they can only be seen under very powerful microscopes. This variety of quartz is called chalcedony. There are a number of different types of chalcedony. Here is the list:

Red and Yellow is called Jasper

Green is called Chrysoprase

Black and white is called Onyx



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Banded with many colors  
is called Agate

Agate can also look like  
massive chalcedony with  
inclusions that look like  
moss. This is called Moss  
Agate.

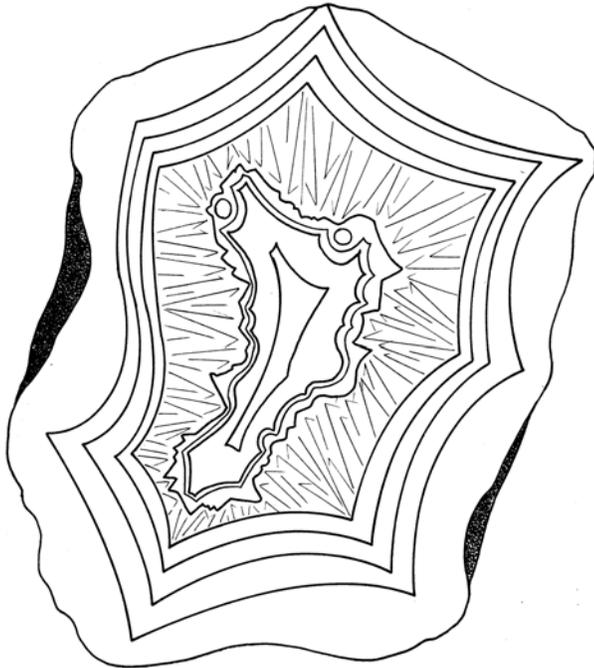
Agate can also have many  
different colors that com-  
bine in interesting and pretty patterns.



Gray to black chalcedony is called Flint.

Green with red dots is called Bloodstone or Heliotrope

Orange to red-brown chalcedony that is translucent (lets light through it) is called  
Carnelian.



*Color the agate drawings on these pages. In  
the space below, draw your own banded  
agate specimen.*



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## Make Light With Two Quartz Crystals



**What You Need:** Two (2) average quartz crystals that you can scratch up and damage without crying.

### What to do:

1. Hold one quartz crystal in each hand.
2. Rub the edge of one crystal (Crystal #1) across the face of the other crystal (Crystal #2).
3. When you rub one crystal against the other, push the two crystals hard against each other.

Practice steps 1-3 a few times in a well-lit room. This is just so you can get used to doing it and how it will feel in your hands.

Now you are ready for the **WOW!** moment.

Turn the lights out so that the room is completely dark. Now, repeat the three steps. Look carefully at Crystal #1 as you rub Crystal #2 across its face.

### Did you see it?

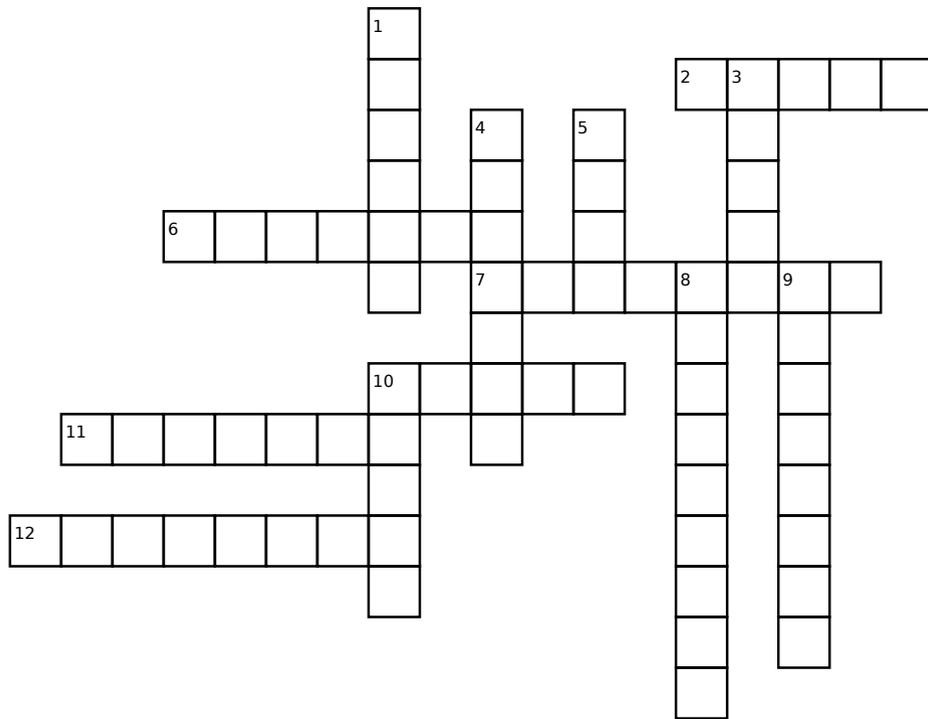
What you will see is a flash of yellow light **INSIDE** Crystal #1!

You just used two quartz crystals  
to create light.

Image right from Rockhounding Arkansas, [www.rockhoundingar.com/experiments.php](http://www.rockhoundingar.com/experiments.php).  
Check out the website for more quartz experiments you can do at home.



# Quartz Puzzle



## Down:

1. This mineral is made of silicon and oxygen
3. The white variety of quartz.
4. The pointed termination of a quartz crystal.
5. The pink variety of quartz.
8. Quartz crystallizes in this crystal system.
9. Quartz is a member of this group of minerals.
10. The green variety of quartz.

## Across:

2. The black variety of quartz.
6. Another name for skeletal crystals is \_\_\_\_\_ crystals.
7. The purple variety of quartz.
10. The long, straight part of a quartz crystal.
11. A crystal that has a narrow stem (prism) and a larger top.
12. The quartz crystals from Herkimer County, New York are called Herkimer \_\_\_\_\_.

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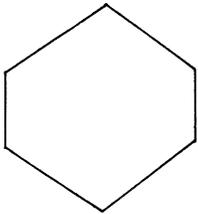
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## Quartz Crystal Model: Hexagonal Pyramid

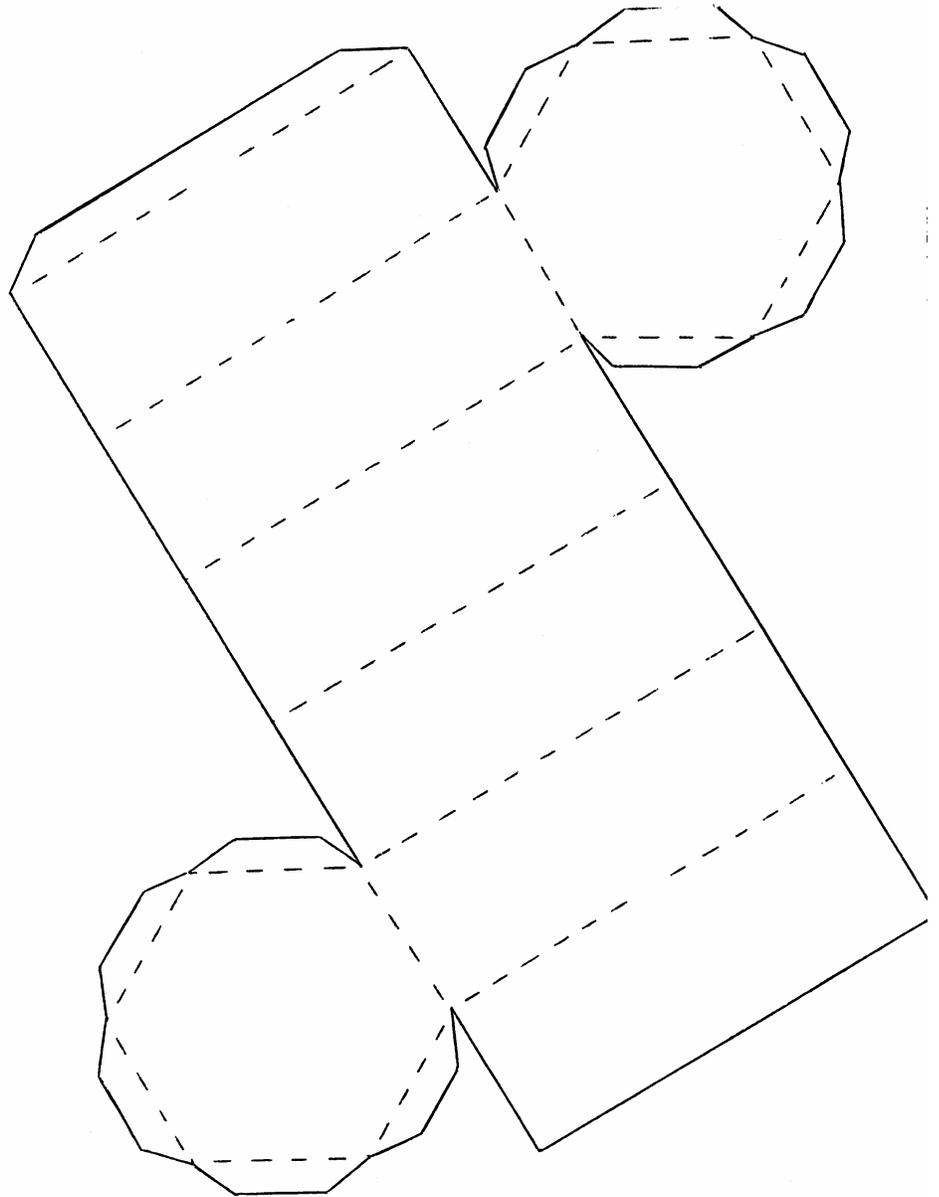
Quartz crystallizes in the Hexagonal Crystal System. "Hexagonal" means it has six sides. Cut a quartz crystal across the crystal and you will see six sides (left).



Many quartz crystals are a long stem with a pyramid on top.

Mineralogists call the long "stem" a prism. Here is a cut-and-fold quartz prism (6-sided) for you to print and make as many times as you like.

Directions: Cut the model out on the solid lines. Fold on the dotted lines. Carefully fold the tabs toward the opposite side of the crystal model and tape the tabs to the opposite faces.



**Oh, wait! Before you make the crystal model, color it first!!**



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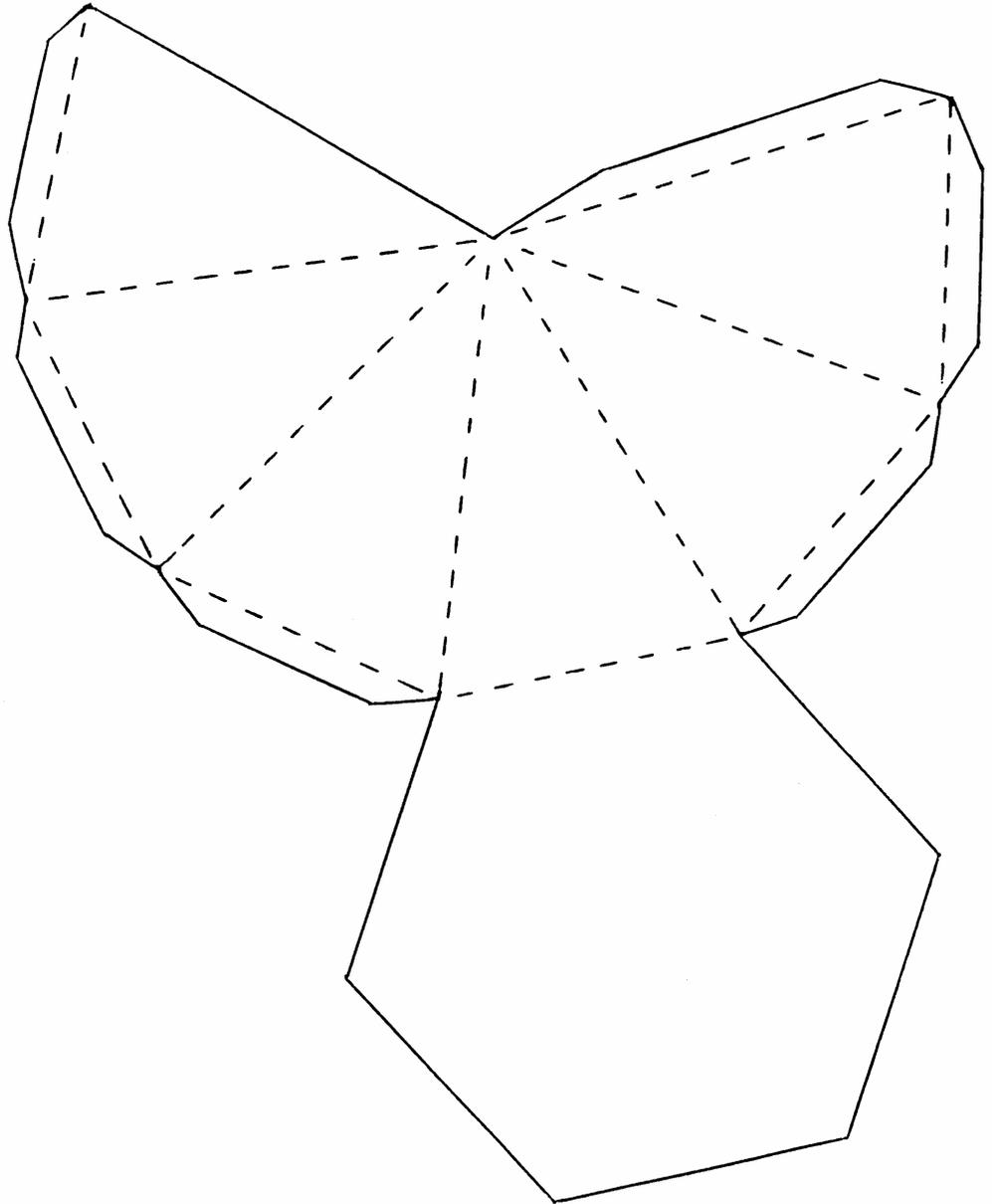
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## Quartz Crystal Model: Hexagonal Pyramid

Quartz crystallizes in the Hexagonal Crystal System. "Hexagonal" means it has six sides. Many quartz crystals are a long stem with a 6-faced pyramid on top. Here is a cut-and-fold quartz pyramid (6-sided) for you to print and make as many times as you like.

Directions: Cut the model out on the solid lines. Fold on the dotted lines. Carefully fold the tabs toward the opposite side of the crystal model and tape the tabs to the opposite faces.



**Oh, wait! Before you make the crystal model, color it first!!**



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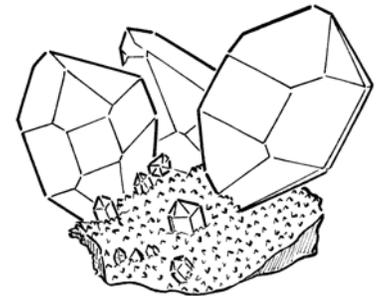
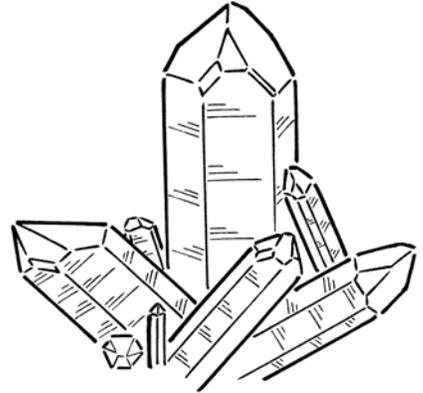
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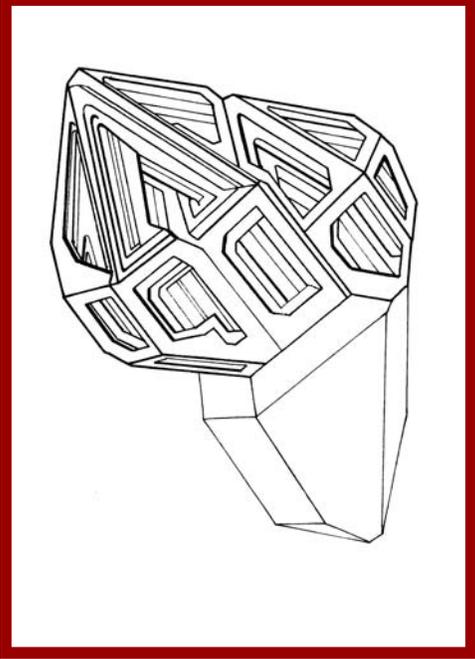
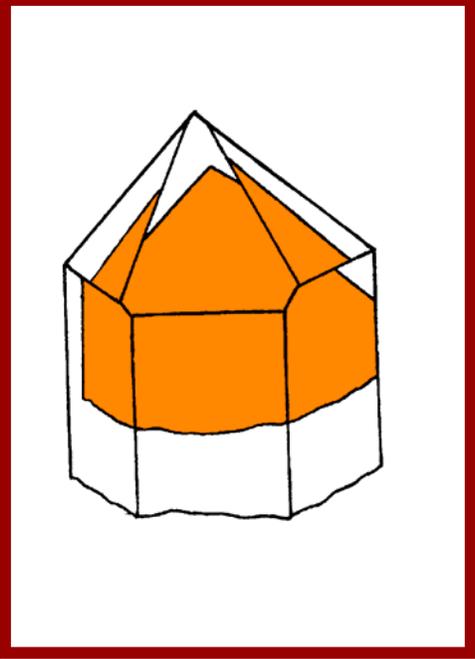
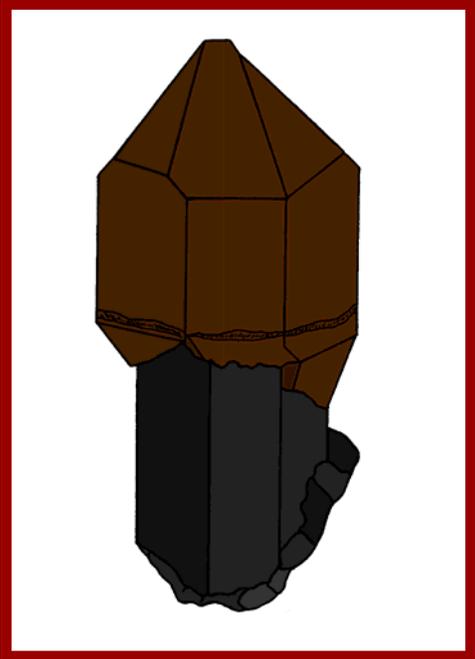
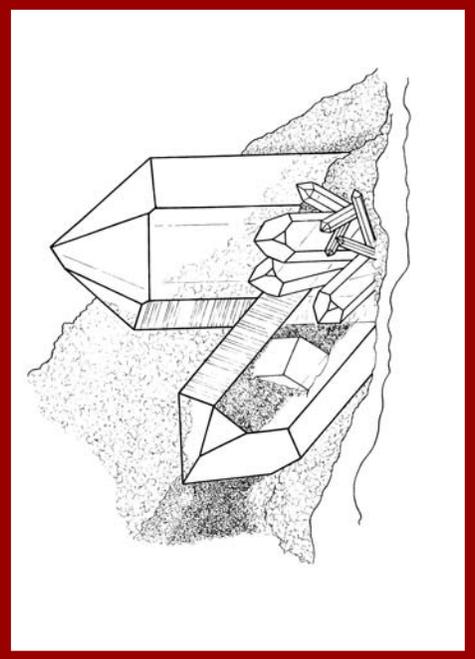
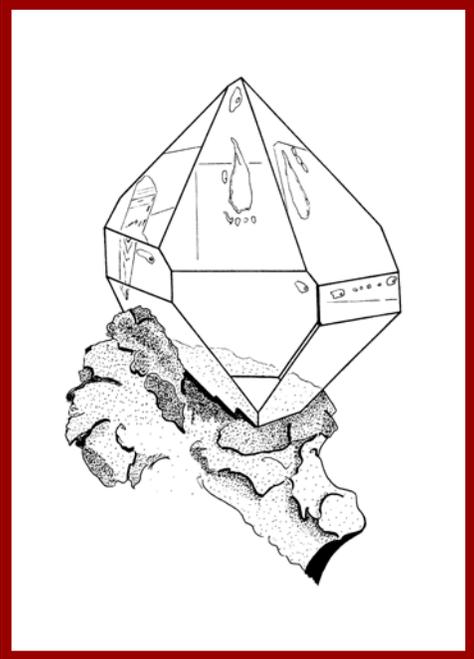
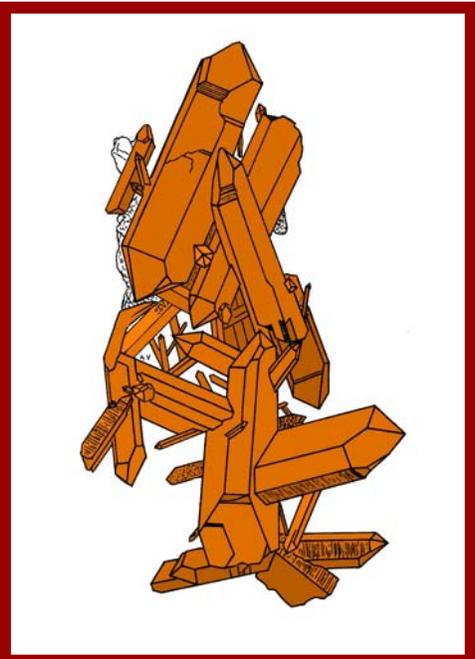
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## Quartz Facts: Fill in the Blanks

1. Quartz is number \_\_\_\_\_ on the mineral hardness scale.
2. Quartz is a very rare mineral. True or False.
3. Quartz is found in igneous and metamorphic rocks, but not in sedimentary rocks. True or False
4. Purple quartz is called \_\_\_\_\_.
5. Pink quartz is called \_\_\_\_\_.
6. Black quartz is called \_\_\_\_\_.
7. In ancient Rome, quartz was believed to be water that froze so hard it would never melt. True or False
8. Quartz contains the elements Lithium and Oxygen. True or False
9. Quartz contains the elements Lithium and Sulfur. True or False
10. Quartz contains the elements Silicon and Oxygen. True or False
11. Quartz is used in electronics. True or False
12. White quartz is called \_\_\_\_\_.
13. Colorless quartz is called \_\_\_\_\_.
14. Quartz is the second most abundant mineral on the earth's surface. True or False.
15. Yellow quartz is called \_\_\_\_\_.
16. Quartz crystals can weigh over a ton. True or False
17. What is the source of the silicon that is used to make computer chips? \_\_\_\_\_
18. Name the type of quartz that has microscopic crystals.  
\_\_\_\_\_
19. Rubbing two clear quartz crystals together will create what? \_\_\_\_\_
20. Quartz has a dull luster. True or False





## Smoky Quartz

Black quartz is called “smoky quartz.” It is often found with the mineral feldspar. Here in this specimen the smoky quartz is with a green variety of feldspar called amazonite. The white mineral is albite. This specimen is from the Rocky Mountains of Colorado.

## Iron-Stained Quartz

This orange quartz crystal cluster is from Arkansas. It is colorless, but it is coated with a thin layer of iron oxide. Quartz is such a common mineral, and it occurs in every kind of rock (metamorphic, igneous and sedimentary) that it is found with many different minerals.

## Amethyst

Quartz that is a shade of purple is called amethyst. The name amethyst comes from a Greek word that means “not drunk.” Ancient Greeks and Romans believed that if they drank wine from an amethyst cup, they would not get drunk

Amethyst can be very light purple all the way to very dark purple.

## Scepter Crystal

Quartz crystals can form in special shapes. One of those shapes is called a scepter. A scepter is a long rod held by a king. It is a symbol of the king’s power and position in the country. On top of the long rod is a piece of jewelry, often a very large gemstone, that is wider than the rod itself. A scepter crystal is similar: it has a rod and a wider crystal sitting on top of it.

## Quartz Crystal

Perfectly clear quartz is called quartz crystal. Pictured on this card are two quartz crystals from Italy.

They are sitting on marble. These crystals are so perfectly clear that they look like pure glass. You can see through the crystals to the marble that is behind them.

## “Herkimer Diamond”

“Herkimer Diamonds” are glass-clear quartz crystals that are found in Herkimer County, New York.

They have terminations on both ends of the crystal. This is called a double termination.

They are not diamonds at all. They are quartz. Diamonds are number 10 on the hardness scale. Quartz is number 7. But these crystals really sparkle and so they have been called “Herkimer Diamonds.”

## Skeletal Crystals (Fenster Quartz)

“Skeletal” crystals are also called fenster crystals or fenster quartz. In these crystals, the edges of the crystal faces grew faster than the flat faces themselves. This causes indentations where the faces should be. This kind of growth can happen in other mineral species as well.

## Phantom Crystal

Sometimes crystals start and stop and start again when they are growing. When the growth stops, the surface of the quartz can be coated with something. Or, the original crystal may be a certain color. Then, when growth starts again, the crystal can be colorless. When you look at the final specimen, you can see the smaller, first crystal inside the larger crystal. It is like a ghost or a phantom. So it is called a phantom crystal.

## Green Quartz Prase

There is a rare color variety of quartz that is called prase. Prase is green. Pictured on this card is a specimen of prase quartz from Greece.

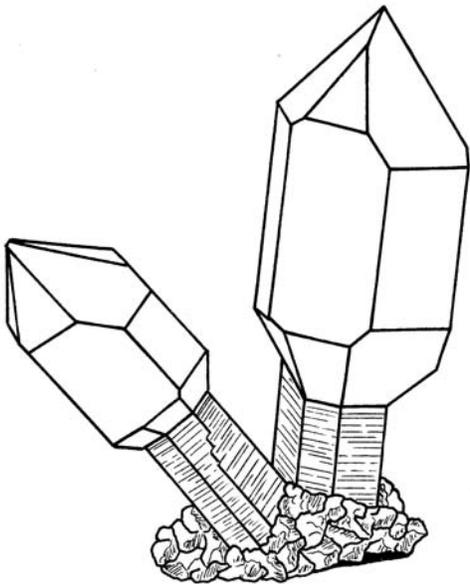
Other unusual colors for quartz are blue, red, orange and strawberry red.

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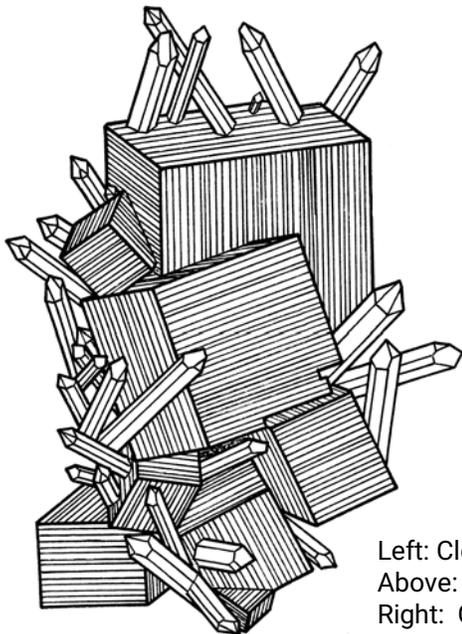
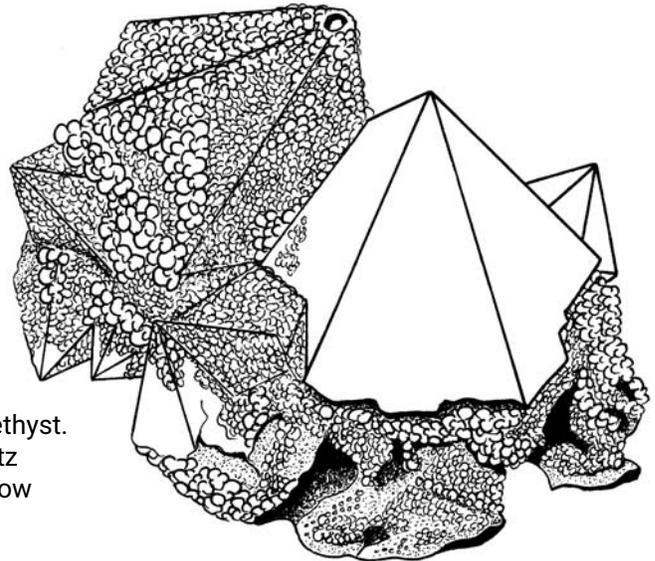
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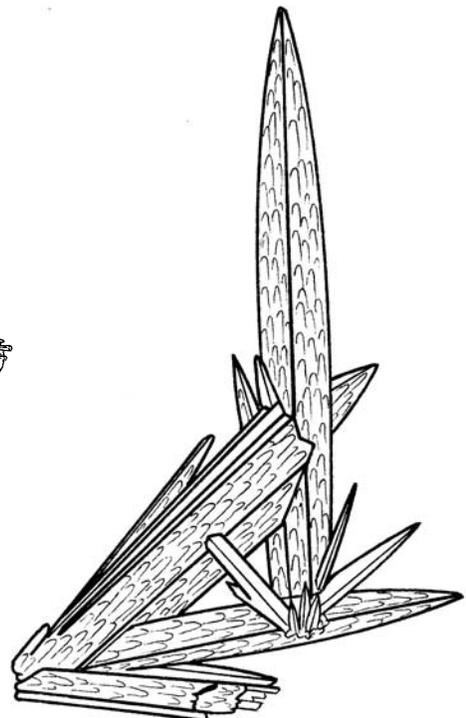
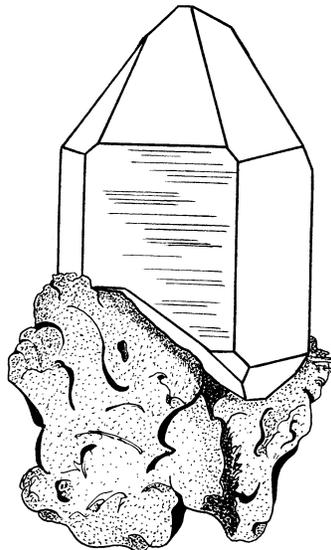
## The Colorful World of Tectosilicates: Have Fun Coloring!!



Left: Purple Amethyst.  
Right: Milky quartz  
covered with yellow  
pyromorphite.



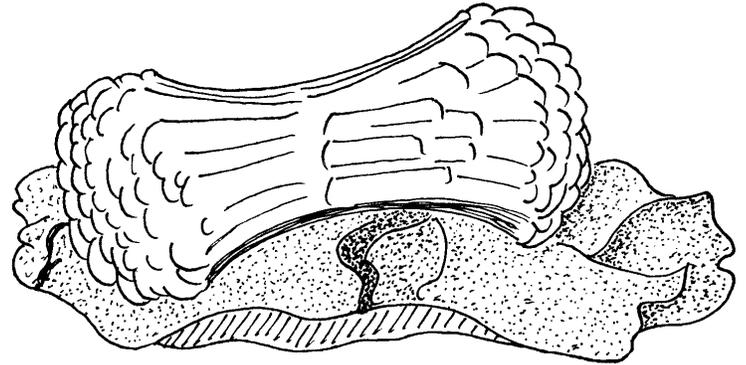
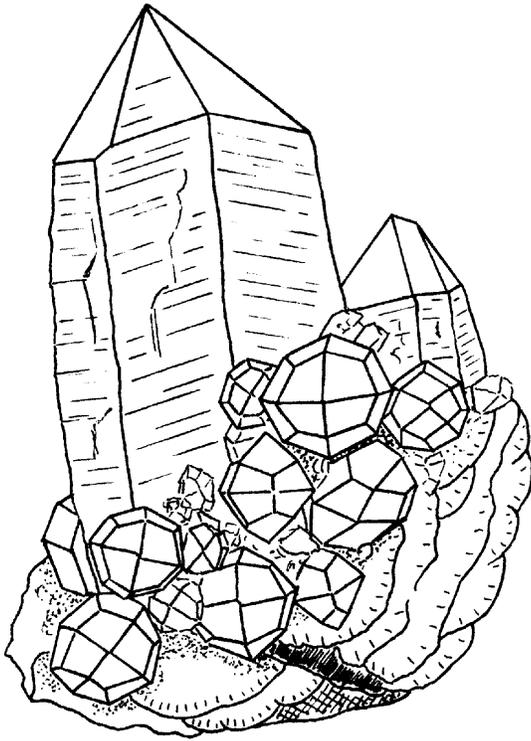
Left: Clear quartz on brassy pyrite.  
Above: Purple amethyst.  
Right: Green quartz.



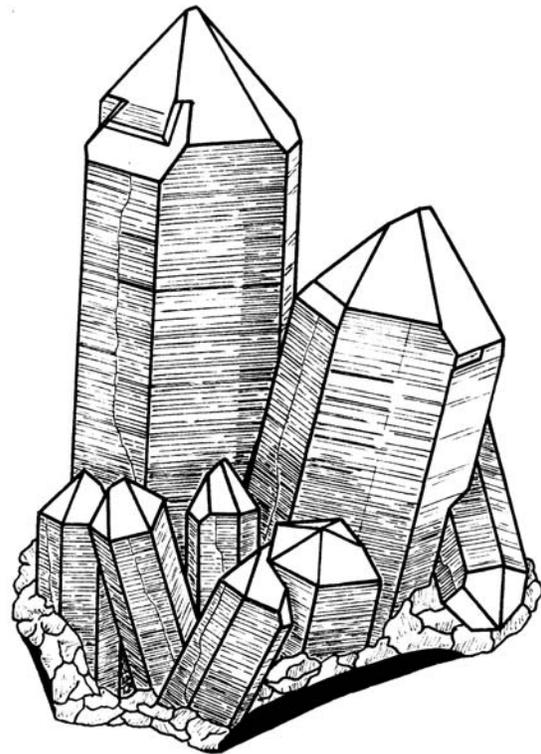
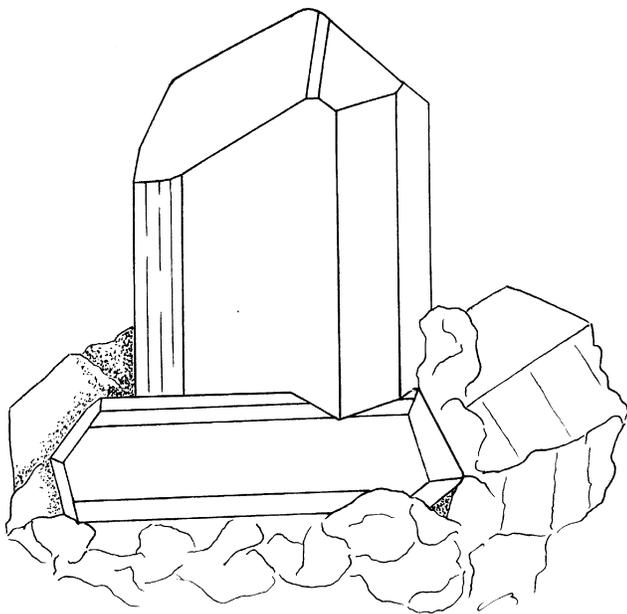
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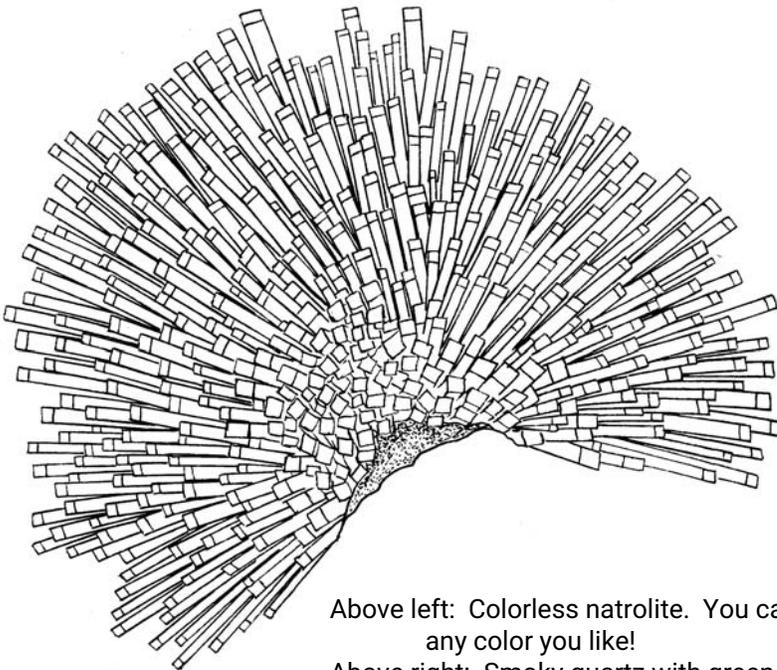
Left: Black smoky quartz with red garnet.  
Above: Light pink stilbite.  
Below left: Light green scapolite.  
Below right: Chocolate brown quartz.



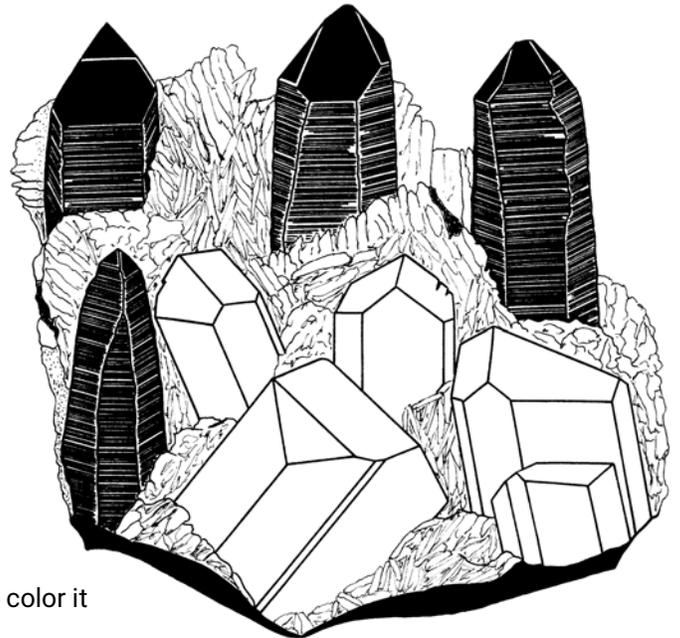
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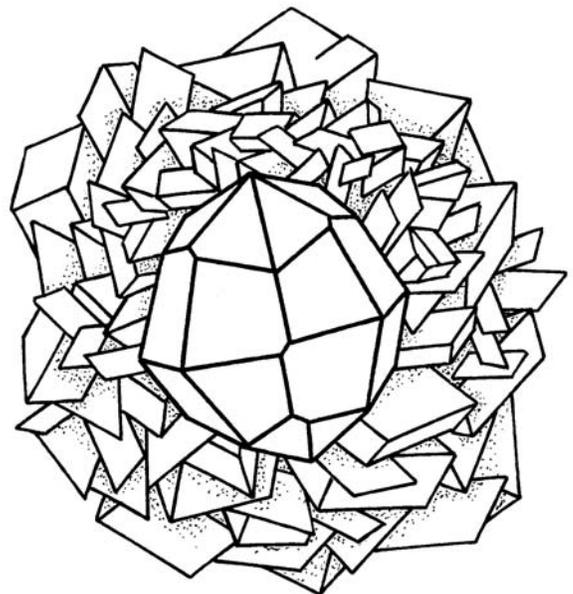
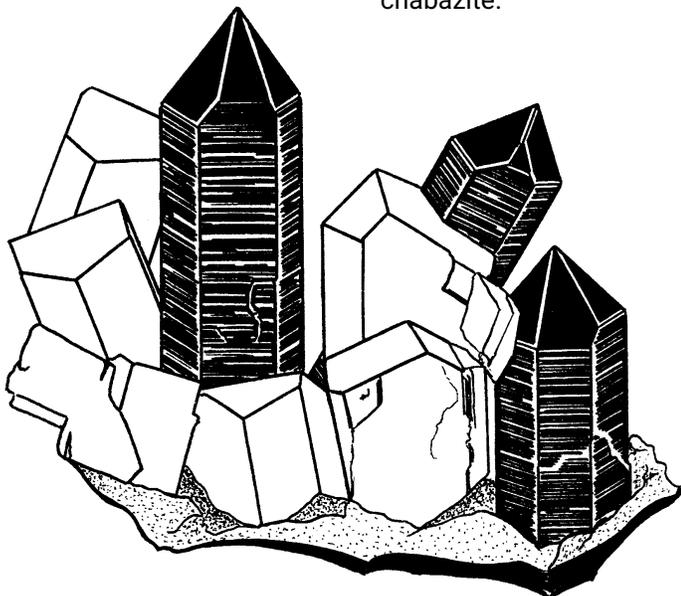
Above left: Colorless natrolite. You can color it any color you like!



Above right: Smoky quartz with green amazonite feldspar.

Below left: Smoky quartz with flesh-pink orthoclase feldspar.

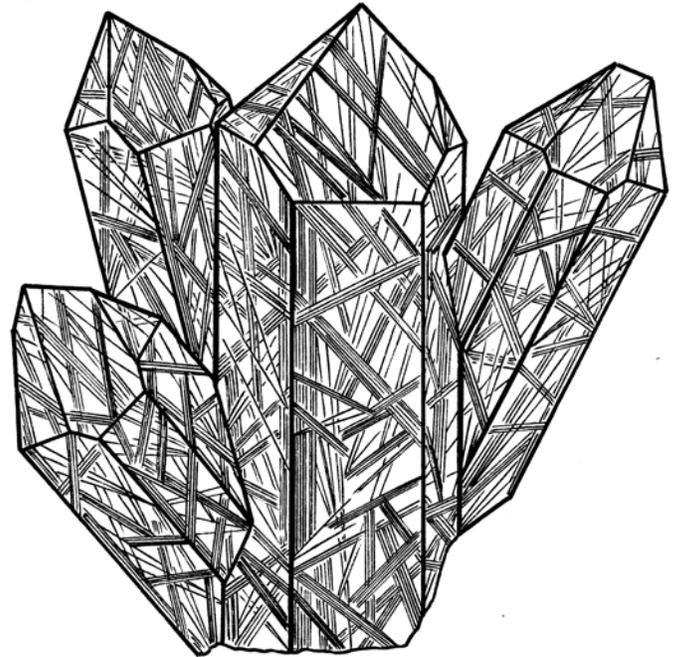
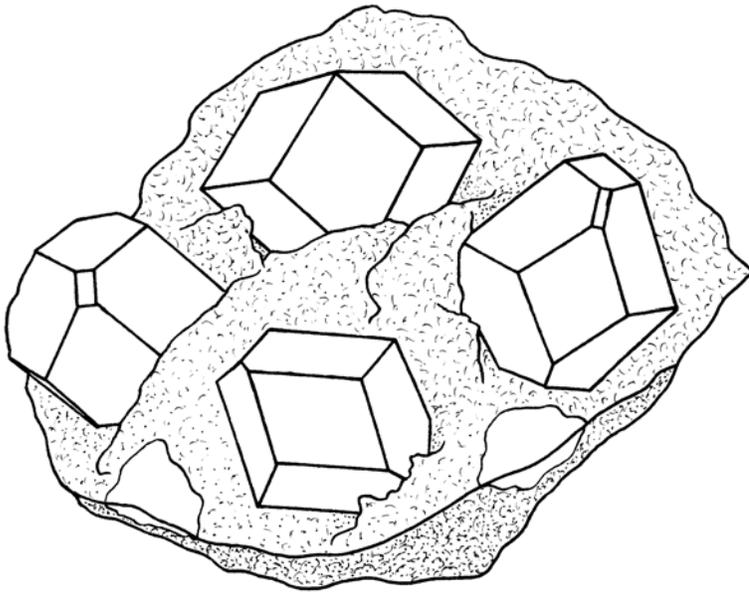
Below right: White analcime on light pink chabazite.



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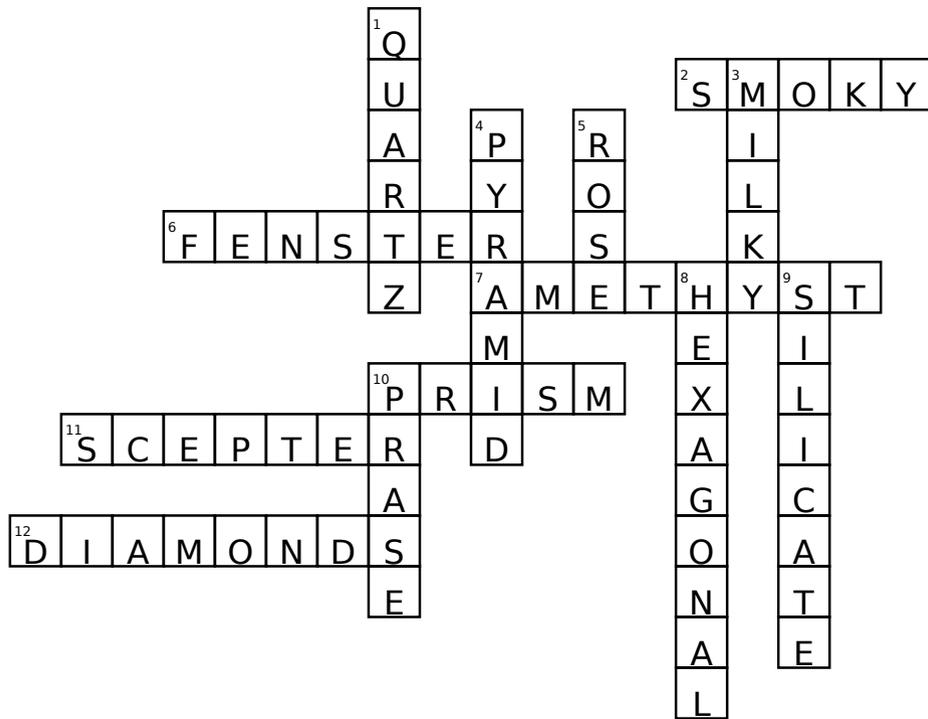


Above left: Dark blue lazurite.  
Above right: Golden rutile crystals in clear quartz.

Draw Your Own Quartz Crystals In The Space Below



# Quartz Puzzle



## Down:

- This mineral is made of silicon and oxygen
- The white variety of quartz.
- The pointed termination of a quartz crystal.
- The pink variety of quartz.
- Quartz crystallizes in this crystal system.
- Quartz is a member of this group of minerals.
- The green variety of quartz.

## Across:

- The black variety of quartz.
- Another name for skeletal crystals is \_\_\_\_\_ crystals.
- The purple variety of quartz.
- The long, straight part of a quartz crystal.
- A crystal that has a narrow stem (prism) and a larger top.
- The quartz crystals from Herkimer County, New York are called Herkimer \_\_\_\_\_.

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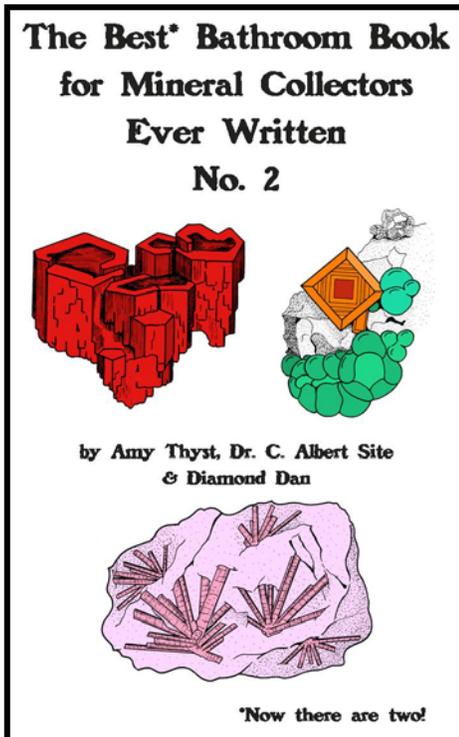
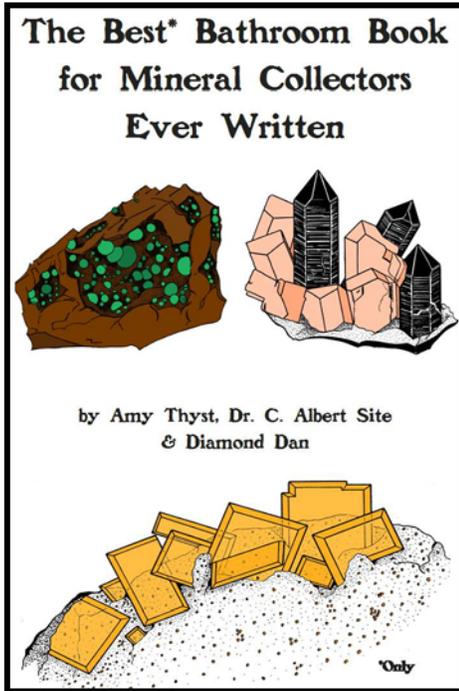
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## Quartz Facts: Fill in the Blanks: Solutions

1. Quartz is number 7 on the mineral hardness scale.
2. Quartz is a very rare mineral. False. *Quartz is the second most common mineral in the earth's continental crust.*
3. Quartz is found in igneous and metamorphic rocks, but not in sedimentary rocks. False. *Quartz is found in every kind of rock, including sedimentary rocks.*
4. Purple quartz is called amethyst.
5. Pink quartz is called rose quartz.
6. Black quartz is called smoky quartz.
7. In ancient Rome, quartz was believed to be water that froze so hard it would never melt. True.
8. Quartz contains the elements Lithium and Oxygen. False.
9. Quartz contains the elements Lithium and Sulfur. False.
10. Quartz contains the elements Silicon and Oxygen. True!!
11. Quartz is used in electronics. True. *Watches and clocks, and other electronic devises, have very thin wafers of quartz in them. In watches and clocks the quartz is used to create a pulse that keeps very accurate time.*
12. White quartz is called milky quartz.
13. Colorless quartz is called rock crystal.
14. Quartz is the second most abundant mineral on the earth's surface. True.
15. Yellow quartz is called citrine quartz.
16. Quartz crystals can weigh over a ton. True. *Quartz crystals the size of small cars have been found in Brazil.*
17. What is the source of the silicon that is used to make computer chips? Quartz
18. Name the type of quartz that has microscopic crystals. Chalcedony
19. Rubbing two clear quartz crystals together will create what? Light
20. Quartz has a dull luster. False. *Quartz has a vitreous, or glassy, luster.*



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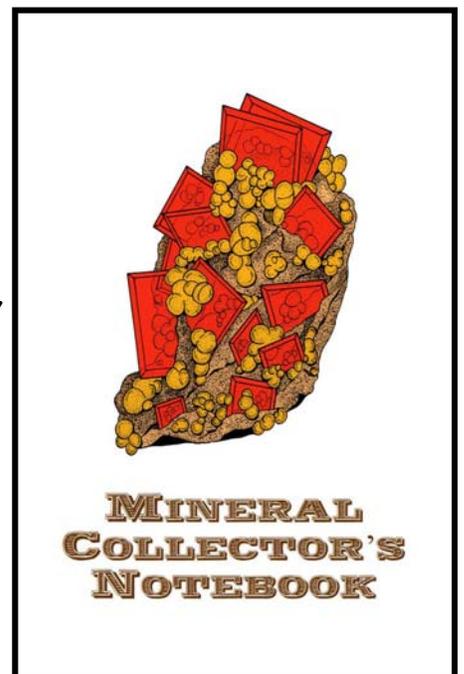


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