

THE
MINERAL
BOOK

multi-age format
WONDERS *of* CREATION



DAVID MCQUEEN

First printing: November 2014

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Unless otherwise noted, Scripture quotations are from the King James Version of the Bible.

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Dedication

To my wife, Shirley McDonald McQueen, my first and most loving editor since 1872, *no, no David, 1972 . . .* Thanks, Shirley, for catching that!

Who can find a virtuous woman? For her price is far above rubies (Proverbs 31:10).

Agate gemstone

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Cover image: Large symmetrical piles of salt (halite)
Inside front cover: A view of the Fort Knox Gold Mine,
just north of Fairbanks, Alaska, which is the largest
open pit mining operation of its kind in Alaska.

Calcite under
ultraviolet light.





Foreword

Minerals continue to fascinate me. They have such beauty, such elegance—particularly when viewed through a microscope or in their crystal phases. And they also contain a historical message, especially when considered from a biblical creation perspective. They tell us much about the world’s origin and the timing of events mentioned in Scripture. From minerals we can learn about creation itself, the great Flood of Noah’s day, and even details pertaining to the history of Israel.

Mr. Dave McQueen has been my dear friend for many years. As geologist colleagues we have traveled far and wide on various geological field trips. Even though our geological work together has most often centered on the rock strata or the fossils within the rocks, Dave always considers the minerals, too. Before working with him, I had seldom understood their full importance.

In the pages to follow, Dave will open up the world of minerals to you, just as he did for me. You will thrill with the surpassing design of crystals and the microscopic detail of transparent thin sections of minerals. A whole new aspect of God’s wondrous creation will be revealed before you. You will grow to appreciate the monetary value of some minerals and learn how creation scientists use other tiny minerals in creation research to expand our understanding of both our Creator and His marvelous creation, and our place in it.

So enjoy your educational excursion into the fascinating world of minerals. Allow them to not only increase your understanding of the physical world around you but deepen your understanding of its Creator as well.



John Morris
President of the Institute for
Creation Research

Our best-selling Wonders of Creation Series is even better!

The series is being developed with an enhanced educational format and integrated with a unique color-coded, multi-skill level design to allow ease of teaching the content to three distinct levels.



SAFETY FIRST!

This book contains encouragements for field work and mineral collecting on roadsides. For your safety, we ask that you always have adult supervision.

How to Use This Book

The Three Skill Levels

The Mineral Book has been developed with three educational levels in mind. These can be utilized for the classroom, independent study, or homeschool setting. For best possible comprehension, it is recommended that every reader examine the text on the off-white background. More skilled readers can then proceed to the green sections as well. Finally, the most advanced readers may read through all three sections. Look for the following icons and special features throughout the book:



Level One

Introduces minerals to younger readers. The information written for this level serves to whet the appetite for the naturally inquisitive child's mind. The young reader will be drawn to the colorful minerals they have already discovered in nature, in their classrooms, and in museums. It points them to God's creative design.

Level Two

Written for those with a more expanded vocabulary, and introduces them to mineral identification and to minerals that are mentioned in the Bible. This age will be challenged to begin collecting minerals from their environment or as they are vacationing. As they read this book, they will be motivated to collect and study minerals with a whole new perspective on how important these have been, and continue to be, to our world.

Level Three

Written at the highest skill level, and will especially be of value to amateur mineral collectors, who want to make more sense out of their beautiful collections. It is our earnest desire that level-three discussions inspire young men and women to become creation scientists. This information will serve to have them look at minerals from a biblical, scientific viewpoint of these God-designed gifts to us.

Chapter Mineral Focus

At the beginning of each chapter is a level-two introduction of a specific mineral, detailing its name, chemical formula, crystal system, hardness, luster, and streak, as well as a biblical passage that relates to the mineral (Rock Solid Minerals). Also, details are included concerning where this particular mineral is found and what it is used for. The Fun Fact on the page is always level-one content.



The Scarlet Thread and the Colored Stones

Dr. W.A. Criswell did a detailed study on the significance of the blood sacrifice that God has required for redemption. He imagines the references to the blood to be like a scarlet thread that begins in Genesis, when God had to kill the first animal in order to clothe Adam and Eve after sin shattered their innocence. This scarlet thread winds through Leviticus, when the priest performed animal sacrifices to cover the sin of God's people, and culminates in the New Testament, where Christ becomes the sacrificial lamb and is slain, so that His blood could cover our sins.

Dr. Criswell refers to a physical scarlet thread in Joshua 2:18. Joshua has sent spies into the city of Jericho, which God had commanded them to destroy. The spies were hidden by a harlot named Rahab. God had already been working in her heart, because she risked her life for these men. She had heard of these people who served a God who struck fear in the hearts of their enemies. She wanted to be on their side! Before they escaped the city, she knew they would be back to destroy it. She asked them to show her a kindness and spare her and her family. In Joshua 2:18, the spies answered her: "Behold, when we come into the land, thou shalt bind this line of scarlet thread in the window which thou didst let us down by: and thou shalt bring thy father and thy mother, and thy brethren, and all thy father's household, home unto thee."

What a wonderful analogy of being saved by a scarlet thread to that of being saved by the red blood of Jesus Christ. Rahab was a harlot, yet her name is included in the genealogy of Christ! (Matthew 1:1-16). One person's faith has a huge impact on historical outcomes.

Creator. Savior. Lord.

These three names are represented by the three stones shown throughout in this book. It helps us tie together the idea that God has loved us eternally. He created a beautiful world and then created us in His own image, (purple stone of creation), He planned a way to save us (red stone of the blood), and in sending His only Son, He did redeem us and offer us His lordship (gold nugget of His lordship in our lives.)





The purple color will remind us of the creation week. Amethyst is purple quartz. It is one of the minerals that is referred to in both the Old and New Testaments. Amethyst was created as a lovely purple-hued hexagonal crystal.

This hexagonal crystal is one of the six crystal systems in which God chose to design minerals.

Imagine, of the thousands of minerals God made, He used only six basic crystal shapes. This is a wonderful reminder to the six days of creation.

The red color will remind us of Jesus our Savior. The red emphasizes the blood of Christ, which is God's gift of grace to us. God created jasper as one of the beautiful red minerals mentioned in both the Old and New Testaments. As you read about the many minerals God has given us, and learn how they allow us to live a richer life, I think you will begin to understand that they are, just as grace is, something we get from God that is totally undeserved.



The gold color will remind us of Christ's lordship in our lives. When we put our trust in Christ, we crown Him as King of our life. **Gold** is mentioned at least 350 times in the Bible. It is considered one of the most precious minerals. Gold is a soft metal, which is easily shaped, or malleable. Think of Christ's work in our hearts, as we read His word, and imagine that your heart, which is God's greatest treasure, to be like gold in His hand. He is shaping it to know Him, and worship Him as our Creator. Psalm 100 tells us that it is God who has made us, not ourselves. **YOU** are His creation. This speaks of our relationship to Him, which will last throughout all eternity!

Where Do We Find Minerals?

There are about 4,000 known minerals in the world. They can be found in every locality around the globe. Minerals appear in caves, in deserts, on ocean floors, in mountain ranges, and in river sediments, just to name a few. Some are native minerals (also called native elements), such as gold, copper, and silver, and contain only one element. The common mineral quartz is found in beach sand and river sediment that is scooped out to be part of the mixture we call concrete.

The Bible is full of references to minerals, rocks, metals, and gems. Gold is mentioned as early as in Genesis, the first book of the Bible. King Solomon was known throughout the ancient world for his mineral treasures. The book of 2 Chronicles records what is called “a covenant of salt” that was used as a sign of an unbreakable agreement, and in Matthew 26, our Savior was betrayed by Judas for 30 pieces of silver. These and other minerals are found all around us.



Terms

Rare minerals – *Those minerals that are more uncommon, generally more valuable, and often harder to gather because of the process involved.*

Chemical interactions – *The reaction that occurs when two or more chemicals are combined.*

Native mineral – *A native element (or mineral) you pick up that looks like a rock, but is actually a mineral composed mostly of a metal.*

Interior of the Conch Bar Caves on the island of Middle Caicos in the Turks and Caicos Islands.

Level 1

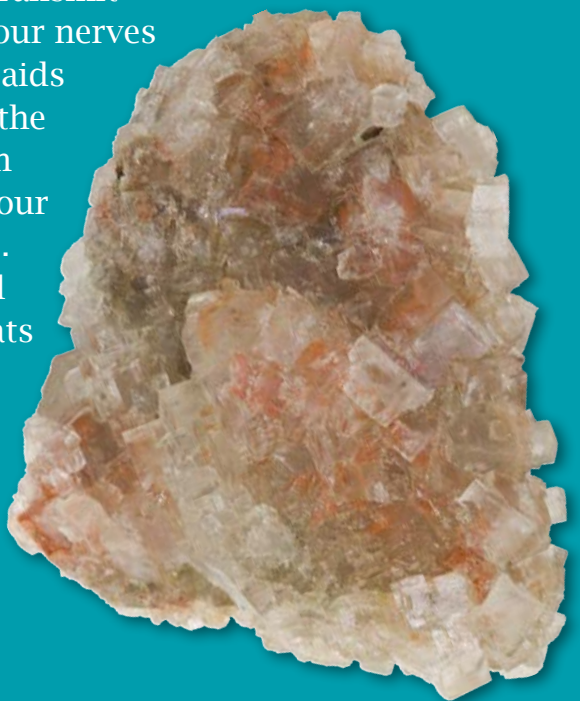
Level 2

Level 3



Where is it found? Salt is found in mines, worldwide. Sea salt is evaporated from ocean water. The largest salt mine in the United States is in New York. The largest salt mine in the world is in Ontario, Canada.

How is it used? Salt is essential to our nutrition. It is the sodium ions present in salt that the body requires in order to perform a variety of functions. Salt helps maintain the fluid in our blood cells and is used to transmit information in our nerves and muscles. It aids in digestion by the intake of certain nutrients from our small intestines. Salt is also used to preserve meats and vegetables. Salt melts ice, so it is used in cold climates to clear the roads.



Fun Fact: All of our body fluids are salty. Salt is in every cell in our body. That is why our tears and our sweat taste salty!

MINERAL FOCUS	Salt or halite
CHEMICAL FORMULA	NaCl
CRYSTAL SYSTEM	Cubic
HARDNESS	2½
LUSTER	Vitreous
STREAK	White



Ye are the salt of the earth: but if the salt have lost his savour, wherewith shall it be salted? it is thenceforth good for nothing, but to be cast out, and to be trodden under foot of men.

Matthew 5:13

Salt Production: Methods and Miners

Salt is a vital mineral needed by people around the world. The process of producing salt is generally done in one of the following three ways:

Evaporation: In drier coastal climates, near salty sea water or salt lakes, salt water is directed into shallow pools, where the wind and sun help evaporate the water and leave behind the salt.

Deep-shaft mining: Much like regular mining for minerals like zinc and copper, this involves drilling shafts into the earth where salt deposits are found, crushing the salt, and bringing it to the surface, usually to be used as rock salt.

Solution mining: Most table salt is made from gathering salt from salt beds and injecting water into the mix to remove the salt. This brine solution is then evaporated in salt pans at a processing plant.

The workers involved with the solution mining or salt panning are often exposed to very harsh conditions for very little pay. Both their exposure to the salty brine with little protective gear and exposure to harsh weather conditions takes its toll on their health, and the livelihood of their families, who often must travel with them wherever the work can be found.



Salt pans in India dry up sea water to produce salt.



Salt pans in Maras, Peru, have been in use since the Inca culture, approximately 500 years ago.





How important are minerals to us?

Let's just imagine a typical morning. Before you taste your eggs, you salt them. You have just added a mineral. Salt is NaCl , an extremely important mineral in our diet. Picking up a fork, you eat your eggs. This stainless steel utensil is made by mixing iron with another metal called chromium, which stops the fork from rusting. Who wants to eat from a rusty fork? The iron and chromium, by the way, both come from minerals! As you fill your glass with milk, you may be surprised to know that your glass started out as pure quartz sand. The quartz (SiO_2) was melted down and mixed with other ingredients to make it transparent and leak-proof! Next you pick up a pencil with a lead made from graphite, a soft mineral that enables you to write a quick note to your

dad, reminding him of your dental appointment after school. You quickly stick this to the wall, which is drywall, which is made from heated gypsum plaster. Did you know gypsum is a mineral? Grabbing your backpack, you head out the door to catch your ride. You walk down a brick path that leads to the driveway. The bricks are made from clay, a very common and plentiful mineral. There you have it. You have benefited from at least seven minerals, and the day has just begun!



The deep waters of the Dead Sea in Israel are shown dark blue, while brighter blues indicate shallow waters or salt ponds. In the modern age, sodium chloride and potassium salts evaporated from the sea are used for water conditioning, road deicing, and the manufacturing of polyvinyl chloride (PVC) plastics. The expansion of massive salt evaporation projects are clearly visible over the span of 39 years.

Minerals in the Human Body

There are a good number of minerals beyond just salt in the human body that are vital for our health, and are the foundational material for our bones, cells, and tissues. Your body can't produce the minerals it needs, so God has provided sources all around us to provide you with the balance you need. Here are just a few of the needed minerals, where you can get them, and what they do for your body!

Enzymes in your body, more than 200 of them, need zinc to help them process the chemical reactions. Zinc can be obtained from eating eggs, fish, various meats, and wheat germ.

Connective tissues in your body need silicon to help them form stronger ligaments and tendons, and also in the growth of our bones. Silicon can be found in root vegetables, like carrots, whole grain bread, and cereals.

Blood transports oxygen through your body, and for this to function well it needs iron, which works best in combination with vitamin C. Your body can get iron from many sources, which include eggs, oysters, red meat, and seeds.

Cells need potassium and sodium to help them function, as well as to regulate the water in your body. A good source of potassium is citrus fruit, as well as nuts, leafy green vegetables, and potatoes, while sodium comes from table salt, fish, and other salted meats.

Bones contain masses of crystals composed of minerals like calcium and phosphate to make them stronger. Calcium can best be obtained from milk and other dairy products, as well as green vegetables and nuts. You can get phosphate from chicken, eggs, fish, nuts, and seeds.

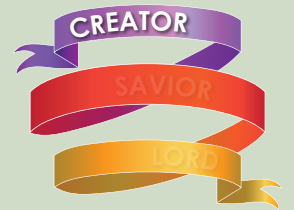
Mineral Composition

What is an example of a rare mineral? This question is not nearly as simple as you might think. Search online yourself. Some websites list apatite as a rare mineral, yet it is seen in every Mohs' mineral harness set sold worldwide (see chapter 2). Why would anyone view apatite as an example of a rare mineral? Apatite's chemistry is not simple, yet not as complex as some. Here is what we mean: Apatite, which is rich in fluoride, is written as: $\text{Ca}_5(\text{PO}_4)_3\text{F}$. Apatite is actually a group of minerals. If it is rich in chloride, the formula is written: $\text{Ca}_5(\text{PO}_4)_3\text{Cl}$. It is a phosphate mineral containing calcium, fluoride, chloride, and hydroxide. Some scientists consider apatite rare because its particular crystal form is not frequently found.



Apatite

Are minerals an accident of chemical interactions, simply appearing on earth due to chance and impersonal forces of nature? Some books will tell you that minerals are naturally occurring substances, which implies that it is simply a part of mother earth. Instead, do minerals reflect an order and beauty that could only be designed by an intelligent Creator? This idea implies that each mineral type was specially created to reflect a God-designed universe. As you examine minerals, think of this verse: "For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse" (Romans 1:20).



The more intensely one looks at the order and design of minerals, the more the truth of this verse in Romans rings true. The minerals we find on this amazing planet are lovingly designed by a God who wants us to see and believe that He exists! "But without faith it is impossible to please him: for he that cometh to God must believe that he is, and that he is a rewarder of them that diligently seek him" (Hebrews 11:6). As we look at minerals with this verse in mind, He will reward us with wisdom and awe that far surpasses the scientific minds of those who do not believe in the Creator God.



Minerals or Rocks?

It seems a bit confusing on the surface to say that minerals are not rocks, but all rocks are made up of minerals. This is why it is often said, "Let us get the minerals out of that rock!" Minerals contain metals. In mining, rocks are broken to yield minerals, which then are smelted to release metals such as gold or zinc. Geologists classify three types of rocks: igneous (like lava), metamorphic (like marble) and sedimentary (like sandstone). All three kinds of rocks were formed both during the Creation week and the Flood year.



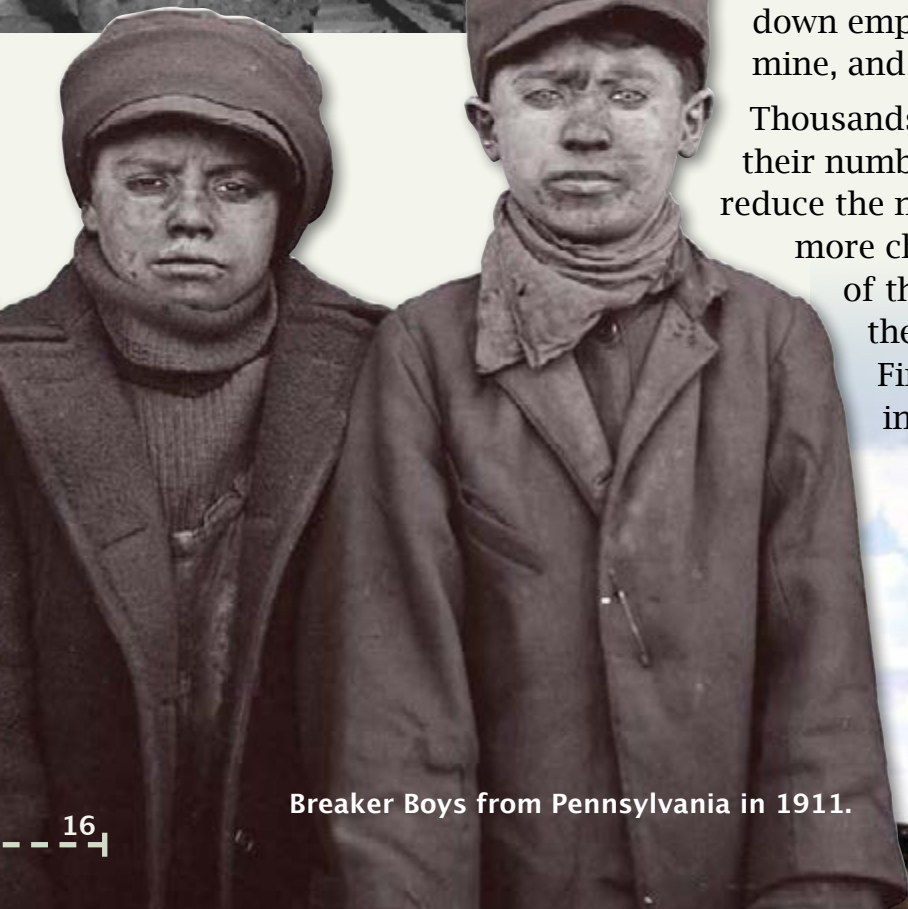
Ancient Egyptian quarry

For thousands of years, people have mined minerals and other materials like coal in order to provide both aesthetic and useful benefits for their cultures. These mining operations have always been strenuous, as well as dangerous. In the mid-1800s, there was a movement to use young boys in coal mining; a movement that last nearly 60 years. They were called *breaker boys*, some as young as 8, and though the public often fought against the use of children in something so unsafe, they used them to mine in both the United States and the United Kingdom.

MINING

The breaker was where the coal was crushed, then sent to be sorted by the boys. They would often work 6 days a week, hard days lasting 10

Nipper Willie Bryden at age 13.



hours or more. The work was exhausting, and they were liable to lose fingers if they couldn't pay attention, and their fingers were often cut by the sharp slate.

Spraggers is what they called the boys who slowed the racing mine cars down with sprags, pieces of wood used as manual breaks. *Nippers* is what the boys were called who would open the doors when the mule and driver pulling the coal cars passed through, which meant nippers were often sitting alone in the damp darkness. *Mule drivers* were the older boys who helped bring down empty coal cars throughout the entire mine, and pulled out the loaded carts.

Thousands of young boys worked in the mines, their numbers diminishing as technology helped reduce the need for their labor, and as more and more child labor laws were created because of the public dismay over the conditions these children were forced to work in. Finally, by 1920 the use of breaker boys in the mines neared its end.



Breaker Boys from Pennsylvania in 1911.

Modern mineral mining operations are considerably different from mining in the past, but the dangers of mining still exist. Because of the value of the minerals, often operating a mine can run in the billions of dollars, including the expense of the equipment, the land rights, environmental regulations, trained personnel, transportation, time of processing, and more. And often the sites that hold these valuable minerals, such as gold or diamonds, are either in remote areas or involve deep and costly excavation procedures.

Sometimes the costs become too high to maintain operations if the return from minerals extracted is not as expected. One such site was the Beaulieu Mine in the Northwest Territories of Canada. It began production near the end of 1947, but only recovered about 30 troy ounces of gold by 1948. A troy ounce is used to measure precious metals and is slightly more than an ounce (1.09 ounces). The mine was closed soon after because of bankruptcy.

All the costs must be carefully weighed before new operations are presented to investors, and even then one can never know for sure about the return of investment possible. Mining feasibility studies are used to help companies and investors evaluate whether or not to proceed, but they are always limited. This is what has come of our modern need for certain minerals in a sinful world where they no longer simply fill the rivers, ready to be easily gathered by hand. We must work hard to collect them.



Marion steam shovel reminiscent of Mary Anne from the 1939 children's classic *Mike Mulligan and His Steam Shovel*.



Electric shovels can carry up to 56 cubic yards or 98 tons of ore in a single scoop. The trucks themselves cost about \$3 million each!



The Bagger 288 is a bucketwheel excavator used in strip mining. It is also the largest land vehicle of all time.



As with many monuments and historic buildings, the Taj Mahal in India was made of various kinds of marble, beautifully carved with exquisite detail. Marble is a metamorphic rock and made up of minerals like calcite. For thousands of years, marble has been used by artists to form lifelike figures into sculptures. Carrara is a city in Italy that has supplied much of the beautiful white and blue-gray stone, used by artists including the marble Michelangelo used to sculpt his famous figure of Moses in Rome.

Additional Research

Compare the definitions of minerals from three mineral or geology books in your library or from online sources. If you can, obtain a copy of *The Geology Book*¹ and read chapter 8. Note the differences between secular sources and Christian sources.

¹ Morris, John D. *The Geology Book* (Green Forest, AR: Master Books), 2000.

Minerals in Everyday Materials

A cloth towel: contains chromite and sphalerite for dyes.

Batteries: contain galena, graphite, and sphalerite.

Carpet: contains sphalerite (dyes), chromite (dyes), and sulfur (foam padding).

A computer: contains wolframite (monitor), copper (wiring), quartz (electronics), and silver.



The Wealth of Nations

Minerals and gems have played an important role throughout human history. Yet, man has no control over where the diamond or iron ore deposits are formed. From the biblical geology viewpoint, God decided where all minerals were placed. God's grace and mercy allowed people in the pre-Flood world and the post-Flood world to actually find mineral deposits necessary for making metals that come from these deposits.

Wars have been fought over mineral wealth. In WWII, Germany invaded certain European areas because of their mineral wealth, not in spite of the mineralogy. In addition, many of the art treasures of the world were painted using mineral-based pigments. Empires have been symbolized by golden crowns encrusted with precious gems. Most coins from ancient times until now have been made from metals, which are refined from minerals. Examples of these metals are gold, silver, copper, bronze, and brass.



The Dutch artist Johannes Vermeer (1632–1675) painted *The Milkmaid* using more expensive mineral-based paints, such as ultramarine from lapis lazuli, in order to bring out the vibrance of the colors.



• Varying colored clays and other mineral compounds have been used in the past to create lasting color for artwork. Paints have been produced from the earthy tints red and brown clay, as well as greens from malachite, blues from azurite, and yellows from fool's gold.