***Prospectors***

Learning about the story of rocks and the age of the Earth increases our sense of geological history, helping us discover and appreciate the wonder of our planet. Comprehending the constantly changing processes which have altered our landscape over the eons is a difficult task given our limited human sense of time. But it is necessary understanding if we are to see where we are, and where we might be going

The variety of rock-its colors, textures, forms, its contrasts with plants, light and beautiful place. A walk through a canyon, the rattle of pebbles on the beach, granite or marble statues, the pavement of the street, the buildings of the town-all are made with rock. It is rock from which the seas were squeezed, the atmosphere expelled and the mountains uplifted.

-adapted from A Sense of the Earth, by David Leveson

Prospectors

The Prospectors discovery group works by giving value to a relatively common mineral (quartz) and thus calling the students’ attention to the rocks around them. One they have become excited about rocks, they are ready to learn about the geological forces which created them by playing the pegmatite game and performing the metamorphic mash. Similarly, once they begin to understand the reasons behind why we value certain minerals, prospection for other riches becomes exciting. The trip to the crystal beds or the all-day, to the jasper pits or copper mines, is always a highlight.

**Activity** **Concept**

Quartz Rush Definition of rocks and minerals

Minerals of Pikes Peak granite

How minerals become valuable

Natural Crushers Forces of erosion

The Rock Cycle Igneous, metamorphic and sedimentary

 formations, How rocks change

Metamorphic Search Different combinations of similar minerals

Contact Zone Batholith formation, Contact zones, and

 Pegmatite formation

Stagecoach Road Local mining history

Prospecting Hike Sense of Wonder, Sensory awareness

Claim Staking Crystal structure, Pegmatite formation

 Varied appearance of minerals

Concluding Discussion Dependence of all life on rocks, The

 Constantly changing Earth, The

 Kinds of wealth-and values

**Prospectors ALL-DAY**

Mining Techniques Shaft mines, strip and placer mining

 Ore refining processes

 Environmental impact of mining

Jasper Pits Option Volcanic rock formations and contact

 Zones, Description of jasper,

 Local mining history

Copper Mines Option History and formations and contact zones

 Formation of Florissant Fossil Beds

 Description of copper

 Local mining history

**Prospectors**

After taking roll at the meeting stake, divide the students into four mining companies, each lead by a counselor. To help set the role, counselors may want to dress like prospectors, in overalls, plaid shirts, old hats, with dirt on their faces. Now read or describe the following news bulletin from a piece of old newspaper.

NATIONWIDE QUARTZ RUSH IN PROGRESS!

Scientists working on alternative energy sources have discovered that quartz is the source of a new type of nuclear fuel which is safe, economical, inexpensive and does not have dangerous by-products. Prospectors all over the country are searching for this precious mineral whose value has increased one hundred times over night.

Now the leader can sneak a piece of pure quartz out of his pocket and show it to the prospectors group, taking care not to let any of the other groups see this valuable mineral. Explain that rich deposits of quartz are known to exist in the High Trails area. This is the break you’ve been waiting for-a chance to become prospectors and “strike it rich”! The leader can now take the mining companies to the first strike site. They may want to choose a name for their companies along the way.

 **QUARTZ RUSH**

**Definition of rocks and minerals**

**Constituent minerals of Pikes Peak Granite**

**How minerals become valuable**

Upon arrival at the prospecting site, give the students about 10 minutes to look for quartz. Have them take all the quartz they find to the “Assay Office” where the value of their finds can be determined. At the Assay Office a teacher or staff member can play the role of the “Mad Assayer”, who loves quartz and awards points on the quartz finds of each individual prospector. The prospectors, in turn, report their points to their mining company leaders and continue the search for quartz. The “Mad Assayer” can barter with prospectors as well as help them recognize the constituent minerals of Pikes Peak Granite (quartz, mica, feldspar). After the Assay Office closes, the mining companies can tally their points. After the assays are complete, gather the students again and discuss their discoveries.

*What is quartz? A rock or a mineral? What is the difference between rocks and minerals?*

Rocks are made of specific minerals just as cake is made of specific ingredients. Like gold, silver and other precious metals, quartz is a mineral. It is sometimes found alone in a near pure state, but more often it appears in combination with other minerals.

*In what combination is the quartz they found? Use a hand lens to distinguish the various minerals.*

The combination of minerals found here is a rock called Pikes Peak Granite. It is composed of three minerals:

Quartz-light grey grains

Mica-black, smaller grains

Feldspar-pinkish, larger grains

*What makes a mineral valuable? Why is gold valuable? Silver? Uranium? Are some minerals which have no use valuable for other reasons?*

Though gold has certain properties which make it useful-its durability, its malleability, its use as a conductor-gold is valuable largely because of its brilliant appearance and beauty-and its scarcity. Fromman’s earliest times gold was used as an adornment, as coinage for trade, and as a symbol of wealth and stature. But, just as we give a $100 bill value by printing $100 on this otherwise worthless piece of paper, so we give gold value by agreeing that it is valuable. This agreement is the real reason for its value today: Gold has long been used as a monetary standard worldwide to insure a nation’s paper money. Silver is valuable for many of the same reasons-its appearance and beauty and some of its uses-but is no longer used as a monetary standard.

Today, we often give minerals without aesthetic properties value. Uranium and molybdenum, for instance, are not used in jewelry or as coins. These minerals are used for energy and to strengthen steel, giving them real utility, and accounting for their value. Nevertheless, many people still recognize the value of a beautiful rock, and are willing to pay for beautiful and relatively scarce specimens of quartz and other crystals.

NATURAL CRUSHERS

**Forces of erosion**

*Since quartz pieces are combined with feldspar and mica in granite, why are there some small relatively pure pieces of quartz lying around? What happened to break these pieces apart? As prospectors we know that the purest ore is most valuable at the assay office. Some large pieces of granite contain a lot of quartz, but how will we get at it?*

See how many examples the students can find of forces that might break the granite apart. Give the students five minutes to climb around the rocks and compile a list of natural erosion forces which they can support with direct evidence on these rocks. The assayer can offer to “buy” ideas for natural “crushers” from the companies and award points at the end of the activity.

Erosion of rock surfaces is caused by many different forces:

Lichen- This tiny plant can grow on the rock and secretes a mild acid which will slowly decay the rock.

Plants- Sees are sometimes planted in cracks in rocks. As the plant grows, a mild acid in the roots will help break the rock apart. Also the growing root will enlarge the crack.

Ice- Water is caught in cracks in the rock. In the spring and fall this water may freeze at night and thaw again during the day. As the water expands when it freezes, it will force the crack open a little farther.

Water- Water running over the rock carries away loose particles. As bits of gravel are carried over the rock, it acts as sand paper and wears down the rock.

Wind- Wind can pick up small loose particles of gravel around the rock and have a sand-blasting effect on the rock.

*How have humans copied these natural crushers to extract mineral from the earth? What are some of the side effects of these methods?*

We use machines and chemicals to extract mineral from rock, crushing it, heating it, or using chemicals to leach out the minerals. IN some places we have taken so many rocks from an area that we have literally destroyed mountains, leaving piles of waste rock (called tailings) in their place.

THE ROCK CYCLE

**Formation of igneous, metamorphic, and sedimentary rocks**

**How rocks change**

Sometimes prospectors were simply lucky- they stumbled upon some outcrop of precious mineral-or followed another prospector’s lead and looked around an area known to be rich. But, more often, prospectors were shrewd amateur geologists, studying the land and rocks to determine the best place to search. As miners, we need to understand the basic types of rocks in our area if we are able to strike it rich. Gather the students again and ask them where the granite came from. *How did it get to the surface of the Earth?*

Pikes Peak Granite is an igneous rock which was pushed up from deep in the Earth’s crust. One billion years ago it cooled and solidified 1-3 miles below the surface. It has since been exposed by the forces of erosion. *If Pikes Peak eroded at the rate of 1 millimeter per year and is 3,000 meters high, how long would it take to disappear? If Pikes Peak is 10 million years old, and is still approximately the same size, how fast is it growing? (*About 3mm/year*)*

*What will now happen to the Pikes Peak Granite? Notice all the tiny pieces of rock lying around, broken by the erosion forces we have just discovered. Ten years from now will they be uphill or downhill from where they are now?*

Rock bits are moved downhill by gravity, sometimes aided by water, wind or other forces of erosion. Eventually, they accumulate in low places, especially seas and lakes

*Look again for separate pieces of quartz, mica, and feldspar-all the components of Pikes Peak Granite. If all of these pieces were somehow stuck together again, would they be granite again?*

The reconstituted mica-quartz-feldspar combination would now be a sedimentary rock. The sedimentary layers form in ocean basins, lakes, streambeds or other depressed areas where rock particles gather.

THE SEDIMENTARY/ METAMORPHIC MASH

Small pieces of igneous rock, like the Pikes Peak Granite we have been investigating, eventually gather in lakes and other depressions on the surface of the Earth. Here, they are pressed into compact sedimentary layers.

To demonstrate the formation of sedimentary and metamorphic rocks, ask the students to close their eyes and imagine the following: You have become a layer of sedimentary rock. Think about being flat and heavy, unable to move. Wind, glaciers and streams dump silt, sand and gravel on you, volcanoes bury you in deep ash. These sediments solidify into rock, and more materials accumulate to form more layers of rock on top of you. Hundreds of millions of years pass and the pile becomes two or three miles thick. What do you feel? Pressure? Heat? Changed?

As sediment settles on more sediment, the bottom layers will change under the intense pressure and accompanying heat. This “changed” rock is called metamorphic rock.

METAMORPHIC ROCK SEARCH

**Different combinations of similar minerals**

We will be able to find rock that looks just as squished and warm as we felt when we pretended to be metamorphic. Ask the mining companies to walk West, looking for a rock that is different from Pikes Peak Granite. The Assayer can offer to give bonus points to any company able to find examples of the metamorphic rock.

After everyone has found the “different” rock, gather all the mining companies together at a spot which has a few large specimens of this rock. Ask the students to inspect it closely. How is it different from Pikes Peak Granite?

Using hand lenses, inspect this rock for minerals. Are the *different minerals easier to find or harder to find than those in Pikes Peak Granite? What are the minerals?*

This rock is schist, a common form of metamorphic rock. It is made up of the same minerals as Pikes Peak Granite, but in different forms. This schist is about two billion years old, some of the oldest in Colorado.

You may want to use the polariscopes to look at slides of granite and schist composed of quartz, feldspar and mica. Notice the similarities and differences in the two slides. Quartz and feldspar both appear as gray minerals when viewed with the polariscopes. The mica will be more brightly colored.

CONTACT ZONE

**Batholith formation**

**Contact zones and pegmatite formation**

Now, walk to the base of Little Blue where the students will begin to find large pieces of granite and schist side by side. Ask them to look especially for individual rocks which are composed of both granite and schist. As prospectors, we know that were two different rock formations meet; we can often find valuable minerals. After the students find samples of both kinds of rocks in one individual rock, seat the students for a brief discussion about this area.

*What is unique about this area? What do the rocks you have discovered here indicate?*

This area at the base of Little Blue is a different contact zone, the place where two different rock formations come together. The metamorphic rock of Little Blue is over a billion years older than the Pikes Peak Granite, so it was solid when the granite was still molten. The molten granite was contained in a huge area called a batholith. The Pikes Peak batholith extends East of Pikes Peak and we are sitting on its Western edge!

*Why is this contact zone a good place to prospect? If you were mining for gold or silver instead of quartz, would this be a good place to look?*

 Valuable minerals may often be deposited where two different types of rock met. In such an area there may have been cracks in rocks and perhaps the heat necessary to deposit these minerals. In the formation of granite, as the rock cools and solidifies, the rock contracts and cracks. Into these cracks some of the remaining molten rock can flow, including the last part of any odd minerals that did not fit into the general make-up the rocks. These cracks, or pegmatites, make good prospecting not only for large pieces of quartz but also for other valuable minerals.

THE PEGMATITE GAME

To demonstrate how pegmatites are formed, have all the students stand within a circle you draw on the ground. This circle represents the boundaries of the granite batholith. Now designate an equal number of students as feldspar, quartz, and mica. Next, designate 3 additional students as quartz and one student each as gold, silver, and copper. All the students together represent roughly the molten mass of magma which cooled to form Pikes Peak granite. Next have the granite cool-feldspar, mica, and quartz students should try to get together. Once one feldspar has joined with one quartz and one mica, this trio should join hands, stop moving and push as close to the center of the circle as they can. They have become granite. When all the possible granite combinations are formed there should be only 6 student’s still moving-3 quartz, and the gold, silver and copper-and they should be on the other edges of the granite. The quartz and metals will form pegmatites as they cool.

STAGECOACH ROAD

**Local mining history**

Before leaving this area, take a minute or two to inspect the road at the base of Little Blue. This is an old stagecoach road first used over one hundred years ago.

*Where did the road go? What do you think the stagecoach carried?*

This road ran from Cripple Creek, a once large and bustling mining community, to Florissant, which was much larger 100 year ago than it is today. Cripple Creek was the world’s greatest gold town for many years-with millions and millions of dollars of gold found there and as many as 50,000 people in residence. As the news of the gold strike in Cripple Creek spread, more and more people rushed to the town in hopes of finding their fortunes. The stagecoach carried people and supplies to Cripple Creek and sometimes even cargos of gold from the mining town. Imagine what it would have been like to have lived in a gold camp.

*What kind of place would it be to grow up? What would the atmosphere be like?*

There was so much gold in Cripple Creek millionaires were made almost by accident. When people tried to put up buildings they would strike gold-one mine was even found when a man threw his hat up and dug where it landed. As a result of all this new wealth, there were many examples of crime and greed, but there were also great philanthropists, who had so much money they couldn’t possibly sped it, and spent their time and money contributing to the growth of Colorado Springs. The everyday miner had a tough row-not much money and a very risky job-but often improved his take home pay by high-grading-taking a bit of ore out of the mine in his pockets.

PROSPECTING HIKE

**Sense of wonder**

**Sensory awareness**

After exploring the Stagecoach Road or telling the legend of Shady Pete, (see all day) explain that you are going to continue your search for a quartz bonanza.

On the way to the Crystal Beds, have the mining companies “prospect” the area for a different type of riches. Each group can watch for and make note of anything they see of special interest-animal tracks, homes, signs, a tree which has been struck by lightning, beautiful clouds, etc. Points will again be given to the companies on the basis of their finds. Remember that throughout human history, the more scarce or rare a find, and the more beautiful or useful-the more value humans have given it.

CLAIM STAKING

**Crystal Structure**

**Pegmatite Formation**

**Varied appearance of minerals**

Before arriving at the Crystal Beds, stop and explain what quartz crystals look like and why they have their special shape. It helps to have a crystal to show the group.

Quartz crystals have six sides like a pencil and may be terminated in a point. The quartz molecule is a tetrahedron, or three-sided pyramid shape. When these are packed together as closely as possible, a six-sided figure is formed.

Next, discuss the proper procedure in staking a claim. In order to stake a claim, the mining company must mark the four corners of an area which is 15 feet long and 3 feet wide (the standard Colorado mining claim is 1500 feet long and 300 feet wide). Next, they must describe the location as accurately as possible by noting the distance from landmarks (10 feet East of large rock, 30 feet North of 3 ponderosa pines, and so on).

Counselors in charge of the mining will have “claim forms” which must be filled out before prospectors can “work” the claim. These claim forms are turned in to the “Claims Office” (teacher or staff member) with the location of the claim accurately detailed, the prospectors’ names and mine name. Each mining company may file several claims on areas not already claimed by other groups.

After explaining how staking claims works, walk where you first begin to see pieces of quartz from the Crystal Beds. The let the companies stake their claims.

When the students have had ample time to dig on their claims and look for crystals, gather the group again and discuss their discoveries.

*How many different kinds of quartz did they find? Did anyone find anything which was not quartz? Were there reddish streaks in any of the quartz? What was this? What kind of geologic formation caused these crystal beds? Is it a good place to look for minerals other than quartz?*

The Crystal Beds are a pegmatite outcropping of the type mentioned in relation to the contact zone of Pikes Peak granite and Little Blue schist. The crystals were formed when silicate cooled very slowly in a crack in the granite which made room for crystals to grow. Large clumps of milky quarts, small pieces of optic quartz, smoky quartz and pieces of mica are found in abundance here. (Gold, like quartz, looks very different depending on what kind of ore it is found in.) Hematite, which is a form of iron ore and has a reddish-brown-black color, may also be found here.

CONCLUDING DISCUSSION

**The dependence of all life on rocks**

**The Earth itself is constantly changing**

**There are many kinds of wealth-depending on what we value**

*On your way back to High Trails, stop at a good place with a good view and ask the students if they can think of any ways that rocks and minerals contribute to life. To human life? To animal life? To animal and plant life?*

Rocks are the basis of life as we know it. The early atmosphere came from the elements of rocks, and all of the Earth’s water came from exploding volcanoes. Algae, bacteria, aspen, trout, robins, humans-all forms of life are made by atoms which once existed within rocks.

Rocks are the primary source of the soil in which our food is grown. The bricks, cement, iron and steel of our cities come from rocks. The metals which from our tools, machines and vehicles are minerals. Virtually everything on Earth takes its beginning from rocks.

*Sit quietly for a few minutes and imagine that you have x-ray eyes. Can you see the forces at work under Pikes Peak causing it to “grow”? Can you see the weathering forces at work wearing it down? Think about the rock you are sitting on. Can you imagine the forces which formed it deep under the surface of the Earth? Can you picture what will happen to this rock in the future-a long trip to the ocean floor, being changed by the heat and pressure to metamorphic rock, perhaps coming to the surface in some far away place.*

*Spend a few minutes now discussing prospecting. What is prospecting? The men who came West during the great gold rushes in the late 1800’s were looking for gold, silver, and other precious metals. Are there other kinds of prospecting? Is material wealth the only kind of wealth? Could we prospect for happy or joyful feelings, for beauty, for knowledge?*

Ask the students to spend a couple of moments quietly prospecting for these intangible types of things. Some may want to share their discoveries with the group-the view of Pikes Peak, the warmth of the sun, the feeling of friendship, the sight of a flower, the song of a bird. These are really the most important things we can search for and discover today.

As you walk back to High Trails, continue to prospect for these “real riches”.

**PROSPECTORS ALL DAY**

 The prospector’s all-day trip may take a variety of routes and will begin with material presented in the half-day curriculum, except for the concluding discussion. In addition, the all-day trip will go to the Copper Mines depending on the season and weather conditions.

Along the route, you can continue the prospecting game played on the way to the crystal beds-looking for unusual and interesting objects in nature. The teacher or staff member can help increase the students’ awareness by offering points for the mining company to see a bird’s nest, a lightning scarred tree, a berry, a winged seed, etc.

A number of mining-prospecting stories are also available for use during the Prospector all day. They may be used during rest stops on the trip out, at lunch, or along the return journey. At the Stage Coach Road, you may want to tell the story of Shady Pete.

SHADY PETE

*In the late 1890’s, the stage running between Florissant and Cripple Creek carried primarily passengers and supplies, but occasionally it carried another cargo shrouded in secrecy. The passengers on these special days were not normal passengers-though they appeared to be at first glance. But under their coats they carried revolvers and their eyes were watchful and suspicious. The cargo on these days was gold worth hundreds of thousands of dollars being carried from the world’s richest mining camp.*

*Hanging around Cripple Creek at that time was a shadowy figure called Shady Pete by the locals. Rumors had it that he had killed half a dozen men and pulled off so many bank robberies that sheriffs in 10 states were looking for him. But Shady Pete didn’t cause any trouble in Cripple Creek. He was always just around-watching and listening from the shadows.*

*And then on (insert present date) the stagecoach left Cripple Creek with the biggest load of gold ever carried. No one knew about it at the time except the mine owner, the guards, and a strange quiet figure standing in the shadows. They journey went fine until the stage approached that stretch of the road that lies where High Trails is today. It was a misty, eerie day and the drivers had lit their lanterns in order to see the road ahead.*

*Then suddenly as the stage rounded a turn, a figure flew out of the mist with blazing guns. The dazed guards could only stare in amazement as Shady Pete grabbed the gold and disappeared again into the mist.*

*Pete didn’t get far with the gold, however. It was heavy and he knew he would be followed soon so he stopped and buried it at the base of an old gnarled tree. Because the day was misty it was hard to get exact bearings, so to insure he would not lose the spot, he plunged his knife deep into the tree.*

*A couple of days later, Pete showed up in Colorado City in a jolly mood. He spent much time in the bars and spent money like a millionaire. He was having such a good time, in fact, that he didn’t notice the intense stranger who entered the bar. The stranger’s eyes, however, immediately found Pete through the smoke and noise, for he had been one of the guards on the stagecoach. A shot ran out, Pete crumpled to the floor, and the stranger disappeared in the midnight gloom. As Pete lay dying on the floor a companion knelt to hear his words: “Stagecoach gold-buried under tree-my knife.” These were Pete’s last words.*

*The word spread fast that there was a fortune in gold buried under a tree and fortune seekers combed the area. But none had any luck and it was finally agreed that Pete’s dying words had been no more than a final joke.*

*It was about 30 years later when an old man was running logs through the sawmill at Florissant. As one of the logs went through the saw, however, the saw clanked against something that sounded like metal and refused to cut any deeper into the tree. The old man stopped the saw and looked for the offending piece of metal. Slowly he drew it out of the tree until he could plainly see that it was the blade of a knife. And clearly embedded on the blade were the initials S.P.*

*The old man remembered the story of Shady Pete and his hidden gold and knew that he would be wealthy if only he could find the stump of this tree. So he carefully measured the base of the tree (diameter 30 inches) and counted the rings (108) and set off to find the right stump. The old man told no one of his discovery but spent the rest of his life looking for the right stump.*

*Before the old man died, he told his son of the buried treasure, but the son did not believe in Shady Pete or the buried treasure. After the old man’s death he talked freely about his father’s discovery. Some have looked for the treasure since that time but none have found it.*

 **Mining Techniques**

**Shaft mines, strip and placer mining**

**Ore refining processes**

**Environmental impact of mining**

During your lunch stop, you may want to consider some of the different types of mining and their impact on the ecology of the area being mined.

Shaft mines, both vertical and horizontal, tunnel into the earth, and the tunnels can follow veins of the substance being mined. Ore can be removed by ore buckets on pulleys, or in the horizontal shafts by cars on rail.

Building stone can be quarried by digging big holes in the ground. Softer rock like limestone can be cut in blocks and removed; harder rock may be blasted with dynamite.

Coal or rocks in horizontal layers near the Eart6h’s surface may be mined by stripping away all the rock on the surface and digging the desired layer out. This is called strip mining.

Many times the forces of weathering have already completed the task of digging ore from the earth, and the broken rock has been deposited as gravel in stream beds. Some of the earliest gold mines in Colorado were placer mines along streams where sluice boxes or large scale gold panning methods extracted valuable metals from the gravels.

Once out of the ground, most ores require further treatment to refine out the desired substance. This can be done by crushing the ore to a fine powder or sand consistency and separating the valuable minerals with chemicals, like acids. All refining processes require large amounts of water and it is very easy for this water to become polluted with chemicals or finely ground rock.

*Which of these methods is easier? Which do you think produces the most ore? Which types of mining do the most damage to the environment?*

**Stagecoach Game**

**Recreation**

Since time is almost always short for the return trip to High Trails, the Stagecoach game provides a quick and exciting journey.

Two counselor groups become the “Stagecoach” and two counselor groups are the “robbers”. The stagecoach team is given several packets representing the things of value a stagecoach would carry. (For example: Gold – 100 points; silver – 50 points; money – 100 points; small pox – subtract 50 points; etc.) The members of the stagecoach team try to carry these items safely to their destination at High Trails while members of the “robber” team try to steal the packets by tagging players from the stagecoach team. Any player on the stagecoach team who is tagged while carrying a packet must turn it over to the tagging “robber”. Members of the stagecoach team may pass the packets among one another.

It is essential that the teams stay together and with their counselors throughout the game. If at any time the teacher or staff member feels that the teams are getting too strung out, he/she may declare a “town”, or temporary safe base. The game ends when all of the players have entered the High Trails parking lot. Points on the packets in the possession of each team are then tallied to determine the winning team.

**Copper Mines**

**History and formation of Pike’s Peak**

**Formation of the Florissant Fossil Beds**

**Description of copper**

**Local mining history**

The trip to the copper mines will include many elements similar to the Jasper Pits option including the mining methods discussion and the Stagecoach game.

Along the route to the copper mines, there are many good vantage points for viewing Pikes Peak. At one of these points, take a few moments to discuss the Peak. *What minerals is it composed of? How did it rise to 14,000’? How is the Garden of the Gods related to Pikes Peak? What is happening to Pikes Peak now? What will happen to Pikes Peak in the future?*

Pikes Peak is part of the Pikes Peak batholiths which extends to Sunday Rocks and is composed of mica, feldspar, and quartz. About 65 million years ago, this part of the batholiths began to be pushed upward along a crack or fault in the Earth by forces from the interior of the Earth. It took many millions of years to rise to its present height. As Pikes Peak rose, the sedimentary rocks which lay to its South were forced upward on edge and became the Garden of the Gods. Today Pikes Peak is still rising – perhaps two inches every hundred years. However, it is also eroding away at about the same rate, so its height remains almost the same. When Pikes Peak stops “growing”, the forces or erosion will take over and eventually, over millions of years, Pikes Peak will be worn away. Geologists have discovered that in the past there have been at least one and probably more mountain ranges where the Rocky Mountain now stand. These ancestral Rockies eventually eroded away, and their remains can now be seen as the sandstone and soil on the plains of Eastern Colorado and even Kansas.

From your vantage point, look also for the outline of ancient Lake Florissant. This lake, which existed about 35 million years ago was dammed by lava from nearby volcanic explosions. Ash from these volcanoes sifted over the lake time after time, trapping leaves, insects and even fish. These plants and animals were fossilized and can be dug up and studied today to help tell us what life was like here 35 million years ago. Although there is evidence of some plants that are extinct and some that now live in Arizona, New Mexico, California, and the South, many of the fossils represent plants that can still be found here- like mountain mahogany and ponderosa pine trees. ***What does this tell us about the climate of this area 35 million years ago?***

Upon arrival at the copper mines, show samples of the most common copper minerals in the area: malachite (green) azurite (bright blue) and chalcopyrite (gold). Talc which is white and powdery is also present. ***These rocks don’t look like copper. Why?***

Copper is found here in combination with a variety of other minerals which give it different appearances. Like gold, silver, and other precious metals, it is rarely found in a pure form in nature. A milling process is used to extract the copper from the ore.

The copper mines are located in a contact zone between Pikes Peak Granite and metamorphic rock. These holes were probably dug in the early 1900’s and were abandoned because they didn’t pay off.

Give the students time to explore the area for copper. You may want to use the claim staking activity described in the half-day curriculum. The mine shaft is rotten so please don’t allow anyone to enter or go within 20 feet of the shaft.

Old cabin ruins in the area also provide good investigations. ***How long do you think the prospectors lived here? Did they live here during the winter? How many people lived here? Can you find any of the stumps of the trees the miners cut to make their cabin or mine?***

After the students have had an opportunity to investigate the area thoroughly, gather the group and move to a high point for the concluding discussion described in the half-day curriculum. The Prospecting Search which concludes the half-day may be used for the hike back to High Trails.