Making Geology Fun

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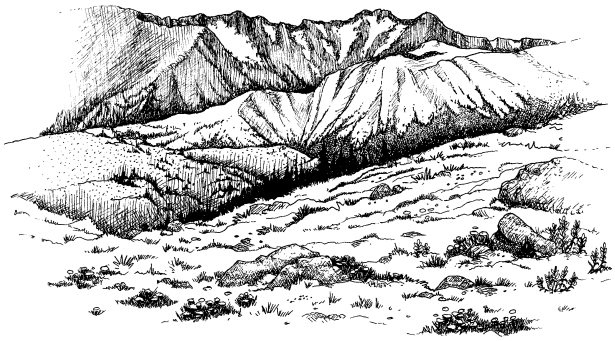
Ancient Denvers images of geological landscapes:
http://www.dmns.org/main/minisites/ancientDenvers/landscapes.html

More resources from Open Space and Mountain Parks
https://bouldercolorado.gov/osmp/elearning

Sample themes for geology programs:

- Rocks tell us stories about what this site used to look like long ago.
- The geology of this site is the canvass upon which all the living creatures are painted.
- The landscape you see here is still forming, and some day it will look very different.
- Geologists are like detectives, searching for clues among the rocks to see what has happened here.



Every Rock has a Story: This activity shows what physical characteristics of a rock mean about its past, and can also be used to introduce the major rock types at your site. However, the objective is not to name or classify all the samples. It's to stimulate observation, creative hypothesizing and deductive thinking.

Break your larger group into smaller groups based on the number of samples you have. Give each group a sample. First have each group make very detailed physical observations of their sample rock: describe its color, weight, density, composition, any fossils (you might want to tell them the age of their rock here), etc. Have each small group share their findings with the whole. Next, using their physical observations of the rock, have each group try to make some educated guesses (and maybe even some cool illustrations) about the environment in which the rock was deposited. If you want, you can use the *Ancient Denvers* booklet to show how paleontologists, artists, and geologists have used the same process to reconstruct Denver's ancient past.

Find your own rock: This activity teaches observational skills necessary to detect differences between individual rocks, and works as a great warm-up activity for a geology hike. It works well with all age groups, even pre-schoolers (although you'll need to use rocks that are clearly very different from each other). For a lead in, you may tell your group that, like snowflakes or people, each rock or pebble is unique and its appearance reflects the unique events that make up that pebble's story. At the end of the activity, people will feel very differently about "their" pebble than they did before!

Have a bag of nearly identical small rocks. Each person takes a rock and studies it for a minute or two. As they handle their pebble, suggest things to notice: is it smooth, rough or broken? What color is it? Does it have crystals poking out, bands of color, or an interesting texture? Is it big or little? After a few minutes of study, ask everyone to put the pebbles back in the bag. Dump the rocks out in a heap, and have each person find the rock they had. (Careful! If a group of kids all rush at the pile together, they may bash heads!) Twists: Have them study the rock blindfolded, or describe their rock to a blindfolded or back-to-back friend who has to find it (use simpler rocks).

Geology time line: This activity demonstrates how LONG the earth has been around. Even the dinosaurs, which seem like a long time ago, appear close to the present day when considered in the context of the earth's entire history. You may conduct this outdoors by asking your group to pace out the distances and leave a person at each stage of the timeline; or you may use a string with large knots tied at various intervals to mark key events. A 50 foot string works in a class room.

For a 100 step line or 100 foot string: Formation of the earth 4.6 billion years ago, 0 steps. First simple life 3.5 billion years ago, 24 steps. Cambrian (many invertebrates) 570 mya, 88 steps. Ordovician period, first fish, 475 mya, 90 steps. Devonian perioid "Age of Fish", first land vertebrates (amphibians) 350 mya, 92 steps. Permian, first reptiles, Lyons sandstone, 250 mya, 95 steps. Jurassic period, age of dinosaurs, 150 mya, 97 steps. Extinction of Dinosaurs at end of Cretaceous period, 65 mya, 99 steps. Age of humans: a single hair laid at the end of the time line. You may make a great show of laying the single hair at the end of the line.

For practicality, you'll need to designate an adult chaperone or teacher as the beginning of the earth since they get left way behind and are standing the longest. You can pick the oldest person in the group and ask them to look like they were 4 billion years old. It also helps to come up with some funny or teasing descriptions of each person chosen to represent the stages of the timeline. "OK, Cary, thanks for volunteering. You get to be the slime!" Also, periodically review for the group what each person along the timeline represents to keep all the stages fresh and distinct in their minds.

Pigs in Blankets (the Laramide Orogeny Made Easy)
Ask the most hyper-active members of your audience if they think they can handle holding still for 1.7 billion years. Invite them to the front and have them get on the floor on their knees in a ball. Explain that they are now granite "pigs." These "pigs" solidified far under ground around 1.7 billion years ago. While the pigs were waiting deep under ground, layers of sediment were deposited at the surface. Use 3-4 different colored blankets to represent the colors of the formations present at your site. Feel free to sprinkle them with appropriate fossil material (e.g. plastic bugs, leaves, paper cut-out dinosaur tracks) as the blankets are being "deposited."

Then the pigs "woke up" (that is, were uplifted). As they stretched their legs (have your pigs unscrunch and get up on their hands and knees) the layers of sediment on top folded and bent around the pigs. Mother Nature went to work eroding away the softer layers of sediment to expose the granite pigs.

Towel Strata: This activity is like a mini version of the previous one. Using colored towels instead of blankets, you can help visitors understand how various strata were laid down over the eons, and also how geological processes may have bent, warped, twisted and sculpted these strata. It's a great way to illustrate anticlines and synclines.

Other strata analogies:

Lasagna: To imagine the differential erosion of hard and soft rock strata, picture a lasagna. If you took a high pressure hose to a huge pan of lasagna, the ricotta, meat and veggie layers blasts away much more easily than the noodle layers. After the "pigs woke up", Mother Nature aimed a high pressure hose (eons of water, wind and temperature changes) at all those layers of rock. Some layers were better cemented (e.g. Dakota, Lyons, Niobrara)-these are the noodles-and formed hogbacks. Some were just blown away (Pierre and Benton shales, Morrison in some cases, etc.) and formed valleys -these are the ricotta, veggies, meat.

A snowpack - layers of snow are deposited on top of previous snow layers and crusts until a complex layered snow pack is built up. What happens to a leaf that falls upon the snow crust when more snow falls on top? It becomes a "snow fossil!"

Texture rubbings: Many rocks have amazing, complex textures. You can make texture drawings of a variety of rocks with smooth, rough, broken faces. Crayons seem to work best, especially broken unwrapped fragments which can be turned on their sides and rubbed.

Continental Crash (Human Sandwich): This activity is a fun giggle-producing way to illustrate uplift when plates collide. Pick three volunteers from your group and have them stand shoulder to shoulder in a line facing the group. Put a smallest person in the middle. Designate the person on one end as one tectonic plate, the person on the other end as another tectonic plate, and the person in between as the continental rocks at the zone of collision. Then ask the two on the ends to push inwards with their shoulders, squashing the person in the middle from both sides simultaneously. When the pressure becomes great enough, the person in the middle gets forced out of line, usually with one shoulder moving forward and the other backward.

At this point, jump in to point out how the shoulder pushed out of line is similar to rocks under pressure being uplifted. The other shoulder has been forced "downward" into the earth for re-heating and metamorphosing. You can name one person "Asian Plate" and another "Indian Plate" to make the middle person become the Himalayas, or name one the Pacific Plate and another the North American Plate.

Glacier Shuffle: Using their feet, your group will show how a glacier piles up rocks and debris to make a terminal and lateral moraines. You'll need a sandy or gravely outdoor area without any plants (they would be trampled and mashed by this activity). Most hiking trails work perfectly.

Form your group into a single file line facing along the gravelly area, each person standing behind the back of the person in front of them. About 15 feet ahead of the first person, drop a stick to mark the end point of the shuffle.

One by one, have each member of the group shuffle straight up to the stick, then jump over it and wait. After everyone has gone, they'll see how their feet have scoured away the gravel in a path leading up to the stick. At the end next to the stick will be a small heap of sand: a

terminal moraine. Along the sides of the scuffed path they'll see small parallel ridges: lateral moraines.

Secret Questions: At the beginning of a geology hike or program, give each participant a "secret question" about geology on a card or slip of paper. Tell them the question must be kept secret but will be answered during the hike, so they must listen. All questions and answers will be shared at the end, when each person reads their secret question aloud and tries to answer it. If they can't, ask the group. YOU MUST know which questions are out and be sure they all get answered during the hike. For example, "Which rock did we see that was formed inside a volcano?" or "Which rock formation used to be an ancient beach?"