MUSEUM OF THE ROCKIES
MONTANA STATE UNIVERSITY

Lesson: Create a Hot Springs

Grade Level: K-12
Activity Duration: 30 minutes

Objectives:

- Students will understand the basic concepts behind how a hot springs works
- Students will understand why different parts of a hot springs are different colors
- Students will understand the difference between geysers and hot springs
- Students will learn what type of life exists in Yellowstone's hot springs

Kit Materials:

- Coffee filters
- Spray bottle

Classroom Materials:

- Markers

Lesson Procedure:

1) Have students look at the two accompanying photographs of hot springs in Yellowstone National Park. What do you notice about the colors? They actually go (mostly) in the order of the rainbow from the outside in: Red at the outside, down in through orange, yellow, greens, and then blue. This doesn't happen at every hot spring, just a handful of special ones in the park.
2) Have students guess why the different colors exist.
3) Remind students about why hot springs exist, and the difference between geysers and hot springs.
    a) The Vent is a critical part of a geyser. It has to be just the right size. If the vent is too wide, the hot water under the ground won't erupt at all, because there is not enough pressure building under the surface. Instead, it just pools at the surface, and we have a **Hot Spring.**
4) Explain that in this activity, you are going to experiment with how to make a piece of art that looks like a hot sprin
5) Take a coffee filter and spread it out in front of you.
6) Use markers to create rings of color on the coffee filter.
7) Take a spray bottle and give the coffee filter a few quick squirts in the center. The color will start bleeding toward the outside of the filter, making your own hot spring!

What's Happening?

The color spreads due to a process known as paper chromatography. The water spreads out, and picks up the molecules of color as it goes along. This is used in a number of different science applications, such as soil testing.

So, How Is This Like a Real Hot Spring?

The colors in a real hot springs are caused by very special bacteria that live in the very hot water. Most creatures can't survive this extreme heat, but Yellowstone is home to bacteria called "thermophiles" that love heat and are found nowhere else on the planet. Each of the different colors is actually home to billions of bacteria – a different kind of bacteria for each color!

The colors actually change as the temperature changes through the year. In the summertime pictures, as you see, there are mostly orange and red bacteria, but in the winter there is more of the green variety.

The center of the pools is bright blue because it the water is extremely pure and pretty deep (GPS – 160 feet, MGP – 25 feet). It is too hot in the very center of these pools (about 160 °F) even for the thermophiles.

Scientists are studying these bacteria to find out more about how life may have started on our planet. One hypothesis is that the first life may have evolved around deep sea hot vents, similar to the bacteria found in Yellowstone pools. Another idea is that if life can be found in these extreme environments here on earth, we may find life like it on other planets as well!