# GEOSC 10 Unit 9 Virtual Fieldtrips

## Virtual Fieldtrip #1: Bryce Canyon National Park

Image 1: Panoramic view of Bryce Canyon

Caption 1: BRYCE CANYON: “A Hell of a Place to Lose a Cow”—quote by Ebenezer Bryce

Image 2: A 2-inch tall dwarf columbine and a dewy Oregon-grape leaf struggle to grow at Bryce.

Caption 2: Although Bryce Canyon is higher, cooler and wetter than many of the nearby parks, life is still tough on the unstable slopes of the canyon. Here, 2-inch-tall dwarf columbine (right) and a dewy Oregon-grape leaf struggle to grow at Bryce.

Image 3: Cedar Breaks National Monument, near Bryce, has the same sort of limestone as Bryce, of the same age. Notice where a small fault has offset the white layer in the upper-right corner.

Image 4: A valley of hoodoos (towers of rock with the harder rocks on top) in Bryce

Caption 4: As at Arches, water works wonders widening joints. But the rocks here are not strong enough to hold up arches, instead making hoodoos (towers usually with harder rocks on top).

Image 5: A closer view of some hoodoos shows striations of color

Caption 5: Much of the coloration is linked to how rusty the iron is in the rocks. The sedimentary layering is quite evident.

Image 6: Another close view of hoodoos.

Caption 6: Guidebooks almost always refer to Bryce as a “fairyland”. The wonders of differential erosion – softer rocks, and rocks along cracks, go faster – really are amazing.

Image 7: A hoodoo named “Queen Victoria” because the top looks like a queen.

Caption 7: The Park Service now discourages “naming” rocks, because visitors are so disappointed when erosion then changes those rocks. This one was named Queen Victoria back when naming was condoned. The layered sedimentary rocks are beautiful by any name.

Image 8: Trees in Bryce Canyon.

Image 9: Logs across a stream bed.

Caption 9: A decade or so ago, the Park Service put the logs across the stream bed to slow the burial of a trail by sediment. As we’ve seen with dams, rocks filled the space upstream from the logs, and erosion happened downstream. Fast erosion supplied lots of rocks to fill the “lake” above the dam quickly.

Image 10: A close up of a rock at Bryce shows river gravels, conglomerates and clasts and sedimentary rocks.

Caption 10: Bryce’s rocks are mostly limestone, but include river gravels such as the conglomerate shown here. Many types of clasts are present; the orange one in the middle is a conglomerate itself, and the clasts in it include several types of sedimentary rocks. This picture shows a long and complex story--try telling it.

## Virtual Fieldtrip #2: Arches National Park

Image 1: A rock arch at Arches National Park.

Caption 1: ARCHES NATIONAL PARK: Stories in Stone Photos by R. Alley

Image 2: Dr. Anandakrishnan at Arches with the La Sal Mountains in the background.

Caption 2: Dr. Anandakrishnan, Arches National Park. The La Sal Mountains in the background are named for the salt beneath them. The motion of the salt created joints that then isolated the fins that made the arches, such as the one next to Dr. Anandakrishnan’s shoulder.

Image 3: looking down onto the ground at Utah’s Grand Staircase-Escalante National Monument. The ground is white with a grid pattern of green plants.

Caption 3: This isn’t Arches, but Utah’s new Grand Staircase-Escalante National Monument. Plants follow water that soaks down into joints in the fossil dunes of the Navajo Sandstone, making the grid pattern in the rocks. Various joint patterns exist; parallel rather than crossing joints are very important in making arches at Arches, as we will see next.

Image 4: End on view of fins at Devils Garden, Arches NP and an angled view of fins at Devils Garden, Arches NP.

Caption 4: The tough sandstone has been broken by parallel, vertical joints, and weathering along those joints isolates “fins” of sandstone that then are eroded to make arches.

Image 5: Three images of Delicate Arch.

Caption 5: The sandstone of Delicate Arch started as a sand dune (note bedding, top-right picture).

Image 6: Two pictures of arch shaped amphitheaters created by falling fins in sandstone.

Caption 6: CAUSE student Raya Guruswami in Glen Canyon (right), and a cliff in Canyon de Chelly National Monument (top). Rock falls from the sandstone cliffs have left arch-shaped amphitheaters. Similar falls from fins help make arches.

Image 7: Two pictures of rocks that have fallen and the arch shaped scars they left in the stone cliff above.

Caption 7: (right) an arrow points back up from the fallen rock to its arch-shaped scar. (left) Fallen rocks are gone, but an arrow shows their arch-shaped scar. Two views of fossil sand dunes over redder flood-plain muds, Grand Canyon. Sand fills a gigantic mud crack on the right (yellow arrow). Today, sand dunes encroach on the Nile in a very similar setting. The arch-shaped rock fall scars suggest how arches may form.

Image 8: Landscape Arch is the world’s longest natural stone arch. You can see that numerous large blocks that have fallen from the arch, many since the park was founded, plus joints in the rock that make additional falls likely.

Image 9: CAUSE instructor Eric Spielvogel photographing a lupine near Double Arch.

Caption 9: The high desert of Arches is a harsh environment, but surprisingly beautiful flowers appear after the rare, brief rains.

Image 10: Double Arch. You can see dark streaks on the rock.

Caption 10: The dark streaks down the rock are desert varnish, mineral deposits formed partly by microorganisms that grow briefly when rainwater runs down the rock.

Image 11: Close up of dark streaks (called varnish) at Double Arch.

Caption 11: There is a crack near the top of the arch through which rainwater flows to form desert varnish. Enlargement of the crack will eventually lead to rock fall, changing the arch.

Image 12: Two pictures of men standing close to Double Arch.

Caption 12: Rock falls have helped shape the immense cliffs.

Image 13: A rock with a grid like pattern of mud cracks in it.

Caption 13: Mud deposited in a small lake near the sand dunes dried and cracked in the sun. More mud washed in and filled the cracks. After the mud hardened, the rocks were split apart, and the upper piece turned over; Dr. Alley’s index finger points to the crack-filling mud.