VIRTUAL GEOLOGY FIELD TRIPS: BRINGING THE STORY OF ROCK OUTCROPS TO TODAY'S CLASSROOM

www.GeologyVirtualTrips.com

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WHY USE THIS WEBSITE?

If you can't get into the field because you have:
- No time
- No funding
- Too far to travel
- A Pandemic

Then, this online supplement to classroom work *brings the outcrop to the classroom.*

WHAT'S IN THE WEBSITE?

Understanding the Geology of an Outcrop without leaving the classroom is done through:

(A) PERTINENT PHOTOS (from nearly 60 locations in US and Canada)

Photographs of
- All Rock Types -- *Igneous* (Plutonic and Extrusive)
  Metamorphic (Regional and Contact) and
  Sedimentary (Detrital and Chemical)

- Large and small-scale structures
  e.g. --Cross-bedding --Unconformity types --Slickensides --Dikes & Sills
  --Fault & Fold types --Dunes & Ripples --Channels --Mudcracks
  --Cave deposits --Stromatolites

- Different Settings
  e.g. --Plutonic --Volcanics --Shelf Deposits --Meteor Impact
  --Tidal Flat --Glaciers --Lacustrine --Salt Tectonics
  --Hot Spots --Rifting

(B) CONCISE DESCRIPTIONS
- General tectonic summary provided
- Local geologic setting defined
- Descriptions of each photo given

(C) PROBING QUESTIONS
- Student Questions to evaluate learning are given for each stop. Answers are gleaned from the text or outside research.

(D) ANCILLARY MATERIAL
- Comprehensive Index and Answer Guide available for over 325 questions
- Special sections on Structures and Fossils

STUDENT OUTCOMES:

- Student interest and motivation are enhanced
- Learning is self-paced
- Learning is interactive
- Students accountable through questions provided

WHERE ARE THE FIELD TRIP LOCALITIES?

(I) GSA South-Central Section (12 Stops) including:
-Numerous stops within the Texas Hill Country

(II) GSA Northeast Section (8 Stops) including:
-Palisades Sill -Granton Sill -Watchung Basalts -Niagara Falls
-Long Island Glacial -NYC Bedrock -Ramapo Border Fault

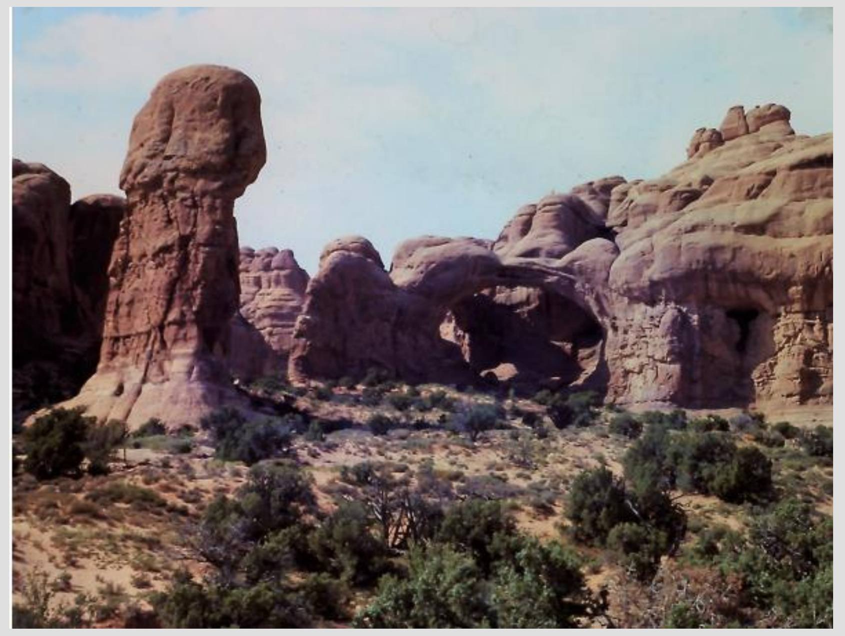
(III) GSA Rocky Mt. North Section (15 Stops) including:
-Canadian Rockies -Glacier NP -Grand Tetons NP -Montana Rockies
-Yellowstone NP -Craters of the Moon -Devils Tower

(IV) GSA Rocky Mt. South Section (14 Stops) including:
-Arches NP -Bryce Canyon NP -Grand Canyon -Meteor Crater
-Zion NP -Monument Valley -Shiprock

(V) GSA Cordilleran Section (6 Stops) including:
-Crater Lake -Hawaiian Volcanoes -Yosemite NP -Mt. St. Helens

SOME LOCATIONS PICTURED IN THE WEBSITE

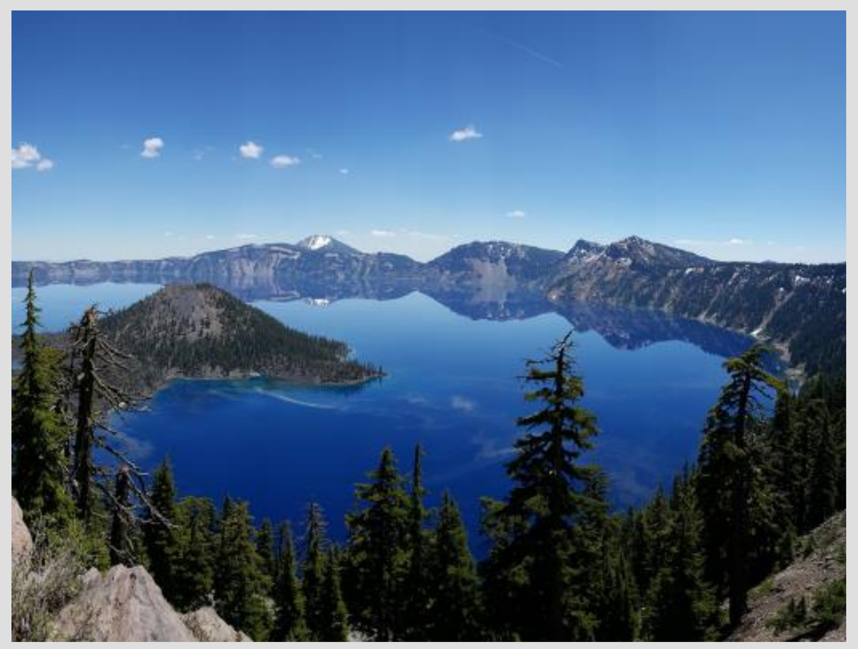
ARCHES NATIONAL PARK – Differential Erosion and erosion along joint planes as a consequence of salt tectonics.



ZION NATIONAL PARK – The Navajo SS represents sand dunes moving from left to right in a Jurassic desert.

MONUMENT VALLEY TRIBAL PARK – Buttes and pinnacles expose Permian & Triassic floodplain, stream channel, and aeolian dune deposits.

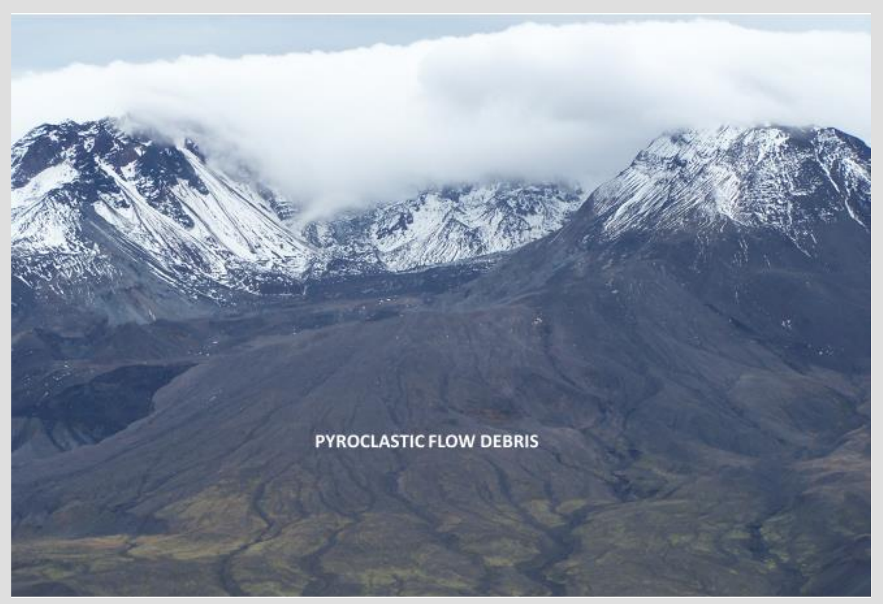
CRATER LAKE NATIONAL PARK – Inside a dormant Pleistocene caldera. A Cinder Cone volcano rises 2700 ft above the crater bottom.



JASPER NATIONAL PARK (CANADA) – Terminal & Lateral Moraines of the Athabasca Glacier reflect glacial retreat of 35 ft/year.

YOSEMITE NATIONAL PARK – An Exfoliation Dome within a Mesozoic Granitic Pluton exposed due to Tectonic activity.

MT. ST. HELENS VOLCANICS – Pyroclastic Flow deposits poured out of the north face which lost 1300 ft of its summit.



SCAN & VISIT THE WEBSITE!

GRAND CANYON NATIONAL PARK – Great (Angular) Unconformity separates PreCambrian sediments from the Cambrian and younger Paleozoics.

TYPICAL FIELD TRIP STOP

GRANTON SILL and Contiguous Sediments

FIELD TRIP STOP – GRANTON SILL INTRUSION INTO TRIASSIC SEDIMENTARY BEDS

LOCATION: *Found in North Bergen, New Jersey near 80th St. and Tonnelle Ave. More specific directions can be found in Schuberth (1968).*

GEOLOGIC FEATURES: Triassic Granton Diabase Sill; Triassic Lockatong Formation; Triassic Sediments; possible Xenolith; Cyclothem; Decompression Melting.

DESCRIPTION: At this exposure the ***Granton Sill*** is seen to be injected into and between beds of the ***Lockatong Formation.*** The Granton Sill has basically the same diabase composition as the Palisades which is found a few miles to the east. The *Lockatong* is comprised mainly of black shales, red, purple, gray or black argillites, and thinly bedded sandstones with occasional limestones. Environments generally represented quiet water lakes, ponds, or swamps with numerous fresh water fossils. Sediments are thought to have been deposited in cycles ("cyclothems") representing alternating wet and dry climates, each cycle lasting about 20,000 years. Origin of the *Granton Sill's* magma (as well as the ***Palisades Sill*** and ***Watchung Basalts*** of the Newark Basin) is commonly thought to be related to rifting events (and decompression melting) associated with the breakup of Pangaea.

STUDENT QUESTIONS:
(1) *What is suggested by the diabase of the Granton Sill and Palisades Sill having the same composition?*
(2) *What is the cause of the black color in some of the shales of the Lockatong Formation?*
(3) *What is a Xenolith and how is it formed?*
(4) *What is the difference between a shale and an argillite?*
(5) *CHALLENGE: Discuss a possible large-scale phenomenon that might account for periodic depositional sequences such as the cycles within the Lockatong.*
(6) *CHALLENGE: Explain the relationship of rifting to the generation of magma by "decompression melting."*

SELECTED REFERENCES:

-Schuberth, Christopher J. 1968, *The Geology of New York City and Environs.* The Natural History Press, Garden City, New York. 304 pp.

PHOTOS:

Figure 1 - Outcrop of cyclic sedimentation within the Lockatong Formation illustrating alternations of black carbonaceous shales and lighter colored sediment.

Figure 2 - Notice the forceable intrusion of the dark homogeneous sill from the left (west) into and above the layered sediments of the *Lockatong Fm.* to the east. Sediments above the sill have been eroded away. As with the Palisades and *Stockton Fm.*, beds are inclined to the west at about 15 degrees.

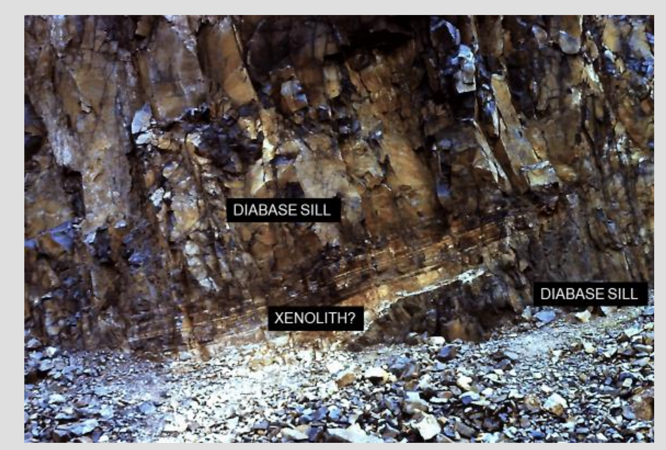


Figure 3 - Here, an angular piece of the layered *Lockatong* is surrounded above and below by the diabase (right half of photo). If the piece were found to be completely torn off and incorporated within the diabase, it would be considered a Xenolith.