Bryce Canyon

- Located ~50 mi NE of Zion in southern Utah
- On Paunsaugunt Plateau: Wetter and Colder than Zion
- Bounded by Sevier Fault to west and Paunsaugunt Fault to east
- Rocks are ~100 Ma older than at Zion
- Geomorphic features are ‘open’ amphitheaters compared to closed canyons of Zion

Geomorphological Features of Bryce Canyon
- Features here are caused by mass wasting of the plateau wall.
- Precipitation on top of the plateau washes down the wall
  - In sheet wash (not channelized)
  - This water flow causes weathering of the rocks.
- This is very different process than the undercutting by Virgin River at Zion
  - Rocks are different between Zion & Bryce and this has much to do with difference in features
Result of weathering of plateau wall:
‘Badland’ topography

- Open amphitheaters
- Pillars (pinnacles or hoodoos)
  - The formation of these are joint controlled
  - Two perpendicular joint sets at Bryce produces columns

Weathering = physical disintegration and chemical decomposition of rocks

- Mechanical weathering = physical and biological forces break rocks into smaller pieces
  - Mass wasting = myriad of processes that remove weathered material (falls, slides, flows etc.)
- Chemical weathering = inorganic and organic chemical reactions alter the mineralogy and composition of rocks
Physical weathering increases surface area!

This enhances chemical weathering, by increasing the rates of chemical reactions!

Chemical Weathering: Chemical reactions between the rock and water/atmosphere (e.g., Oxidation, hydration, solution)

- Dissolved Ions are transported away with the fluid
- Surface becomes pitted as mass is lost. Stable minerals left as sediment/soil
Examples of Mechanical Weathering

- Frost Wedging
  - This makes potholes in the roads!
- Clay expansion is a similar processes where clay minerals become wet and expand, forcing open cracks
- You should understand these two processes

Frost wedging causes these boulders to break away from the cliff above. (this is what happens at Zion - remember)
Joints/breaks in rocks are pathways for fluids

Biologic activity also serves to break rocks

Sheeting - caused by expansion of upper surface of rock as it is unloaded.

Spheroidal Weathering - combined physical (granular disintegration) & chemical weathering (attaches the corners)
Joint controlled weathering (granular disintegration, dissolution, oxidation, hydration) cause the features we see in Bryce Canyon

Differential Weathering

- More resistant rocks remain intact while less resistant rocks disintegrate.
- Thus, rocks weather at different rates and this produces interesting features at Bryce
  - e.g. Thor’s Hammer a hoodoos
Hoodoos

Natural Bridge: resistant limestone cap rock and exfoliation (spherical sheeting) of less resistant rocks.

Grottos: dissolution of limestone windows

Pillars - resistant cap rock on the very top of each
Geologic History of Bryce

- Continuation of the History of Zion! (ended with Carmel Limestone)
- Cretaceous sea floods the continent depositing Dakota Sandstone (beach) and Tropic Shale (deeper water)
  - = Transgressive sequence.
- This sea regresses and most of the Cretaceous sediments are eroded
- Dakota and Tropic Shale (not exposed in Bryce) are at the base of the Pausaungunt Plateau

Late Cretaceous: Laramide Orogeny uplifts the Colorado Plateau region

- Basins (between the uplifts) fill with water (huge lakes!)
- Claron Formation = lake deposits (limestones, mudstones, sandstones and conglomerates)
  - These layered rocks are the main rocks exposed in Bryce.
  - Differential weathering of the different rock types produces the features we saw above.
Miocene (~15 Ma) Basin & Range extension produces the Faults and Plateaus we see today