The Depositional Environments of the Claron Formation in Southern Utah

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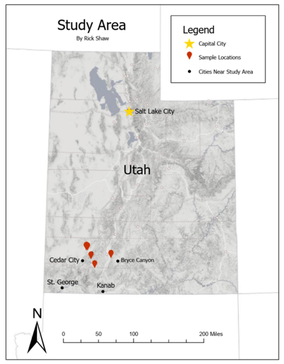
Abstract

The Claron Formation is a geologic unit that was deposited in southwestern Utah during the Eocene Epoch, between 56 and 33 Ma. The Claron consists of two members: the lower pink member and the upper white member; both consist of alternating layers of clastic and carbonate sedimentary rocks, representing the varying depositional environments in the Eocene as southwestern Utah experienced climatic and tectonic changes. In the early period of deposition, the Sevier and Laramide orogenies shed larger clasts from the uplands, forming the basal conglomerate layers. As the climate shifted into the warmer Eocene Epoch, ancient lakes formed allowing for the deposition of sandstone, siltstone, and shale, and the precipitation of limestone. Basin and Range deformation has uplifted the Claron, forming faults and other geologic structures over time, creating the High Plateau region of Utah. Major rivers continue to dissect the plateaus, further segmenting the Claron and creating some of the spectacular scenery in our National Parks.

Study Area



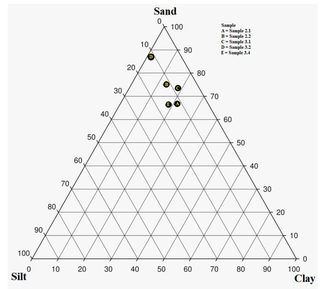
Above: Map of the study area with sampling locations. Right: The varying colors of the Claron Formation in Bryce Canyon National Park.

The Claron Formation tops much of High Plateau region and provides some of the distinctive scenery in southwestern Utah.

The two members of the Claron have variable thicknesses: the lower pink unit (~ 700 ft) and the upper white unit which varies in thickness but is usually about 300 ft. Both units consist of clastic sedimentary rocks and limestones. The Claron represents the final sedimentary deposits in southern Utah, and reflects the varying depositional environments associated with orogenic and climatic changes.

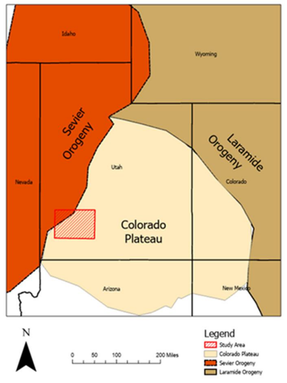
Methodology

Field samples were collected from Claron outcrops associated with geologic mapping at Parowan Gap, Duck Creek, Red Canyon, and Brian Head near Cedar Breaks National Monument. The smaller-grained samples were crushed and separated using a Gilson Model SS-15 Sieve Shaker to identify the different grain sizes, then plotted on a ternary diagram. The conglomerates were described and used to correlate major tectonic events associated with orogenic activity and sea level fluctuations.



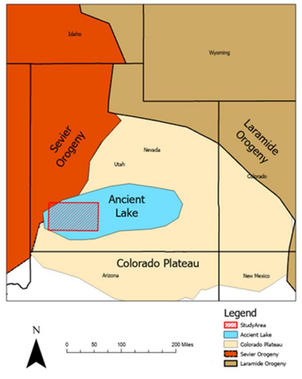
Above: Cedar Breaks National Monument is one of the best places to see the transition from the lower pink member of the Claron to the upper white member. The color difference is due to the presence of iron in the form of hematite, which oxidizes when exposed to the atmosphere.

Discussion



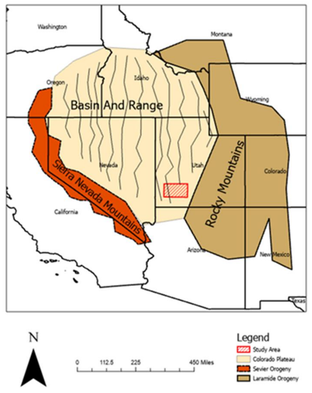
In early deposition of the Claron, faulting and uplift associated with the Sevier (160 – 50 Ma) and Laramide (80 – 35 Ma) orogenies shed larger clasts and sands onto the Colorado Plateau. These sediments were deposited into alluvial fan systems and reworked by fluvial systems across southwestern Utah. These sediments would eventually form the basal conglomerates and sandstone layers in the Claron.

160 – 35 Ma.



Near the end of the Sevier Orogeny in the Eocene Epoch, the climate transitioned to a warm and humid environment across the Colorado Plateau. Ancient lakes covered the lower elevations, allowing for the deposition of sandstone, siltstones, and shales, and precipitation of freshwater limestones. Continued uplift in the area provided larger clasts for the interbedded conglomerates. These layers often contain plant fossils associated with the Eocene climate maximum.

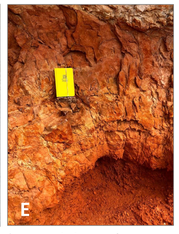
65 – 50 Ma.



While the deposition of the Claron ended long ago, there are still structural changes occurring. Basin and Range deformation has caused the Claron to be uplifted and faulted, creating the High Plateau region of Utah. The climate has transitioned from the warm and humid Eocene to the high desert environment it is today.

18 Ma – Present

A: The red layers at the top of the hill are basal conglomerates of the Claron, which make up part of the Red Hills region near Parowan Gap. B: the conglomerate is primarily composed of large quartzite cobbles in a silt matrix.



Climatic changes caused rapid transitions in the depositional environment. C: Ancient lake sediments at Bryce Canyon National Park. D: Red Claron siltstone with overlying conglomerates. E: Limestone layers above and siltstone below.

F: Red and white Claron layers at Cedar Breaks National Monument, showing the upper transition of the formation. G: The view from the Paunsaugunt Plateau with the Aquarius and Kaibab plateaus in the distance.

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Conclusion

The Claron Formation is the youngest sedimentary formation in southwestern Utah, and records the tectonic and climatic changes that occurred over the past 160 million years. In the early part of deposition, the Sevier and Laramide orogenies shed larger clasts forming the basal conglomerate layers. As the climate shifted into the warmer Eocene Epoch, ancient lakes formed allowing for the deposition of sandstone, siltstone, and shale, and the precipitation of limestone. Today the deposition of the Claron is complete, but changes are still occurring. Basin and Range deformation has uplifted the Claron, and continues to form faults and other geologic structures over time, creating the High Plateau region of Utah. Major rivers continue to dissect the plateaus, further segmenting the Claron and creating some of the spectacular scenery in our National Parks.

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