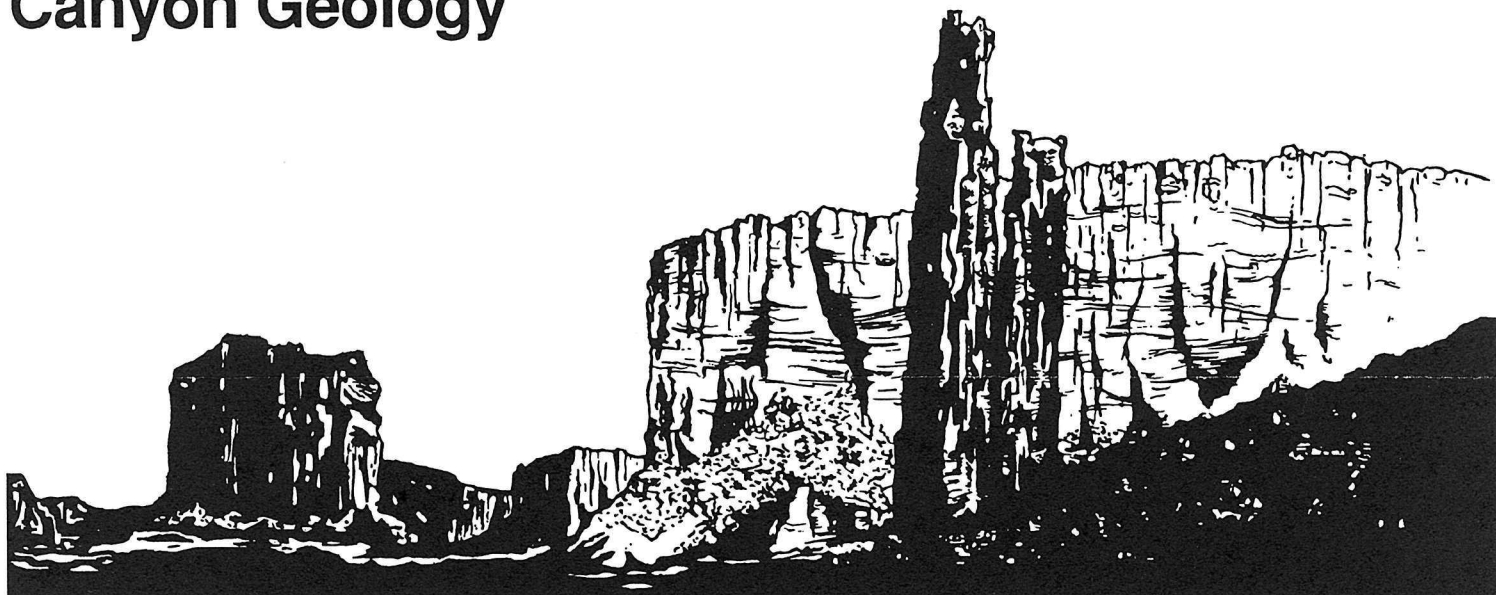


# Canyon de Chelly

National Monument  
National Park Service  
U.S. Department of the Interior

## Canyon Geology



Bob Paltrow

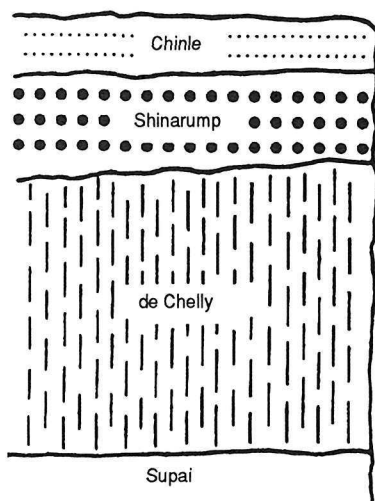
### LANDSCAPE

The landscape of the American Southwest is like no other. In this land of striking beauty and contrast, visitors from around the world stand in awe as they gaze into deep red rock canyons, up stony spires, and over long mesas.

Canyon de Chelly is not the deepest canyon in the Southwest, nor the

widest, nor the longest. But its awesome beauty rivals that of any other. The sandstone cliffs of Canyon de Chelly National Monument embrace a past of more than 200 million years of geologic history and 2,000 years of human history.

### LAYERS



#### Supai Formation

Try to picture Canyon de Chelly of 280 million years ago as a geologist would. At that time the first mammal-like creatures were evolving. Dinosaurs had not yet walked the earth, much less had man. At this time when glaciers grew near the equator, northeastern Arizona was subtropical. The oldest layer of rock found in Canyon de Chelly, the Supai Formation, was deposited during this period. Fossil plants found in the mud, silt, and sandstone of the Supai tell us that the climate was hot and moist.

#### De Chelly Sandstone

Thirty million years later, 230–250 million years ago (MYA), the de Chelly sandstone was deposited. The climate had changed from subtropical to arid desert, and the de Chelly sandstone, a light red rock of uniform grain, was formed from desert sand dunes. As you travel the rim drives, look for this cross-bedded sandstone, which was formed by northerly winds.

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## Shinarump Conglomerate

Fifty million years later (approximately 200 MYA), the Chinle Formation was deposited on top of the de Chelly sandstone. Only the base layer, the Shinarump conglomerate, remains;

the other layers have long since eroded away. Look for this stream-deposited conglomerate at the overlooks on the South Rim Drive. This grayish-brown caprock contains sandstone pebbles, quartz, basalt, chert, quartzite, and petrified wood.

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## Canyon Formation

As the dinosaurs were facing extinction, two major geologic events took place that created today's canyons. The Defiance Uplift, which took place 63 MYA, and a second uplift of the Colorado Plateau 3 MYA, joined with the forces of mountain building and stream cutting. As the plateau and canyon walls rose, surging rivers cut through

the rising rock. Millions of years of mountain building, stream cutting, wind, and erosion have created today's canyons. Geologists believe that little has changed geologically since 10,000 years ago, when the last ice age ended and early man inhabited the earth.

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## Desert Varnish

"Desert varnish" is the name given to the long dark streaks on the canyon walls. The origin of this thin mineral coating, misunderstood for many years, lies in manganese-fixing bacteria that live on the canyon walls in the

moist areas where rainfall runs over the rim. These microbes take minerals, primarily manganese, from airborne dust and "digest" it. This metabolic process results in the fixing of manganese to the canyon wall.

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## Rocks for Man

For almost 2,000 years, people have made these towering walls their home. The Anasazi Indians inhabited Canyon de Chelly for 1,000 years and relied upon the rocks for their very survival. Their homes were built of rock fitted into exfoliated alcoves within the canyon walls. Rocks were used to grind food and mix plants for pigments used in rock art. Rocks provided material for tools and weapons. Ground rock (clay) mixed with water was used for pottery. The cliffs heights provided

access to warmth from the sun and protection from intruders.

Today the Navajo people call these canyons home. The rocks provide a source of tools, weapons, and protection for the Navajo, just as they did for the Anasazi. In addition, prominent rock formations, such as Spider Rock and others, hold a special significance to the Navajo—one more reason why Canyon de Chelly is seen as a continuing and viable sacred place by many cultures.

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## Continued Reading

The geologic story of Canyon de Chelly is complex, yet fascinating. For more in-depth information, the following books are available for purchase at the park's visitor center.

*Canyon Country Geology*, by F. A. Barnes.

*Roadside Geology of Arizona*, by Halka Chronic.

*Scenes of the Plateau Lands*, by William Lee Stokes.

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