

"Missing Time"

as printed in
Northwest Valley Lifestyles Magazine
January 2004



"Missing time" contact between granite and sandstone along Echo Canyon Trail on Camelback Mountain in Phoenix, Arizona

If you look through some of the various articles I've written (for example, "Time Travel and other Everyday Things", April 2003), you might think I've got a slight obsession with time. And you're right. I do! Sometimes I think the reason I love geology so much does not have to do with rocks *per se*. It has to do with time -- the concept of *deep time*. It's something akin to looking into the night sky high overhead and being enthralled by the great distances to the stars -- the depth of space. They are so, so far away that even with our best technology today, just getting to the nearest (not counting our sun) star, only some 4 light-years distant, would take over 120,000 years!

The depth of *time* has that same kind of fascination for me, and, for sure, lots of other geologists. "Deep time" is another name (and, I think, a more appealing one), for "geologic time" -- those time-spans of millions and billions of years that are so incomprehensible to all of us.

I've mentioned in previous stories that many of the rock formations encircling Phoenix are very, very old, like those around Squaw Peak (nearly 1700 million years old). And I've talked

about others that are quite young -- the basalt on Moon Hill, for example (some 15 million years old). So where are the ones that are in-between? What is their story?

It's simple. Around the Phoenix area, they just don't exist anymore. This was something I didn't really grasp when I first moved here, until I hiked up Camelback Mountain. There are places there where you can walk up and put your finger on a thin line which has replaced those missing rock formations -- a line representing essentially all the deep time that elapsed during the time they were deposited, and then eroded away.

You don't have to take that heart-pounding jaunt up the Echo Canyon Trail, though, to see that line. Just drive around the west end of the mountain a bit. Or you can even see it from Camelback Road, anywhere from 44th Street to say, 56th Street.

The west end of the mountain, what some people see as the head and neck of the reclining camel (it must have been the heat that got to him!), is formed of reddish sandstone (and conglomerate -- a rock made of mixed sand, gravel, and boulders) layers. They are tilted

gently towards the west, and they lie on top of coarse-grained granite, which further to the east of there forms the highest part of the mountain. The granite also looks reddish here, but that's because of a thin coating of rust-colored sand grains, loosened from the rocks above, now covering it.

The place where the two different rocks contact each other is called an "unconformity" in geology-speak. In other words, there was no direct transition from the formation of the lower rock to the other one above it. In this case, that line of contact represents over *a billion and a half years* of time -- time in which many thousands of feet (probably) of younger rocks were deposited by wind and water over the older granite, and then subsequently eroded away back down to the granite. Then, on top of the granite, the younger red sandstone formations we see now were laid down by more wind, water, and maybe some really destructive landslides (see "Rock and Roll Geology", August 2003). These layers of stone are approximately 25 million years old.

In my photo, taken along the Echo Canyon Trail on the north side of Camelback Mountain, you can see where the line separates the two rock types. It runs from near the center of the picture towards the lower left corner. The

sandstone is seen in the vertical face. The lumpy-looking rock below the line, or unconformity, is the very old granite. Here, confusingly, as I mentioned above, both look reddish-orange, due to the dusty coating. Far in the background and across the valley, you can see the McDowell Mountains.

Any of you who have traveled to our spectacular Grand Canyon may have seen another and famous (but unrelated) unconformity. Down by the river, the flat-lying rock formations that make up all those colorful layers visible in the canyon walls are sitting directly on much, much older rock. There, that contact is called the "Great Unconformity", and it is a classic, textbook example, well-known to generations of geology students from, where else, their textbooks, where it is always prominently discussed.

You can see more scenes of Camelback Mountain, along with its unconformity, and discover more of our area's "deep time" story by going to **www.gemland.com**. Go to the "Geology" section, and on the map called "The Rocks of the Valley of the Sun", click on "Camelback Mountain" to begin the series of pictures.

--- Richard Allen

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Northwest Valley Lifestyles Magazine is published monthly in Glendale, Arizona.

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