“ Full Tilt ”

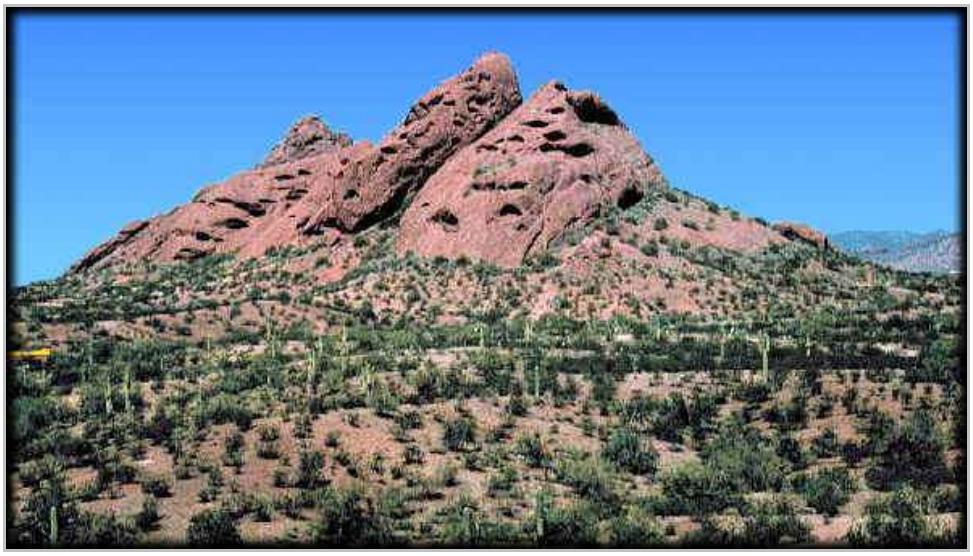
Weirdly-shaped rocks. I’ve heard that phrase over and over again, mostly from tourists. Wondering why the rocks look like they do, those visiting the Valley of the Sun notice them immediately, as those formations are almost right next to the airport where the visitors have just arrived. The pinnacles stuck in my mind, too, on my first visit to Phoenix, many years ago. Brightly orange in the setting sunlight, it was something about their curvy, pointed look, all filled with voids and cavities: they seemed like frozen flames rising from the flat desert floor.

The Papago Buttes, we call them. They are the centerpiece of Papago Park, one of the City’s thoughtfully planned expanses of preservation in what otherwise surely would be yet more endlessly repetitive housing tracts, strip malls, and asphalt checkerboard development.

What people first notice about the buttes are the caves and the holes in the rock. In geology-speak, those are called “tifoni”. I looked up that word, and it means “typhoons” in Italian. I’m not sure why or how those storms made it into the lexicon of geology, let alone in Italian, but maybe that’s a subject for another day.

As for the openings themselves, they are caused by differential weathering and breaking-down of the host sandstone and conglomerate (which is a rock composed of different-sized stones and particles, sometimes called “puddingstone”).

But there is more here of which to speak. The structure of the buttes, or the way in which they connect to the rocks underneath, is one of the more interesting facets of the geology here.



Tilted red bed formations of the Papago Buttes in Phoenix, Arizona.

In other writings, I’ve previously described to you the nature of the rock surface underlying our valley—an amazingly deep, rugged trench in the Earth’s crust. The buttes are just the tips of some craggy peaks that are almost completely buried by the sand, gravel, and salt beds that fill the valley and give its floor such a flat appearance. They poke through the surface in Papago Park just enough to make a great backdrop for the Phoenix Zoo, and the Desert Botanical Garden.

Drive along Galvin Parkway near the Zoo, or better yet, take a walk around the Hole-in-the-Rock area in Papago Park and look over at the prominent tall butte, just to the northwest. You will notice there, I hope, that the reddish sandstone and conglomerate is layered, and that the layers are slanted steeply to the southwest.

Recall also, that I told you about the South Mountain Metamorphic Core Complex (I just love that phrase—it’s got such an academically-sounding, yet melodic, ring to it.) in my previous essay, “Name That Tune”. I explained there how the broad, arching dome of South Mountain was pushed up from the heated, plastic rock of our planet’s crust around 25 million years ago. Though the rock was hot and soft down deep, it had to push through higher layers that were cool and rigid. Some of those layers are the orange rocks that make up the Papago Buttes.

Rigid rocks don’t bend, of course. They break. And when they broke, in this case, they had to “get out of the way” of the emerging dome, part of which we see now as South Mountain. In making way for that uprising mass, they couldn’t just simply slide out sideways, as they were confined by other rocks in the same layer, and rocks behind, above, and below those.

You might be thinking that South Mountain is quite a distance from Papago Park, so why the problem? Geologically, of course, it is not. And at depth, down there below the fill material in the valley, their rocks are physically connected. When the rock layers broke from the pressure below, they could only break up into fragmentary pieces or slabs, looking something like how a deck of playing cards looks when it is unevenly pushed from the side, splaying the cards into a skewed stack.

Now imagine those cards as the rock slabs, first breaking into pieces, then standing up, while tilting back and away from the imposing mass coming up from below. That's what you see at the Papago Buttes, and in my accompanying picture. The tilt can even be seen at Tempe Butte, next to Sun Devil Stadium, even though that is a different type of rock. *All of the rock layers are tilting away from South Mountain*.

Theoretically, other rock layers hidden beneath us also tilt away from South Mountain, making it the center of a giant bulls-eye, of sorts. Those inclined layers strangely reveal one more chapter of the ongoing story written in the rocks all around us.

To learn more about "weirdly-shaped rocks" and the rest of the Phoenix area's engaging geology, visit **www.gemland.com**. Go to the "GeoScenery" section, and click on "Papago Buttes" on the map to begin a series of images. There are geologic explanations available in pop-up windows, and you can send any web scene to your friends as an E-postcard for FREE!

--- *Richard Allen*

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