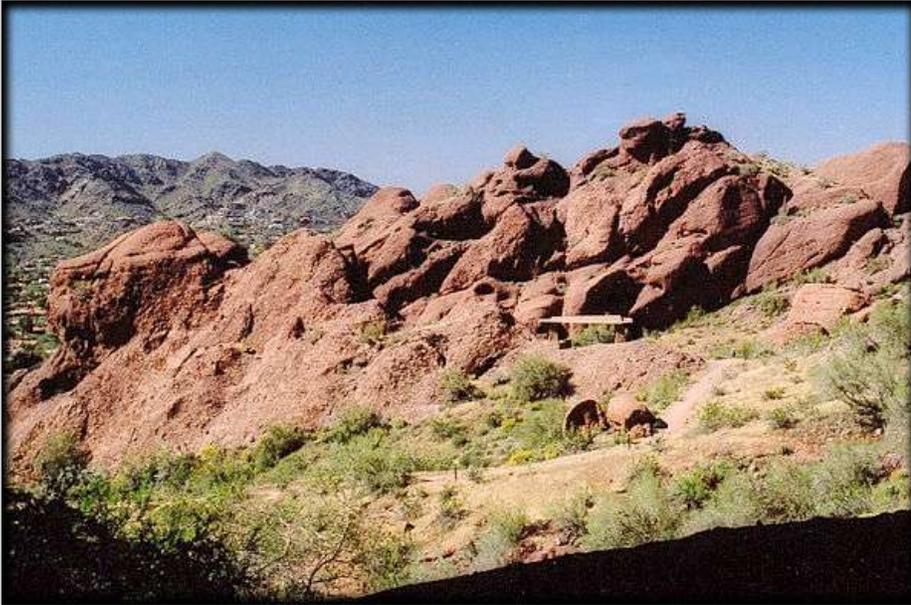


“Breakdown”



Strangely weathered rocks near the Camelback Grotto.

What goes up, must come down. Or so the saying goes. But in geology, what goes down, must come up, too. This is a key part of what we call the “rock cycle”. Eroded material becomes deposited material. Rocks worn away by wind and water result in new rocks, eventually. Profound? Not really, you might think. But the concept does deserve further analysis.

It’s the first of these dynamics that I want to consider here: the “erosion” part of geology, not the “deposition”. The creation of rock formations leads to structure, but it is erosion that gives the land character. Like ancient sculptors who turned blocks of marble into Greek goddesses, wind, water, and other agents give the rock formations of the Earth *personality*.

Erosion is defined as the “physical breaking down, chemical solution, and movement of broken-down and dissolved rock materials from place to place”. Wind and water are part of it, but it is also facilitated by chemical weathering. Even particular life forms, such as lichens and bacteria, contribute to the decay of rocks by processing the minerals to sustain life.

Rock formations sometimes contain numerous fractures or cracks along which erosion and weathering can occur. These may be of a large-scale regional nature, or a small-scale local nature, and they can result from de-stressing, buckling, and with some rock-types, cooling of the rock after its formation.

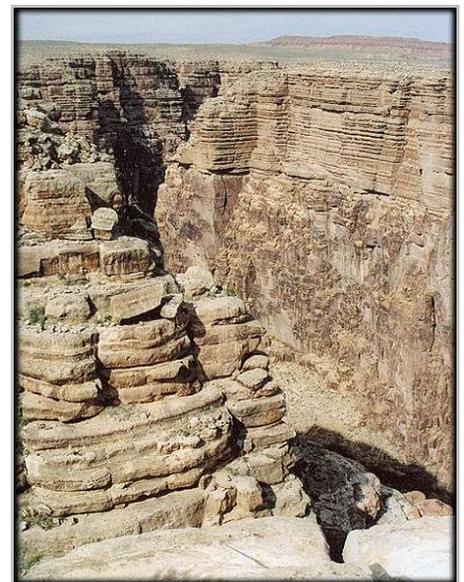
Many times these fractures form in sets which meet at different angles, known as a *joint system*. Erosion along such fractures and sets can make for some really spectacular scenery. The sandstone towers of Monument Valley, in the Four Corners area, as well as the granitic spire of Pinnacle Peak locally, were initiated by jointing.

On a smaller scale, the beautiful granite boulders in and around Carefree also weather out along joint patterns. The dark basaltic lava flows along the Black Canyon Freeway (I-17) north of Phoenix lie in blocky and rubbly patterns because the bedrock has disintegrated along intersecting cracks caused by shrinking of the stone when it cooled down.

Carbon dioxide, which is a naturally occurring gas (as well as human-produced) in our air, reacts with atmospheric water droplets to make “acid rain”, and such precipitation over time dissolves the mineral cement that holds sand and silt particles together in certain hardened rocks. Such rain can actually dissolve some rock, like limestone, completely.

In Phoenix’s Papago Park, the strangely-weathered, orange rocks of the Papago Buttes are pitted and hollowed by chemical breakdown of the mineral matrix, further enhanced by the physical effects of wind and water. You can see this, too, near Camelback Mountain’s west end.

And where else better illustrates the power of wind and water than Arizona’s own Grand Canyon? Water especially. In only a few million years, the Colorado River’s flow has carved an immense gorge and its side canyons out of sandstone and limestone that took hundreds of millions of years to accumulate.



Sedimentary rocks in the Little Colorado River Gorge.

The development of a landscape's look – its geomorphology – is the product of the kinds of rocks there originally, their individual resistances to weathering and erosion, zones of weakness within them, and the types and rates of erosion present.

So it turns out that the natural beauty of Earth's rocky landscape is not only a creative process – it is mostly a destructive process. And the nature of how the destruction proceeds *amidst the structure* gives us our special places.



Basalt boulder rubble helps "paint" the landscape of the Sonoran Desert.

In an art gallery one time, while I was viewing a quite mediocre landscape painting, I realized why the artist had failed to get the scene "right". The rocks in his painting were weathered wrongly.

Though he had been striving for visual accuracy, he hadn't broken down the lay of the rock formations correctly, and they just didn't look believable, even when everything else about the picture did.

Had the painter looked more closely at how the rocks were placed in nature, he would have seen more clearly how (and why) they had eroded in reality, and how much more character they then would have possessed in his artwork.

There is an art of placement (for rooms, building sites, gardens, etc.) in Chinese philosophy called *Feng Shui*, and it's no coincidence that those words mean "Wind" and "Water" in their language.

The shape of the landscape, whether big or small, determines the "feel" of the place, and hence, its spirit.

To learn more about Arizona's engaging rock formations and natural beauty, visit www.gemland.com, go to the "GeoScenery" section, and click on whichever name on the map interests you.

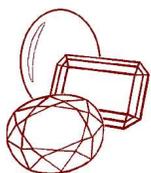
That will initiate a series of images, together with geologic explanations, and you can even send any picture you like to your friends as an E-postcard for FREE!

----- *Richard Allen*

June 2006

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At right: natural Arizona Peridot and 22K Gold
gent's ring by GemLand © 2006



by *Richard Allen*

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