

About

Theories of Desert Pavement

From Andrew Alden, Your Guide to Geology.

Geologic history is swept under the rug of desert pavement

When you decide to visit the desert, you have to go off the pavement, onto a dirt road. Sooner or later you arrive in the brightness and space that you came for. And if you turn your eyes from the distant landmarks around you, out where the road ends, you may see another kind of pavement at your feet, called *desert pavement*. (See a bigger photo [here](#).)

It's not at all like the drifting sand that people often picture when they think of the desert. Desert pavement is a dark, stony surface with sand or vegetation that covers large parts of the world's drylands. It's not photogenic, like the twisted shapes of hoodoos or the eerie, sometimes sphinxlike forms of yardangs, but seeing its dusky presence on a wide desert vista gives a hint of the delicate balance of slow, gentle forces that create desert pavement. It is a sign that the land has been undisturbed, perhaps for thousands—hundreds of thousands of years.

What makes desert pavement dark is rock varnish, a peculiar coating built up over many decades by windblown clay particles and the tough bacteria that live on them. Varnish has been found on fuel cans left in the Sahara during World War II, so we know that it can form fairly fast, geologically speaking.

What makes desert pavement stony is not always so clear. The usual theory is that the pavement is a **lag deposit**, made of rocks left behind after the wind blew away all the fine-grained material. Another explanation relies on moving water, during the occasional rains, to do the same thing. A third theory is that internal soil processes, during repeated wetting and drying cycles, push the stones to the surface and keep them there.

The newest theory of pavement formation comes from careful studies of places like Cima Dome, in the Mojave Desert of California, by Stephen Wells and his coworkers. Cima Dome is a place where lava flows of recent age, geologically speaking, are partly covered by younger soil layers that have desert pavement on top of them, made of lava rubble. Obviously the soil has been built up, not blown away and yet it still has stones on top. In fact, there are no stones *in* the soil, not even gravel.

There are ways to tell how many years a stone has been exposed on the ground. Wells used a method based on cosmogenic helium-3 to show that the lava stones in the desert pavement at Cima Dome have all been at the surface the same amount of time as the solid lava flows right next to them. It's inescapable that, as he put it in a July 1995 article in *Geology*, "stone pavements are born at the surface."

For the geologist, this discovery means that some desert pavements preserve a long history of dust deposition beneath them. The dust a record of ancient climate, just as it is on the deep sea floor and in the world's ice caps. To those well-read volumes of Earth history, perhaps we can add a new geologic book whose pages are desert dust.

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