NASA Shows How Famous Movie Rocks Got Their Tilt

Vasquez Rocks look like an alien planet, but their shape tells a real story about water, rock, and moving plates.

Tilted rock ridges rise from a dry Southern California landscape beneath a clear sky.

NASA's Earth Observatory highlighted Vasquez Rocks in Southern California this week, according to NASA, showing how a famous filming location also tells a deep Earth science story. The jagged rocks have appeared in Star Trek and other science fiction shows because they look strange and otherworldly. But their real story is not about aliens. It is about **sediment**, **pressure**, moving plates, and millions of years of change.

Vasquez Rocks Natural Area sits in the Soledad **Basin**, a basin being a low area of land surrounded by higher land. The rocks stand out because many of their layers lean at sharp angles instead of lying flat. Geologists, scientists who study Earth's materials and history, estimate that the sedimentary rock **strata** there tilt about 50 degrees on average. Sedimentary rock forms from pieces of older rock, sand, mud, or other material that build up in layers. Strata are those layers. At Vasquez Rocks, the tilted layers are so steep that some ridges seem to point upward toward the sky.

Those rocks did not begin that way. NASA explains that about 25 million years ago, sediment spread out across **alluvial** fans. An alluvial fan is a cone-shaped pile of sediment that forms when a fast stream flows out onto flatter land and drops what it is carrying. Much of the material probably came from nearby higher land. Over time, the layers were buried and cemented together into **sandstone** and conglomerate. Sandstone is rock made mostly from sand-sized grains. Conglomerate is rock made from rounded pieces of older rock held together.

The next part of the story involves **tectonic** plates, the huge moving pieces of Earth's outer shell. Near Vasquez Rocks, two plates move past each other along a boundary that includes the San Andreas **Fault**. A fault is a crack or zone of cracks in Earth's crust where rocks move. The San Andreas is a strike-slip fault, which means the land on each side slides mostly sideways. NASA says the North American plate moves southeast there while the Pacific plate moves northwest. Over a very long time, those forces

lifted, bent, folded, and rotated the rock layers in the Soledad Basin.

After the layers were tilted, **weathering** and **erosion** kept shaping them. Weathering breaks rock down, and erosion moves broken material away by wind, water, gravity, or ice. Softer material wore away more easily. Harder sandstone and conglomerate remained as fins and ridges. That is why the landscape now has sharp stone shapes that can look like a set for another planet.

NASA also showed how the rocks appear from space. Landsat 9, an Earth-observing satellite, carried an instrument called the Operational Land Imager that captured the area. In natural color, the view looks more like what human eyes might see. In false color, scientists use light that human eyes cannot see, such as infrared light, to make differences in land and plants easier to spot. From orbit, Vasquez Rocks look less dramatic than they do from the ground, but they still appear as gray bands between mountain ranges.

This matters beyond one park. A place used to imagine faraway worlds can also help explain this one. The same landscape connects rock layers, plate motion, satellite technology, and the way movies use real places to create make-believe settings.

Written from reporting by NASA.

THINK IT THROUGH

1. **Should a place like Vasquez Rocks be taught mainly as a science site, a cultural landmark, or both? Defend your choice.**

2. **What can a satellite view help people understand about a landscape, and what might it leave out compared with visiting on the ground?**

3. **If a local place near your community had a hidden science story, what kinds of evidence would you look for before explaining it to others?**

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ALLUVIAL BASIN EROSION FAULT PRESSURE
SANDSTONE SEDIMENT STRATA TECTONIC WEATHERING

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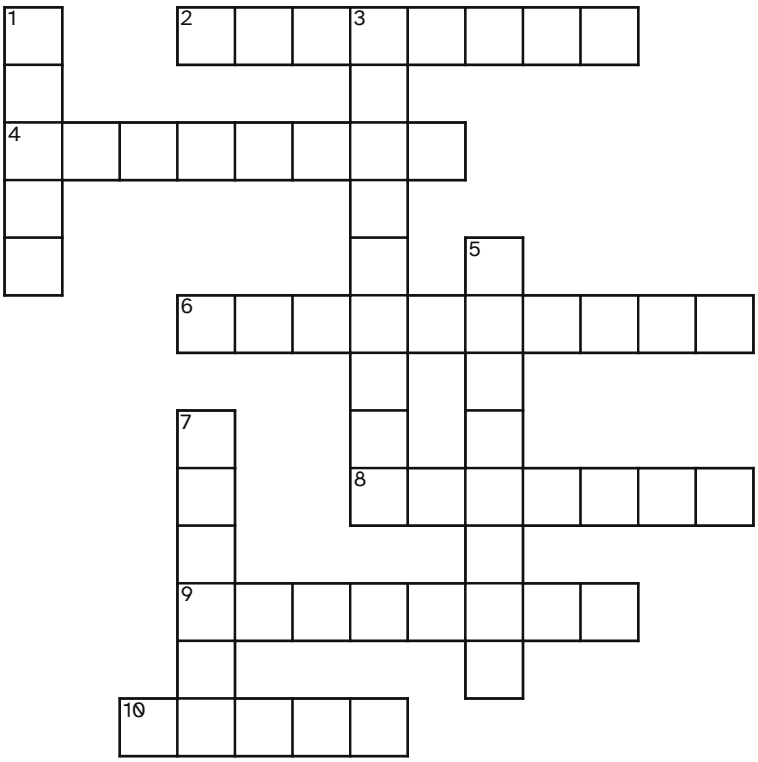

ACROSS

2 Pushing force that can bend, lift, or squeeze rock layers

4 Rock, sand, and mud pieces that settle in layers

6 Breaking down of rock at Earth's surface

8 Carrying away broken rock or soil by wind, water, ice, or gravity

9 Describing material left behind by flowing water

10 Crack zone in Earth's crust where rocks move

DOWN

1 Low land area surrounded by higher ground

3 Rock formed when tiny grains are pressed and cemented together

5 Related to movements and forces of Earth's huge outer plates

7 Rock or soil layers formed at different times

Where this came from

This article was written for 3andB from the reporting below. It is not a reprint — the wording is ours and the facts are theirs.

NASA

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