

Stratigraphy --Common Q/A

Earth Science Essentials
by Russ Colson

Wait a minute--if the oldest rocks are on the bottom, why don't rocks get younger at higher elevation? Don't they have too?

Sometimes they do. The layer-cake rocks at the Grand Canyon retain the sequence of older on the bottom-younger on the top. Older rocks, like the Vishnu Schist, are found down in the bottom of the canyon. Younger rocks like the Kaibab Limestone are found at the crater rim.

However, if we compare the high peaks in the Rocky Mountains to the lower plains of Kansas, the rocks high in the Rockies are mostly older than the rocks of the lower plains. The mountains were formed by compression and uplift of rocks. Younger rocks eroded away, and the older rocks have been lifted up much higher than the younger rocks out on the plains to the east.

In other places, rocks have been tilted, so that there is a large difference in the elevation of rock layers from one place to another. Rocks of the same age might be at very different elevations over a relatively short distance. Younger rocks at one location could easily be at lower elevation than old rocks at another location.

Movement on a fault can lift up one side of the fault relative to the other. After erosion, the rocks exposed on the uplifted side will be older than the rocks at the same elevation on the other side of the fault.

How can the rocks form in flat layers if an ocean advances over the land? If the ocean advances to higher elevation, won't the rocks be sloped upwards?

Hmmm. Yes, I suppose that if an ocean rises over land, the layer has to slope slightly upward as originally deposited. However, the ocean may advance hundreds of miles inland with an elevation change of only tens or hundreds of feet. This corresponds to a slope of only a tiny fraction of one degree. This is so close to horizontal that you couldn't see the slope if you were looking at the rock layer. The key idea is that sediments can't be deposited in a big layer that slopes up into the sky with nothing underneath it. Gravity will pull sediments down into a nearly horizontal layer.

Also, ocean advances can result from the landscape subsiding (rather than ocean rising). In this case, the subsidence of the land, with sea level approximately constant, might keep the rock layer even closer to horizontal.

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