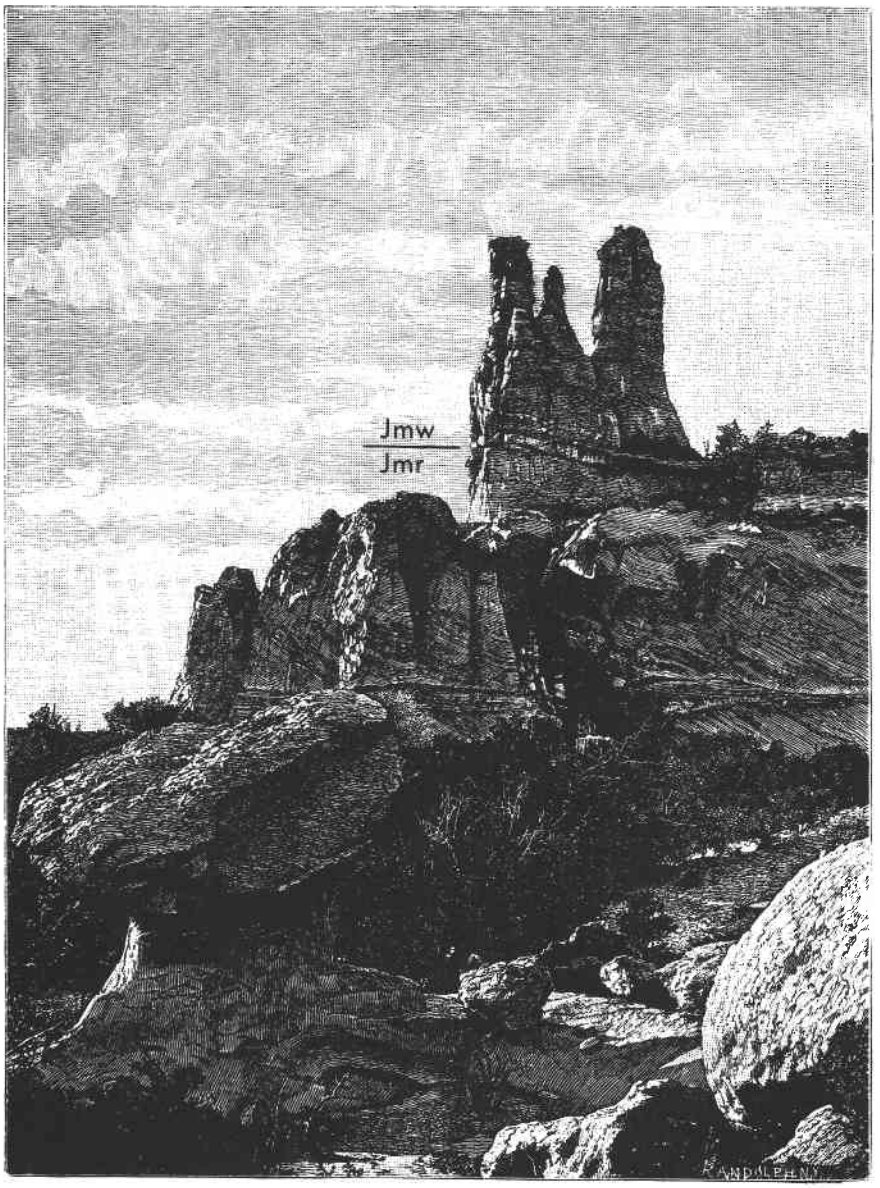
Gallery of Geology



Navajo Church

This woodcut, based on a photograph of Navajo Church taken by Captain Clarence E. Dutton's field party, was published in 1885 in the sixth annual report of the director of the U.S. Geological Survey. The modern traveler cannot help but notice the topographic feature (elev. 7,350 ft) immediately north of Red Rock State Park, 5 miles east of Gallup along I–40. NM–566, which leads northward from the I–40 frontage road, passes within 0.5 mi of Navajo Church and offers a view of the local Middle and Upper Jurassic section.

The three spires at the top of Navajo Church are erosional remnants carved in the Upper Jurassic Morrison Formation, Westwater Canyon Member (**Jmw**). The **Jmw** rests on the spectacularly crossbedded and somewhat friable sandstone of the Recapture Member of the Morrison (**Jmr**). The **Jmr** rests on heavily talus-covered, Middle Jurassic Wanakah Formation (formerly Summerville and Cow Springs Formations).

In the Recapture Member (**Jmr**) thick sets of high-angle (24–26°) crossbeds dip southeastward to eastward indicating prevailing westerly winds during deposition of this eolian sequence. In the uppermost part (20–25 ft) of the formation, reworking of sand destroyed the eolian crossbedding prior to deposition of the overlying **Jmw**. Also in the upper portion of the **Jmr** are vertical masses or columns that show a greater degree of induration and also evidence of intensive bioturbation and trace fossils. Trace fossils have been reported in eolian sandstones, but such occurrences are considered rare.

A fluvial depositional system succeeded the eolian one with the onset of Westwater Canyon (**Jmw**) deposition. A minor disconformity at the break is marked by a surface of low relief (1–2 ft) and by two thin, sandy mudstone layers with interbedded fine-grained sandstone. This entire mudstone interval is only 2 to 3 ft thick, but it forms a reentrant; the more massive, resistant, coarse-grained, and conglomeratic sandstone above forms an overhang. Indeed the spires themselves are weathering away by the process of undermining, i.e. the friable **Jmr** is continually being worn away and this undermining results in large blocks of **Jmw** falling and accumulating as talus on the windswept slopes of the **Jmr.**

The conglomeratic sandstones are arkosic, contain clay clasts or rip-up clasts, and are typical of Westwater Canyon sandstones throughout the southern San Juan Basin. Recognizable in thin stringers is the dark-colored, structureless, carbonaceous matter that impregnates the sandstone and constitutes uranium ore in the Grants uranium district. The implications are that much more of this material has been washed away via the Puerco, Little Colorado, and Colorado Rivers than has ever been mined.

—Orin J. Anderson