

## g19 Sonoma orogeny

< Painted Desert and Petrified Forest, Chinle fm, Navajo Sandstone >

To speak of North America before the Jurassic is to speak of utopia (Greek *ou no + topos* place, a word coined by Sir Thomas More and used as the name of the imaginary country described in his book *Utopia*, 1516.<sup>1</sup> —HR

What is now the western margin of North America, became an oceanic-continental convergent plate boundary during the early Mesozoic. Then it was the northwestern margin of Pangea. The Farallon plate dipped steeply southeast to below it. The Cordillera expression of that convergence was the end-Permian Sonoma orogeny. The mountains raised are recorded by Triassic sediments shed southeast (east, as oriented today) onto the craton. Details of some related events are recorded in formations well-exposed in Zion National Park, Utah.<sup>2</sup> A top down description of these (referring to places and directions as these are today) is:

**Glen Canyon group**, in which the Jurassic-Triassic boundary somewhere lies, are vividly colored shales, silts, and sandstones that accumulated in and around a basin of internal drainage centered on northeastern Arizona. Gradual uplift on the east, caused a progressive westward shift of the basin's center. Navajo fm (Jurassic) and older Wingate fm (Triassic) are a succession of alternating alluvial sediments deposited by west-flowing rivers, and east-blown sand dune accumulations. Cross sections of these latter, characteristically show immense dune-slipface (lee-face) cross bedding between parallel, horizontal, truncation planes.

**Chinle group** (Upper Triassic) sediments cover and extend far east of the Moenkopi fm (described below). Fossil wood is characteristic, and is locally abundant as is seen in the Petrified Forest, eastern Arizona. The trees, unlike coal-swamp flora, had wood with seasonal growth rings.

The basal member of the Chinle group is the Shinarump Conglomerate that though thin (50 m) is persistent over a great area. Large well-rounded pebbles in it are characteristic: maximum coarseness occurs along the Mogollon Rim, Central Arizona, where it fills valleys eroded into the Moenkopi fm. Its coarseness decreases to the north and east where it grades into sandstone with exposures in Monument Valley, southeastern Utah.

**Moenkopi fm** (Lower Triassic) is of reddish brown shales, silts, and sands of a broad coastal plain. This sloped northwest to where, in the Painted Desert, Arizona, thin limestones and gypsum beds with marine fossils, intercalate with bright red, or maroon shales, and cross-bedded red sandstones. □

### Footnote g 18.1 Comstock lode

Silver coinage could begin to supplement gold currency in the United States after James Finney and Henry Comstock took advantage of curious rancher August Harrison's discovery in 1859 that the throwaway blue-black mud that clogged the quicksilver mats of rocker boxes and sluice boxes of worked gold claims on the slopes of Mount Davidson, Nevada, assayed as silver ore!<sup>8</sup>