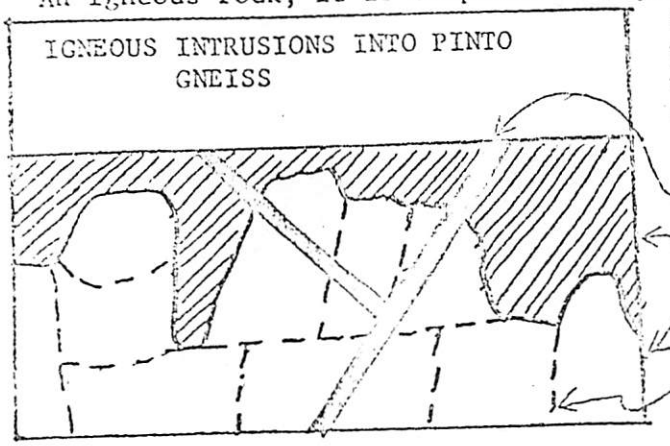
GEOLOGY OF MAJOR LANDFORMS
JOSHUA TREE NATIONAL MONUMENT

The three most common rocks found in the Monument are Pinto gneiss (pronounced "nice"), quartz monzonite and aplite.

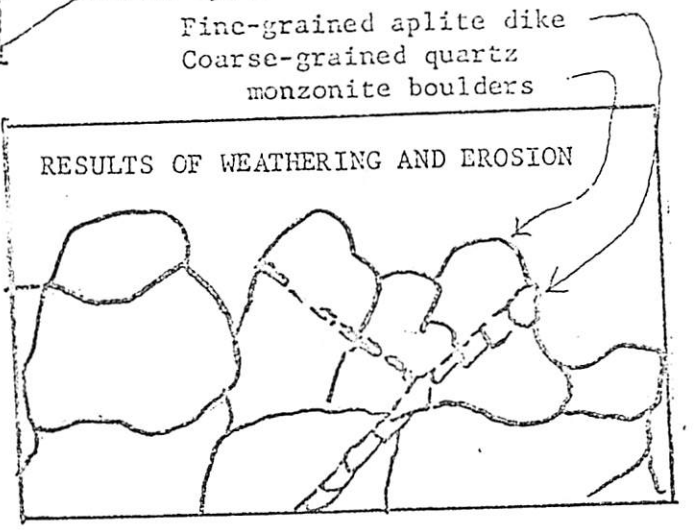
The dark-colored rocks of which most of the mountains are composed is Pinto gneiss. ~~six~~ 600 million years old at least, it is the oldest rock in the Monument. Pre-existing sedimentary rocks (laid down in parallel layers in ancient, shallow seas), when subjected to heat and pressure, folded and recrystalized to form this metamorphic rock. The distinguishing characteristic of Pinto gneiss are parallel dark and light bands which have been folded. Biotite mica gives it a predominantly dark color; other minerals include quartz and feldspar.

The large, light-colored boulder piles characteristic of Hidden Valley and Jumbo Rocks are composed of quartz monzonite, a type of granite. An igneous rock, it is composed of crystals of feldspar, quartz and micas, and dates back 83 to 163 million years. At that time, molten magma was forced upward under pressure into the overlying Pinto gneiss.



As it cooled, it solidified into crystals, which give the quartz monzonite the texture of very rough sandpaper. Small cracks or joints formed in systems perpendicular to each other.

Sometime later, magma was forced into some of these cracks. It solidified into a fine-grained rock called aplite. This light-colored rock cuts across monzonite boulders in regular straight lines called "dikes".



Weathering and erosion have gradually stripped away the softer Pinto gneiss (see above), leaving the monzonite intrusions exposed. The joint systems are zones of weakness, where weathering can occur more quickly than along the main rock masses. For this reason, many of the boulders are rectangular and gradually weather into spheroidal or ovoidal shapes. The aplite dikes, composed of more quartz than monzonite, weather less rapidly and so jut from the boulders in regular lines and blocks.

Good examples of contact points, where Pinto gneiss and quartz monzonite come together, exist at Ryan Mountain and Pleasant Valley. Excellent examples of aplite dikes may be seen along the road near the entrance to Jumbo Rocks. Here, since the surrounding rock has been weathered parallel to the aplite rather than across it, the dikes have the appearance of regularly constructed stone walls.