Figure 3. A turn-of-the century oil-well pump, used until recently on the Marr Ranch, northeastern Simi Valley. Photograph by R. L. Squires.

the shallow-marine, upper part of the formation. A representative snail and scallop are shown in Figure 4. The Vaqueros Formation in Simi Valley has also yielded a few marine mammals (porpoise and sea lion). The formation is exposed only in the northwestern part of Simi Valley on the south flank of Big Mountain.

Conejo Volcanics

Overlying the Vaqueros Formation near the western margin of Simi Valley is a thin interval of Conejo Volcanics, and an unconformity separates the two formations. The Conejo Volcanics first accumulated as submarine lava flows, but eventually the volcanic pile became emergent through continued outpouring of lava flows and volcanic debris during middle Miocene time. The volcanics are not present beyond the north-central part of Big Mountain because of erosion that took place prior to the deposition of the overlying Calabasas Formation. The source area for the volcanics is the Conejo Hills southwest of Simi Valley. Radiometric age dates of the volcanics indicate that the Conejo Volcanics accumulated about 14 million years ago. The chemical composition of the Conejo Volcanics strongly points to a subduction zone-related origin for these rocks. Why there was volcanic activity during Conejo time is not clear, but some form of subduction may have occurred. Soon thereafter, slippage (discussed earlier under the Sespe Formation) along the San Andreas fault caused the presumed subduction-zone activities in the Conejo Hills area to cease because no more volcanic activity took place after 14 million years ago.

Exposures of the Conejo Volcanics are also present along Olsen Road in the vicinity of the Ronald Reagan Presidential Library and underlying the hill with the cross on it. At these two locales, the Conejo Volcanics are about 200 feet thick (60 m). The volcanics also flowed southward into the western Santa Monica Mountains area.

The Calabasas Formation

The Calabasas Formation was deposited during middle Miocene time about 13 million years ago. Near the extreme northwestern corner of Simi Valley (Figure 1), the formation overlies the Conejo Volcanics and an unconformity separates the two formations. Elsewhere along the south flank of Big Mountain, the Calabasas Formation overlies the Vaqueros Formation and an unconformity separates the two formations. The Calabasas Formation is about 295 feet (90 m) thick near the western margin of Simi Valley but is not present east of Big Mountain because of erosion that took place prior to the deposition of the overlying Modelo Formation. The sandstones of the Calabasas Formation are composed of beach sands and nearshore-marine deposits. Fossils are fairly common and include barnacles, scallops, sand dollars, and some whale vertebrae. In the Simi Valley area, the Calabasas Formation is present only in the northwestern part of Simi Valley on the south flank of Big Mountain.

The Modelo Formation

The Modelo Formation overlies the Calabasas Formation and an unconformity separates the two formations. The Modelo Formation was deposited during middle Miocene time, about 12 to 6 million years ago. The formation is 1,970 feet thick (600 m). The basal part of the formation consists of silty sandstone extremely rich in shallow-water benthic foraminiferal microfossils. The remainder of the Modelo Formation consists of diatomite, a soft white siliceous (rich in silica) deposit that formed in a cold, deep-marine environment and is composed largely of the remains of microscopic floating algae (diatoms). Tremendous diatom blooms were responsible for stagggering numbers of diatoms which subsequently died and settled to the ocean floor. This high productivity was spawned by late Miocene climatic cooling which intensified oceanic upwelling. The deep basinal depositional setting of the Modelo Formation was similar to the present offshore southern California continental borderland, the Gulf of California, and the western margin of South America. The basin in which the Modelo Formation in Simi Valley accumulated subsided rapidly and received a considerable thickness of sediment. These organic-rich deposits are the primary source for the rich oil accumulations in various rock units in Simi Valley.

The white diatomite in the Modelo Formation forms very distinctive exposures. Diatomite is exposed along the flank of Big Mountain, just west of Tapo Canyon, and forms a prominent cliff that many residents of Simi Valley refer to as "White Face." The top of Big Mountain is also made up of Modelo Formation diatomite. There are no stands of trees on top of Big Mountain because diatomite is not conducive to having water flow freely through it, and, therefore, deep-rooted plants cannot grow there. It is interesting to note, that the "rolling-hills" look that Big Mountain possesses resembles grass-covered hills of the Midwest. For that reason, movie companies filmed in the vicinity of Big Mountain when they wanted the "look"of Kansas or Minnesota. Many of the outdoor scenes in the TV series "Gunsmoke" were shot in the Big Mountain area. Also, the scene of Laura Ingalls running down a grassy, flowered-covered slope in the opening of the TV series "Little House on the Prairie" was filmed with Big Mountain landscape. The set of the town of Walnut Grove (supposedly a town in Minnesota) in the show "Little House on the Prairie" was built on the top of Big Mountain at its east end.

The Modelo Formation in Simi Valley has also yielded remains of land plants, clams, fish, whale bones, and possibly sea lions.

During Miocene time, there seems to have been 64 to 81 degrees of clockwise rotation of the western Transverse Ranges. Also, within the last few million years, a large "bend" has formed in the San Andreas fault in southern California north of the Transverse Ranges. This "bend" has caused the crustal plates to push against each other, as well as to slip past each other. Forces related to the pushing have caused rock layers south of the fault to be extremely compressed and form geologic structures or folds called synclines and anticlines, or to be cut and offset by faults.

Simi Valley is situated in a syncline caused by the compression (pushing) related to the "bend" in the San Andreas fault. A syncline is a "U"-shaped fold in which the rock layers are younger in geologic age nearer the middle of the structure. Simi Valley, furthermore, is in a syncline that plunges (tilts) downward in a westwardly direction. In order to visualize a plunging syncline, take a piece of paper, fold it into a "U" shape, and tilt it down and away from you.

Big Mountain just north of Simi Valley is an anticline. An anticline is an inverted "U"-shaped fold in which the rock layers are older in geologic age near the middle of the structure. If the rock conditions are right, oil can accumulate along the axis of an anticlines, and Big Mountain is one such