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"Basinal Dynamics of the Joaquin Embayment in California"

Mesozoic tectonism and the sedimentary mechanics of the Joaquin embayment in central California are poorly known. Much of the original basin in the west has been greatly compressed by severe folding and faulting into the Central Coast Ranges. Its relatively unaffected portion known as the Central Valley is still subsiding and receiving sediments. This Central Valley portion coincides essentially with the eastward thinning shelf of the formerly much larger embayment. Moreover, its deformed emergent marine sedimentary rocks are thrust eastward over shallower water deposited rocks along the Ortigalita-Tesla fault zone, accentuating still further the narrowness of the basin. Although orogenic movements have meen episodic since the Late Jurassic Nevadan orogeny, the climactic movements apparently occurred during the Miocene and later in the Pliocene. Quarternary or Recent movements are indicated by a strong monoclinal flexure involving Pleistocene unconsolidated sediments along the abrupt west border of the San Joaquin Valley and also by tilted stream terraces in the foothills.

Several fundamental characters of this area must be thoroughly analyzed and interrelated before a satisfactory explanation of its sedimentary mechanics can be advanced. Not one cause but several interacting phenomena probably have shaped this area. Some of these are enumerated below:

1. Increasing sodic content and decreasing silica of granitoid rocks westward toward the San Andreas fault have been documented by many recent workers. The Gabilan massif, west of the San Andreas fault which shows relatively low soda and high silica, is anomalous. It perhaps represents a detached segment of the Sierran block achieved through either lateral or oblique slippage.

2. En echelon offset of the California Coast Ranges is obvious on the state geological map. Individual ranges deviate about 30 degrees more to the southeast than the broad regional alignment and supposedly represent second order fold belts produced by right lateral slippage of the San Andreas fault system, i.e., relative north motion on its west side.

3. Southward shift of the Late Mesozoic and Cenozoic loci of maximum deposition (or depocenters) along the west border of the Sacramento and San Joaquin Valley is apparent from measurements of their sedimentary sequences. Maximum thickness of the Late Jurassic Knoxville section is about 25,000 feet in the northwest Sacramento Valley; the Lower Cretaceous depocenter comprising about 20,000 feet is about 60 miles farther to the south. About 200 miles southward in northwest Fresno County of west central San Joaquin Valley, Upper Cretaceous beds are nearly 30,000 feet thick. A tremendously thick petroliferous Tertiary section locally exceeding 35,000 feet is located 100 to 150 miles farther to the south in the southwest San Joaquin Valley which is the setting for the well-known Bakersfield-McKittrick oil district.

4. The Cretaceous sequence of the Joaquin embayment which onlaps the tilted Sierran block thins eastward through loss of section from its base, through thinning of its various lithic components, and by truncation of the overlying Tertiary sedimentary wedge.

5. Both large and small scale sedimentary features ranging from current marks to buried submarine channels and imbricated sand lenses up to thousands of feet in thickness suggest sedimentary transport from the north and almost parallel to the sedimentary margin and to the gross sedimentary axis. This conforms with similar observations in both the Arkoma basin of Oklahoma and the Wales basin of Great Britain. Ironically, earlier interpretations were divided between an eastward Sierran source and a westward Coast Range source. Now, it appears that although some detritus came from various peripheral sources the bulk moved southward down the basinal axis.

6. Geophysical data indicates that the western Joaquin embayment is developed in an area of thin crust about 20 kilometers in thickness, whereas the nearby Sierra Nevada has crustal roots extending as deep as 50 kilometers. The Coast Ranges show intermediate values.

Fitting these seemingly random factors into a scheme of interrelated basinal dynamics is a considerable challenge, and this writer, lacking really conclusive data, will attempt some guesses. The Pacific Ocean block and its western rim is rela-

tively stable owing to its thin homogenous simatic crust. The Cordilleran province is notoriously unstable owing to its great thickness of heterogenous sialic crust. Orogenies and associated downwarped areas tend to migrate southeastward throughout its extent with the main compressional (Nevadan to Late Laramide) movements in that direction. These southeastward movements are implicated for the similarly shifting loci of the depositional troughs in the marginal California sector. These forces acting obliquely or almost tangentially to the southeast oriented California shore produce right lateral drag along this margin and in the adjacent sialic wedge. Shear directions tend to be tangential and parallel to the shelf, which coincides with the present shore. Secondary folds develop in the thicker sedimentary lenses at a roughly 30 degree angle to this shear direction. This condition is fulfilled by the major fault systems and fold belts in central California.

Another possible dynamic factor unrelated to the above tectonic situation but nevertheless reinforcing it is the southward transport of sediments by longshore currents around the Klamath promontory. This promontory is essentially the pivot or right angle turn of the Nevadan fold belt from northwest to northeast in northwestern California and southern Oregon. The south current drift along the west shore of North America is probably a persistent feature related to the coriolis force which generates the extensive clockwise swirls of oceanic currents in the northern hemisphere. California, occupying the lee side of this promontory, received the bulk of these transported sediments which then prograded southward and were joined by sediments flowing down the slope of the ancestral Sierra Nevada. These sediments encroached on this Sierran massif during much of Cretaceous time, except for a temporary regression during the Late Cretaceous and Early Tertiary transition. This simultaneous southeastward regression by progradation and northeastward transgression by onlap warn that conclusions about transgression and regression derived from one vertical profile may be misleading. The best method for reconstructing the sedimentary dynamism of a basin such as the Joaquin embayment is still a three dimensional analysis.

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"Paleogeologic and Quantitative Lithofacies Analysis, Simpson Group, Oklahoma"

The Joins, Oil Creek, McLish, Tulip Creek, Bromide, and Corbin Ranch Formations of the Simpson Group were correlated throughout the subsurface of Oklahoma in order to (1) establish formational equivalents between measured surface sections in the Arbuckle and southwestern Ozark Mountain regions, (2) determine erosional or depositional limits of each of the formations, (3) illustrate suspected existing interformational regional disconformities, and (4) provide basic operational units from which thickness and gross lithologic data could be derived quantitatively for construction of a series of isopach and facies maps.

A technique of lithofacies expression based on the classifying function ("D-function") is advanced. The method was conceived by Pelto (1954) as a means of mapping multicontinent systems alternative to methods devised by Krumbein and Sloss (1951). With one exception (Forgotson, 1960, p. 88), the classifying function technique generally has not been utilized in practical application. Simplicity of map design, compared with corresponding composite maps based on percentages and ratios, the extreme rapidity with which the maps are constructed, and the facility of tectonic and environmental interpretation justify recognition of this method as a usable mapping tool.

Detailed subsurface correlation and faunal evidence substantiate the thesis that the thin lower Tyner-Burgen sequence cropping out along the southwestern flank of the Ozark uplift is equivalent to at least the lower part of the thick Oil Creek Formation of the Arbuckle region. The middle Tyner shale is considered by the writer to be McLish, and the upper Tyner dolomitic limestone and Fite Limestone are herein correlated conjunctively with the Corbin Ranch Formation. A distinct break in sedimentation between the upper and middle Tyner beds represents a significant hiatus during which time Tulip Creek and Bromide strata were eroded from the Ozark area.

The Simpson Group contains many interformational unconformities and onlap pinchouts of both regional and local magnitude. Intraformational discontinuity on a lesser scale is suspected but not confirmed.