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Title: THE GREAT VALLEY FOREARC BASIN, 40 YEARS A.D. (AFTER DICKINSON)

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Abstract: Today, four decades after the plate tectonic revolution began, the Mesozoic Great Valley basin of California is widely regarded as the type example of an ancient forearc basin, due largely to a series of articles published in the 1970s and 1980s by W.R. Dickinson and various co-authors. The robust data generated in those studies underpinned provenance and paleogeographic interpretations that remain compelling at first-order to this day. Those studies also identified critical questions about basin origins, underlying basement, and drivers of subsidence that likewise retain their currency. Nevertheless, methodologies and concepts available only in the last two decades add rich detail to understanding of the basin and highlight key unresolved issues relevant to the Great Valley basin and forearc basins in general.

The origins of the Great Valley basin remain controversial, obscured by burial, erosion, and tectonic overprint. Recent ideas, as yet untested, may add to the debate: detrital zircon data bearing on provenance and chronology may signal a significant unconformity at the base of the sequence and allochthoneity of the lower portion of the basin fill. These controversies notwithstanding, the overall forearc setting of the sequence is little debated, but there is now a growing recognition that the structure of the basin is more complicated than once supposed. Apparently, extension characterized at least the northern part of the basin in the Early Cretaceous and controlled loci of sedimentation. Recent reflection seismic investigation of the basin south of Modesto reveals transverse structural segmentation dating to inception of the basin, analogous to that seen in the modern Indonesian forearc. In addition, seismic imaging of early Late Cretaceous arcward thrusting of the outer forearc basin and possibly the accretionary wedge, similar to the modern Barbados forearc, suggests that flexural subsidence mechanisms at least partly controlled arcward migration of forearc subsidence.

The basin fill, visualized in the 1970s in terms of deep-marine depositional systems, can also be understood in terms of sequence stratigraphy. Although stratigraphic packaging may partly reflect eustatic sea level changes, particularly the long-term Late Cretaceous global rise, much of the third-order sequencing likely reflects convergent margin tectonism and changing patterns of forearc ponding versus throughput to the trench. Petrology of basin sand was early used to define magmatic arc provenance in the global provenance scheme of Dickinson, and closer examination of sand composition revealed apparent episodicity in arc denudation and volcanism in the Sierran arc during the late

Mesozoic. New methods, such as trace-element/REE analysis, support the sand provenance interpretations, and detrital zircon studies add rich insights, as yet incompletely investigated, into erosional denudation and evolving fluvial drainage patterns in the Sierran arc.