

ogy, mass transfer, and provide the hydrodynamics for hydrocarbon migration. Facies control the distribution of significant chemical components, including hydrocarbon sources. The tectonic setting controls fracture porosity, thermal gradients, and timing of hydrocarbon migration.

The important diagenetic reactions are interpreted on the basis of five phases: (1) silica, (2) carbonate, (3) clay, (4) organics, and (5) seawater. From the reactions characterizing these five phases, paragenetic sequences can be derived for each of the four solid components (opal, carbonate, clay, and organics) in the presence of seawater as temperature increases. Integration of paragenetic sequences results in an interpretive model of the diagenetic history of the Monterey Formation.

Three significant Monterey facies are: (1) sandstone-diatomite, (2) diatomite, and (3) carbonate-diatomite. The carbonate-diatomite facies in the Monterey has outstanding source rock potential; some of the mud and siltstone contain 18 wt. % organic carbon.

Hydrocarbons evolve when source rocks are buried to or below 6,500 ft (1,981 m). The hydrocarbon migration path is controlled by fracture porosity along active tectonic zones, particularly near fault systems at the margin of the fold (basin). The reaction, organic matter \rightarrow hydrocarbons, provides pressure buildup and hydrocarbon expulsion, whereas the reactions, opal A \rightarrow opal CT, and opal CT \rightarrow quartz, provide the fluid drive for the hydrocarbon migration.

SUTTNER, LEE J., Indiana Univ., Bloomington, IN, ROBERT K. SCHWARTZ, Allegheny College, Meadville, PA, and W. CALVIN JAMES, Univ. Notre Dame, Notre Dame, IN

Late Mesozoic to Early Cenozoic Foreland Sedimentation in Southwest Montana

Stratigraphic variations in the petrology of Upper Jurassic through lower Tertiary sandstones from southwest Montana, and inferred dispersal patterns and depositional environments, reflect the tectonic evolution of a foreland basin in response to gradually increasing orogenesis. Upper Jurassic to Lower Cretaceous (Ap-tian) chert-litharenites were largely derived from an older folded and faulted miogeoclinal prism of terrigenous and carbonate rocks farther west in Idaho. Volcanic and plutonic sources were negligible. Deposition was on a broad coastal plain extending east toward the craton. Subordinate admixtures of sediment containing low-rank metamorphic rock fragments derived from an intrabasinal reactivated Precambrian structure (Belt arch) and regionally extensive intercalated fresh to brackish-water limestones are unique characteristics of this retro-arc sequence.

Marked upward increase in the quantity of locally derived plutonic and volcanic rock fragments in Blackleaf (Albian) and younger sandstones indicates the progressively more important role of nearby comagmatic sources. A transition in time from paralic sedimentation to dominantly alluvial sedimentation, was associated with the increase in igneous detritus. Dispersal patterns were complex because of local topographic barriers.

Early Tertiary sedimentation occurred in extensional

fault-bounded basins in an intra-arc setting. Highly immature lithic sandstones and arkoses with a complex plutonic-volcanic-gneissoid provenance accumulated in a variety of high- and low-energy alluvial environments.

SWAIN, F. M., Univ. Delaware, Newark, DE, and E. G. ANDERSON, Louisiana Geol. Survey, Baton Rouge, LA

Comparison of Gulf Coast Late Jurassic Ostracoda with Those of Western Europe

More than 30 genera of Ostracoda are represented in the Upper Jurassic rocks of the central Gulf region, United States. Most of these occur in the Schuler Formation, Dorcheat Member (Portlandian-Tithonian). About 12 of the genera are of European origin and, of these, several (e.g., *Nophrecythere*, *Galliaecytheridea*) began in earlier Late Jurassic or in Middle Jurassic of the European province. Emigration to the Gulf of Mexico region probably occurred around the northern margin of the opening Atlantic Ocean.

About 10 of the other Jurassic ostracode genera were endemic to the northern Gulf of Mexico or the western Atlantic. Most of these remained in those areas, some extending into the Cretaceous. Only a few Gulf forms, particularly *Hutsonia* and *Paraschuleridea* dispersed sparsely eastward to Europe. *Schuleridea*, which became abundant on both sides of the Atlantic, may have migrated eastward from the Gulf region in the Oxfordian or Kimmeridgian, as indicated from occurrences in offshore wells in the western Atlantic where it is associated with index foraminifera.

SWEET, WALTER C., Ohio State Univ., Columbus, OH

State of the Art in Conodont Taxonomy

Two taxonomic schemes have been available to students of conodonts for more than 120 years. Until about 1970, most taxonomists opted for a "nuts-and-bolts" approach, or form-taxonomy, which emphasized similarities and differences in the morphology of discrete skeletal elements. Since the mid-1930s, however, it has been known that skeletal apparatuses of many conodonts included mineralized elements of more than one morphologic type. Beginning about 1964, clues to assembly of at least parts of multi-element apparatuses from collections of morphologically diverse discrete specimens came to be more systematically explored. In recent years with empirical reconstruction of a rather small number of skeletal-apparatus plans, and repeated confirmation of the general applicability of these in samples through much of the known range of conodonts, emphasis has shifted away from form-taxonomy to multi-element taxonomy. Major problems that remain include (1) standardization of descriptive and locational terminology for components of multi-element apparatuses, (2) resolution of nomenclatural problems that arise because multi-element affinities of numerous type specimens cannot be (or have not been) established, and (3) correction of errors introduced by application of multi-element models to collections in which they cannot be objectively justified. The advantage of