sion Canyon and overlying Charles Formations, in conjunction with cross sections through the field showing both formations, reveal timing of compaction and quantitative compensation by overlying deposits. Curves from 3 wells show percent compaction versus overburden. With 250 m of overburden, mechanical compaction is essentially complete and, on average, marine sections have been compacted 31%.

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Genesis of Mississippi Valley-Type Lead and Zinc Ore Deposits and Consequent Exploration Thinking

Mississippi Valley-type ore deposits provide most of the lead and a large part of the zinc presently mined in the world. They are stratabound epigenetic precipitates largely in dolostone host rocks that occur on the flanks of deeply subsiding sedimentary basins or between two sedimentary basins along an axis of reduced subsidence. They were commonly emplaced at or close to the platform-to-basin facies front, well removed from igneous or metamorphic influences. Sulfides commonly infill interstitial or intramoldic porosity in collapse breccias, and are formed by the intrastratal solution of evaporites and/or carbonates either by downward-percolating meteoric waters or by upward-escaping basinal fluids. In a few places, karstic caverns were precursors to ore precipitation; more commonly, lower grade deposits occur in intergranular or intercrystalline space. The strong force of crystallization of sulfide minerals may cause local pressure solution encroachment on the carbonate host rock, but the vast bulk of any deposit is void-filling and, therefore, the average porosity (% voids) determines the likely grades.

The mineralogy is simple: galena and/or sphalerite, marcasite and/or pyrite, accompanied by only a white sparry dolomite, in places calcite and/or quartz gangue.

The host rocks have many of the attributes of a carbonate rock petroleum reservoir of recognizable anticlinal or stratigraphic trap type. Residues of hydrocarbons and former evaporites are common characteristics.

The metals probably migrated considerable distances as soluble chloride complexes in low-temperature, high-salinity brines and precipitated where these brines encountered host-rock brines with abundant reduced sulfur. Lead and sulfur isotopic and trace-element compositions of the ores and host rocks are complex and the brines strongly resemble petroleum-associated basinal fluids, but, so far, geochemical criteria have failed to impose a consensus on metal(s) source(s). Some Mississippi Valley-type deposits appear to be little younger than their host rocks; others may lag by long periods of time.

Genetic models lead to consequent exploration thinking that mimics many aspects of oil finding.

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Exploration Along Lower Cretaceous Shelf Margin—Golden Lane, Mexico, to Louisiana

Exploration for hydrocarbons from Lower Cretaceous shelf-margin carbonates began more than 40 years ago and continues today along the Gulf Coast of Mexico, Texas, and Louisiana. The early discovery of the oil-rich Golden Lane and Poza Rica fields of Mexico provided encouragement for exploration for similar fields in Texas and Louisiana. Exploration along the shelf margin of the U.S. Gulf Coast has resulted in the discovery of smaller gas fields in south Texas.

Detailed core studies along the shelf-margin indicate the existence of a nearly continuous trend of rudist banks and associated tidal bars. Seaward, argillaceous carbonate mud was deposited in deeper water; landward, shallow-water lagoon and shelf sediments were diverse and resulted in the accumulation of a wide variety of facies.

In the Mexican fields, extremely high early secondary porosity in the Golden Lane is believed to have formed when the carbonates were exposed to subaerial weathering during early stages of the Laramide orogeny. In the Poza Rica field, production is from intercrystalline dolomite porosity. Along the U.S. Gulf Coast, most porosity is primary within the preserved rudist shells and permeability is very low. Originally high intergranular porosity in the grainstone facies was destroyed by several layers of calcite cement deposited during subsequent burial. The source rocks for the hydrocarbons of the entire area are probably the argillaceous, dark-colored mudstones and wackestones of the Gulf basin.

The Mexican fields have been prolific and have produced a billion barrels of oil. In contrast, the south Texas fields have produced 150 bcf of dry gas and are estimated to have reserves of 1 to 1.5 tcf of gas. Major differences in postdepositional burial history account for these extreme differences in hydrocarbon production.

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Structural Evolution of Chihuahua Tectonic Belt

The Chihuahua tectonic belt is a Laramide foreland fold and thrust belt that is in the initial phase of exploration. It can be compared to the Southern Overthrust belt prior to the Pineview discovery in 1975. The part within the United States is approximately 300 mi (483 km) long and extends from southeast of El Paso to Presidio, Texas. The frontal thrusts of the belt lie against the Diablo platform.

The stratigraphic sequence involved in thrusting is Permian to Lower Cretaceous. Thrusting has been accomplished by decollement of Jurassic and Permian evaporates. The Malone Formation (Jurassic) is the proximal part of a fan-delta complex and contains marine, subtidal, intertidal, and supratidal facies.

Two distinctive locally derived conglomerate facies are present: (1) clast-supported, bimodal, dolomite-pebble conglomerate (sheet-flood facies); and (2) a matrix-supported, dolomite-pebble conglomerate that lacks sorting (debris-flow facies). Probable correlatives of the Malone Formation occur at Sierra del Kilo and Sierra de la Alcaparra in Chihuahua 60 mi (97 km) to the southwest.

By using new surface-mapping and surface-sampling plus interpretation of seismic and gravity data, a sequence of tectonic events can be inferred: (1) Late Triassic(?) faulting and formation of the Chihuahua trough; (2) Laramide folding and thrusting; (3) late Laramide en echelon left-lateral strike-slip folding; and (4) basin-and-range faulting.

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A Three-Dimensional Seismic Study of Challenger Knoll

Several intersecting multichannel seismic lines shot by The University of Texas Marine Science Institute in the deep Gulf of Mexico provide a three-dimensional grid in the vicinity of Challenger Knoll. Seismic stratigraphic sequences identified on the lines include the Sigsbee, Cinco de Mayo, Upper and Lower Mexican Ridges, Campeche, and Challenger units. Isotime