Colmar-Plymouth Conundrum

The Colmar-Plymouth oil field is the only significant field found so far in the northwesternmost Illinois basin. Since its discovery in 1914, it has produced more than 5 million bbl, and still produced almost 28,000 bbl in 1977. Intermittent, but persistent search for additional production since 1914, has been largely unsuccessful. Why have no other significant discoveries been made? Does reexamination of the region considering current concepts and conditions hold any hope for additional hydrocarbon production?

The reservoir at Colmar-Plymouth is the Hoing Sandstone, an isolated lens of well sorted, mature, Devonian shoreline sand. The shoreline borders the northern flank of the contemporaneous Sangamon arch. Oil in the field apparently originated in shale of the Upper Ordovician Maquoketa Group, which is exposed on the pre-Devonian unconformity beneath the reservoir. The field also lies almost on the crest of one of a series of broad northwest-trending structural noses crossing the arch. Consideration of these conditions provides our only geologic key to the Colmar-Plymouth conundrum.

One legacy of the dismal and largely unguided exploration history of the past 70 years in west-central Illinois, is the accumulation of a large mass of sociologically interesting data of unpredictable scientific value. Perceptive analysis and interpretation of these data might well lead to additional discoveries and have a certain entertainment value in its own right.

The shallow depth at which oil occurs in the area, the demonstrated longevity of production, and current market conditions, encourage exploration.

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Depositional Environments of Ullin Limestone and Fort Payne Formation (Mississippian), Illinois Basin

The Fort Payne Formation (Valmeyeran, Mississippian) in the Illinois basin in part grades laterally into the Ullin Limestone and in part thins and pinches out under an increasing thickness of the Ullin. The Fort Payne is a deep-water basin facies consisting of dark colored, siliceous, sparsely fossiliferous, micritic limestone. This facies grades laterally into a deep-water shelf facies of the Ullin composed of light-colored, fine- to coarse-grained, crinoid- and bryozoan-rich bioclastic limestone. In Lawrence and Wabash Counties, Illinois, the shelf-basin transition occurs along the western edge of the La Salle anticline. Significant shelf-basin facies changes also occurred in this same geographic area during Silurian and Devonian deposition.

The depositional unit containing the Fort Payne facies thins westward and pinches out at places in Hamilton and Wayne Counties, Illinois. There it is overlain by several hundred feet of light-colored bioclastic Ullin Limestone that is younger than the part of the Ullin that grades laterally into the Fort Payne facies.

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Seismic Refraction Study of Buried Valley Near Peninsula, Ohio

A seismic refraction study of the ancestral Cuyahoga River Valley in Boston and Northampton townships provided data for a structural contour map of the bedrock surface. The results generally agree with previous work, but a narrower valley floor is indicated. Inferences from the seismic velocities were made as to the bedrock type and to the nature of the glacial fill. The data are generally statistically significant for the area except in several locations where problems were encountered in interpreting the proper waveforms in the field.

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Illinois Basin, Its Future Petroleum Prospects, and Numbers

The Illinois basin has produced oil for nearly a century and few scientists anticipate significant new accumulations will be discovered in the future. Drilling activity and exploration, although greatly diminished from past levels, continue at an impressive rate largely in response to an enhanced economic condition over the past 5 years. What petroleum reserves and likely sizes of new fields remain to be discovered in the Illinois basin?

Estimates of remaining undiscovered hydrocarbon reservoirs can be made in a variety of ways. Total hydrocarbon production data for the basin are expected to be guassian; thus, future production can be predicted from past production. Frequency distributions of discovered field sizes permit estimates of those field sizes remaining to be discovered. These distributions may be either cumulative or annual plots which when coupled with production by field size data allow estimates of undiscovered reserves to be made.

Conclusions resulting from data for the Illinois part of the basin confirm anticipated, intuitive expectations that only small fields, less than 100 acres (40 ha.) reasonably can be expected in the future although a few medium fields, 100 to 500 acres (40 to 200 ha.) apparently still remain to be found. Most of these undiscovered fields will be stratigraphic accumulations. Total reserves discovered in the future will be small.

Although the days of petroleum exploration by major and minor oil companies, as well as large independent operators, have passed completely or are rapidly disappearing in the Illinois basin, opportunities for small independent operators and individuals are perhaps better today than ever before. More geologic information now is available to them and economics will continue to become increasingly more favorable to them.

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Coal in West Virginia: Geology and Current Mining Trends

Coal measures of West Virginia range in age from earliest Pennsylvanian to Permian. The state is divided into southern and northern coalfields or basins separated by a zone termed the hinge line. Deposition of the coal measures in the southern basin occurred under conditions of rapid subsidence, while deposition in the northern basin occurred on a relatively stable platform.

The hinge line appears to mark the northern limit of a series of growth faults that account for much of the subsidence in the southern basin.

Coal production in 1979 was 113,793,868 short tons (85,697,048 short tons in 1978), according to the West Virginia Department of Mines Annual Report. Estimated remaining recoverable reserves total 57,139,067,471 short tons.

The West Virginia Geological and Economic Survey is involved in a 10-year program to remap coal seams and map mines to obtain more accurate estimates of remaining reserves throughout the state. A great number of coal samples are being collected and analyzed; most analyses are available to the public and will be used to map coal-quality parameters.

Mining has proceeded from outcrops of thick, high-quality coals near early railroads and navigable waterways to areas where the coal is thin, deep, impure, or relatively far from surface transportation facilities. Recently, exploration and development have occurred in the hinge-line area, traditionally regarded as relatively barren.

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Pottsville Alluvial Plain Coals in Northern West Virginia

In upper Pottsville strata (Pennsylvanian) in the central Appalachians, dominant facies are alluvial-plain sandstones. Flood-plain shales and siltstones intercalated with these sandstones contain numerous coal beds. The coals are laterally discontinuous, but locally thick and may be of interest in continuing development of coal resources of the region. Geometry of coal beds is facies-controlled and in many places may be predicted through interpretations of positions, trends, and geometries of associated facies components.

In a study area covering the Philippi and Weston 15-minute quadrangles in north-central West Virginia, Pottsville strata can be subdivided into (1) a lower interval (average thickness in range of 50-60 m) with relatively lower-energy, mixed-load, coal-poor, alluvial-plain deposits, and (2) an upper interval (average thickness in range of 80 to 100 m) with higher-energy, bed-load, alluvial plain deposits with numerous coal beds, commonly at depths less than 300 m. Lower Pottsville strata in the study area contain multistoried sandstone units that occur in belts averaging 6 to 8 km in width. Individual sandstone units are up to 15 m thick and typically include one or more channel-fill sandstone bodies averaging 6 m thick, as interpreted from geophysical logs. In upper Pottsville strata multistoried sandstone units occur in belts averaging 8 to 10 km in width. Individual sandstone units are up to 120 ft (36 m) thick, typically containing one or more channel-fill units averaging 8 m thick. Coal beds up to 2 m thick (as interpreted from geophysical logs) intertongue with or terminate against sandstone units. Coals record deposition in flood-basin environments. Coal thickness may be related partly to variable channel positions, differential compaction, and the interaction of regional subsidence and supply of clastics. Future economic development of such coal units should be carefully keyed to an understanding of facies relations.

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Red-Bed Evaporite, and Carbonate Facies Associations in Interior Basins—A Model for Resource Exploration

Mid-Continent evaporite sequences exhibit a common association with red beds and carbonate rocks. These lithologic elements can be interrelated in a model of coastal evaporite sedimentation, based on modern analogs of evaporites in association with mud-rich tidal flats, coastal sabkhas, and hypersaline brine pans.

As an example of these relations, upper Clear Fork-Glorieta strata (Permian, Leonardian) in the Texas Panhandle contain red beds, evaporites, and carbonate rocks, and are characterized by a gradual basinward (southerly) shift in facies through time. Upper Clear Fork rocks in the study area record dominance of coastal evaporite and carbonate environments early in the development of the study interval. Evaporites and associated carbonates, which were deposited in hypersaline, tide-fed brine pans, landward of open-marine shelf environments, include (1) algal-laminated carbonate rocks, commonly with swallowtail-crystal pseudomorphs after gypsum, (2) laminated anhydrite, and (3) mud-banded salt. Chaotic mudstone-salt is present and was deposited in landward salt-mud flats. Glorieta rocks record late-stage dominance of siliciclastic sedimentation. Laterally-persistent Glorieta siliciclastic units consist of mudstone-siltstone facies, deposited in intertidal mud flats, and grade basinward into sandstone and dolomite deposited in clastic shelf environments. Periods of siliciclastic deposition alternated with periods of evaporite deposition. During sedimentation of each siliciclastic sequence, mud flats prograded seaward into the shelf terrane. Subsequent deposition of evaporites was on the expanded mud flats surface.

This example exhibits many similarities with evaporite sequences in other parts of the Permian basin, parts of the Salina basin, and selected salt occurrences in the Rocky Mountains. Understanding of facies interrelations is important in predicting resource potential of evaporite beds, and the occurrence of hydrocarbons in evaporite-associated strata.

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Upper Devonian Tide-Dominated Deltaic-Intradeltaic Sedimentation in West-Central Pennsylvania: A Sedimentologic Model for Distribution of Petroleum Sandstone Reservoir Types

Upper Devonian Catskill Formation outcrops in west-central Pennsylvania were studied to develop a regional depositional model, and a better understanding of the sedimentologic controls on distribution of the petroleum sandstone reservoir types in the subsurface part of the basin. The Catskill Formation is characterized, from base up, by the Irish Valley, Sherman Creek, and Duncannon Members, whose thicknesses and propor-