

bly also served as intermittent avenues for migration of sub-fault oil into producing structures above the fault. (*Paschall*)

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PETROLOGY OF BUCKNER MEMBER OF HAYNESVILLE FORMATION IN ADJACENT PARTS OF TEXAS, LOUISIANA, AND ARKANSAS

The Buckner Member of the Haynesville Formation is an evaporitic mudstone unit of Late Jurassic age that is present only in the subsurface around the margin of the Gulf Coast embayment. It has been divided informally into two parts, lower and upper.

The most common rock types in the Buckner are nodular anhydritic mudstone and nodular anhydrite. The nodules consist of swirls of lathy anhydrite in a matrix of blocky to anhedral crystals. The mudstone matrix consists of a red or gray non-laminated or poorly laminated mixture of silt and clay minerals. The clay minerals are mostly illite and chlorite. The next most common rock type is light gray crypto- to micrograined laminated anhydrite that is largely confined to the lower part. This type contains scattered minute rounded dolomite grains, clay mineral grains, and fine-grained sand and silt. Some less common rock types in the Buckner are oölitic and detrital limestone, oölitic-micritic and detrital-micritic limestone, rock salt, micrograined dolomite, and medium-grained dolomite.

The member was deposited around the margin of the Gulf Coast embayment in linear basins. Contemporaneously growing salt-cored anticlines along the seaward margin caused restricted circulation with the open sea. The lower part was deposited mainly in standing bodies of water and the upper part was deposited on a tidal mud flat that was, from time to time, flooded by both marine and non-marine water. The sea generally was regressing during deposition of the Buckner.

Micrograined anhydrite is associated with rock salt and is considered to be primary. Nodular anhydrite is associated with brackish-water fossils and was probably deposited as gypsum.

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GEOMORPHIC EVOLUTION OF CONTINENTAL MARGINS

Continental margins are important realms of gas and oil accumulation; 20 per cent of United States production already is offshore. It is necessary, therefore, to try to understand the genesis of continental margins and their subsequent geomorphic evolution. The writer suggests that continental margins are young (generally not older than mid-Mesozoic) and may be classified into two types: (1) accretionary margins caused by the collapse of continental rises and the associated accretion of new fold belts to the continents (Pacific-type); and (2) modified rift scars remaining after continental drift (Atlantic type). Most of the margins around the Atlantic and Indian Oceans are of the latter type but the bulge of Africa and the bight of North America are regarded as Pacific type. One can expect the two types to develop somewhat differently insofar as sedimentary modification and geomorphic evolution are concerned. They are either sites of mountain building and hence uplift, or are subsiding isostatically and accumulating a capping wedge of sediments and a thick continental-rise prism. These two elements (the terrace wedge and

the rise prism) are "living" examples of the miogeosyncline and the eugeosyncline, respectively. Continental-rise prisms probably are petroliferous, but the petroleum is lost through metamorphism when the rise is collapsed into a eugeosyncline; terrace wedges also are petroliferous, and this petroleum is not lost with time because the presence of sial beneath prevents intense metamorphism. In equating terrace wedges with miogeosynclines, it is to be noted that both have a wedge-shape rather than the form of a syncline. This is regarded as a natural consequence of continental-margin sedimentation. In the search for oil in miogeosynclines, geologists should be aware that they were not closed basins but one-sided "basins" open toward the sea. Thus, instead of basin deposits, one finds mainly those sediments deposited during the prograding and retrograding of paralic-zone sediments.

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PROCESSES OF SUBMARINE EROSION IN LA JOLLA FAN-VALLEY AND THEIR RELATION TO SEDIMENT-DISTRIBUTION PATTERNS

Observations from *Deepstar*, a research submersible, indicate that submarine erosional processes are actively modifying the main channel of La Jolla fan-valley. Internal terraces, slump scars, scour depressions around isolated erratic boulders up to 3 feet across, and a lack of talus deposits at the base of the steep walls of the main channel indicate an over-all downslope movement of the sedimentary fill on slopes of less than 1° in depths to about 4,000 feet. Cobble beds, probably deposited as part of the La Jolla fan in depths greater than 2,000 feet, presently are being eroded. The redistribution of the eroded products is evident in box cores which contain rounded balls of semi-consolidated deep-sea clay in a coarse sand matrix. The patchy distribution of different types of sediment along the axis of the fan-valley indicates that the processes currently active in moving coarse-grained sediment down the canyon were not a continuous event. The occurrence of a 2-4-inch-thick layer of fine-grained silt and clay overlying a medium- to coarse-grained sand indicates an abrupt change in the type of sedimentation active in the fan-valley approximately 1,100 years ago.

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DEPOSITIONAL ENVIRONMENTS OF SALEM LIMESTONE (MISSISSIPPIAN) OF SOUTH-CENTRAL INDIANA

Five major environments of deposition were present along the outcrop trend of the Salem Limestone in south-central Indiana. These environments are based on lithic and biologic distributions.

Three separate regions existed during deposition of lower and middle Salem sediments. The northern region was restricted, as indicated by the presence of argillaceous, dolomitic, bryozoan calcarenite. This was a shallow sea which connected with the Michigan basin where evaporite deposition was occurring. The central outcrop region was one of open circulation where algal-mollusk and echinoderm-bryozoan sparry calcarenite was deposited. Distribution of the calcarenite indicates a regression toward the south. The Indiana building stone is quarried mainly from this facies. The southern region was the site of extensive large-scale (30 feet of relief) sparry calcarenite sand bars as indicated by the existence of macro-cross-beds.