grainstone buildups. South of the basin center, only a single shoaling-upward sequence is present, with dolomitized, mostly restricted-marine skeletal wackestone to pelletal wackestone or packstone reservoir facies. Nesson anticline, between these 2 areas, contains a single shoaling-upward sequence without an anhydrite cap. In northern Nesson anticline, Mission Canyon reservoir facies are oolitic-pisolitic, intraclastic wackestone or grainstone buildups or open-marine skeletal packstone or grainstone. Both limestones and dolostones are productive in southern Nesson anticline. Limestone reservoir facies are transitional, open to restricted-marine slightly intraclastic, skeletal wackestone or packstone facies. Dolostone reservoir facies are restricted-marine mudstone to skeletal mudstone and pelletal wackestone or packstone.

Northeast of the Nesson anticline, production is from oolitic to pisolitic packstone or grainstone buildups in the Rival (or Nesson) subinterval and from restricted-marine, dolomitized spiculitic mudstone in the Midale subinterval (base of Charles Formation). In the northern Nesson anticline, Rival (Nesson) reservoir facies are offshore open to restricted-marine, skeletal, intraclastic, pelletal wackestone and/or packstones.

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Reservoir Geology of Portion of Sailor Springs Consolidated Field and Its Impact on Primary and Secondary Production

The pool under study is part of the Sailor Springs Consolidated field, Clay County, Illinois. The 23 wells within the pool have produced more than 350,000 bbl of oil from the McClosky limestone (Mississippian-upper Valmayeran) since 1981. The average depth of the wells and the pay zone is 3,000 ft.

The trap is predominantly stratigraphic in nature. Examination of core, thin sections, and geophysical logs indicates that the producing zone is composed of a complex series of oolitic bars. The individual bars are laterally discontinuous, flat bottomed, convex upward, and composed of oolitic skeletal grainstones that grade into dense skeletal wackestones and mudstones that act as reservoir seals. The bars are commonly subtle and easily overlooked. Several wells produce more than 100 BOPD from a zone less than 3 ft thick.

Detailed mapping of total pore volume, total permeability, and facies cementation patterns is essential for successful field development and secondary waterflooding. These parameters have had a direct impact on primary and secondary production performance within the pool. Detailed reservoir mapping also reveals that the pool is subdivided into several reservoirs separated by reentrants that cut across the oolitic bars.

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Beach-Swash Zone: Primary Ooid Factory?

The shore of Long Bay along the southeastern coast of Providenciales Island in the Turks and Caicos Islands, British West Indies, represents a bankward-accreting beach and dune complex of Holocene oolitic grainstone. Offshore, en echelon bars of very low relief consist of skeletal-pelletal grainstones with thin oolitic coatings. Nearshore, the oolitic coatings become more numerous and thicker with the largest and most completely developed ooids found in the beach and swash-zone environments. Adjacent beach and storm-berm sands serve as the source for oolitic particles that have constructed dunes as much as 40 ft high.

This observed relationship between ooids forming in the beach and swash zones, and their subsequent deposition in adjacent beach dunes may provide the most reasonable explanation for the topographically high oolitic dunes of Pleistocene age (some as high as 150 ft) that rim many of the narrow shelf margins of the Bahama Banks. In these settings, little evidence appears for extensive offshore bar development. It is possible, though difficult to prove, that production of oolitic coatings in Bahaman submarine tidal bars and banks (Cat Cay, Schooner Cays, south end of the Tongue of the Ocean) primarily occurs during periods of low tide in a beachlike environment rather than during periods of movement associated with strong tidal currents.

This swash-zone method of oolite formation provides an alternative model to the traditional bar mechanism for the formation of elongate oolite sand accumulations. Such a mechanism might also explain extensive ancient oolitic sand sheets that may have grown through lateral accretion of the oolite-forming beach facies, or as a basal transgressive beach facies deposited during a relative sea level rise.

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Carbonate Structural and Stratigraphic Trap with a Diagenetic Twist: West Purt Field, East Texas

The Rodessa Limestone (Aptian) produces from structural and combination traps in the East Texas basin. West Purt field, in northeastern Anderson County, is a Rodessa combination trap where porosity and permeability have been affected by hydrocarbon alteration, adding an additional complexity to the reservoir.

In West Purt field, porous skeletal grainstones successively pinch out obliquely across the crest of a northwest-plunging structural nose. The structure is cut by a eastward-dipping fault that forms the eastern boundary of the field. The reservoir grainstones have been subdivided into 3 facies. Two of these facies are fine-grained to cobble-size, poorly sorted coral-skeletal rudstone, cyclicly interbedded with fine-grained, well-sorted mollusk-echinoid grainstone and packstone. The third facies is the overlying fine to coarse-grained mollusk-peloid grainstone, commonly laminated or graded. The overall sequence is interpreted as a prograding shoreface and foreshore deposit.

Among the more significant aspects of diagenesis are the early formation of moldic porosity that is partially filled with phreatic isopachous and equant calcite spar cements. Later compaction and minor cementation by saddle dolomite and anhydrite had a minimal effect on porosity. The final stage of cementation was the precipitation of solid bitumen. This bitumen causes a moderate decrease in core-measured porosity, but a significant decrease in permeability by plugging pore throats. The presence and distribution of solid bitumen are not discernible on logs owing to the lack of significant density contrast between crude oil and bitumen. Solid bitumen occurs only in wells adjacent to the eastern boundary fault, regardless of structural elevation. Geochemical analyses of bitumen samples suggest that secondary gas from an underlying source (migrating up the eastern boundary fault) caused the precipitation of solid bitumen by deasphalting the in-place oil.

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Oil-Productive Miocene Algal and Sea Grass Carbonate Mudbanks, South Sumatra, Indonesia

Ramba and Tanjung Laban oil fields, located about 70 km northwest of Palembang in southern Sumatra, produce from wackestones and packstones in the lower Miocene Batu Raja Formation. Reservoir rocks are part of relatively small, undolomitized, low-relief carbonate buildups that accumulated on a widespread platform facies. Rocks in the platform facies are dominantly shaly nodular wackestones, whereas rocks in the buildup are dominantly nonshaly wackestones and packstones. The regional setting, the abundance of micrite in the buildups, the absence of both coralline algae and marine cements, and the geometry of the buildups suggest that noncalcareous algae and/or sea grasses were the dominant organisms responsible for forming these mudbanks.

The absence of shale in the mudbanks has been important in forming the secondary porosity that yields most of the oil. Vugs and molds form as much as 30% of the rock in the best reservoir zones. Fractures formed by dissolution and collapse greatly enhance reservoir quality in many places. Another type of porosity, microintercrystalline, occurs within "chalky" micrites scattered through the upper part of the buildups. Porosity in these micrites reaches 25%, but permeability is very low.

The recent discovery of oil in these low-energy carbonate mudbanks of the Batu Raja Formation has opened a new exploration play in the South Sumatra basin. Many similar buildups will likely be found as exploration continues and the basin's paleogeography becomes better understood.

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Southern Appalachian Thrust Model