great depth of field, stereo, and x-ray analysis capability affored by TEM and SEM, enable us to examine the individual clay particles by the use of ultra-thin sections (TEM), to observe the particle surface and its three dimensional structure (SEM), and to determine the clays' chemical composition.

Clay fabric from various environments, such as shallow-marine deltas, deep ocean trenches, and laboratory consolidated samples have been investigated. Clay fabric study of these sediment reveals a good correlation with their physical properties as well as depositional history. Thus, combined information of clay fabric analyses, geotechnical properties, and mineralogic data will not only be useful in reflecting different conditions of sedimentation, but will also be beneficial in depicting postdepositional history. It is the time to develop the new science of clay fabric analysis, and hope that our understanding of argillaceous sediments can be further improved by these new analytical approaches.

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Icebergs and Glacial-Marine Sediment of Central Arctic Ocean

Mechanism of one variety of glacial-marine sediment transportation and deposition is inferred from observation of the activity of ice island T-3. This iceberg carries a significant sediment load. As T-3 moves with the Arctic pack ice, several meters of ice melt annually, releasing sediment to the ocean floor. The sediment accumulates at rates measured in a few mm per 1,000 years but in remarkably homogeneous layers. This uniform sedimentation in a seemingly heterogeneous environment is unexpected. The uniformity results from clockwise rotation of the pack ice that transports T-3–sized icebergs at rates up to several km/day in constant patterns. T-3 currently is in at least its third traverse of the Amerasian Basin during the past 30 years. The consistent Arctic surface currents have brought T-3 over the same areas during the different cycles.

There has been little change in central Arctic sedimentation since at least the late Miocene. Late Cenozoic layers of glacial-marine sediment on the Alpha Cordillera have been organized into thirteen lithostratigraphic units. Even thin units can be correlated over several hundred thousand square kilometers. A textural classification of Arctic glacial-marine sediment recognized four classes, all forming since the late Miocene in the Alpha Cordillera region.

Quantities of glacial ice, bearing sediment derived from similar source areas and transported in similar patterns by constant ocean basin currents, account for the uniform glacial-marine sediment in the Arctic Ocean.

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Depositional Environments and Diagenesis of Salem Limestone (Middle Mississippian) Reservoirs in Southern Illinois

The 1972 discovery of oil in the Salem Limestone (Valmeyeran Series) in Wayne County, Illinois, stimulated a resurgence of Salem and deeper exploration that continues to dominate Illinois basin activity.

Lower parts of the porous pay intervals in the Salem reservoirs are cross-bedded, oolitic grainstones and packstones, grading upward into highly bioturbated, mixed oolitic-skeletal grainstones. Hardground surfaces and fenestral vugs filled by anhydrite and sparry calcite are common in the uppermost parts of the pay zones. The reservoirs are capped by fine-grained, dolomitic, and argillaceous peloidal packstones and wackestones. Although most Salem reservoirs discovered occur at or near the crests of plunging anticlines, there commonly is no apparent structural closure over the pool, and the up-dip entrapment is entirely stratigraphic owing to thinning of the porous oolitic facies and thickening of the overlying packstone-wackestone facies. These variations in thickness probably reflect relict topography across oolite shoals.

Porosity and permeability in the Salem are closely related to depositional facies. Most Salem porosity is primary—depositional interparticle and intraparticle spaces, subsequently reduced in volume by pressure solution and cementation. Cementation of Salem grainstones was strongly influenced by the availability of suitable particle surfaces for nucleation of cement crystals. Sparry calcite cement is common on clean crystalline substrates (fossil fragments, especially monocrystalline echinoderms) and is rare on microcrystalline substrates (micritized fossils, peloids, oolites). Highest porosity and permeability occur in rocks with high percentages of oolitic coatings and micritized grains—most notably the oolitic grainstone facies.

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Superposed Laramide and Basin-and-Range Deformation in Santiago and Northern Del Carmen Mountains, Trans-Pecos Texas

Persimmon Gap, the northeast entrance to Big Bend National Park, lies astride a reverse-faulted monocline of a northwest-trending segment of the Santiago Mountains. Preserved Cretaceous rocks, about 762 m of Comanchean, and an incomplete section of Gulfian, consist of limestone, marl, and sandstone. Slip reversal, between Laramide and basin-and-range deformation using part of the Santiago thrust, is well-displayed in this range.

Laramide deformation produced the southwest-facing, N58°W-trending, reverse-faulted monocline of the Santiago Mountains. Structural relief across this faulted monocline is about 914 m. On the upthrown side, northeast of the Santiagos, are en echelon folds that suggest a left-lateral component of movement along the fault. The northwest end of this segment turns north where it becomes an unfaulted monocline with about 762 m of structural relief. To the southeast, structures in the Santiagos turn south and the monocline is unfaulted, with structural relief being about 762 m. The transition southward from the narrow northwest-trending Santiagos to the relatively broad, asymmetric anticlines with faulted limbs of the northern Sierra del Carmen involves both Laramide and basin-and-range episodes of deformation.

Basin-and-range deformation has reactivated the steeply-dipping Laramide fault planes and displacement is reversed. Throw along these faults ranges from 30 to 945 m. This area lies along the southeastern extension of the Texas lineament and suggests a left-lateral component of movement during Laramide time and a right-lateral component during basin-and-range time.

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Rapid Evaluation of Mature Hydrocarbon Producing Provinces in Sedimentary Basins