

Within these depositional settings, several parameters determine the potential for extensive peat formation: (1) botanical parent material, (2) climate, (3) frequency of delta-lobe switching, (4) subsidence, (5) detrital influx, and (6) marine inundation. Each factor controls the variability in ash content and mineralogical composition of the peats.

Five areas were cored. Analysis of more than 2,000 samples shows that the average ash content of true peats (less than 25% ash) in the Mississippi delta is 18.3%, and that 5–15% of all sediment in the upper 4.5 m (15 ft) consists of true peat. It appears then that parameters 1 and 3 inhibit extensive peat accumulation, parameter 2 is favorable, whereas 4, 5 and 6 vary depending on the depositional setting.

When studying peats as precursors for coal, one should consider quality as well as quantity of the ash. Examination of ashes indicates that major components are water-soluble salts and silica. Leaching ashes with distilled water result in loss of salts and reduction of ash weights up to 77%. Scanning electron microscopy shows that abundant silica is biogenic and in a state of dissolution. Decrease of the amount of ash by natural dissolution of salts and silica during early diagenesis may result in better quality peats and more true peat overall.

Organic-rich deposits in the Mississippi delta may provide examples of modern coal-forming environments if conditions are properly considered. An understanding of the processes in peats will help in deciphering the rock record with respect to deltaic lignites and coals.

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Sigmoidal Bundles and Other Tidal Features, Curtis Formation (Jurassic), Utah

Recently, a new suite of tide-generated sedimentary structures has been described, principally from sandy shoals and large excavations associated with flood-control structures in tidal estuaries of the Dutch coast. These sedimentary structures can be less ambiguous than criteria previously used to recognize tidalites. Structures and sequences of structures like those recognized in the North Sea can be applied to the rock record, in this case the Curtis Formation (Jurassic), San Rafael swell, Utah, to significantly enhance our ability to interpret tidal facies.

Our discussion centers on the recognition of tidal bundles, the lateral succession of cross-strata generated by the migration of a large-scale bedform during one dominant tidal episode. Tidal bundles in the Curtis consist of two gently dipping sigmoid-shaped pause planes which enclose avalanche foresets. They are up to 80 cm (30 in.) thick and 11 m (36 ft) long. Pause planes may be accentuated by erosion of the megaripple by the subordinate tide, by generation of ripples or small megaripples with opposed inclinations, and/or by a drape of fine sediment which settles during slack water. Systematic variability that occurs within bundles is due to increasing then waning current velocity during a tidal episode. Systematic variability among tidal bundles results from regular fluctuations of tidal current velocities during a lunar month (neap/spring cycles). These include changes in bundle thickness, dip of foresets, internal geometry, and lateral extent. Recognition of these features in the Curtis leads to an uncontested interpretation of its tidal origin.

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Regional Gravity and Tectonic Study of the Ouachita System

A regional study of the Ouachita system has been undertaken using gravity and deep-drilling data. An integrated analysis of gravity maps, computer models, and geologic data suggests that the crust beneath the Gulf coastal plain is variably attenuated continental crust. The transition zone between this crust and the craton, which is marked by a steep gravity gradient that lies along the trend of the Ouachita system, may have been created by Mesozoic reactivation of a crustal zone of weakness inherited from a plate collision during the late Paleozoic Ouachita orogeny. Gravity minima along the frontal zone of the Ouachita system are due to a thick sedimentary rock pile in conjunction with a gulfward dipping intracrustal or crust/mantle boundary in some areas. The arcuate Ouachita gravity maximum is the result of denser (metamorphic) rocks of the interior zone,

with uplifts and upper crustal mafic intrusions making contributions in some areas. Gravity anomalies in the Gulf coastal plain are a combined effect of variable crustal attenuation, subsidence, and densification of the upper crust. Maxima in the southern Oklahoma aulacogen area are the result of uplifts and upper crustal mafic intrusions and/or lower crustal upwarps.

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Ostracodes as Indicators of Low-Energy Versus High-Energy Marine Carbonates, Northeastern Yucatan Shelf, Mexico

Carbonate sediments on the inner Yucatan Shelf occur as textural belts paralleling the shoreline. Nearshore, high-energy, ooliticly coated grains occur in the strait between Isla Mujeres and the mainland. Nichupte Lagoon, on the lee side of the tombolo connecting Punta Cancun and Cancun, contains fine-grained, low-energy, magnesium-calcite rich mud.

Five widely spaced quantitative (total = live + dead) benthic reconnaissance samples were collected from each of these radically different depositional settings. Ostracodes (approximately 300/sample) isolated from each sample were speciated, and ternary plots of the first 3 dominant species generated.

Plots from the low-energy Nichupte Lagoon indicate: (1) *Cyprideis* sp. is the first-order dominant in 80% of these samples, (2) second-order dominants are usually *Xestoleberis* sp., with some *Paranesidea* "frilled" and others, (3) other *Paranesidea* ("frilled" and "arched") occur as third-order dominants, and (4) the percentage spread among the 5 samples of the first-order dominants is approximately 52%, whereas it is only 24% among the second- and third-order dominants.

Ternary diagrams of the first three dominants in high-energy strait sediments reveal: (1) *Paranesidea* "arched" is the first-order dominant in 60% of these samples, (2) second-order dominants are almost equally divided between *P.* "arched" and *P.* "elongate," (3) third-order dominants are almost equally divided between *P.* "elongate" and *Neonesidea longisetosa*, and (4) the percentage spread among the 5 samples of the first-order dominants is approximately 32%, whereas it is only about 16% among the second- and third-order dominants.

The smaller spread (32%, 16%) of the high-energy grainstones of the carbonate strait separates these sediments from the greater spread (52%, 24%) of the low-energy lagoonal sediments of Nichupte Lagoon.

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Charting Exploration Strategy in a Mature Producing Area, Northwest Shelf of Delaware Basin, New Mexico

In formulating strategy for mature areas, management has to consider chance factor for success, as well as the chance of finding sizeable reserves. As a case history, we describe an investigation of the Northwest Shelf of Delaware basin carried out in 1979 to locate areas having the best potential of finding new reserves. In 1983, we tabulated the activity since 1980 to compare our predictions against the drilling results.

The 1979 study had shown that out of a total of almost 200 wildcats drilled during 1974-79, the largest number (63) had been drilled for San Andres (Permian) objective with a success ratio of 33%. Forty-six wells had been drilled for various Pennsylvanian objectives with a success ratio of 40%, and 25 wells had been drilled for Siluro-Devonian targets with a success ratio of 16%. However, based on wildcat success ratios and cumulative-frequency plots of field sizes, the probability of a wildcat discovering reserves larger than 1 million bbl was only 6% in San Andres, 19% in Pennsylvanian, and 7% in Siluro-Devonian.

The 1979 study allowed us to "high-grade" three blocks representing 5% of the total 5.25 million acres. These blocks were considered to have the best potential for San Andres and Siluro-Devonian objectives. Subsequent analysis of 1980-83 drilling results shows that these blocks contain 55% of the 20 new successful San Andres tests and the only new discovery in the Siluro-Devonian. However, as predicted, all of these have been small discoveries. Such studies allow management to develop a course of action for mature areas.