

vironments was able to keep pace with rising sea level as the transgression continued. In the pinnacle-reef environment, several lithofacies developed through time. Of special importance, due to recent production, is an upper porous dolomite in which the original limestone has undergone extensive fabric-obscuring dolomitization. In the platform environment, there developed a patch-reef lithofacies and several quiet-water shallow-marine lithofacies which illustrate a vertical subtidal regressive sequence. In addition, the pinnacle-reef and platform environments grade into an uppermost intertidal and/or supratidal regressive series of dolomites and anhydrites. Carbonate production did not keep pace with rising sea level in the interreef environment resulting in topographic relief. Subaqueous laminated lithofacies were deposited throughout the basin and between the pinnacle reefs.

During the regressive phase, barrier reefs formed in northern Alberta which restricted the basin and resulted in the deposition of evaporites (Prairie) which eventually filled the basin.

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#### Programmed Pyrolysis of Organic Matter in Thermally Altered Cretaceous Black Shales

Organic-rich, Cretaceous black shales from DSDP Site 41-368 on the Cape Verde Rise in the eastern Atlantic were penetrated by hot diabase sills during Miocene time. Programmed pyrolysis and pyrolysis-gas chromatography were conducted on organic matter from core samples taken at various distances from a major sill. These methods show the types of hydrocarbons generated, the remaining generative potential, and the thermal maturity of the kerogen in the shales.

Systematic changes in kerogen elemental compositions are a consequence of the thermal cracking of volatile organic products from the kerogen. Loss of these products causes progressive aromatization of the residual kerogen closer to the sill. This conclusion is supported by an increase in the ratio of thermally distilled hydrocarbons to total hydrocarbons generated by pyrolysis, and an increase in the temperature required for maximum generation of hydrocarbons from the kerogen.

Although the major sill was 15 m thick, solvent extraction and pyrolysis results show that hydrocarbon generation was restricted to within about 10 m of the shale/sill contacts. At a given distance, the temperature appears to have been higher above than below the sill.

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#### Seismic Stratigraphic Analysis of Lower Cretaceous Rocks, Deep Southeastern Gulf of Mexico

A dense grid of multifold seismic reflection lines was combined with results of DSDP Leg 77 to subdivide the Lower Cretaceous section in the deep southeastern Gulf of Mexico into four seismic sequences (I to IV). Age and gross lithologic assignments were made by correlation with DSDP holes 535 and 540. Isochron and seismic facies maps were constructed for each sequence. These data document the complex filling of the deep southeastern Gulf of Mexico by pelagics and fine-grained carbonate debris shed from the adjacent growing Early Cretaceous margins on the east and west. This sedimentation accompanied subsidence of a rifted continental (transitional) crust formed during the early rift history (Late Triassic-Jurassic) of the Gulf basin.

The oldest unit (IV, Hauterivian-Berriasian) thins to the east,

whereas unit III (Barremian-Aptian) thins to the west, suggesting a depocenter or source area shift to the east. A chaotic, hummocky, discontinuous unit (II, Aptian-mid-Albian) thinning to the south indicates deposition, in part, by northeast- or northwest-source debris flows from the flanking margins. Unit I (mid-Albian-Early Cenomanian) is a tabular parallel to sub-parallel sequence grading to more discontinuous facies at the base of the Florida escarpment, suggesting an eastern source. A prominent regional unconformity, characterized by erosional truncation, forms its cap. This corresponds to a 50-m thick pebbly limestone unit encountered in DSDP holes 97 and 540 that may span the entire Upper Cretaceous.

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#### Dipmeter Interpretation of Turbidite-Channel Reservoirs, Delaware Basin, New Mexico

Stratigraphic interpretation on high-resolution dipmeter logs can provide important information concerning the morphology and distribution of reservoir sandstones. Stratigraphic dip data were correlated with primary rock properties observed in cores and borehole-log data to define the internal morphology of turbidite-channel sandstones in the Cherry Canyon Formation at Indian Draw field, Eddy County, New Mexico. Characteristic dip patterns allowed the delineation of erosional unconformities, channel sequences, slump faulting, contorted and massive bedding, and sedimentary drape.

The erosional unconformity which marks the base of the Indian Draw channel exhibits a characteristic dip pattern consisting of an abrupt change in the trend of dip magnitude and dip azimuth across the unconformity, marked by higher dips (6 to 9°) above the unconformity in the channel-fill, and lower dips (2 to 4°) in the basin-plain sediments below. Slump faults exhibit an abrupt increase in dip with depth over a small interval, and an associated progressive dip azimuth rotation approaching the fault. Contorted beds show a random dip pattern, commonly marked by poor-quality, high-magnitude dips. Massively bedded sandstones lack computed dips and sedimentary drape patterns typically consist of a decrease in dip upward within basinal deposits overlying a sandstone.

Detailed mapping of the reservoir sandstones indicates deposition as stacked, laterally discontinuous lenses within a previously eroded channel. Direction of sedimentary drape over sandstone lenses can be used to map their trends. Channel-fill lenses are 5 to 30 ft (1.5 to 9.1 m) thick, and are elongate parallel with depositional dip with a sinuous geometry. Such turbidite-channel deposits can be anticipated to form complex multilayered reservoirs, consisting of a series of isolated sandstone lenses of restricted areal extent.

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#### Fan-Delta Sedimentation, Waltman Member, Fort Union Formation, Wind River Basin, Wyoming

The Fort Union Formation (Paleocene) was deposited in structural and sedimentary basins which developed in the Rocky Mountain states in response to Laramide structural disturbances. Exposures of the Waltman Member in the eastern Wind River basin reveal an interaction of alluvial fan and lacustrine depositional processes. Fan deltas developed where the distal reaches of alluvial fans, which issued from the tectonically active Granite Mountains to the south, prograded into an isolated or restricted body of fresh water that occupied the rapidly subsiding basin.