

tems persisted. Strike-oriented shoreline sandstone bodies separated by finer grained shelf and back-barrier sediments are the dominant feature of the Lewisville Member. This marine-dominated succession reflects significant aggradation which kept pace with vertical rates of delta sand accumulation in adjacent areas along depositional strike.

Classical regressive beach sequences are rare in outcrops of the strike-oriented sandstones. Instead, there is evidence of substantial modification by tidal channel incision, or by partial reworking during episodes of low-energy marine inundation. External and internal geometry of these sandstones is thus highly complex. Trace fossils are abundant and indicate locally discontinuous sedimentation. *Thalassinoides* and *Ophiomorpha* are dominant, but escape burrows characterize some beds. Oyster reefs developed in tidal channels and interbar depressions, and along bay or lagoon margins. Clays and silts of coastal lake, bay, and lagoon origin reflect seasonal variation in sediment supply and water chemistry. Small flood-tidal deltas and washovers developed in places along the seaward margins.

Fluvial facies are prominent in outcrop but are not reflected in subsurface sandstone isoliths, presumably because of the volumetric dominance of the strike-oriented systems. Bed-load and mixed-load streams supplied fan deltas and small bayhead deltas, respectively. Fan-delta sandstones, with irregular Gilbertian foresets, but lacking the more typical upward-coarsening pattern, show a varied suite of trace fossils, including *Gyrochorte*, arthropod tracks, and delicate feeding traces.

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Depositional Environments of Some Naborton-Dolet Hills Sediments (Tertiary, Northwestern Louisiana) and Their Relation to Lignite

A preliminary study of the Naborton-Dolet Hills ligniferous sediments from a single cored well suggests deposition in subenvironments of a deltaic system. The lithology, sedimentary structures, macerals, clay mineralogy, and facies relations are comparable to sequences found in the recent deposits of the Mississippi delta.

The upper Naborton Formation, including the Chemard Lake lignite lentil, consists of organic rich muds, carbonaceous clays, and lignite which probably formed as aggradational deposits on a deltaic plain during a constructional phase of deltaic development. The eroded top of the lignite seam in the study well indicates that a brief marine inundation, or destructional phase, followed deposition of Naborton sediments in the study area. Thinly laminated silty clays containing foraminifera overlie the lignite. The clays grade upward into the fine to medium-grained sand of the Dolet Hills Formation. This sand is massive to ripple laminated and most likely represents a crevasse, or bay-fill deposit.

Several well samples were tested for the presence of radioactive elements. No unusual concentrations of these elements were found associated with the Chemard Lake lignite.

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Foraminifers and Calcspheres from Cuesta del Cura and Lower Agua Nueva(?) Formations (Cretaceous), East-Central Mexico

This study is based on measured and sampled sections in Peregrina Canyon, Tamaulipas, Santa Rosa Canyon, Nuevo León, and at several localities in the Sierra de Catorce, San Luis Potosí. All sections included some covered intervals.

The Cuesta del Cura and the Agua Nueva(?) are composed of gray to black well indurated, laminated, microcrystalline, cherty limestones and dark fissile limestones and calcareous shales. The fissile limestones and shales are voluminous in the Agua Nueva(?), giving it a more clastic aspect which is the basis for its separation. Typically the Cuesta grades over a short interval into the underlying lighter gray, thicker bedded, unlaminated limestones of the Tamaulipas to form a distinct change in lithic properties, but the upper contact is obscure and necessarily arbitrary. The Cuesta del Cura averages 150 m in thickness; a maximum of 190 m of Agua Nueva(?) was measured and sampled.

Foraminifers and calcspheres are common to abundant in most samples. Along with radiolarians, they form the grains of wackestones and packstones. Planktonic forms dominate, giving faunules a strongly pelagic aspect. Induration allowed study by thin section only. Recrystallization and two dimensional specimens made identification difficult. However, many critical species of the middle Cretaceous fauna were recognized, including *Favusella washitensis*, *Ticinella roberti*, *Globigerinelloides breggiensis*, *Thalmaninella subticinensis*, *T. ticinensis*, *Planomalina buxtorfi*, *Rotalipora apenninica*, *Praeglobotruncana stephani*, *P. delrioensis*, *Globigerinelloides bentonensis*, *Rotalipora gandolfi*, *R. greenhornensis*, *R. cushmani*, and *Globotruncana helvetica*.

The distribution of the foregoing forms permitted division of the succession into eight informal biostratigraphic zones: *Globotruncana helvetica* zone (First occurrence); *Grandes globigerines* zone (Interval); *Rotalipora cushmani* zone (Total Range); *Rotalipora greenhornensis* zone (First occurrence); *Rotalipora gandolfi* zone (Partial Range); *Planomalina buxtorfi* zone (Total Range); *Thalmaninella ticinensis* zone (First occurrence); *Thalmaninella subticinensis* zone (First occurrence).

The foraminiferal distribution establishes a range of middle Albian to middle Cenomanian for the Cuesta del Cura and middle Cenomanian to middle Turonian for the lower Agua Nueva(?).

Calcspheres present include: *Calcsphaerula innominata*, *Pitikonella ovalis*, *P. trejoi*, *Stomiosphaera conoidea*, and *S. sphaerica*. The ranges reported for these forms are long. Their distribution generally reinforced foraminiferal implications.

Microcalamoides diversus (forma C) of unknown affinity occurs in the basalmost few meters of the Cuesta del Cura, suggesting correlation with the middle Albian.

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Louisiana Chenier System—Some Preliminary Reinterpretations and Refinements