associated porosity development. In addition, dolomitization of oolitic facies is more extensive in the updip half of the shoal-complex trend. These facies/diagenetic relations can be used as an exploration tool in the Smackover Formation in south Texas.

MCBRIDE, EARLE F., Univ. Texas at Austin, Austin, TX

Diagenetic History of Norphlet Formation (Upper Jurassic), Rankin County, Mississippi

Most of the Norphlet sandstone examined in four cores (−15,770 to −22,500 ft or −4,807 to −6,858 m) is eolian in origin as shown by thick, high-angle cross beds, bimodal texture with well-sorted laminae, and relict hematite grain coatings typical of desert sand. Norphlet sandstones average 77% quartz, 16% feldspar, and 7% rock fragments.

Partial to total loss of halite cement from cores during coring and slabbing operations hampers the interpretation of diagenetic history. However, the inferred sequence of diagenetic events is: cementation by illite, K-feldspar, quartz, calcite, anhydrite, and halite; development of secondary porosity by dissolution of halite, plagioclase, VRF's, and carbonate cement; hydrocarbon migration and pyrite generation; dolomitization; and cementation by late-stage illite and quartz. Halite and anhydrite were derived from the underlying Louann. Pyrite is present in most samples and formed when sour gas passed through the sands and reduced hematite grain coatings to pyrite. The scarcity of quartz cement is attributed to the lack of shale beneath the Norphlet.

Illite cement of two ages is present. Early-formed illite is leaflike flakes that coat quartz grains that inhibited the development of quartz overgrowths. It is not a seriously deleterious mineral. Late illite is thread-like and grows in narrow secondary pores where it seriously reduces permeability. Illite cement and sericitic alteration of plagioclase are more abundant deeper than −19,900 ft (−6,065 m).

Halite was introduced after moderate burial because prior to its development the sandstones underwent modest compaction as shown by sutured quartz grains and pre-cement porosity values of 22 to 30% (indicating compactional losses of 15 to 23% porosity before cementation).

The original texture of the sands strongly influenced diagenetic events.

MCNULTY, C. L., Univ. Texas at Arlington, Arlington, TX

Emendation of Pecan Gap Chalk (Campanian) in Northeast Texas

The outcrop of the Pecan Gap Chalk in northeastern Texas can be divided into two parts at the change in strike from westbound to southbound. The eastern part, about 60 km in length, is composed of chalk with partings and thin beds of marl, which overlie the Wolfe City Sandstone unconformably. The upper contact with the Marlbrook marl varies from disconformable to questionably conformable. The southern part, about 30 km in length, is composed of a silty marl unit, hitherto unnamed, and an overlying chalk and calcarenite with silty quartz. These two units are conformable to slightly unconformable with one another and apparently conformable with the Wolfe City and Marlbrook. At the junction of the two parts of outcrop, there is an area of about 2 sq km with exposures of a quartzose arenite and calcarenite that is distinguished by abundant glauconite-phosphorite, abundant foraminifers, coccoliths, pelecypod prisms, thin, even bedding, and prominent mottles of burrows. These three units are described as new members of the Pecan Gap, and the formation is emended accordingly.

The relations of the three units to one another and to the chalk of the eastern belt are unclear, particularly in the environs of Farmersville, Texas, where the sequence seems discordant with that elsewhere. The appearances of the planktonic foraminifers, *Globotruncana ventricosa* (White) and *G. calcarata* Cushman, seem to bear out the stratigraphic complexity of the Farmersville area; elsewhere they suggest absence of the silty marl along the eastern outcrop and approximate equivalence of the chalk and calcarenite of the southern outcrop and the Pecan Gap of the northern part. They indicate that much of the section of the southern part of the outcrop is missing farther south and along the eastern outcrop.

NEURAUTER, THOMAS W., Racal-Decca Survey, Inc., Bryan, TX, and THOMAS E. PYLE, National Ocean Survey, Rockville, MD

Bed Forms on West Florida Shelf as Detected with Side-Scan Sonar

A Side-Scan Sonar investigation on the west Florida shelf reveals a multitude of bed-form types. A nongenetic classification was devised based on apparent wavelength and ripple index (R.I. = Wavelength/wave height). This system divides the observed features into four groups: *Giant*—wavelength greater than 30 m, R.I. 30 to 100; *Large*—wavelength less than 30 m but greater than 1 m, R.I. 15 to 30; *Small*—wavelength less than 1 m, R.I. 5 to 15; and *low-relief swells*—wavelength greater than 300 m and relief only a few meters.

Five major zones roughly parallel to the coast are delineated according to the distribution of bed-form types.

Zone A, parallels the coastline out to approximately 20 m depth and is characterized by giant to large-scale bed forms. These features are observed on the sonographs as long, sinuous, and sometimes bifurcating, troughs of high reflectivity (coarse-grained?) sediment, interspaced with mounds of presumably finer grained material. Similar bed forms described in the literature have been labeled "current lineations."

Zone B extends out to mid-shelf depth (40 to 100 m) and is characterized by low-relief swells and a few patches of giant to large-scale features. The low-relief swells at times correlate with large elliptical patches of apparently fine sand on a relatively coarser grained, flat, sea floor.

Zone C is centered around the Florida Middle Grounds region and is characterized by small-scale bed forms and low-relief swells. These small-scale bed forms observed on the sonographs resemble current ripples. The orientation of these ripples varies from predominantly north-south across the Florida Middle Grounds to an east-west orientation in areas farther south.

Zone D is situated offshore Cape San Blas along the Florida panhandle. The bed forms in this zone are characterized by high relief (2.0 to 8.0 m) giant-scale features. Superimposed on the giant-scale bed forms and on the sea floor fringing this zone are small-scale bed forms resembling current ripples.

Zone E encompasses the outer shelf and is generally void of bed forms. However, a few unusual giant to large-scale features are observed.

Most of the giant, giant to large, and large-scale bed forms on the west Florida shelf are considered to be storm-related features. Some giant-scale features and the low-relief swells may be relict structures left over from times of lowered sea level. The small-scale bed forms within Zone C are possibly the results of either internal waves or tides set up on the summer thermocline and/or currents created by Loop Current intrusion on the shelf. The latter event may also generate strong shelf-edge currents creating the bed forms in Zone E.