massive sandstone unit, and lignite isopleth maps. Dendritic, contributary sandstone belts of low to moderate sinuosity comprise the dominant geometry displayed by these terrigenous clastic rock bodies, even with the basal Wilcox progradational interval. Nine distinct sandstone belts between 6 and 10 mi (9.6 and 16 km) wide are noted in the lower Wilcox: seven of these same belts occur in the upper Wilcox. The Meridian has a much higher overall sandstone content than the Wilcox units, averaging 70%, but the 90% sandstone contour line highlights 8 sandstone belts occupying roughly the same positions as maximum sand belts in the lower Wilcox.

A bifurcating, distributary net sandstone pattern characteristic of upper delta plain facies is noted for the basal Wilcox, lower Wilcox, and upper Wilcox stratigraphic intervals of southern Bolivar, Yazoo, Sharkey, Issaquena, and Washington Counties. Lignite isopleth maxima of 17 and 18 lignites, respectively, for the lower and upper Wilcox of central Washington County lend further support for this interpretation. The principal distal deltaic sand bodies of the Wilcox high-constructional Holly Springs delta system, however, have been mapped by other researchers 75 to 125 mi (120 to 200 km) downdip from this area.

Lignite prospecting in the Wilcox-Meridian section of North Mississippi can be greatly aided through an understanding of the geographic and stratigraphic distribution of the major depositional systems.

CLEAVES, A. W., Mississippi Min. Resources Inst., Univ. Mississippi, University, Miss., and M. C. BROUSSARD, Amoco Prod. Co., New Orleans, La.

Chester and Pottsville Depositional Systems, Outcrop and Subsurface, in Black Warrior Basin, Mississippi and Alabama

Terrigenous clastic depositional systems of the Upper Mississippian Chester Group and the overlying Lower Pennsylvanian Pottsville Group in the Black Warrior basin of Alabama and Mississippi were deposited in distinctly different tectonic settings. The predominantly deltaic Chester sandstone units accumulated on the stable northern shelf of the basin and had a cratonic source to the north or northwest. Detailed subsurface mapping of these cratonic delta systems indicates that the northern shelf can be subdivided into a terrigenous clastic western element (Parkwood and Floyd Formations) and a largely carbonate eastern element (Bangor, Hartselle, Monteagle, and Pride Mountain Formations). Total thickness of the Chester interval on the shelf averages 1,200 ft (366 m). Pottsville sediments, in contrast, had a principal source to the southwest of the Black Warrior basin. They represent the thick clastic wedge shed from the Ouachita orogenic belt. Pottsville deposition occurred in a rapidly subsiding foreland basin and involved a maximum sediment accumulation exceeding 12,000 ft (3,658 m) in the basinal core.

Within the Chester Group four cycles of deltaic progradation have been identified through data gathered from 600 well logs. Two deltaic depocenters, a carbonate shelf and ramp, and a shallow basin carbonaceous shale unit comprise the principal depositional systems along the northern margin of the basin.

With the surface and shallow subsurface Pottsville of the Black Warrior basin in Alabama, the 2,000-ft (610 m) stratigraphic interval can be subdivided into a minimum of seven vertical genetic components. In contrast with the Chester units, however, laterally extensive coal seams rather than marine transgressive limestone tongues form the bounding elements. On the surface, the lowest Pottsville unit has no productive coal seams and is dominated by massive, quartzarenite sandstone bodies interbedded with dark gray shale.

COATES, E. J., C. G. GROAT, and GEORGE F. HART, Louisiana State Univ., Baton Rouge, La.

Subsurface Wilcox Lignite in West-Central Louisiana

The Wilcox Group in west-central Louisiana is a wedge of terrigenous clastic sediments which prograded into the northern margin of the ancestral Gulf of Mexico. Subsurface correlations provide the basis for dividing the Wilcox Group into three primary intervals—lower Wilcox, upper Wilcox, and Carrizo Formation. Furthermore, lower Wilcox is subdivided into four regional lithologic units, informally referred to as intervals 1, 2, 3, and 4.

Lignites occur as component facies of fluvial, deltaic, and lagoonal rocks. Lignites are identified from electric log response based on "operational" definition. Associated environmental interpretations are derived from log responses characteristic of deltaic environments. Expected properties of lignites are predicted from their geologic setting analogous to modern peat deposition and other ancient lignite accumulations.

The Carrizo Formation represents a meander-belt facies within an alluvial plain. The Carrizo Formation is devoid of any *significant lignite accumulation* because of the destruction of overbank deposits.

The upper Wilcox is a lagoon–barrier bar complex characterized by fine-grained deposition updip and strike-oriented accumulation of coarse sediment downdip. The interval is basically not lignitiferous. A maximum of 8 seams occur updip of major strike-oriented sand accumulation. These lignites are expected to be lagoonal and of poor quality.

The lower Wilcox is a typical progradational deltaic complex to the east and marginal delta plain to the west. The lower Wilcox is the major lignitiferous interval of the Wilcox Group. Thirty-five lignite seams are found within the interval, are associated with interdistributary flood-basin deposits, and should be of good quality, based on similarity to deposits elsewhere.

DAVIES, DAVID K., and WILLIAM R. ALMON, Davies, Almon, & Associates Inc., Houston, Tex.

Reservoir Quality, Pliocene-Pleistocene Sandstones, Offshore Gulf of Mexico

Significant variations in the quality of sandstone reservoirs commonly reflect the amount of clay content which is controlled by the environment of deposition and diagenesis.

In the Pliocene-Pleistocene sandstones, offshore Gulf of Mexico, the clay content varies significantly between sands deposited in delta and submarine fan environments. The overall shapes of the gamma ray and SP curves for both environments are commonly similar, but differences between high and low resistivities can reflect differences in original environment of sand deposition.

Diagenesis can add significant quantities of clay to a rock through chemical precipitation in pore spaces. Diagenetic (authigenic) clays are of importance because they can significantly effect electric-log response (SP, gamma ray, neutron, density), and can largely control the reaction of a sand reservoir to well-bore fluids. It is often forgotten that diagenesis can also remove clays from a sandstone, thereby "cleaning-up" an originally dirty sandstone.

The composition of drilling and stimulation fluids also has a significant effect on reservoir quality, especially when the sandstone pores are lined with diagenetic clays. Use of incorrect drilling or stimulation fluids can make a potentially good reservoir nonproductive.

In the Pliocene-Pleistocene section of the Gulf of Mexico, variations in environment of deposition, diagenesis, and the composition of drilling fluids can play havoc with interpretations based solely on log characteristics.

DEPAUL, GILBERT J., Cities Service Oil Co., Houston, Tex.

Environment of Deposition of Upper Wilcox Sandstones, Katy Gas Field, Waller County, Texas

At Katy gas field, sandstones of the upper Wilcox Group produce gas at depths of 10,021 to 11,000 ft (3,054 to 3,353 m) in reservoirs controlled by stratigraphic and structural characteristics. Producing zones are from 6 to 42 ft (1.8 to 12.8 m) in the upper Wilcox "First Lower Massive" sandstones, and "D," "C," "B," "A," and "Second Wilcox" interbedded sandstones and shales. The reservoir sandstones are dip-trending with production being localized on the top of the anticline.

The upper Wilcox sequence has been interpreted as delta-front grading upward to bay-marsh transitional deposits and, alternately, as deep-water turbidite deposits. The field is located downdip from the Wilcox fault zone, downdip from known delta-destructional deposits in the upper Wilcox, and is as much as 45 mi (75 km) downdip from the postulated late Sabinian shoreline. Full-diameter cores from the upper Wilcox sequence show the sandstones are submarine, constructional-channel turbidites, giving way vertically to thinner turbidite sandstones in a predominantly shale section. The sandstones are representative of submarine fan deposits, having bedset associations characteristic of channel deposits (A, AB, and ABD) becoming middle fan associations (AE, BE, ABCE, and BCE) and then outer fan associations (ABE, BDE, CDE, and DE) upward in the section. The thicker channel sandstones show limited lateral extent along strike, grading to thin, overbank sandstones.

Sandstones are sparsely bioturbated, and shales are bioturbated only when they overlie sandstones. The burrows are characteristic of a wide range of water depths from middle neritic to bathyal. Benthonic forams found in the cores are abraded by transport and represent a range of water depths from middle to outer neritic. Therefore, water depths during Wilcox deposition were probably bathyal, as indicated by deeper water trace fossils.

The deposition of the upper Wilcox Group is associated with transgression during late Sabinian and incipient uplift of a deep-seated, diapiric mass under the field. Electric-log correlations and sandstone isopach maps suggest that the sands were deposited as parts of a submarine fan that shifted northeastward through time.

DUTTON, SHIRLEY P., and CHARLES W. KREITLER, Bur. Econ. Geology, Univ. Texas at Austin, Austin, Tex.

Cap-Rock Formation and Diagenesis, Gyp Hill Salt Dome, South Texas

Cap rock from Gyp Hill salt dome, Brooks County, south Texas, was formed by salt dome dissolution that left a residuum of anhydrite sand, which was subsequently cemented by gypsum and at a later time altered to gypsum by fresh meteoric groundwater. The cap rock consists of gypsum at the surface (0 to 90 m) and gypsum-cemented anhydrite above the salt (90 to 273 m). Samples from the salt contain 13 to 42% disseminated anhydrite crystals and $<$1.0% dolomite rhombs in halite. The cap-rock–salt boundary is marked by a cavity several meters high. Salt dissolution has concentrated the insoluble material into an anhydrite sandstone with 20% porosity at the base of the cap rock. Cap rock porosity is largely occluded within 6 m above salt by poikilotopic gypsum cement and crushed anhydrite laths (presumably from the overburden pressure of the cap rock). A transition zone occurs between 90 and 120 m below the surface where anhydrite is being completely hydrated to gypsum. Above this zone, the cap rock is entirely gypsum and indicates flushing by fresh meteoric groundwater. Through the total thickness, anhydrite is in disequilibrium, as evidenced by the gypsum cement and embayed anhydrite laths.

EDWARDS, MARC B., Bur. Econ. Geology, Univ. Texas at Austin, Austin, Tex.

Live Oak Delta Complex—Unstable, Shelf-Edge Delta in Deep Wilcox Trend of South Texas

Detailed correlation and study of approximately 500 well logs from the deep Wilcox trend of south Texas have shown at least three major deltaic complexes in the Rosita delta system. These sandstone-bearing units, previously considered to be a lower Wilcox strike-transported, shelf-edge sand facies, are reinterpreted as upper Wilcox deltas that prograded across a stable shelf to an unstable shelf margin.

The Live Oak delta complex, the youngest observed, consists of numerous lobes. The youngest of these, the Luling and Slick deltas, are both extensively growth-faulted and show a downdip change from delta plain to pro-delta facies. Areas of maximum net sandstone occur in the downdip part of the growth-fault zone where rapid relative subsidence rates compensated for basinward decrease in sandstone percent. A gulfward displacement of facies and associated growth faults occurred between deposition of the older Luling to deposition of the younger Slick delta. This suggests that the deltas prograded out to the shelf margin and that the associated growth faults reflect gravity instability