phase of the delta, is a complex of various lithologies which is divided into 4 major facies: coastal swamp, fluvial estuary, barrier island, and neritic marine. The fluvial estuary is open landward to a major distributary channel and exhibits high-energy, fluviatile bed forms. The barrier island sandstone body shows a N65°E orientation and separates 2 major facies—the coastal swamp/fluvial estuary facies on the northwest and the neritic marine on the southeast. *Ophiomorpha* burrows, indicators of littoral and shallow neritic environments, are common throughout the barrier-island sandstone. Unit E represents the destructional phase of the delta with initial deposition of marine black shale capping the complex of deltaic sediments of unit D. A grain-size increase upward through unit E, to fine-grained sandstone, culminates in the development of linear, offshore sandstone bars in the upper part of the interval. The sandstones have been bioturbated thoroughly by detritus feeders. Paleorelief, caused by the underlying stratigraphy of unit D, influenced the distribution of the unit E sandstone. Paleotopographic depressions found over the previous positions of both the subshoreface facies of the barrier-island sandstone and the coastal swamp facies, received the thickest offshore sandstone bar development, whereas paleotopographic ridges, specifically above the barrier-island sandstone, received the thinnest offshore bar development. No significant paleorelief was present at the end of the deposition of unit E and the beginning of the deposition of the upper shale member of the Mancos Shale.

The zircon:tourmaline ratio, determined by heavy-mineral analysis of the sandstones, can be used to differentiate fluvial and marine sandstones. Because zircon (Sp. G. 4.7) and tourmaline (Sp. G. 3.1–3.3) have widely different specific gravities, their relative abundances can be used as sensitive indicators of depositional environments. This sorting is related to the particular energy regime which existed at the time of deposition. Ratios greater than 1:1 are representative of high-energy fluvial sandstones, and ratios less than 1:1 are representative of low-energy marine sandstones. The marine environment can be subdivided further between shallow neritic (barrier islands, offshore bar, and shoreface environments) and deeper neritic with the shallow neritic having abundant heavy minerals and the deeper neritic having rare heavy minerals.

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GEOLOGY OF FELDER URANIUM DEPOSIT, LIVE OAK COUNTY, TEXAS

The Felder ore deposit is a 5 million-lb uranium deposit in the South Texas coastal plain. It occurs in the basal sandstone of an Oakville Formation (Miocene) alluvial system. The host sandstone is a carbonate-rich arkose which contains virtually no carbonaceous debris and has been reduced by the local introduction of hydrogen sulfide. The ore lies well within the reduced zone and occurs as coffinite and uraninite that fill interstices and coat and replace grains.

The overall geometric configuration of the ore is that of a winged, crescentic ore roll. Weak mineralization extends the wings of the ore roll and gives greater expression to the roll character. Departures from the shape are controlled by discontinuities in bedding and by proximity of the ore to the surface. Associated with the uranium is a broad halo of anomalous molybdenum.

Subsidiary mineralized trends suggest a preexisting updip position for the main roll. Oxidation from the surface largely destroyed this previous roll by solubilization of uranium. Uranium subsequently migrated into favorably reduced sandstone and reprecipitated at the present roll position.

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CHARACTERISTICS OF TIDAL SEDIMENTATION IN PHOSPHORIA (PERMIAN) STRATA AT COTTONWOOD CREEK FIELD, BIG HORN BASIN, WYOMING

Phosphoria reservoir rocks at Cottonwood Creek field, in the Big Horn basin, exhibit many characteristics of sediments deposited by a confined current, such as those in channels in modern carbonate tidal flats. Such physical properties, observed in thin sections and hand samples, are marked in contrast to the appearance of the nonporous carbonate facies of the Phosphoria. Nonporous strata, updip and laterally adjacent to this large stratigraphic oil accumulation, have properties common to sediments of interchannel and supratidal environments observed in modern tidal flats. These observations, in conjunction with the problem of anhydrite pore-filling and fracture distribution, help to explain the distribution of the reservoir and trap at Cottonwood Creek field, and may have application in exploration elsewhere in this province.

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REEVALUATION OF UNCONFORMITY CRITERIA IN CARBONATE SUCCESSIONS

Studies of modern carbonate sediments during the past 15 years have resulted in 4 revelations that should modify traditional stratigraphic concepts and definitions relating to unconformities: (1) brief subaerial exposure and attendant cementation of scattered small tracts, such as sand bars and tidal flats, are normal and continuing aspects of shallow-water carbonate deposition; (2) submarine cementation of carbonate sediments is a widespread, ongoing process; (3) submarine erosion and transportation of contemporaneously cemented fragments also are taking place constantly within the carbonate depositional realm; and (4) some features formerly thought to represent "soil" or vadose origin are essentially indistinguishable from marine-organic structure, or products or submarine cementation.

By analogy, these same concepts probably apply to ancient carbonate rocks. Consequently many of the traditionally accepted criteria for outcrop and core recognition of unconformities are invalid or tenuous at best.

A new definition of "unconformity" is needed. "Missing section" is not satisfactory as a definitive criterion because an apparent hiatus in fact may be only a function of unrecognized lithofacies or biofacies patterns, depending on the magnitude of the interval involved. Clearly, the really important connotation of "unconformity" is that an area of regional extent was eroded, and the new definition should reflect both qualities: erosion and extent. Along the same line, a useful classification of nongradational stratigraphic boundaries can be constructed, based on the same two criteria.

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REEVALUATION OF USE OF GLAUCONITE FOR RADIOMETRIC STRATIGRAPHIC DATING

Glauconite is a potassium- and rubidium-bearing clay mineral that forms at the seawater-sediment interface in marine environments. As such, it should be useful in