quences, and geomorphology, four linear barrier complexes have been identified within 10 km of the present coast. Each is a transgressive, peak-sea-level barrier complex including barrier and washover sands and gravels, tidal-marsh muds, and fossiliferous lagoonal sands and muds. A regressive sequence of sand and gravel occurs between each barrier. From most landward to most seaward, the barriers were formed at sea levels of about +5.4 m, +4.3 m, +2.8 m, and −1.0 m relative to present sea level. Age estimates based on amino acid racemization for shells within lagoons behind these barriers suggest a Sangamon age for at least the three most landward barriers.

Thus the upper 15 m of the horizontally correlative Pleistocene Columbia Group consists of at least four chronologically discrete, parallel, linear barrier-lagoon complexes formed during multiple marine transgressions and regressions. This interpretation of trends and vertical sequences of nearshore marine and coastal deposits may prove useful in the understanding of other ancient coastal deposits.

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Detailed Stratigraphy and Sedimentology of Whitsett Formation in Uranium Area of Western Karnes County, Texas

The Whitsett Formation of the upper Eocene Jackson Group contains, in ascending order, the Dilworth Sandstone, Conquista Clay, Deweesville Sandstone, Dubose, Tordilla Sandstone, and Fashing Clay Members. In Atascosa to McMullen Counties, the Calliham Sandstone Member, considered to be a stratigraphic equivalent of the Tordilla, is apparently the same age as the Fashing. The Deweesville is called the Stones Switch Sandstone Member by some geologists.

The Fashing contains flood-plain, lagoon-bay, and distributary-channel facies. The Kellner and Rosenbrock uranium mines are in the distributary-channel facies of the Fashing. These mines have previously been considered to be in the Tordilla Sandstone Member. The Calliham Member apparently represents tidal-delta sandstone at its type locality.

The Tordilla is a transgressive barrier-beach unit in the areas of the Pfiel-Wright and Weddington-Butler-Galen-Sickenius uranium-ore trends. Farther east, in the Manka and Stoeltje uranium mines, the Tordilla is represented by a back-barrier island facies.

Although the predominant facies of the Dubose is paludal and bay-lagoon mudstone, the ore in the Lauw and Bieker uranium mines is in a sand-filled distributary-channel facies.

A back-beach facies of the Deweesville contained the ore of the Searcy mine, and the F. Brysh mine is in the lower of two beach units in the Deweesville.

The sandstone members of the Whitsett Formation were deposited in transgressive barrier beaches, although locally they may be represented by progradational beaches or tidal inlets and deltas. Sandstone deposited in the distributary channels is equivalent in age to the clay members. The grains of the sandstone units in the Whitsett are composed mostly of feldspar and quartz. Some facies also contain abundant volcanic shards. Montmorillonite and clinoptilolite and part of the feldspar are authigenic constituents in the sandstone. The sandstone of the distributary channels is coarser grained than that in the beach sequences.

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Mineralogic Composition and Diagenesis of Tertiary Sandstones along Texas Gulf Coast

The upper Gulf Coast Wilcox Formation is composed dominantly of quartz with feldspar, metamorphic and volcanic rock fragments, and mud clasts. The lower Gulf Coast Wilcox Formation contains more quartz and volcanic rock fragments. Lower Gulf Coast Yegua and Jackson Formations are composed of quartz, volcanic, and lesser carbonate rock fragments. Northward they become more quartz-rich and contain metamorphic rock fragments and mud clasts. Lower Gulf Coast Frio and Vicksburg Formations are similar to the Yegua and Jackson. Northward, they become more quartz-rich, but carbonate rock fragments are absent.

Despite variations in composition, Tertiary sandstones exhibit a similar diagenetic sequence idealized as follows.

Surface to shallow subsurface diagenesis (0 to 4,000 ft; 1,200 m) begins with pedogenic clay coats and with leaching and calcite replacement of feldspar. Minor kaolinite, feldspar overgrowths, and iron-rich carbonate material are also precipitated. Porosity is commonly reduced by compaction from the original 40% to less than 30%.

Moderate subsurface diagenesis (4,000 to 11,000 ft; 1,200 to 3,300 m) involves leaching of early carbonate cements and subsequent cementation by quartz overgrowths and later carbonate cement. These stages commonly reduce porosity to 10% or less, but this trend may be reversed by late leaching of feldspar, rock fragments, and carbonate cements. Restoration of porosity to more than 30% can occur, but this may be reduced by late cementation by kaolinite and iron-rich dolomite and ankerite.

Deep subsurface diagenesis (11,000 ft; 3,300 m) is a continuation of late iron-rich carbonate cements.

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Sedimentation Rates in Coastal-Plain Estuary, Rhode River, Maryland

Estuarine sedimentation rates have traditionally been determined by indirect means or by estimation. A recently developed and potentially useful, absolute dating method for modern sediments—lead-210—previously has been applied with success to lacustrine and continental-shelf sediments. The results of the present study indicate that lead-210 may be useful in the estuarine environment as well.

The Rhode River estuary is a shallow, western arm of Chesapeake Bay. Piston cores 2 m long were collected in areas of suspected high deposition rates throughout the estuary. Subsamples taken at regular intervals down

the cores were leached for lead. Activity levels of the lead isotope were counted for 24 hours on an alpha spectrometer. A constant exponential decrease of lead-210 with depth was found, implying a relatively constant flux of the isotope from the atmosphere to the estuary, with little bioturbation and negligible vertical diffusion of lead within the sediment. The resulting sedimentation rates show that parts of the estuary have been filling rapidly with sediment over the past 100 years.

The lead-210 technique appears to be readily extendable to estuaries and to any other environment of relatively undisturbed deposition.

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Nugget-Navajo Sandstone Environmental War—Can Trace Fossils Help?

No abstract available.

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KOALA—Minicomputer Log Analysis System for Geologists

An interactive computer medium for log analysis is generally preferable to batch processing in view of the almost inevitable uncertainties regarding key petrophysical parameters and even the compositional nature of subsurface units. KOALA is an interactive package of log analysis routines developed by the Kansas Geological Survey and run on its minicomputer system. Resolution of mineralogic and porosity proportions is made by either maximum variance, unique solution, or least-squares matrix algorithms, depending on the degree of determinancy prescribed by the number of components as related to number of logs. An alternative linear programming method is also available for the incorporation of local geologic information to aid in solutions with restricted log data. Reservoir analyses of fluid saturations, permeability indices, and invasion characteristics are programmed following standard solution procedures. Wherever possible, error diagnostics are generated to alert the user to inconsistencies which are implied between the solutions, input parameters, and log values. Intelligent response to these diagnostics allows the user to initiate revisions in a learning sequence of modifications that converge on a satisfactory solution.

Dipmeter data are processed via a variety of graphic options such as flat and perspective cylindrical projections, Wulff and Schmidt polar plots, together with eigenvector analyses of vector fabrics. A simple synthetic seismic modeling procedure is also included and multivariate statistical procedures, such as discriminant functions and factor analysis, will be incorporated to serve as aids in pattern recognition studies.

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Can Geochemistry Find Oil?

No abstract available.

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Vitrinite Reflectance—What, How, and Why?

Vitrinite reflectance is a proven technique for determining the thermal evolution of sedimentary organic matter. The reflectance power of the coal maceral, vitrinite, increases with depth of burial in response to increasing temperature and time. Because most coals and sedimentary kerogens contain vitrinite, the technique has universal application in determining rank or degree of catagenesis.

Kerogens are concentrated by acid leaching, then are mounted in epoxy and polished, and the degree of reflectance (R_o) is determined with a reflecting-light microscope. Most kerogens contain mixtures of primary and recycled materials commonly with various contamination products such as drill-bit cavings and mud additives. Vitrinite reflectivity can also be affected by chemical or physical weathering, bitumen or pyrite inclusions, natural coke and, in low-rank rocks, by variations in various vitrinite subgroups. Semifusinite, pseudovitrinite, and some solid bitumens are often misidentified as vitrinite. All of these variables must be dealt with before the maturity (average R_o) of a sample can be determined.

A sequence of R_o values in a well or exposed sedimentary section results in a maturation gradient, the slope of which depends on the geothermal gradient and the sedimentation rate. Because both reflectance increase and oil and gas generation are time- and temperature-dependent chemical reactions, maturation gradients based on vitrinite reflectance can be used to determine whether hydrocarbons have been generated in source beds or preserved in reservoirs. Maturation gradients can also be used to recognize major faults and unconformities and to estimate the amount of section lost, proximity to igneous activity, the rank of recycled material when deposited, geothermal history, and other features useful in understanding the geologic history of basins. If properly measured and interpreted, vitrinite reflectance can be a powerful exploration tool.

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Uranium Resource Evaluation in Antarctica

The continent of Antarctica is the only large land area on earth that has been left almost totally unexplored for uranium resources. In 1976 the first systematic uranium resource evaluation was started as part of the Antarctic International Radiometric Survey. Two areas in the Transantarctic Mountains and one area in Marie Byrd Land have been examined by airborne gamma-ray spectrometric methods. Most flight operations are conducted using Bell 212 helicopters. The equipment in use is a GeoMetrics GR-800 gamma-ray spectrometer with a GAX 512 detector and a GAR 6 analog-recorder. The equipment has proved to be satisfactory, and no plans have been made to increase detector size or to alter data acquisition systems owing to the extremely rigorous nature of the Antarctic field operations.