sils. Within the canyon-fill sediments, there are some unusual water-escape structures.

The southern wall of the canyon is well exposed in a large quarry, where four "steps" occur in a vertical height of about 60 m. Upcanyon, these pass into fewer but higher "steps." Small overhangs caused by protruding bedding surfaces are original features, as gravel fill still adheres to the marly walls. Canyon downcutting toward the east is shown by widening of the present outcrop of the fill in that direction, and eastward-moving paleocurrents are indicated by boulder imbrication. Rapid downcutting and filling is suggested by the well-preserved wall overhangs, and channeling within the fill sediments suggests that the deeply cut canyon was filled by several successive influxes of sediment.

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Hydrocarbon Prospects in Basins West of United Kingdom and Eire

No abstract available.

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Assessing Oil and Gas Plays in Facies-Cycle Wedges

Oil and gas potentials of formations in frontier areas can be assessed by reference to formations in corresponding parts of facies-cycle wedges documented in producing areas. The transgressive-regressive facies-cycle wedge is a body of rock bounded above and below by regional unconformities or the tops of major nonmarine tongues. The ideal wedge includes, from base to top, facies successions from nonmarine, to coarse (sandstone or grain carbonate), to fine (shale or micrite), to coarse, and back to nonmarine. Different types of potential coarse reservoir formations (plays) are identified by their distinctive vertical facies successions within this cycle: *wedge base*, fine over coarse (potential reservoir) over nonmarine; *wedge middle*, fine over coarse over fine; *wedge top*, nonmarine over coarse over fine; *wedge edge*, nonmarine over coarse over nonmarine; and a special category, *subunconformity*, which includes any truncated part of a wedge unconformably underlying another wedge. These play types have distinctively different spatial relations between their coarse reservoir facies and their fine oil-source and seal facies. Different wedge positions thus typically have different hydrocarbon potentials; within each position, however, there are also large ranges of potentials related to variations in source richness, reservoir quality, or trap capacity. As a result, the assessment procedures for new plays have three critical steps: (1) selecting look-alike productive plays of the same wedge position; (2) scaling the potential hydrocarbon yield to compensate for obvious differences in thickness, areal extent, etc; and (3) risking the results for other factors that might render the new plays nonproductive.

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Braided-Stream Processes and Facies in Modern Arc-Trench Gap, Southwestern Guatemala

Modern fluvial processes and facies in arc-trench gaps have been little studied even though prograding coastal-plain sequences may be the dominant facies in parts of ancient arc-trench gaps underlain by continental crust. The Pacific coastal plain in Guatemala is abruptly terminated 25 to 60 km inland from the Pacific shoreline by the steep slopes of an active Quaternary volcanic arc. The volcanic slopes are locally bare of vegetation and, in response to strongly seasonal torrential rainfall, provide abundant bed load to high-gradient, low-sinuosity braided streams that discharge onto the coastal plain and flow, in a roughly parallel pattern, into the Pacific.

Studies of the Rio Samala reveal systematic downstream changes in cross-channel bed-relief index (from 8.2 to 1.3), maximum particle size (from 180 cm to 6.4 cm), and facies composition. The dominant facies, in a tract from proximal to distal, are: proximal (0 to 17 km)—crudely bedded gravel that records flood-event processes associated with longitudinal-bar and boulder-string formation, as well as channel scour and plugging; mid-distal (17 to 40 km)—horizontally stratified sand deposited by flat-bed accretion in channels and on bars; and distal (40 to 53 km)—trough and tabular cross-stratified sand produced by migration of dunes and foreset bars. These facies characterize, respectively, the Scott-, Bijou-, and Platte-type braided-stream vertical sequences described by Miall.

Recognition of similar downslope changes in braided-stream sequences deposited in ancient arc-trench gaps should enhance interpretation of proximity to source, direction of paleoslope, shoreline trend, and trench orientation.

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Map Display Formats for Environmental Geologic and Related Data

A variety of map formats can display basic geologic and related environmental data derived from aerial photographs, detailed field investigations, and published and unpublished studies. These depictions provide information on natural environments for various types of environmental maps directed toward selected uses and audiences. Examples include:

1. Geology and Natural Environments of Padre Island National Seashore, Texas, which employs a typical map format of colors, symbols, and written descriptions to show the location and distribution of barrier-island and lagoon environments. Color photographs of each mapped environment provide visual reference for the intended popular audience composed of National Seashore visitors.

2. Sediment Distribution, Bathymetry, Faults, and Salt Diapirs: Submerged Lands of Texas, Galveston-Houston Sheet, which displays surficial sediments, water depth, and structural features using contours, colors, and symbols, with colors keyed to a unique color-coded

sediment-classification diagram. The map also depicts the precise locations of the hundreds of sediment-sampling points from which data were obtained.

3. Composite Environmental Suitability Map: Brazoria County Geopressured-Geothermal Prospect Area, which uses a series of transparent-translucent overlay sheets on which specific environmental characteristics are shown in varying shades (intensities) of gray to map relative environmental suitability for geopressured-geothermal fluid production and disposal activities.

4. Lavaca and Lower Guadalupe River Basins Environmental Geologic Map, which consists of units that are defined in terms of substrate lithology, soils, landscape morphology, biologic assemblages, and geologic processes. Derivative maps prepared from the environmental geologic map include substrate materials, active geologic processes, and biologic assemblages.

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Deep-Sea Deposition in Density-Stratified Cratonic Basin, Bell Canyon Formation (Permian), Delaware Basin, Texas–New Mexico

Sand and silt of the Bell Canyon Formation were deposited in a euxinic, deep-water, density-stratified basin. Laminated silt formed by suspension deposition from density interflows which moved along thermohaline interfaces; silty sand was deposited by bottom-hugging density underflows in submarine channels. The geometry of sandstone bodies is controlled by the configuration of nearly parallel, erosional channels oriented at high angles to the basin margin which range from less than 0.5 km to more than 8 km in width, 1 m to greater than 35 m in depth, and extend more than 70 km basinward. Channel erosion and sediment transport are interpreted to have resulted from long-lived density underflows which had many irregular fluctuations in flow strength. The flows may have originated as saline water was flushed from evaporitic shelf lagoons during storm ebb flow. The channels differ from modern and ancient submarine-fan channels attributed to turbidity-current processes in several ways, including: (1) the lack of radial or branching distributary-channel pattern; (2) few proximal to distal changes in grain size, bed thickness, and sedimentary structures; (3) the presence of abundant large-scale cross-stratification; (4) the lack of graded beds and Bouma sequences; and (5) the absence of clay-size detritus, levee, or overbank deposits.

More than 100 oil and gas fields produce from the Bell Canyon Formation in west Texas and southeast New Mexico. Most reservoirs in the northern Delaware basin are stratigraphic-hydrodynamic traps which occur where deep sandstone-filled channels are incised into less permeable interchannel siltstone. Similar types of elongate, basinal, sandstone bodies confined to linear channels might be expected in other cratonic basins where there is a high potential for density stratification of basin waters and the generation of saline density currents.

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Sedimentologic Studies in Jurassic of Tunisia

Modern sedimentologic interpretation of the Tunisian Jurassic is based on excellent field studies by Tunisian and French geologists from 1955 to 1972. Jurassic facies north to south across Tunisia were formed where the African craton sloped into the southern edge of the Tethyan Sea and to the south in a restricted marine and evaporitic basin on the African shield itself. Thickness of the system varies abruptly off banks and into starved basins between 300 and 1,000 m.

The Lias of central Tunisia forms a broad and typical carbonate platform separating the pelagic facies of the north from the major interior evaporite basin. A great north-south escarpment through southern Tunisia beautifully exposes these evenly bedded, restricted marine carbonate rocks and gypsum. Through the Middle and Late Jurassic the northern starved basin and slope facies (respectively radiolarian shales and Ammonitico Rosso) expanded into central Tunisia. Carbonate banks and patch reefs developed along the north-south axis west of the Sahel and its extension in the Jurassic ranges from Zaghouan to Bou Kornine uplifts. These probably rimmed the western margin of an ancestral Pelagian block. Bathonian slope deposits here consist of debris flows near Tunis, and the Kimmeridgian of Jebel Zaghouan shows a local reefy facies grading abruptly into turbidites and pelagic limestones to the north and west. These abruptly changing facies indicate a moderately unstable (rifting?) margin with intermittent reef growth. The Bathonian debris flows record a tectonic pulse which can be correlated with marked changes in thickening and elimination of strata along the Tebaga-Djeffara lineament, an important structural feature separating the southern evaporite basin from the northern unstable platform and basinal area.

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Biogenous Sediments Recovered by Deep-Sea Drilling

The Deep Sea Drilling Project has provided about 60,000 m of cores that contain a record of biogenous sedimentation over a major part of the world ocean during the past 150 m.y. Subduction and subsidence bias the record in older strata toward sediments deposited near rise crests, and technical drilling problems bias the samples toward low latitudes. After factoring out the effects of plate motions and subsidence, the main features of maps of post-Jurassic biogenous facies reflect primarily the patterns of oceanic fertility and of dissolution of carbonates with depth. These in turn respond to changes in the interacting climate and the deep and surface oceanic circulation systems, which are ultimately determined by the changes in locations, shapes, and interconnections of the ocean basins and their marginal seas.

One great value of the cores is in their being samples whose biostratigraphic age is precisely known, whose paleolatitude, paleolongitude, and paleodepth can be specified, and whose pressure-temperature and pore-water history during burial and diagenesis generally can be far better constrained than for most sediments on land. Biostratigraphers and paleoenvironmentalists