high/low or shallow/deep. Special facies types include stromatoporoid and evaporite, both supratidal and deep. Facies and fabrics vary considerably throughout the sequence, both interformationally and intraformationally. Mudstones, wackestones, and packstones are most common although grainstones and boundstones also occur. Within textural constraints, each fabric contains their respective amounts of skeletal and nonskeletal allochems. Because of frequent and sharp facies changes, it is important to discriminate among different facies that superficially have similar fabrics. Examples are deep/shallow evaporites, or supratidal/subtidal oolites and pisolites. Peloidal wackestones/grainstones, skeletal wackestones/packstones, and mottled mudstones are the prevalent fabric types. Significant sedimentary structures include burrows, flat pebble interclasts, desiccation cracks, bird's-eye structures, and collapse breccias.

Porosity types common to all, except for the Ashern and Bakken, are intercrystal, interparticle, moldic, vuggy, and breccia. Significant porosity in the Ashern and Bakken formations is from fractures.

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Computer-Assisted Prospect Generation in a Frontier Basin

Limited time and personnel resources often justify the utility and integration of computer techniques into exploration efforts in frontier basins. A large percentage of the exploration staffs of geologists and geophysicists have little comprehensive computer training. In addition, computer programmers and analysts have only limited experience using exploration data. To improve communication, it is often necessary to coordinate and "cross-educate" the two staffs. This enables computer applications to be used as an important tool by exploration personnel.

Computer techniques were used by Pennzoil in the exploration and evaluation of the Santa Barbara channel basin in offshore southern California. Regional computer mapping including computer contouring located certain prospective areas permitting early concentration on the areas of interest. This effort resulted into the acquisition of Lease OCS P-0315 in Sale 48, June 1979.

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Structural Development of Upper Magdalena Valley, Colombia

The Neiva and Girardot basins of the upper Magdalena Valley are en echelon late Cenozoic structural depressions between the Central and Eastern Cordillera of the Colombian Andes. The basins contain three depositional sequences up to 9,000 m thick resting on Paleozoic crystalline basement: (1) a Triassic-Jurassic nonmarine clastic and minor carbonate sequence, (2) a middle Cretaceous to Paleogene marine to nonmarine clastic and minor carbonate sequence, and (3) a thick Neogene nonmarine molasse sequence.

The Andean orogeny in the upper Magdalena Valley occurred in two phases: (1) late Oligocene–early Miocene (Neiva basin), and (2) late Miocene–Pliocene (Neiva and Girardot basins). The first phase was dominated by basement-cored domes and basement-driven thrusts displaced toward the east from the Central Cordillera, while the second phase was dominated by basement-driven thrusting toward the west from the Eastern Cordillera. The basement-rooted thrusts splay upward within the Cretaceous and Paleogene strata and form complex shallow to moderate-dipping thrust sheets or terminate within the sedimentary cover to form a series of tight folds. From middle Miocene to late Pliocene, a thick molasse sequence accumulated on the earlier structures in both basins. During the younger phase of deformation, the molasse was deformed by continued movement on basement-rooted faults.

The basement-driven structures in the upper Magdalena Valley are probably the result of transpressional movements along the eastern margin of the Andean volcanic arc in the Central Cordillera.

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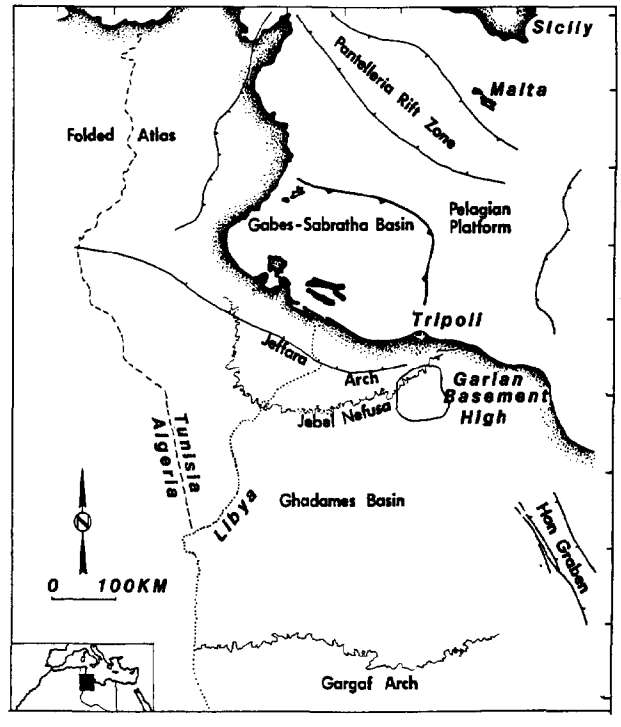
Lower Cretaceous Braided Stream–Fan Delta Deposition, Northwest Libya: A Future Petroleum Exploration Target, Offshore Gabes-Sabratha Basin

The southern margin of the present Gabes-Sabratha basin roughly parallels the coastline of northwest Libya and southeast Tunisia and is contiguous to the northern margin of a Lower Cretaceous subaerial delta platform. The Lower Cretaceous Chicla and Cabao formations, exposed along the Jebel Nefusa escarpment and in the subsurface of the onshore Ghadames basin in Libya, represent a thin (0 to 200 m), laterally extensive, fluvio-deltaic sequence. A detailed study of 15 measured outcrop sections indicates each formation is a transgressive fluvio-deltaic package. A complete package can be subdivided into three major sedimentary facies from base to top: (1) braided fluvial delta plain (facies 1) or braided fan delta plain (facies 1a), (2) delta front–prodelta slope (facies 2), and (3) prodelta shelf (facies 3).



The Chicla and Cabao fluvio-deltaic packages were derived from two sediment source areas: (1) a large, undetermined area far to the south, and (2) a smaller, proximal area, 50 to 100 km inland of the Libyan coast.

A system of large to small northwesterly flowing braided streams, fed from the quartz-rich southern source, deposited clean, laterally persistent, reservoir sands (braided fluvial and delta front facies) and impervious sealing shales (prodelta slope and prodelta shelf facies) across the slowly subsiding Saharan Platform. These deposits can be traced northward in the subsurface, across the entirety of western Libya, into the outcrop in the Jebel Nefusa, the northern limit of onshore control. Deposition ultimately extended northward into the more rapidly subsiding, organic rich, Gabes-Sabratha basin.

Simultaneously, the locally sourced reservoir facies were deposited, north-northwesterly, from the region of the Garian basement high. Coarse conglomerate quartz sands (braided fan delta plain facies) were transported a short distance to the Jebel Nefusa and northward, forming a wedge of clean, reservoir quality sands (braided fluvial and delta front facies) and sealing shales (prodelta slope and prodelta shelf facies) lying below well control in the Gabes-Sabratha basin area immediately adjacent to the Libyan coast due west of Tripoli.

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Lithofacies and Paleontology of Late Paleozoic Allochthonous Deep-Water Carbonates: Example from West Texas Subsurface

Twenty-one lithologies have been identified in cores of lowermost Wolfcampian limestone and shale in six wells in Reagan and Crockett Counties in the general area of World field, Midland basin. These lithologies are summarized into four major lithofacies: (1) floatstone and variably compacted rudstone containing angular, lithologically diverse, platform-derived lithoclasts and bioclasts in a clayey or marly matrix; lithoclasts are a product of disintegration of lithified platform facies, probably Wolfcampian; (2) interbedded shale and thin, horizontal, and in places ripple-laminated, carbonate sands mainly of allochthonous bioclasts; (3) micritic rudstone and wackestone containing platform-derived micritic intraclasts and bioclasts; this facies is variably porous with intergranular, moldic, solution-enlarged moldic, intragranular, and fracture porosity; (4) argillaceous packstone and wackestone with allochthonous bioclasts and intraclasts and semi-intraclasts of off-platform origin; this facies displays a variety of soft sediment deformation features.

Facies components probably were supplied and emplaced episodically by a variety of shelf edge and slope processes during a time of faulting in the area. Syndepositional faulting is interpreted from thickening of strata on downthrown sides of faults. Rudite-size clasts were transported 15 mi (24 km) or more from the Central Basin platform to the west. Finer detritus swept basinward for much greater distances. Limited comparison is made with carbonate sediments of Exuma Sound, Bahamas.

Off-platform Wolfcamp facies abruptly overlie and contrast strongly with a variety of Des Moines (Strawn) shallow subtidal platform facies displayed in three cores. The contact, present in one core, is interpreted primarily as a nondepositional disconformity.

Age and facies determinations from the cores significantly alter correlations and interpretations made with wireline logs alone, resulting in improved exploration play concepts. Allochthonous carbonate complexes may well provide new, potentially important reservoirs in this region.

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Holocene Gypsum Types and Formative Processes in Tidal Flat Settings, Carnarvon Basin, Western Australia

Study of gypsum presently forming in terrigenous and carbonate tidal flats along the semiarid coastline of Western Australia indicates that gypsum crystal habits, textures, structures, and fabrics developed on or within host sediments can be correlated with the physical, chemical, and hydrologic conditions of formation. By treating the study of gypsum from a sedimentologic approach, a classification of gypsum types is developed which allows comparative analysis and appears to be applicable to the interpretation of ancient evaporitic sequences.

Gypsum precipitated on a substrate from a free-standing body of water crystallizes in a habit dominated by the prism (110) and displays variations in texture, fabric, and structure that are related to the maintenance or progressive change in environmental conditions within the brine body. The action of physical and organic agencies is important in the genesis of the fabrics and structures displayed and in their destruction to form clastic gypseous sediments.

Gypsum precipitated within a host sediment crystallizes in a habit dominated by the hemi pyramid (111) and displays textures, fabrics, and structures that are related to host sediment properties, brine chemistry, ground-water hydrology, and the mechanisms for maintenance of such environmental conditions. Gypsum emplacement acts to disrupt and modify sedimentary features within the host and to form new textures, fabrics, and structures which are related to, and overpoint, their precursors.

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Sunnyside Petroleum-Impregnated Sandstone Deposit, Uinta Basin, Utah

The Sunnyside oil-impregnated sandstone deposit is a giant, exhumed oil field which occurs in the Green River Formation (Eocene), southwestern Uinta basin, Utah. The updip limit of the deposit has been eroded; thus, the precise mechanism of entrapment cannot be determined.

The deposit occurs within a transgressive continental and lacustrine sequence. The alluvial Colton Formation (early Eocene) underlies the deposit and grades into marginal lacustrine strata of the overlying Green River Formation. The lower part of the marginal lacustrine sequence is predominantly deltaic, but the upper third is interbedded with open lacustrine facies. The uppermost part of the Green River Formation in the area is eroded.

Petroleum-impregnated sandstone beds occur throughout the approximately 1,370 ft (418 m) of exposed marginal lacustrine facies. However, the main part of the deposit has a gross oil column of at least 860 ft (270 m) of which 640 ft (195 m) are petroleum-saturated siliciclastic rocks.

The deposit is exposed only on the southwest side and at the northwest corner. Only 12 significant wells were drilled in an area of 20 sq mi (52 sq km) prior to 1979. Thus, the limits of the deposit and the contained petroleum resource are difficult to assess. The delineated part of the deposit contains about 2.2 billion bbl of petroleum in place. The downdip limit of the deposit has not been defined.

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