algae may have been just as important for producing carbonate sediment during the early Paleozoic as codiacean algae are in the modern ocean. This algal contribution is difficult to recognize in most ancient sediments probably because absence of early interparticle cementation, allows compaction, filling of tubules with micrite cement, or micritization.

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Diagenesis of Upper Cretaceous Teapot Sandstone, Powder River Basin, Wyoming

The Upper Cretaceous Teapot sandstones of Well Draw field, Converse County, Wyoming, are turbidite fan deposits bounded stratigraphically by marine shales. They presently occur from 6,360 to 7,200 ft (1,920 to 2,195 m), dipping to the northwest.

Cored samples selected from nonbioturbated *A* bedsets show that the sandstones are fine to very fine-grained feldspathic litharenites. Major authigenic minerals include carbonate cement, quartz overgrowths, and clay minerals.

The clay minerals originated either as alteration rims on detrital silicates or as precipitates from pore fluids. Alteration rims typically consist of illite, smectite, mixed layer illite/smectite, and lesser chlorite. Feldspars are altered to kaolinite. Precipitated clays occur as (1) thin, unoriented, grain coating chlorite and kaolinite, (2) pore lining mixed layer illite/smectite and lesser chlorite oriented with (001) normal to the pore wall, and (3) unoriented, poorly crystalline, pore filling chlorite.

The diagenetic sequence is (1) compaction and limited quartz overgrowth development, (2) complete calcite cementation and precipitation of grain-coating clays, (3) dissolution of carbonate cement, (4) precipitation of pore lining and later pore filling clays, and (5) development of second stage quartz overgrowths. Development of silicate alteration rims occurred throughout the diagenetic history.

Dissolution of carbonate cement produced the majority of present-day porosity; however, this secondary porosity was reduced by precipitation of clay minerals. In the downdip sandstones, hydrodynamic flow and an increase in the abundance of detrital labile grains have caused an increased abundance of clay mineral precipitates, reducing the reservoir potential. The pore fluids which controlled sandstone diagenesis were likely provided by dewatering and diagenesis of enclosing shales.

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Porosity Distribution in Wolfcamp Strata, Palo Duro Basin, Texas Panhandle: Implications for Deep-Basin Ground-Water Flow

Average-porosity distributions in the Wolfcamp deep-basin aquifer are critical to discernment of the geographic trends in effective-porosity in the Palo Duro basin. Precise data are used to improve resolution of porosity values for computer-simulated areal ground-water modeling. Assessing vertical distributions of lithology and porosity in each well studied involves analysis of crossplotted neutron- and density-porosity log responses. This method more accurately identifies lithology and porosity than does the commonly employed crossplotted neutron-porosity and sonic (interval traveltime) responses. Log-derived average-porosity distributions yield information about effective pore volume (i.e., movable water) in the Wolfcamp aquifer and enhance the accuracy of estimates of traveltimes and velocities of brines in basinwide traverses. Mathematical analysis of average traveltime and total effective pore volume yield estimates of the rates of annual discharge from the Wolfcamp aquifer in the Palo Duro basin. Based on average flush rates between 2.2 and 1.5 m.y., annual discharge rates from the Wolfcamp aquifer, across the northern and eastern basin boundaries, are about 3.6×10^5 m^3 $year^{-1}$ to $5.3 \times 10^5 m^3 year^{-1}$.

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Geophysical and Geologic Studies of Ross Sea Continental Margin, Antarctica

In February 1984, the U. S. Geological Survey conducted geophysical and geologic investigations of the Ross Sea Shelf and outer continental margin of Antarctica aboard the research vessel *S. P. Lee*. The geophysical data included 24-channel seismic-reflection, high-resolution seismic-reflection, sonobuoy seismic, gravity, magnetic-gradiometer, bathymetry, and heat-flow measurements. Sea-floor samples were collected for geologic and geochemical studies, using 3-m gravity corer, box corer, and rock dredge.

Principal survey areas were along the southern and western Ross Shelf, near Cape Adare and Islin Bank, and along the central outer continental margin. These areas lie adjacent to those covered by earlier multichannel-seismic-reflection surveys made by France, West Germany, and Japan.

Three north-south-trending sedimentary basins, containing as much as 5 km (16,404 ft) of Cenozoic sediment, lie beneath the Ross Sea Shelf and extend seaward beyond the continental shelf edge. These basins are separated by basement ridges and are bounded on the west by the Transantarctic mountains and on the east by mountain ranges of Marie Byrd Land. Seismic stratigraphy, crustal-thickness measurements, and rock samples from the Ross Sea region indicate that the three basins may have formed initially by crustal rifting during the middle and Late Cretaceous time and have subsequently filled with early Tertiary(?) as well as Oligocene and younger glacial marine sediment. Sedimentary thicknesses, heat-flow values, and geochemical analyses indicate that some parts of the Ross Sea Shelf may have favorable conditions for the generation of hydrocarbons.

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Implementation of Graphical Layout Editor for Geologic Applications

The increasing availability and sophistication of data processing technology have given geologists new insights into the interpretation and evaluation of geological data. In many instances, however, software and hardware limitations have prevented geologists from effectively combining the graphical results from many of these specialized packaged procedures. At Aramco, the emphasis has been toward providing geologists and geological technicians with a convenient, user-friendly approach to effectively merging the graphical results of the various software packages.

Initially designed for an IBM graphics workstation, the graphics layout editor (GLE) offers the user a method of quickly merging or compositing the graphical results of the most frequently used geological software packages in a menu-driven, interactive environment. Applications of GLE technology not only allow the user to produce expanded or enhanced variations on the original graphical output, it also gives geologists the flexibility to conveniently experiment with combinations of graphical results which would otherwise be cost prohibitive owing to drafting complexities. To support final design and presentation, GLE in an interactive mode also provides high-quality text capability, allowing the cartographer to quickly build and annotate presentation quality composites. GLE techniques of graphical overlay, insertion, and interactive editing provide geologists with an infinite series of perspectives into geologic problem solving.

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Shear and Compressional-Wave Surface and Downhole Tests in Southern Louisiana

Shear- and compressional-wave seismic tests using the Vibroseis system were performed near a well in south-central Louisiana to study acquisition, processing, and interpretation problems typically encountered in low-velocity, relatively uncompacted Gulf Coast sediments. The primary objectives envisioned for these tests were to improve S-wave data quality by studying surface noise patterns to optimize source and receiver arrays, provide a direct correlation of P- and S-wave seismic data by using vertical seismic profiles (VSP), and measure the decay of P- and S-wave seismic energy with depth by using a downhole geophone.

To achieve these objectives, an expanding reflection profile (ERP), a walkaway noise analysis, and a VSP were recorded with both S- and P-wave sources. The S-wave ERP shows reasonable data quality although it was very band-limited (5-12 Hz). In contrast, the P-wave data quality is excellent. The difference in data quality is primarily due to strong, source-