Dipmeter data can provide a link between large-scale seismic and small-scale core information that is being used to identify structural and stratigraphic traps of the mature, highly faulted Gulf Coast area. This information is available on the first well drilled and can help unravel complexities inevitably uncovered in field development.

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Gas Hydrates Beneath Continental Slope off Northern California

The continental slope and plateau off northern California are underlain by a well-defined and extensive acoustic reflector that crosses other reflectors and mimics the surface of the sea floor. This bottom-simulating reflector (BSR) lies at an average subsurface depth of 250 m and is laterally continuous beneath the Klamath Plateau (water depths of 800-1,200 m) off northernmost California. Limited data show that it extends northward into offshore Oregon and seaward at least to the base of the slope (3,000 m water depth). The BSR has been mapped along the continental margin for a distance of over 130 km and underlies an area of at least 3,000 km^2.

The water depths and sediment depths of the BSR, as well as its pervasiveness, all suggest that it represents the base of a natural-gas hydrate. Using standard phase-boundary diagrams for hydrate stability, we estimate that the geothermal gradient in this area is about 50°/km. Such a gradient is higher than found along most subduction margins, possibly because the subducting oceanic crust in this region is young. This acoustically inferred gas hydrate is the first mapped along the western United States conterminous continental margin.

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Salt Tectonics and Oil Accumulation in Campos Basin, Offshore Brazil

Salt tectonics were responsible for the development of optimum conditions for accumulation of large hydrocarbon reserves in Campos basin.

The salt movements, triggered by basin tilting and differential loading, initially formed low-relief salt pillows that controlled the porous facies of the shallow-water Macaé limestones. The continuous evolution of halokinetic processes produced growth faults, rollover crests, and faulted anticlines. Upper Cretaceous turbidite sandstones were channelized in the downthrown blocks of growth faults. Salt-collapse, residual, and relief-inversion features were formed in areas where the salt was sufficiently thick.

The oil, generated in the Neocomian shales of Lagoa Feia Formation, migrated to upper formations through normal faults associated with the rift phase, stratigraphic conduits such as porous rocks and regional unconformities, and gaps created by salt flowage in the Aptian evaporite section. Oil migration to the post-salt rocks was favored by active growth faults and by the presence of a regional unconformity developed at the Cretaceous-Tertiary boundary and covered by turbidite sheet sands.

The oils underwent progressive alteration along their paths to the post-salt reservoirs. Oil-oil and oil-source rock correlations suggest that the hydrocarbons trapped in many diverse plays, although affected by bacterial degradation and water washing, belong to only one oil family. The oil degradation was probably enhanced by meteoric water invasions during Tertiary low stands of sea level in areas close to the paleocoastline. These phenomena resulted in large amounts of oil becoming heavier and enriched in sulfur, resins, asphaltenes, and cycloparaffins.

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Depositional Systems of a Tight Gas-Productive Barrier-Strandplain Sequence: Corcoran and Cozzette Sandstones, Northwest Colorado

The Corcoran and Cozzette sandstones (Campanian) are members of the Price River Formation within the Mesaverde Group of the Piceance Creek basin, and consist of marginal-marine facies between the underlying Mancos Shale and the overlying continental Mesaverde. Log-interpreted facies within the Corcoran-Cozzette vary from shale with thin siltstone to sandstone interbeds (shelf to lower shoreface), through upward-coarsening sequences (upper shoreface to foreshore), to interbedded thin coal, sandstone, and shale (alluvial plain to bay or lagoon). Plateau and Shire Gulch are the largest fields that produce gas from low-permeability (0.002-0.08 md), fine-grained to very fine grained sandstone of the Corcoran and Cozzette (over 8.4 bcf produced through 1982).

Within these fields, 7 distinct northeast-trending strandplain and barrier units have been identified. Strandplain sandstones form the lower half to two-thirds of each member, and barrier sandstones form the upper depositional units. Net sandstone thickness of the strandplain units increases from less than 20 ft southeast of the fields to more than 80 ft within Plateau field. Along the southeastern Plateau field margin, upper units in each member contain 30-55 ft thick sandstones that repeat the shoreface sequence.

Most completions are in the lower (39%) and upper (33%) Corcoran, whereas the lower and upper Cozzette each account for 14% of perforated intervals. The underlying Mancos Shale and overlying coal may account for the greater gas production of the Corcoran. Gas productivity of individual depositional units cannot be defined due to commingled production from multiple intervals in most wells.

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Coding, Storage, and Retrieval of Stratigraphic Data: FORTRAN Mapping Technique

A unique technique of coding, storing, and plotting descriptive stratigraphic data uses a series of FORTRAN programs. The basis for the technique is a search-and-store algorithm that may be modified to produce a time-series sequence of lithologic or environmental maps. Coded data are displayed as a 2-dimensional output array in the form of an inked, line-drawn planimetric view of the research area. User-specified intervals of the range of data are represented by symbology, color code, or literal string. The final product is a time series of computer-constructed surfaces representing the geologic evolution of a particular area. These surfaces may emphasize environments of deposition, sediment lithology, or any other stratigraphically derived information (porosity, permeability, consolidation, mineralogy, biostratigraphy, geochemistry).

Stratigraphic data are stored as an alphanumeric code. Data are presumed to have been derived from cores or some similar means of vertical sequence control. A single core occupies one line of a data file with an operating field width of 132 columns. Columns 1-9 and 122-132 contain location and identification data. The remaining locations (columns 10-121) consist of repeating 14-column groups. Each group contains codes describing a single stratigraphic unit. Thus, each line of the data file may describe a sequence of 8 stratigraphic units.

This technique was used to display the development of the Bay and Atlantic coasts of Delaware from 10,000 b.p. to present. A series of maps has been produced that details the geomorphology of the coast at regular chronologic intervals. This allows a detailed analysis of the evolution of a complex region as a response to known Holocene conditions of rising sea level.

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Evolutionary Importance and Economic Potential of Mesozoic Unconformities of Levant

Six unconformities are discerned in the Mesozoic section of Israel and adjacent countries. Four unconformities (mid-Triassic, Late Triassic, Late Jurassic, and Aptian-Albian boundary) are genetically related to global sea level drops and divergence of the Tethys. The divergent processes are associated with faulting, volcanism, and clastic accumulations along the passive margins of the Arabian craton.

The Late Cretaceous unconformity is associated both with global sea level drop and convergence of the Tethys. The late Middle Jurassic unconformity is related to a global eustatic low without any apparent tectonic activity in the region. All the unconformities are widely distributed and, except the one at the Jurassic-Cretaceous boundary, mark only short periods. Therefore, they serve as markers and correlation guides for the geologic evolution of the Middle East. Their economic importance can be summarized as follows. (1) The tectonic setting of the blocks overlying