of carbonate-rock horizons at reasonable depths there.

Despite this selective use of BHT data, the geothermal gradient contours do not necessarily represent areal variations in heat flow. Since all the horizons charted are petroleum reservoirs (and in their updip reaches, some are also aquifers), hydrodynamics also must be involved. High gradient anomalies may thus be due to upwelling of basinal waters; low anomalies may be a result of recharge. Hydrodynamic influences also provide a local means for delimiting structures, with uplifts commonly being the loci of upwelling and thus registering relatively high geothermal gradients. High anomalies are even more consistently correlated with fault zones, as seen along the Luling-Mexia trend in south-central Texas where there is an overlap of gradient highs among the three horizons contoured.

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40 Ain't Over the Hill

Some exploration philosophies dictate "If it's not new—it's not good" when referring to seismic exploration data. Costs for new data acquisition have skyrocketed. With oil demand down, less money is available for exploration. Prudent exploration management judgment must now consider and use a variety of data sources. Existing seismic data (conventional or 100%) is a viable alternative. Ninety-five percent of exploration is for shallow, small structures. Conventional data is very effective at depths less than 15,000 ft (4,600 m), and its tight data grid allows for detailed exploration. Systems are in operation to enhance the 100% conventional data using modern computer technology. Data recorded in the early 1940s when enhanced by today's state-of-the-art technology, is comparable in many cases to recently acquired data costing as much as 100 times more; in some cases, the results are better. Considerable time, effort, and expense have gone into the acquisition of this mass of valid exploration data. It cannot replace modern CDP data in some areas, but it can complement many exploration activities while stretching exploration dollars.

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Cyclic Sedimentation Within Point Lookout Formation (Upper Cretaceous)—A Model for Strandline Progradation and Sandstone Distribution

The regressive marine Point Lookout Sandstone in the southeastern San Juan basin, New Mexico, was deposited under conditions of relatively low wave energy, moderate tidal strength, and locally moderate fluvial input. Two idealized coarsening-upward vertical profiles characterize the preserved lithologic record. The first profile, documenting strike-aligned sandstones dominated by wave processes, is composed of the upward progression: offshore mudstone—offshore transition mudstone to sandstone—lower shoreface sandstone—upper shoreface sandstone—estuarine sandstone. The second vertical profile, reflecting local fluvial input and dip-aligned sandstone bodies, is typified by the upward progression: offshore mudstone—offshore transition (prodelta) mudstone to sandstone—delta-front sandstone—estuarine and tidal distributary sandstone. In both profiles, subaerial beachface and shallowest marine lithofacies are rarely preserved due to erosion and replacement by estuarine sandstones during seaward strandline migration.

Basinwide regression of the Point Lookout formation consists of numerous small-scale asymmetric transgressive-regressive cycles. Mappable erosive and/or non-depositional surfaces characterize transgressive events which separate genetically equivalent progradational sandstones. Duration of these small-order cycles is broadly estimated in the range of 10^4 years, probably at less than 50,000 years each. Cycle geometry is dependent upon the interplay of sedimentation rate and submergence, such that sedimentation rate controls the down-dip progradational sandstone width, and submergence influences the total cycle thickness. Because differences in thickness within the overall Point Lookout formation result from variability in cycle overlap (stacking), an understanding of cycle geometry allows prediction of local stratigraphic pinchouts which may serve as stratigraphic traps for hydrocarbons.

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Relative Depth Position of Fusulinids and Ammonoids in Late Pennsylvanian Regressive Sequences in North Texas

Fusulinid foraminifers and ammonoid cephalopods occur in mutually exclusive positions in the regressive portions of Late Pennsylvanian cycles exposed on the eastern shelf of the Midland basin in north Texas. Ammonoids occur consistently in deeper water parts of the cycles than fusulinids do, and are common in phosphate nodule-bearing dark shales that occur immediately over transgressive limestones. Their abundance rapidly decreases upward in the overlying gray shales of the regressive sequence. Fusulinids are absent from ammonoid-rich dark shales, and first appear in overlying gray shales where ammonoids are rare and of small size. Fusulinids found in these strata are small juveniles, and not transported. Full-size fusulinids occur in overlying gray shales containing high diversity biotas. Concentrations of unabraded fusulinids occur in shales located at the margins of limestones and sand sheets in the mid portions of the regressive sequences, and are formed by current winnowing of mud or accumulation in areas of reduced sedimentation. Fusulinids are rare in unequivocal shoal-water deposits, occurring mostly as transported, worn, and fragmented individuals in sandstones capping regressive sequences. These occurrences suggest that fusulinids are indicators of moderate depth, mid-shelf environments in Late Pennsylvanian north Texas sequences, while ammonoids are indicators of deeper water environments. The lack of mature fusulinids in deeper water deposits containing small juveniles lends support to the conclusion that fusulinids contained symbiotic microalgae, and were restricted in life occurrence to the photic zone.

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Significant Trends in the Downstream Sector

The characteristics of the downstream sector of the petroleum industry have changed significantly over the past decade. This paper describes the reduction in supplies of overseas equity crude available to integrated companies, decline in consumption of fuel products, changing configuration of United States refineries to use heavy and sour crude, disappearance of subsidies for small refiners in the United States, changing structure of the crude oil market and crude pricing mechanisms, and the growing importance of petroleum futures markets. The paper also discusses effects of these changes, particularly as they relate to demand for and pricing of domestic crude oil, and draws conclusions regarding the future paths these trends may take, resulting changes that may occur in this sector of the industry, and possible effects on the exploration and production sectors of the industry.

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Cyclic Sedimentation in Middle and Upper Holder (Upper Pennsylvanian) Formation, New Mexico

The Middle and Upper Holder Formation (Upper Pennsylvanian), Sacramento Mountains, New Mexico, comprises terrigenous and carbonate facies that accumulated on a narrow open-marine to restricted-marine shelf. Differential subsidence of the shelf combined with eustatic sea level changes caused cyclic deposition.

Deposition began with a varying supply of terrigenous sediments from shifting delta lobes. Several carbonate facies, lateral equivalents of the terrigenous strata, are distinguished on the basis of their allochemical constituents. Bioclastic wackestones to grainstones with cortoids and oncoids characterize open-marine intervals. Laminoid-fenestral mudstones and wackestones with oncoids were common in restricted-marine intervals. Fusulinids and algal and peloidal grainstones are common marginal-marine facies. Restricted-marine sediments were deposited after clastic influxes and during marine transgressions.

The division between the Middle and Upper Holder members can be placed beneath a channel conglomerate an unconformity that developed on a restricted platform. Deposition of predominantly restricted-marine sediments with erosional clastic influxes characterize the Upper Holder. The upward increase both in reworked and encrusted allochems might