tion of time, temperature, solution composition, and exchange ion on the clay. Solution compositions ranged from 400 to 4,000 ppm potassium in all samples. Sodium concentration ranged from 0 to 9,400 ppm, calcium from 0 to 380 and magnesium from 0 to 10 ppm. Silica removal rate increased as the temperature increased from 200 to 350°C, decreased with time, and could be approximated initially by a parabolic rate law. Within the time range (from 1 to 10 days) approximated by the parabolic-rate law, comparison of rate constants allows quantitative evaluation of the effects of solution chemistry and exchange ion. Calcium-saturation of the clay reduced the value of the rate constant, relative to sodium-saturation, by about 50%. In all analyses, increasing solution concentration of an ion decreased the rate of silica removal. On an equimolar basis, magnesium was most effective at inhibiting dissolution, followed by calcium, sodium, and potassium. Reductions of the rate constant by 50 to 75% were observed for a Na-clay with 9,400 ppm sodium and for Ca-clay with 380 ppm calcium, relative to the sodium and calcium-free solutions. Activation energies for silica removal range from 3 to 12 kcal/mole. The highest values are associated with the largest concentrations of ions in solution, thus suggesting dissolution-inhibition by an ion adsorption mechanism. These results demonstrate that silica dissolution rate depends dramatically on solution composition. This relation should be incorporated into models constructed to describe sandstone cementation or porosity enhancement by dissolution and transport of dissolved silica from clays in sandstones or interbedded shales and sandstone sequences.

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Painter Reservoir Field—Giant in Wyoming Thrust Belt

Painter reservoir field is the largest of several recent Nugget Sandstone hydrocarbon discoveries in the Wyoming thrust belt province. The field is located in Uinta County, Wyoming, 5 mi (8 km) northeast of the town of Evanston. It lies on trend with the Clear Creek and Ryckman Creek accumulations, 5 and 10 mi (8 and 16 km), respectively, northeast. These features are also productive from the Nugget Sandstone.

The field discovery, Chevron-Federal 22-6A, was drilled in mid-1977 on a seismic anticlinal structure. The Nugget Sandstone was entered at 9,728 ft (2,918 m) and 1,355 ft (407 m) were penetrated to the total depth of 11,083 ft (3,325 m). After extensive testing, on October 22, 1977, potential of the well was 410 BOPD and 859 MCFGD, on 15/64-in. choke, FTP 1,275. Flow rates as high as 1,500 BOPD were recorded on larger chokes. Gravity of the oil is 48.4° API. Active development began immediately and is still in progress.

Field limits and structural configuration are not yet fully decided, but seismic and drilling data indicate an overturned fold associated with the hanging wall of the Absaroka thrust. Present drilling has established an oil and gas column of over 1,000 ft (300 m). The producing Nugget formation is a cross-bedded, quartz sandstone over 850 ft (255 m) thick with an average porosity of 12% and permeability ranging from 0 to 1,000 md. Analysis of the oil suggests a Cretaceous source.

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Detailed Temperature Logging as Useful Tool for Lithologic Interpretation

Data from an extensive drilling program conducted on the Atlantic coastal plain by the Department of Energy suggest that detailed temperature logs may be useful for interpretation of subsurface lithology and stratigraphy. Temperature was measured to ±0.01°C and was sampled every 0.5 m. Thermal gradients were computed, and compared to lithologic sequences as derived from drill cuttings collected every 3.0 m.

Examination of a vertical thermal-gradient curve reveals that breaks in the curve correspond to major grain-size changes. Many of these breaks correspond to stratigraphic boundaries that are associated with a grain-size change. However, stratigraphic boundaries that are not defined by a grain-size change are more difficult to recognize.

Preliminary results from the first hole at Fort Monmouth, New Jersey, suggest that the correspondence between thermal gradient and grain size is due to a direct correlation between local thermal gradient and the amount of sediment at that depth that is finer than 4.0 psi. This relation allows detailed interpretation of lithologic sequences. Trends within a stratigraphic unit, such as fining-upward sequences, can be readily identified. Also, thin lithologic units (1 to 2 m thick) that were recovered within sediment cores are recognizable on a thermal-gradient curve. These results suggest that detailed temperature logs can provide valuable, detailed information about subsurface stratigraphy and lithology.

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Deep-Sea Drilling: New Dimension in Our Approach to Oceanic Sediments

Over a century ago, when sedimentologists began studying deep-sea sediments, they could grab only small samples of mud from the seafloor. To study the evolution of sedimentation with time, it became imperative to add a vertical dimension and the first long-piston cores opened an entirely new field. When the seafloor-spreading and plate-tectonic hypotheses were developed, it was clear that the best test was to add the time dimension to the models. This combination of interests made the Deep Sea Drilling Project a logical step.

At first, the project aimed at verification and time-calibration of plate tectonics, but it soon became clear that oceanic sediments contain a wealth of information regarding the paleo-oceanographic evolution of the world ocean. One striking result of drilling is that, although the evolution of the oceanic crust appears rather continuous, oceanographic conditions have undergone abrupt changes that may reflect variations in the geometry of the ocean basins. Thus, the sediment record of the past 200 m.y. is both more diversified and more discontinuous than anticipated. For the first time, vertical sequences of cores allow a study of diagenesis of