detected between the facies, owing to the high percentage of preserved intergranular porosity in the sand sheet. Intergranular porosity is preserved by the development of thick clay coats, composed of illite and smectite, which inhibited porosity reduction by quartz and potassium feldspar overgrowths.

The clay coats are derived from mechanically infiltrated windblown clay deposited penecontemporaneously with the sand. This type of clay deposition is common in modern deserts. The thickest clay coats develop in facies where the grains undergo the least abrasion, such as sand sheets and interdunes. Therefore, upon lithification, sand sheets and interdunes will retain a high percentage of their intergranular porosity and will not act as permeability barriers to fluid migration.

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Electron Microprobe Study of Mg Distributions in Recent Mg Calcites and Recrystallized Equivalents from Miocene of Eniwetok Atoll

To determine the effect of early freshwater diagenesis on Mg distributions in former high Mg calcite (HMC) cements, Mg distributions were determined by electron microprobe analysis of two groups of samples as follows: (1) HMC in limestones not yet exposed to fresh water, and (2) HMC and recrystallized equivalents after freshwater exposure. Mg varies little in pristine HMC, and traverses through the cements show no trends or large-scale zonations. Mg content is not related to inclusion abundance. Former HMC from the Miocene of Eniwetok Atoll, most of which are now radiaxial, prismatic calcites, have a much greater variation in Mg content, and traverses through the calcites display definite trends. Generally, the Mg content of the calcite is inversely correlated with abundance of inclusions.

The small variation in Mg content in original HMC cements is a valuable point to be aware of when interpreting Mg trends in recrystallized equivalents. Because Mg content can be related to inclusion abundance in recrystallized, former HMC, but not in pristine HMC, Mg trends in the altered materials most likely reflect dissolution/reprecipitation processes, not original Mg trends. A likely cause for the low Mg content associated with inclusion-rich growth layers in the recrystallized Mg calcites is relatively high rates of dissolution and reprecipitation in these relatively permeable layers. In some places, the cloudy growth layers and increased permeability are due to infestation by endoliths. Such organisms may often cause the cloudiness observed in other radiaxial calcites.

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Attempted Heuristic Approach to Total Potential Estimation of a Petroleum Basin

Several methods have been described in the literature which attempt to estimate the total hydrocarbon resources of large terrains, based on the concept of the petroleum basin. The approach described here employs heuristic procedures which incorporate optimization methods, and are applied to data files drawn from the world's major petroleum basins. Basin variables used include the area, thickness and volume of the sediments, characteristics of facies models, sedimentary cycles, and sedimentary rates; the historical record of depositional and tectonic events; environmental setting; geothermal gradients; potential of viable reservoir units. A diagnostic relationship is developed from a summation of linear nondecreasing functions, each linked with a specific variable.

The goals of this study include a numerical classification of the petroleum basins of the world, the isolation of variables which are both diagnostic and satisfactory, together with evaluations of their individual information content, and the development of a predictive technique for the estimation of the total potential in newly explored territories.

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Source-Rock Analysis, Bear River Formation, Western Wyoming Overthrust Belt

Source-rock analysis was performed on shales from the Lower Cretaceous (Albian) Bear River Formation in the Darby thrust plate of the western Wyoming overthrust belt. Measurements of total organic carbon (TOC); vitrinite reflectance (R_o); visual kerogen analysis, including determination of thermal alteration index (TAI) and kerogen morphology; and pyrolysis provide information concerning the amount, type, and maturation levels of kerogen in the Bear River shales. TOC analysis indicated that the shales are moderately rich in organic matter (1.0 to 1.5 wt. % TOC). Kerogen morphology (structured) and pyrolysis data (suggestive of type III organic matter) indicated that organic matter in the Bear River Formation is humic and gas prone. TAI and R_o values suggest that Bear River shales are in the oil-early gas-generating range (0.7 to 1.1% R_o) in the northern and southern parts of the Darby plate whereas organic maturities are substantially more advanced (1.8 to 2.0% R_o) in the central part of the plate.

The levels of thermal maturation, as defined by TAI and R_o values, were used as constraints on a Lopatin-type time temperature index (TTI) thermal model. The TTI modeling suggests that normal depositional burial could account for the levels of thermal maturation observed in the northern and southern parts of the Darby plate, whereas an additional heat source, possibly burial of the Bear River Formation beneath the Absaroka thrust plate, is necessary to account for the relatively advanced thermal maturation measured in the central part of the Darby plate.

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Dissolution Kinetics of Biogenic Carbonates—Effects of Mineralogy, Microstructure, and Solution Chemistry

Previous models of early carbonate diagenesis assume mineralogy controls alteration sequence, with magnesian calcites dissolving more rapidly than aragonites. Results of this study indicate that: (1) mineralogic effects can be overridden by microstructure; and (2) dissolved magnesium enchances dissolution rates.

The study determined laboratory dissolution rates of biogenic grains found in modern carbonate environments and evaluated the relative importance of grain mineralogy, microstructure, and solution chemistry by determining dissolution rates at various undersaturations in seawater and in freshwater solutions containing different amounts of dissolved magnesium.

Although aragonitic grains dissolved more rapidly than low-magnesian calcites of the same grain size, most aragonites also dissolved as fast, or faster than, magnesian calcites containing 12 to 17 mole % $MgCO_3$. Mineralogy alone, then, is not the sole control on reactivity.

Dissolution rate is also affected by microstructure. Microstructure determines the amount of surface area available for dissolution and may exert greater control over reactivity than