

creases among rocks with abundant diagenetic silica, effects are more pronounced: bulk density systematically varies; cohesiveness, hardness, and brittleness all decrease. Carbonate rocks have comparatively little effect, although cohesiveness and resistance to erosion increase somewhat with the presence of dolomite.

Rocks most likely to be misinterpreted are: (1) quartz porcellanites (due to matte surface, viewed as opal-CT rocks); (2) opal-CT cherts (due to vitreous surface, viewed as quartz rocks); (3) carbonate-bearing mudstones with low (10-15%) detrital contents and high (60-80%) diagenetic silica contents (due to resistance to erosion, viewed as dolomites or limestones); (4) organic shales with low (10-25%) diagenetic silica contents (due to friability of weathered rock, viewed as diatomaceous—even where silica is quartz).

Overall lithologic characteristics suggest that diagenetically-produced boundaries may be more prominent, geophysically, than stratigraphic boundaries within—or formational contacts of—the Monterey Formation. Facies trends interpreted from diagenetic boundaries, however, may be highly misleading.

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Pore-Filling Cements—Products of Shale Dewatering in Upper Miocene Stevens Sandstone, Elk Hills Field, Kern County, California

Scanning electron microscopy shows that the formation of pore-filling authigenic minerals in the deep-water fan deposits known as the Stevens sandstone at Elk Hills field is related to the expulsion of ion-charged water from siliceous shale into adjacent sandstone bodies. Extensive authigenic clay, quartz, and carbonate cements occur in the sandstone reservoirs within the first few meters of the upper or lower contact with a thick shale. All detectable authigenic phases in the Stevens sandstone, including kaolinite, quartz, calcite, ferroan dolomite, iron-rich smectite, and albite, are common to both sandstone and shale units. Cementation is most rapid and extensive in the thin sandstone beds typical of outer fan, levee, or overbank deposits.

Although many low permeability sandstone samples studied appear to contain a high percentage of detrital matrix, SEM examination shows that the "matrix" is actually a dense aggregate of authigenic kaolinite (euhedral booklets up to 30 μ). Authigenic kaolinite, which is commonly intermixed with authigenic quartz, calcite, and ferroan dolomite, occurs in both pore lining and pore bridging forms. Parts of the Stevens sandstone adjacent to thick shale, or below the oil-water contact, have authigenic albite and iron-rich smectite intermixed with the other cements. Permeabilities in the albite-smectite cemented zones are commonly less than 0.3 md.

Petroleum exploitation in zones with low sand to shale ratios and sandstone sequences less than 15 m thick may be difficult in the Stevens sandstone. Thin permeability zones, left open after the initial injection of pore fluids, commonly are occluded by later carbonate cementation. Pore-filling cements related to shale dewatering, if consistent across the basin, may limit significant finds to inner and middle fan depositional regimes in the Stevens sandstone.

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Recent Arctic Foraminifera: an Overview

The quantitative analysis of recent foraminiferal distributions in the Arctic Ocean indicates that major biofacies reflect broad water-mass relations. Shelf biofacies may also be influenced by substrate variability.

Shelf biofacies, within the Arctic Ocean surface water layer (0 to 200 m), show the most variability. Marginal marine environments, characterized by extreme variability in physical and chemical factors, are inhabited by low-diversity assemblages (predominantly *Elphidium* spp.). The permanently ice-covered shelf of the Canadian Arctic contains a dominantly agglutinated fauna while the seasonally ice-free Beaufort shelf is characterized by dominantly calcareous assemblages. These regional differences are basically variations in species abundance and dominance.

Slope biofacies are mixed agglutinated and calcareous assemblages lying beneath the Atlantic water layer (200 to 900 m). Agglutinated species generally become less abundant with depth. Lower slope and basin-plain environments are dominated by calcareous assemblages with agglutinated species virtually absent. These assemblages are indicative of the bottom water layer (deeper than 900 m).

Planktonic foraminiferal assemblages are overwhelmingly dominated by sinistrally coiled *Neogloboquadrina pachyderma*. The distribution of planktonic foraminifera in death assemblages also reflects water-mass structure. Tests are absent or rare in sediments deposited beneath the surface water layer and rapidly increase in abundance below about 200 m.

Species diversity trends in the Arctic Ocean show rapid increase in diversity across the inner shelf, a leveling off from the outer shelf to upper slope, and a decline in diversity into deeper water. Overall diversity is lower than similar depths at lower latitudes. Carbonate dissolution is not a factor in determining diversity or biofacies trends.

Comparison of Arctic Ocean assemblages with foraminiferal faunas in the Gulf of Alaska shows decreasing similarity with depth, reflecting the influence of the Bering Strait as a barrier to faunal migration.

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Late Pleistocene-Holocene Sedimentary Infilling and Faunal Change in a Southern California Coastal Lagoon

Goleta Slough (Santa Barbara County, California) is typical of several small estuaries and lagoons located along the semiarid southern California coast. The slough presently consists of dendritic, shallow subtidal channels surrounded by intertidal salt-marsh vegetation (mostly *Salicornia virginica*). It is the last remaining remnant of a large marine embayment that spread into the Goleta Valley basin as sea level rose toward the close of the last glacial period.

Stratigraphic data from numerous Goleta Valley water wells indicate that the late Pleistocene embayment