evidence from fossil fishes indicates that Lake Idaho extended into northern Utah, where it is recorded in an uninterrupted sequence 60 m thick of diverse carbonate facies in the fluviolacustrine Salt Lake Formation.

In Utah, the lake carbonates are best exposed in a landslide scarp in the Junction Hills, near the northern end of the Wasatch Range. Distinctive carbonate facies in the scarp and nearby exposures include: (1) cross-stratified oolitic calcarenite, in which ooids range from 0.1 to 4.0 mm in diameter, in foreset units from a few cm to 17 m thick; (2) algal stromatolites in cabbage-shaped heads and laterally linked hemispheres as high as 50 cm; (3) skeletal carbonate beds composed predominantly of tests of ostracods and mollusks; (4) convoluted bodies of contemporaneously slumped carbonate sand up to 3 m thick; and (5) a 55-m thick unit of lithographic limestone overlying the scarp sequence. These lake beds appear to represent the thickest and most diverse succession of nonmarine Neogene carbonates known in North America.

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New Surface-Sediment Distribution Maps for Pacific Ocean

New surface-sediment distribution maps at 1:10,000,000 have been compiled as part of the Circum-Pacific Map Project. These maps represent the first depiction of such sediments on a systematic and uniform scheme for the entire ocean basin. The primary data used were the qualitative analysis of all Pacific cores in the Lamont-Doherty Geological Observatory collection (3,710 at last count) using smear-slide analyses by petrographic microscope combined with laboratory determinations of $CaCO_3$ content for quantitative control; additional data were taken from published smear-slide descriptions by others, and secondarily from the World Data Bank and the published literature. Ten dominant sediment types are depicted, with three minor types, in a classification based upon calcareous-biosiliceous biogenic components and conventional textural attribution. Base maps for the new maps, including bathymetry, are the five, 1:10,000,000 sheets produced by the Circum-Pacific Map Project on an equal-area projection. The maps depict unconsolidated sedimentary deposits exposed on the Pacific Ocean floor, at least those presumably at the sediment-water interface recovered by coring and dredging, and do not necessarily represent Holocene or recent material. The Circum-Pacific Map Project is a cooperative international endeavor intended to summarize the relation of known hydrocarbon and mineral resources to the major geologic features of the Pacific basin and surrounding continental areas.

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Burial Diagenesis of Illite/Smectite, a Kinetic Model

X-ray diffraction analysis of clay-rich sediments of Miocene and younger age from 14 wells in offshore Louisiana supports the published conclusion that diagenetic changes in the mixed-layer illite/smectite (I/S) clays involve a progressive downward increase in the proportion of illite layers, followed by a change from random to regular interstratification and a further increase to about 80% illite layers. We also found that the depth at which these diagenetic changes begin and the degree of alteration at any given depth vary substantially from well to well and are related to the age and burial rate of the sediments as well as to present-day subsurface temperatures.

This burial alteration was modeled using a first-order reaction equation with a term to describe a non-linear increase in temperature with time. For each of several wells where we had complete data, we solved this equation for values of activation energy (E) and frequency factor (a). The resulting values of (E) are fairly consistent among wells and are close to those determined experimentally by others. The calculated values of (a) are lower by two orders of magnitude than the reported experimental values, but range considerably. The same equations can be used to calculate the degree of reaction for different times and temperatures, assuming these or other values of (E) and (a). This kinetic model should be helpful in deciphering the influences of I/S reactions on interstitial fluid pressures, fluid and rock chemistry, and shale physical properties.

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Middle Tertiary Laumontite Isograd Offset 37 Km by Left-Lateral Strike-Slip on Santa Ynez Fault, California

The Santa Ynez fault is mappable for 133 km westward from its apparent truncation by the Agua Blanca thrust on the east, nearly to Point Conception on the west. Neogene dip separation is locally large, and substantial left-lateral strike-slip is suspected. Total slip, however, is undefined, and the movement history has been obscure, partly owing to the lack of recognition of any trustworthy piercing point or steep plane.

Some Paleogene and older strata along the fault contain laumontite. This mineral is a distinctive indicator of burial changes in mineralogically immature rocks that have been heated with dilute pore waters at above-average geothermal gradients. Laumontite crystallizes from the surface to more than 7,000 m (controlled by temperature, fluid pressure, and fluid composition); alteration fronts at intermediate depths are clearly defined and locally steep.

Preliminary results of a reconnaissance study suggest that a steeply inclined northeast edge (isograd) of laumontite alteration is offset by the fault 37 km left-laterally. Pervasive alteration south of the fault is conspicuous everywhere in susceptible lithologies of the lower Matilija Sandstone (Eocene) and all older strata west of lat. 118°57′W. Alteration north of the fault is conspicuously absent wherever the same units are visible (subsurface and surface) east of the alteration edge near lat. 119°20′W. Stratigraphic and structural reasoning suggests that the laumontite crystallized about 22 to 25 m.y.B.P. Santa Ynez fault left-lateral slip necessarily predates the inception of San Gabriel fault right-lateral strike-slip (10 to 13 m.y.?B.P.).

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Sandstone Tongue of Cherry Canyon Formation and Upper San Andres Formation (Permian), Last Chance Canyon Area, Southeast New Mexico

The sandstone tongue of the Cherry Canyon Formation and the overlying upper San Andres Formation, exposed in the Last Chance Canyon area, represent a progradational sequence of slope, shelf, and nearshore systems. Based on lateral and vertical lithofacies relations, a paleoenvironmental model in a landward to basinward transect consists of the following: a supratidal through subtidal mixed carbonate-siliciclastic tidal flat; a mixed carbonate-siliciclastic lagoon; a fusulinid shelf shoal or bank complex; a predominantly carbonate open-