pelagic sediments from the incipient stage to the mature stage.

Oceanographic events, diagenetic effects, and lithologic boundaries related to the geodynamic evolution of the crust all affect large areas of the seafloor. Their imprints in the physical properties of the sediments can be recorded on seismic profiles over long distances between drill sites. Thus, for the first time, we can reconstruct the evolution of entire ocean basins from almost their time of creation and can separate basin-wide or even worldwide events from those that are only local in origin.

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Tyler Sandstones (Pennsylvanian), Dickinson Area, North Dakota—A 24-Million Barrel Soil-Zone Stratigraphic Trap

Approximately 24 million bbl of recoverable oil have been found in stratigraphic traps in the Lower Pennsylvanian Tyler Formation at the Dickinson, South Heart, and eastern Green River fields, Stark County, North Dakota. Production is from a multiple sequence of quartzose sandstones 5 to 18 ft (1.5 to 5 m) thick deposited as barrier islands along regressive shorelines. Where a shoreline sandstone is fully developed, a typical vertical sequence consists, in ascending order, of the following.

1. 1 to 6 ft (0.3 to 2 m) of black to greenish-gray, sparsely fossiliferous shale. Thin interbeds of fossiliferous carbonate mudstone may be present (shallow-neritic environment).
2. 1 to 6 ft (0.3 to 2 m) of very fine to fine-grained sandstone containing small, deposit-feeding burrow structures. Stratification is finely laminated to ripple cross-stratified. Thin interbeds of siltstone and shale are common (lower-shoreface environment).
3. 3 to 12 ft (1 to 3.6 m) of fine to medium-grained, well-sorted sandstone which commonly exhibits medium to low-angle sets of cross-stratification. These genetic units are the principal reservoir rocks (upper-shoreface environment).
4. 1 to 2 ft (0.3 to 0.6 m) of fine to medium-grained, well-sorted sandstone which commonly appears massive, but in a few cores exhibits parallel stratification. The upper few inches are clayey and mottled by root structures (foreshore environment).
5. 0.5 to 3 in. (2 to 7 cm) of coal (marsh environment).

In a landward direction (south) the shoreline sandstones interfinger with thin fossiliferous limestones, black shales, and oxidized mudstones which are interpreted to be lagoon, marsh, and mudflat deposits.

Throughout much of the subject area, porosity and permeability in the sandstones have been greatly reduced or completely destroyed by development of caliche paleosols. In the western part, the caliche consists of gray to brown limestone nodules or nodular layers of limestone in the sandstones and contains abundant pyrite. In the eastern part, the caliche has been strongly oxidized, and nodular to brecciated limestone in the sandstones is associated with reddish-brown to white clay, iron oxide cement, and scattered anhydrite nodules. It is estimated that the caliche destroys as much as 50% of the potential reservoir rock in the area and is an essential factor in the stratigraphic entrapment of the petroleum accumulations by providing an eastern (updip) barrier to migration.

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Isotopic and Trace-Element Geochemistry of Dolomite—State of the Art

Large variations in the stoichiometry, perfection of order, and substitution of iron for magnesium in sedimentary dolomite make precise interpretation of the trace-element and isotopic chemistry of this complex mineral difficult.

Redetermination of phosphoric acid fractionation factors yields values of of $10^3 \ln\alpha$ between 11.4 and 11.9 for most sedimentary dolomites (the redetermined value for calcite is 10.5). A few dolomite types apparently yield values of about 12.5, but the reasons are unknown.

Mathematical modeling of the diagenetic behavior of the trace element strontium, in conjunetion with oxygen isotopic changes during the diagenesis of limestones, substantiates recent suggestions that experimentally determined partition coefficients for calcite may not apply under actual diagenetic conditions. Presumably, an analogous situation exists with respect to dolomite.

At the present state of the art, quantitative interpretation of absolute isotopic and/or trace-element values is tenuous at best. Qualitative interpretation of regional or stratigraphic gradients in either or both of these variables appears to be of far greater utility.

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Tracks and Substrate Reworking by Terrestrial Vertebrates in Quaternary Sediments of Kenya

Reworking of sedimentary substrates by terrestrial vertebrates, especially hoofed herbivores, has stratigraphic significance comparable to that of marine sediments by benthic invertebrates. Environmental analysis of the Pliocene-Pleistocene Koobi Fora Formation in northern Kenya reveals many vertebrate footprints and trackways in fluvial and lake-margin strata. Some beds are completely reworked by trampling of many animals, presumably ungulates, with subsequent disarrangement of primary grain fabric and sedimentary structures. Examination of footprints and game trails in similar modern Kenyan environments, and comparison with those in older sediments, indicate characteristics useful for their recognition elsewhere. Preservation is best in mud and sand interbeds of medium thickness where the animal foot punches out a plug of coherent surface sediment (usually mud) and presses it into underlying units of contrasting lithology (usually sand). Thicker and less coherent muds simply mold the foot. In both situations the print is flat to concave upward with a discontinuous rim that surrounds a low spot where later wind- or water-laid sediments and bone fragments may concentrate. Further trampling of coherent surface mud disturbs the ground surface allowing wind and water to remove the