cm/year and 1.75×10^{-7} mmol/sq cm/year. The diffusion coefficient in this zone is in the range of 2.8×10^{-7} to 4.2×10^{-7} sq cm/sec. Below 4 m the diffusion coefficient was less than 5.4×10^{-8} sq cm/sec.

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Eocene Eustatic Versus Tectonic Changes on Pacific Margin—Comparison Between San Diego, California, and Coos Bay, Oregon

Distinction of eustatic from tectonic causes of sea level change in environments like the Pacific margin is difficult, but the worldwide Vail sea level curve provides a useful standard for comparison. It has been applied with apparent success to the Paleogene of southern California. At San Diego, early Eocene regression was followed by middle Eocene transgression and partial filling of a submarine canyon. At the end of middle Eocene time, regression allowed a gravelly fan-delta to debouch into the canyon. Transgression followed in late Eocene time, and then latest Eocene regression resulted in deposition of nonmarine sediments. These three sea level changes fit the Vail curve so well that eustatic changes seem indicated.

Around Coos Bay, Oregon, middle Eocene turbidites (Flournoy-Tyee) with bathyal foraminifera are overlain by siltstones with evidence for deposition in shallowing-upward neritic depths (Elkton). This prograding shelf sequence is punctuated by channels filled with siltstone or massive sandstone. Shelf deposits are overlain unconformably by a coarse, sandy, coal-bearing facies (Coaledo), which represents progradation by a delta complex across the former narrow shelf. Both here and at San Diego, deltas remained active during late Eocene transgression. Regression at the end of middle Eocene time here and in Washington correlates so closely with San Diego and the Vail curve as to suggest a eustatic fall as its cause. In latest Eocene time at Coos Bay, however, abrupt transgression with deposition of muds (Bastendorf) at lower bathyal depths occurred while widespread regression characterized southern California. Seemingly in Oregon, local tectonic subsidence masked the latest Eocene eustatic fall.

Preliminary comparisons between widely scattered synchronous localities suggest that the Vail curve offers promise for ultimately distinguishing the elusive causes of transgression and regression even in tectonically mobile regions.

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Survival Strategies for United States Uranium Producers in 1980s

The dramatic fall in the spot price of uranium oxide during 1980 from $42 per pound to around $25 has been accompanied by a sharp cutback in uranium production, planned new mines, and exploration, which is of particular concern to geologists. Against this background in the United States, new mines in Australia, Canada, South Africa, and other foreign countries continue to come on stream. Despite lower prices for yellow cake, these mines remain economic for only one reason—they are mining ore that is 3 to 4 times the average grade of ore mined in the U.S.

In addition to this classic ore grade/price relation, the structure of the uranium industry is undergoing change to increasing captive production. For the independent miner and seller of uranium, the shrinking merchant market and shift in the economics of the world uranium industry calls for a reexamination of his role in the industry both in the U.S. and in the world.

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Deep-Sea Oxygen Isotope Record and Sea Level Fluctuations

The oxygen isotopic composition of deep-sea microfossils reveals two trends for the past 100 m.y.: a long term (10^8 years) increase in the ^{18}O content of deep-sea benthic foraminiferal carbonate which suggests a progressive cooling of polar regions related to changes in ocean basin-continent geometry, and the poleward shift of land area since the Cretaceous; and 10^6-year steplike fluctuations in the ^{18}O content of planktonic and benthic microfossils related to changes in the area of shelf seas, relative and eustatic sea level, and polar glaciation.

Benthic isotopic results, after correction for probable ice volume effects in the Oligocene and post-middle Miocene, correspond closely to sea level fluctuation. This correlation appers to be the result of climatic (largely temperature) effects caused by changes in global albedo patterns. During the sea level highstands in the Cretaeous and early Tertiary, shallow seas covered more than 50×10^6 sq km which maximized heat storage in the ocean. The planetary thermal gradient was low, with polar regions producing warm bottom waters (10 to 15°C). In this regime, sea level fluctuations controlled climate. The cause of the sea level fluctuations is unclear. After the middle Eocene, falling eustatic sea level, the reduction of shelf seas to less than about 30×10^6 sq km and the initiation of glaciation in Antarctica produced a rapid cooling of ocean bottom waters and a change in the global heat flux. In this regime, which became fully established with the closure of Tethys and the expansion of southern hemisphere glaciation in the Miocene (ca 15 m.y.), there has been a progressive cooling of deep waters in the ocean and an increase in the vertical thermal gradient. Eustatic and relative sea level fluctuations have been controlled by climatic events in polar regions.

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Carboniferous-Permian Boundary in Southwestern United States

Carboniferous and Permian rocks are exposed in several long sections in southeastern Nevada, the most accessible and best exposed section being in North Arrow Canyon, Clark County. Carboniferous and Permian strata, in steeply dipping beds along the nearly level canyon, are rich in many fossils which have been studied by specialists and students for several years. The section is considered excellent as a reference stratotype for the Carboniferous-Permian boundary in the western cordilleran region.

The sections to the north in east-central Nevada lack most of the late Carboniferous while those to the east in western Arizona contain only a few marine zones. The section to the south near Lee Canyon is more complete but not as well exposed, and access is difficult.

Fusulinids are among the fossils well represented in the succession; they include a progressive series of species and genera from early *Millerella* to advanced *Triticites* in the Car-