of the 5–3-m. y.-interval or upper Pliocene of southern California. (7) Coiling preferences of *Globigerina pachyderma* are predominantly dextral during the past 11,000 years, mostly sinistral from this point back to 3 m. y. B.P. (Pleistocene), dextral although somewhat variable in the 3–5 m. y. interval (upper Pliocene), sinistral in the 5–7 m. y. interval (middle Pliocene), dextral in the 7–10 m. y. interval (lower Pliocene and uppermost Miocene), sinistral in the 10–11 m. y. interval (upper Mohnian-Delmontian transition), and dextral in its earliest occurrences of about 11–12 m. y. B.P. (within the Mohnian).

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FUTURE OF PETROLEUM GEOLOGISTS

The future of the petroleum industry continues to be bright because of the ever-increasing demand for energy both in the United States and the rest of the free world. There will continue to be a demand for well-trained petroleum geologists both in this country and abroad.

The large oil companies will continue to offer high salaries and increasing technical challenge to those petroleum geologists who can put "Rocks and Dollars" together.

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SEDIMENTARY PROCESSES OPERATIVE ALONG WESTERN LOUISIANA SHORELINE

The western Louisiana shoreline represents the complex interaction of low-energy wave turbulence along a broad, shallow shelf, a small tidal range, and a varying sediment supply of very fine sand and mud. These are in turn modified by shoreline orientation and complex offshore bathymetry, proximity to brackish estuary tidal efflux, and varying nearshore salinity.

Three dominant types of strand-line sedimentation have been chosen as typical of the modern shoreline in the study area. Mud flats, both tidal and subaqueous, form one type. Another dominant type of strand-line deposit is described as a sand-rich, "normal" beach. Facies relations of the "normal" beach are similar to the shoreface sequence described for the tidal mud-flat setting. Intermediate between mud flats and "normal" beaches is a transitional type of strand line consisting of thin swash-zone and breaker-bar deposits resting on eroded, earlier-formed mud-flat and marsh sediments.

Mud-flat progradation is initiated by establishment of a shallow-water breaker-bar system, providing a protected site for subaqueous deposition of mud. As sedimentation raises the level of the mud flat to an intertidal level, sand-rich breaker-bars of low amplitude slowly migrate shoreward across the flat. The flat ultimately becomes intertidal. Thin washover-fan sands associated with this setting constitute one form of strand-line ridge found in the Recent chenier plain.

Shoreface sedimentation in the "normal" beach differs from that of the mud flat in having fewer but considerably larger breaker-bars and a rapid shoreward transition into swash-zone, berm, and thick washover-fan sands. The pronounced increase in thickness of washover-fan sands in the "normal" setting provides a second distinct type of strand-line ridge or "chenier."

The intermediate nature of the transitional beach setting is emphasized as a temporal, highly dynamic phase in strand-line development. Although apparently retrogradational, it nevertheless represents a dominantly progradational strand line which builds seaward at an intermediate rate compared with quickly prograding mud flats and relatively slowly prograding "normal," sand-rich beaches.

A classification of progradational shoreline types based on "energy of coastal processes" *versus* "sediment supply" (*e.g.* Bernard, 1965) can be used to typify rates of progradation in the study area. Energy of coastal processes include (1) deep-water wave period, (2) orientation of shoreline with respect to prevailing wave front, (3) width of inner shelf, and (4) tidal range. Sediment supply includes (1) fresh-water efflux and salinity variation, (2) suspended mud supply, and (3) sand supply

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SEDIMENTS OF NHA TRANG BAY, SOUTH VIET NAM

Textural and chemical analyses of 115 sediment samples from Nha Trang Bay on the central coast of South Viet Nam have permitted detailed mapping of the sediment characteristics within this relatively small area. The results show marked juxtapositions of sediment types and ages. Two areas of relict sand left from a time of glacially lowered sea-level are surrounded by Recent detrital and carbonate material. The exposure of these relict sands is a result of the sweeping away of sediment entering the bay by strong currents that develop during the summer and winter monsoons.

Sediments within the bay fall into four basic groups: (1) clayey silt in low-energy areas between islands and in deeper water on the fringes of the bay, (2) sandy silt to silty sand extending out from the river mouths, (3) sand with low carbonate percentages including the relict sand in areas of vigorous currents; and (4) sand with high carbonate percentages; some of this sand occurs on shallow banks and exposed peninsulas and is in equilibrium with the energy environment, whereas that in shallow protected areas does not reflect the energy system. The distribution of organic materials in the bay is closely related to these sediment types. The highest concentrations of carbon and nitrogen occur consistently in the clayey silt areas with intermediate and low concentrations in the sandy silt-silty sand and sand areas, respectively. Exceptions to this are revealed in the plot of carbon/nitrogen ratios where high organic carbon contents occur in coarse-grained sediments of the nearshore and shallow-bank areas.

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ROLE OF MEMBRANE HYPERFILTRATION ON ORIGIN OF THERMAL BRINES, IMPERIAL VALLEY, CALIFORNIA

Unique saturated Na-Ca-K Cl thermal brines (380°C.) are recovered from geothermal wells near the Salton Sea, Imperial Valley, California. The reservoir chamber is fractured metamorphic rock (mainly greenschist facies) at 3,900–8,000 feet. The shallow waters are relatively dilute $NaHCO_3$-Cl, high in B; NH_4, I, and F are present; the Na/K ratio is less than in the brines; CO_2 gas is abundant. The waters of these brines are dominantly meteoric, as evidenced by