Along the southern shores of the Persian Gulf, Holocene carbonate sediment infilling of coastal lagoons has generated extensive salt-encrusted, supratidal surfaces or coastal sabkhas, which are the site of penecontemporaneous dolomitization. Recent diagenetic dolomite is present mainly in the unlithified, upper-intertidal facies sediments, although minor quantities are at greater depths in other sediment facies. The aragonite fraction of the sediment is replaced, and the process may be complete (100% dolomitization) within 1,500 years after primary sediment deposition. Dolomitization is local in effect, depending on a combination of fluids high with $^{m}Mg^{++}/^{m}Ca^{++}$ ratios, a rapid interstitial flow rate (2-3 cm/yr), and a high surface-flooding frequency; the flanks of flood channels and peninsulas best achieve these requirements, and their primary sediments may be completely dolomitized. The local distribution of intensively dolomitized sediments is related to rapid sedimentation and associated shoreline progradation (approximately 2 m/yr); at slower progradation rates, more extensive dolomitization would ensue. The diagenetic dolomite occurs as 1-4 micron rhombs, is nonstoichiometric (Ca_{51-54}), is partly ordered, has $\delta O^{18} = +2.5$ to $+3.7$ °/₀₀, and $\delta C^{13} = +4.0$ to $+4.4$ °/₀₀. Radiocarbon ages increase progressively inland from the present shoreline (1,500-3,500 years ago); these dates, however, reflect more the age of the original sediment than the age of the dolomitization event, most of the carbon in the reaction being derived from the original aragonite. The dolomitizing fluids are of marine origin and have the following characteristics: 3.25-3.75 $^{m}Cl^{-}$/Kg: $^{m}Mg^{++}/^{m}Ca^{++}$ ratios between 7 and 22, pH between 6.3 and 6.9, a minimum $^{P}CO_2$ of 10^{-3} to 10^{-2} atmospheres, temperatures between 25° and 40°C and at saturation with respect to gypsum and celestite. Associated early diagenetic minerals within the coastal sabkha sediments include huntite, magnesite, gypsum, bassanite, anhydrite (nodular), celestite, and halite. Many ancient dolomites of probably analogous, penecontemporaneous, sabkha origin can be shown to have undergone later diagenetic recrystallization with a concomitant coarsening of grain size, approach to a stoichiometric composition, an increase in ordering, and a loss of trace cations.

KOLPACK, RONALD L., Environmental Geology, Univ. Southern California, Los Angeles, Calif.

COASTAL ZONE—SEARCH FOR OPTIONS

Man's involvement with the water environment is most intense in the shallow-water zone bordering landmasses. This area provides food, pleasure, mineral commodities, a means of transportation, an avenue for military exploitation, and a convenient place to dump waste. Historically, rewards for utilization were accrued by the aggressive, imaginative, respectful, and the lucky; losses were sustained by those who tempted or disregarded nature. This relation was direct and accountability was short-term.

Studies have been presented in which evidence was cited for environmental degradation or an apparent increase in the level of contaminants in the water realm as a result of man's activities. Journalists have publicized these studies, but often have neglected or ignored the less sensational reports which are not amenable to instant analysis. Consequently, the public reacts in alarm by advocating stricter governmental control or abolition of activities which may be detrimental to the environment. Conflicts among users arise and a recipe for a confrontation battleground evolves.

This enigmatic situation poses an interesting question: is anyone interested in comprehensive evaluations which require great effort and understanding; or has our capacity for reasoning been limited by impatience, cynicism, and emotionalism?

The present dilemma to choose between two alternatives can be illustrated by several incidents involving environmental concern in coastal waters. These case histories lead to the question: are we really limited to only 2 options?

KRINSLEY, DAVID, Dept. Earth and Environmental Sci., Queens College, City Univ. New York, Flushing, N.Y., and N. KEITH TOVEY, Dept. Engineering, Univ. Cambridge, Cambridge, England

STUDIES OF QUARTZ SAND GRAINS BY CATHODOLUMINESCENCE

Surfaces and cross sections of individual quartz sand grains have been examined and compared in the cathodoluminescence (CL) mode with the scanning electron microscope. Six kinds of nontopographic CL have been found; the presence of non-CL areas commonly is due to the occurrence of a disrupted lattice layer wherever grinding has taken place. This layer is shown to be irregularly distributed, both in cross sections and on grain surfaces; its distribution, depth, and intensity can be examined in detail for the first time. Reversal of CL contrast has been accomplished experimentally by raising the temperature of grains above the alpha-beta transition in quartz (573°C); a similar reversal, found in certain natural sedimentary grains, suggests that they likewise have been heated above the transition temperature. Fractures present on natural grain surfaces in the CL mode can be observed in omissive-mode photographs and probably could be used for environmenta. interpretation. Detail of the same kind, observed in the CL mode but not in the emissive mode on other grains, could further extend the use of sand-grain surface textures for environmental interpretation.

KVENVOLDEN, KEITH A., Planetary Biology Div., NASA-Ames Research Center, Moffett Field, Calif.

DIAGENESIS OF AMINO ACIDS AND THEIR ENANTIOMERS

Diagenesis of amino acids in sediments and shells involves many processes including (1) conversion of one amino acid to another, (2) interconversion of amino acid enantiomers from dominantly L- to D, L- configurations, and (3) ultimate destruction. Amino acids, generally in the form of biopolymers such as proteins, enter the lithosphere from the biosphere. Hydrolytic processes begin immediately to release monomeric amino acids, and in some shells amino acid polymers no longer exist after about 12 m.y. As with any other organic compounds, destruction of amino acids occurs with time, but for many amino acids, such as glycine, alanine, valine, leucine, and isoleucine, the rate is very slow. Evidence for conversion of one amino acid into another is provided by observations wherein certain amino acids tend to disappear with time, while new amino acids are created. For example, pipecolic acid recently found in Pleistocene and Miocene *Mercenaria* is thought to have been derived from lysine through deamination and internal cyclization. The mechanism for the conversion is not yet known.

Interconversion of amino acid enantiomers also takes place with time, L-amino acids racemize to D, L-amino acids at different rates. In deep-sea sediments from the Atlantic Ocean and Caribbean Sea, valine, glutamic acid, and leucine racemize at slower rates than do phenylalanine, aspartic acid, alanine, and proline. Rates of racemization are temperature dependent; in the lithosphere, racemization of amino acids should be complete in about 15 m.y. at the maximum. Measurement of the extent of racemization of amino acids provides a potentially useful geochronologic tool for the very late Cenozoic Era.

LAMAR, DONALD L., Earth Sci. Research Corp., Santa Monica, Calif.

MICROSEISMICITY AND RECENT TECTONIC ACTIVITY, WHITTIER FAULT AREA, CALIFORNIA

The Whittier fault is a principal strand of the San Andreas fault system near the southwest edge of the Puente Hills in the northeastern Los Angeles basin. Physiographic evidence indicates recent movement along the Whittier fault and its southeast extension, the Elsinore fault. Exposures in test trenches