Subsurface sediments in the Cape Kennedy area are widely diversified in sorting, texture, composition, and macrofauna. Major lithologic types are commonly correlative between cores; however, individual cores commonly contain several distinct changes in sediment type. Lithologic characteristics and thickness of strata suggest rapid changes of depositional environment; marsh, lagoon, littoral, and open-shelf facies are represented. Most of the sediments studied were produced by bottom erosion of Pleistocene surfaces and by shoreward migration and mixing of an outer-shelf oolitic sand with an inner-shelf quartzose-molluscan sand during the Holocene transgression.

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PROBLEMS OF CHERT IN OCEAN

Mesozoic-Cenozoic pelagic sedimentary cherts exposed in mobile belts or recovered from the deep sea are diagenetic alteration products of a variety of primary sediments rich in opaline skeletons.

The abundance of skeletal opal in fresh sediments depends on its rate of production, losses to solution during transport and before burial, and dilution by other sediment. The chief effect of volcanism on silica deposition is probably one of inhibiting solution. Maximal quantities of silica are buried in the shallower pelagic sediments, but the percentage of organic silica is normally highest near the carbonate compensation depth, where dilution by carbonate is slight. These normally deep sediments are most susceptible to wholesale silicification (radiolarites). Widespread cherts in otherwise noncherty sequences (Reflectors A and B in the North Atlantic) record chemical changes from a regime of silica solution to one of silica retention and back.

Predilection of chert for permeable beds indicates localization along zones of water movement. Paragenesis may be complicated. In normal abyssal sediments, complete conversion of skeletal opal requires 30–60 m.y., but in areas of rapid burial, high heat flow, and faster connate water flow, the rate must be more rapid.

Two organic events have greatly affected patterns of chert sedimentation. First was the rise, in the early Paleozoic, of organisms with siliceous skeletons; prior to that time silica had been precipitated inorganically. Second was the rise of planktonic carbonate producers during the Jurassic, resulting in restriction of highly opaline sediments to great depths (radiolarian oozes) or to areas of unusual circulation (diatom oozes).

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VARIATIONS IN HEAVY MINERAL COMPOSITION DURING TRANSPORT OF SHORT-HEADED STREAM SANDS

Past studies on variation in heavy minerals along large streams have shown that progressive change, or lack of it, during transport is due to abrasion, dilution, hydraulic conditions, and sorting on the basis of size, density, and shape. In the light of these studies assessment of the variation in heavy minerals was made along the short-headed Canadaway and Cattaraugus Creeks in western New York. In that area the glacial drift and moraine deposits are ready sources of heavy minerals. Major annual erosion and transportation of these materials occur during peak streamflow in March-April and deposition during decreased flow in the succeeding months. Thus, during the summer of 1968, efforts were made to collect part of the bedload deposited during the interim period of optimum and minimum streamflow.

Analyses of samples of similar size distributions show that variation in heavy minerals during transit occurs along these creeks and the relation is best developed in the coarse fractions. Results show a decrease in garnet and complementary increase in hypersthene, hornblende, and tourmaline downstream. Comparison of variation in heavy minerals reveals that although overall difference in weight percent exists, the relation of these minerals and the transport direction do not differ significantly between the two creeks.

Consideration of the possible causes of heavy mineral variation indicates that it is not due to dilution and abrasion. This modification may result from progressive sorting on the basis of size, density, and shape as produced by the annual current-flow fluctuations.

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MINERAL DEPOSITS FOUND IN EXPLORING FOR PETROLEUM

The greater part of the world's supply of mineral commodities, both in monetary value and tonnage, is obtained from strata lying within or near petroliferous regions. Commercial deposits of many metals as well as nonmetallic minerals are present in such sediments.

Serendipity has been responsible for the discovery of numerous valuable deposits of various nonhydrocarbon minerals as a by-product of exploration for petroleum. Such discoveries include enormous reserves of aluminum ore in northern Australia; a major copper deposit in New Guinea; saline deposits comprising various magnesium, potassium, and/or sodium minerals in many parts of the world; most of the sulphur deposits produced by the Frasch process in the USA and Mexico; and uranium in Texas. Hundreds of other valuable deposits probably have been found but were not recognized.

Making full use of all the geologic information that can be derived from petroleum operations inevitably will lead to discovery of additional mineral deposits with little extra cost, and thus increase the return on investment. Conversely, thorough study of stratigraphic zones containing commercially valuable minerals commonly will improve the interpretation of geophysical data and thereby assist in petroleum exploration.

In order to attain maximum profit from exploration, companies should: (1) itemize all mineral possibilities in the area of operations; (2) train personnel to recognize and report all minerals of economic interest; (3) collect and examine cuttings from all shot-holes and wells, from surface to total depth; and (4) take full advantage of the wealth of geologic and geophysical data already in the files.

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MAGNESIUM-RICH WATER FROM EVAPORITE-BEARING SHALES, AND DIAGENESIS OF SUBJACENT CARBONATES—KEUPER-MUSCHELKALK, IBERIAN RANGE, SPAIN

Triassic rocks of the Iberian Range consist of a succession of continental sandstones (Buntsandstein), peritidal carbonates and shales (Muschelkalk), and continental claystones and evaporites (Keuper).

Dolostone, which comprises 75% of Muschelkalk carbonates, bears no relation to sedimentary facies; to the contrary, it is demonstrably joint-controlled. This evidence, together with the near absence of "dedolomite," indicates a late and sustained source of magnesium in excess of that expected from an evaporite-bearing assemblage.

Water samples from Keuper "salinas" (salt-producing evaporating pans) show that meteoric water descending through the Keuper evolves into a brine with Mg:Ca ratios locally 4:1, despite the abundance of gypsum and anhydrite. Samples of Keuper subjected to simple solution in the laboratory liberate Ca:Mg in the ratio of 3:2, which is probably sufficient for dolomitization under reasonable subsurface temperature-salinity conditions. X-ray analysis indicates chlorite as a source of the magnesium, the solubility of which probably reflects diagenetic fixing in the Keuper evaporite basin. The composition of Keuper water, aided prior to unloading by geothermal gradient, is thought to be responsible for Muschelkalk dolomitization.

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PROGRESS IN ICHNOLOGY—STUDY OF ANIMAL SPOOR

Trace fossils—the tracks, trails, burrows, borings, and other spoor made by ancient organisms—are difficult to identify and classify phylogenetically but can be assigned relatively easily to various taxonomical, behavioral, and preservational categories. Analyses of these aspects of spoor can yield considerable information that is potentially very useful in geology.

The most significant contribution of spoor to date has been in paleoecology and environmental reconstructions, including recognition of local and regional-temporal facies changes and documentation of individual paleoecologic parameters. Spoor are potentially valuable indicators of bathymetry, currents, food supplies, aeration, rate of deposition, depositional history, and substrate stability; they also may be useful to some extent in establishing ancient temperature and salinity regimes.

The chief contribution of spoor to paleontology is partial resolution of "the problem of the incomplete fossil record." This includes, inasmuch as possible, the identity, behavioral patterns, and certain evolutionary trends among ancient organisms not otherwise represented in the fossil record. Reconstruction of diversity and trophic relations is important and generally feasible.

Trace-making animals are important sedimentologically because they destroy previous sedimentary structures and fabrics and produce new structures and fabrics. Spoor have certain potential even in biostratigraphy and local correlations. Many trace fossils are excellent geopetals.

Ichnology—the study of spoor—has developed slowly relative to other branches of geology, but the subdiscipline is now on the threshold of widespread acceptance and considerably increased application.

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THE GEOLOGICAL ATTITUDE

Geological ideas from the beginning have clustered on a succession of concerns which can be related generally to social and industrial pressures. Some concerns, in response to contemporary stimuli, swelled explosively into well-defined constellations of activity to which names such as "creation," "evolution," and "conservation" apply. Other culminations of geological activity, more limited in their reference, relate to changes in technical capability, and seem to last about a quarter of a century.

Always present in geological thought, there has existed an attitude of special relationship to the earth; the geologist is an intermediary between his culture and its physical substructure. The actions of geologists in our civilization have profoundly altered concepts of secular time, the church, man, and the balance of nature. In the last, social pressure must be near its peak.

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BUILDING NEW MARSHES AND ESTUARIES IN COASTAL LOUISIANA THROUGH CONTROLLED SEDIMENTATION

Coastal Louisiana wetlands are a product of Mississippi River delta building that has occurred over a period of 3,000–5,000 years. The building processes were very nearly balanced. In modern times man's use of the area (flood control, navigation improvement, exploitation of petroleum and other minerals, road building, *etc.*) has seriously altered the natural balance. As a result, overbank flooding has been virtually eliminated and river flow is confined to channels discharging into the outer shelf area. Most transported sediment is now deposited in the deep Gulf of Mexico or along the continental shelf. Saltwater encroachment in the deltaic estuaries has been detrimental to fauna and flora. Even though considerable sediment deposition has resulted from the historic Atchafalaya River diversion and growth of subdeltas, comparative map studies indicate a net land loss rate of 16.5 sq mi/year during the last 25–30 years. Land loss is only one symptom of general environmental deterioration.

A dynamic management plan is necessary for better utilization of combined freshwater discharge–dissolved solid and transported sediment input of the Mississippi River. Controlled flow into estuaries will reduce salinity encroachment and supply needed nutrients. Large areas of new marshland and estuarine habitat can be built by controlled subdelta diversion. Studies of natural subdeltas indicate that these systems are amenable to environmental management; salinities and sediment deposition may be manipulated to enhance desired conditions.

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SEDIMENTOLOGY AND ECOLOGY OF HOLOCENE CARBONATE FACIES MOSAIC, CAPE SABLE, FLORIDA

The Holocene carbonate sediments of Cape Sable, Florida, form a facies mosaic in which facies are controlled by frequency and duration of flooding. The 4 following zones occur:

1. Flooding 0–5% of the time (*supratidal*)—massive to crudely bedded sandstone or siltstone, abundant birdseye, low species diversity, high abundance of single species with uniform-sized individuals.
2. Flooding 5–25% of the time (*high intertidal*)—low domal and flat laminated algal stromatolites, desiccation cracks and flat laminated pebbles, low species diversity, low abundance of individuals, microscopic invertebrates only.
3. Flooding 25–90% of the time (*low intertidal*)—