Some carbonate muds deposited in intraplatform basins of the Bahamas contain sufficient organic matter to be considered potential source rocks. The sediments are Holocene to late Pliocene and immature.

Total organic carbon (TOC) values range between 0.1 and 2.58% for the basinal sediments of Tongue of the Ocean and Exuma Sound, though averaging 1.0% in the Tongue versus 0.33% for Exuma Sound. The difference appears to be related to the sedimentation rates of the basins, estimated to be 10 to 200 mm/10^3 years for Tongue of the Ocean and 4 to 50 mm/10^3 years for Exuma Sound.

In Tongue of the Ocean we have correlated cyclic variations in TOC with fluctuations of sea level. High sea levels are recorded by aragonite-rich basinal muds (peri-platform ooze) with an average TOC of 0.7% and an abundance of organic-rich turbidite muds with TOC averaging 1.21%. Peri-platform ooze deposited during low sea levels is calcitic, contains few turbidites, and generally is organic lean—0.1 to 0.3% TOC. Of the organic matter, δC^{13} suggests different sources for the organics deposited in the turbidite muds (−13.9 to −16.4% PDB) and the peri-platform ooze (−17.4 to −26.13% PDB). Cyclic variation in organic content in the Tongue is portrayed in the color of the muds: green muds have high TOC, while brown and white muds are leaner. Cyclic variation in sediment color also occurs in Exuma Sound and Columbus Basin. Basin depth does not seem to influence the TOC: Columbus Basin, the deepest, appears to be as rich in organics as the Tongue (shallowest). No clearcut correlation with kerogen types is seen at present.

Gas chromatographic analysis of organic matter evolved from samples heated only to 350°C demonstrated that the material evolved was not simply vaporized, but represented the thermal cracking of relatively heat-sensitive material. Mass spectral pyrolysis experiments on some samples suggests the presence of amino acids or proteins.

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Continental Borderland off Northern Baja California, Mexico: Rifted Segment of Pacific Margin

The California continental borderland consists of two geomorphic provinces: the northern borderland which forms the Pacific margin off southern California and the southern borderland which forms the margin off the northern Baja California peninsula. Although these two provinces are longitudinally continuous, bathymetric, geophysical, and bottom sample data suggest that their structure, lithology, and tectonic evolution differ markedly. Relative to the northern borderland, the southern borderland is on the average much deeper (0.5 to 1 km), ubiquitously volcanic (basaltic), and from heat flow and isostatic considerations, underlain by much thinner crust. Seimsic reflection profiles across the southern borderland show a thin veneer (generally <300 m) of relatively undeformed strata overlying an irregular nonstratified acoustic basement. Dredge hauls from exposed basement highs along these profiles have yielded chiefly basaltic rocks.

Major northwest-southeast-trending synclinoria bound the northwestern and southeastern limits of the southern borderland (Valero Basin and Vizcaino Bay, respectively), and the synclinal axes of these basins strike directly into the southern borderland. Seismic refraction data across these synclinoria indicate that they contain more than 3 km of sedimentary strata (above 6.6 km/sec basement) or at least 10 times the thickness of sedimentary strata recognized on seismic reflection profiles that cross the southern borderland.

The available data suggest that the southern borderland is a rifted segment of the Pacific margin. The extent of rifting is estimated to be about 260 km on the basis of basalt outcrops and seismic reflection profiles. Rifting had probably begun by 17 m.y. ago, and is inferred to be related to the southward migration of the Rivera triple junction.

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Distribution of Recent Benthic Foraminifera from Newfoundland to Yucatan

Benthic foraminifera are important environmental and paleoenvironmental indicators. In 1978, we commenced a project to produce a syntheses of the depth and geographic distributions of all species of recent benthic foraminifera recorded on the continental margins of North America using all published data (800 papers published over the past 150 years). To date, this project has resulted in computerized compilations for the Atlantic continental margin, the Gulf of Mexico, and the Caribbean region. Data manipulation has produced maps dealing with individual species distributions, genus distributions, and foraminiferal zoogeographic provinces. Geographic and depth distributions for over 300 commonly recorded species are tabulated for the eastern continental margin and the Gulf of Mexico. Four depth-related groups of species are noted for the east coast and 14 for the Gulf of Mexico. Species distributions can be used as paleoenvironmental (including paleobathymetric) indicators back at least to the Miocene and genus distributions back to the late Cretaceous.

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Mixing-Zone Origin of "Primary" Dolomite Grains from Cretaceous Marine Sandstones of Western Interior Basin

In a series of papers in the early 1960s, the occurrence of "primary" dolomite grains in Cretaceous sandstones of the Western Interior basin was documented. These grains are usually single crystals, with a rhombic outline that has been modified to varying degrees of roundness by abrasion. The grain size of the dolomite mimics that of other grains in the sandstone. Because these dolomite grains are confined to marine facies, it is unlikely that they are extrabasinal. Also, there is no evidence that the dolomite formed by replacement of other grains. The remaining possibility is that dolomite formed within the basin before significant burial.

Petrographic and stratigraphic evidence from the San Juan basin suggests that primary dolomite was formed in a mixing zone of meteoric water that discharged into shoreface environments. Thick coastal-plain coal sequences and paleoclimatic reconstructions support the existence of a large meteoric flow system in the western part of the Western Interior basin during the Cretaceous. As meteoric water discharged into shoreface sediment, dolomite rhombs were precipitated in the interstices of uncompacted sands. Some of the dolomite thus formed was close enough to the ocean bottom to be later eroded, abraded, and redeposited during storms or transgressions. Dolomite rhombs that were not eroded are similar in appearance to resedimented grains, but show no evidence of abrasion.

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Origin and Geochemical Correlation of Near-Surface Oil and

Asphaltite Deposits of Southeastern Oklahoma

Three Oklahoma oils and six associated asphaltites were studied and found to have a common source, based on geologic and geochemical criteria. Bulk analyses reveal the following: (1) vanadium and nickel are enriched in the asphaltite relative to the oil by an average factor of 41, although the V/Ni ratio only ranges from 0.5 to 3.5 in most of these samples; (2) the average H/C atomic ratio decreases and the average O/C, N/C, and S/C atomic ratios increase significantly from oil to asphaltite; and (3) stable carbon isotope ratio values show that the ratio of ^{13}C to ^{12}C in the asphaltites is essentially the same as that in the oils, being approximately -29.8 ppt (relative to PDB) in almost all cases. These bulk analyses and analysis of isolated chemical fractions of these materials indicate that the asphaltites and oils are of common origin and have a similar temperature history. These data further indicate that asphaltite is a secondary product after oil and that biodegradation, accompanied by other near-surface effects, is the causal mechanism for asphaltite formation. This conclusion is supported by the geology of the region, insomuch as local listric faults could have served as conduits of migration, bringing deeper oil into the zone of near-surface alteration.

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Mineralogy and Petrology of Texaco's Hobson Uranium Deposit, Karnes County, Texas

Texaco's Hobson uranium deposit is located in Karnes County, Texas, along the prominent south Texas uranium trend. The uranium mineralization occurs in the Deweesville Sandstone of the Whitsett Formation of the Eocene Jackson Group. The host rock is a friable, fine-grained, well-sorted, highly porous and permeable sand interpreted to be a beach deposit. The sand contains significant volcanic constituents and ranges in composition from arkosic to tuffaceous. Locally, the host sand contains hard, dense opal-cemented sandstone beds. Bentonitic shales underlie and overlie the minerlized sand unit.

Geometrically, the Hobson uranium-bearing zone resembles an elongated roll-front type deposit. Chemical uranium values compared with gamma ray equivalent uranium values indicate that the uranium has been dissolved from the updip side and precipitated on the downdip side of the roll-front.

Details of the uranium mineralization were studied using thin section microscopy, autoradiography, X-ray diffraction, scanning electron microscopy, and energy dispersive spectroscopy techniques. The uranium mineralization occurs in the pores of the sand, as sand-grain coatings and as replacements of sand-size and smaller grains. The uranium mineralization is commonly associated with pyrite and other opaque grains. Favored hosts for uranium, other than pore openings, appear to be clay aggregates, altered rock and glass fragments, and carbonaceous plant debris. Aggregates of coffinite were identified by XRD and SEM-EDS analyses. Some uranium mineralization also appears to be dispersed, and is postulated to be adsorbed on the clay and carbonaceous matter.

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Domestic Uranium Exploration—Another Perspective

Inherent in a decision to spend money in exploration is an explicit or intuitive judgment that the orebodies found will be rich enough and the market strong enough to support profitable production reasonably soon after discovery. For uranium, these judgments are based upon general principles that derive from historical behavior patterns in other cyclically priced resource commodities, and upon extrapolation of recognized trends that pertain to uranium's unique characteristics. Some of these factors are discussed in an examination of strategies which could be pursued in uranium exploration and development for the 1980s.

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Toward a General Theory of Vertical Migration

Between 1951 and 1954, the Southwest Research Institute of San Antonio evaluated over a hundred little known exploration methods and found only geochemical, radiometric, and electrical methods to be worthy of careful scientific study. Critical examination of the now extensive literature of all three generic methods seems to indicate a mechanism which may relate each method to the other: the physical-chemical phenomenon of vertical migration. A selective review of the theoretical and empirical literature of these methods, together with a similar review of applicable geologic and hydrogeologic studies, was undertaken. Indications that vertical migration is not an implausible common mechanism reinforces the potential validity of each of the methods and suggests the need for additional research directed toward a conclusive condemnation or validation of these methods.

Considering the total of pre-drilling exploration efforts, the current limited use of surface geochemical, radiometric, and electrical methods seems only to preserve them in limbo. Ambiguities will undoubtedly continue to exist, as in all other exploration methods, even if subsequent research should demonstrate increased operational validity of the three methods. The opportunity-cost of not properly using these methods would be tremendous should they be determined to be more reliable than is generally conceded. This consideration, together with the indications of plausibility which this paper describes, justifies serious and concentrated research and demonstration efforts of an order not hitherto performed.

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Mesozoic and Tertiary Carbonate Buildups and Factors Which Control Their Distribution

With the development of global paleogeographic reconstructions, it is possible to examine the original distribution of carbonate buildups at various times in the earth's history. Through an extensive search using published geologic literature, carbonate buildups have been classified based on their association with shelf-edge, shallow-shelf, and basinal sediments. By plotting the data on well-constrained Mesozoic and Tertiary paleogeographic continental reconstructions, it is observed that carbonate buildups are generally restricted to low latitudes. However, the maximum excursion of buildups from the paleoequator varies significantly through geologic time.

The distribution and abundance of carbonate buildups in the Mesozoic and Tertiary appear to be partly controlled by ancient ocean current systems. In a manner similar to the present, carbonate buildups extend further toward the poles along east-facing coastlines. Here, warm westward-flowing