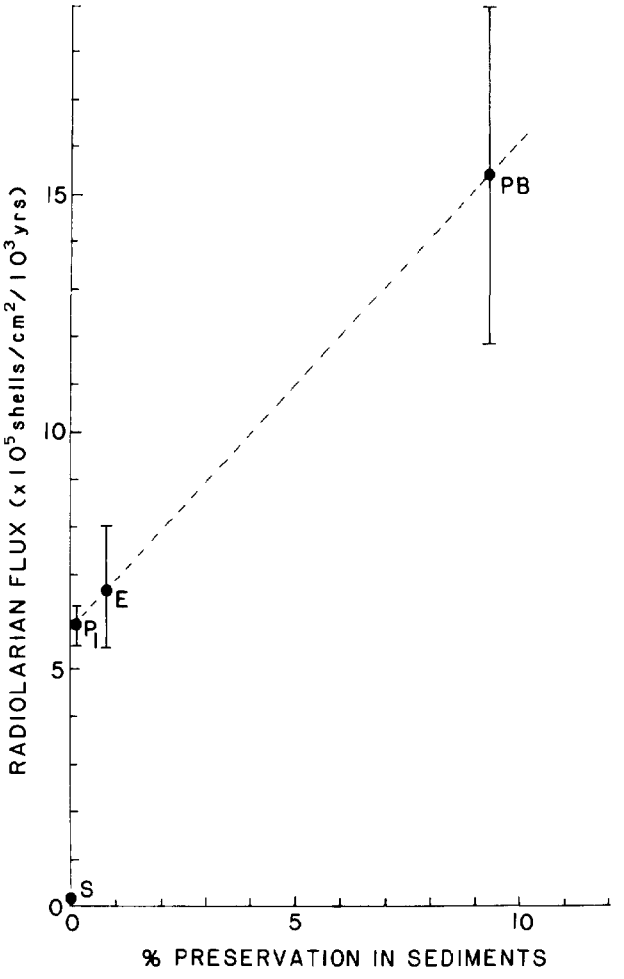
extent of fluxes to the sea floor (see figure). Differential preservation of the species is evidently taking place. For example, Spumellaria, a solution resistant end member, represents 29.2% preservation, whereas Nassellaria and Phaeodaria represent 2.8% and 0%, respectively, in the core tops from the Panama



basin. Clearly, thanatocoenosis in the Holocene sediments is drastically different from the living counterparts in the overlain water column. Major dissolution depth of spumellarian and nassellarian shells is at the sea floor. Phaeodarian shells dissolve in the water column as well as at the sea floor.

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Origin of Natural Gas, San Juan Basin, New Mexico

The Lower Cretaceous Dakota Formation produces gas, gas-condensate, and at the basin margins, gas-rich oil. The coal-bearing Upper Cretaceous produces gas with little or no condensate. Delta ^{13}C(PDB) values for methane, measured in dry and condensate-bearing gases, average -43.3 ± 3.4‰, indicating derivation from sapropel and petroleum, not coal. Locally, isotopically identical methanes occur in all productive formations over a stratigraphic interval of 1,500 m (4,900 ft). Gas chromatography revealed close similarities in ratios involving the subsidiary alkanes of gases in the Dakota, Mesaverde, and Pictured Cliffs Formations. Both lines of evidence demonstrate extensive vertical migration. In the Dakota Formation there is an approximate gradient from the center of the basin to the margin in the $\delta^{13}C$ values of methanes: from -37.7‰ (Ro = 1.9%) to -51.9‰ (Ro = 0.7%).

The mean $\delta^{13}C$(PDB) value of three basin-margin oils is -27.7 ± 0.2, whereas the condensates of the central portion of the basin average -27.2 ± 0.6. These facts are interpreted in terms of a derivation of gas condensate from oil. Condensates and oils were compared on the basis of the detailed composition of their gasoline fractions, particularly in terms of paraffinicity (heptane and isoheptane values). Allowing for natural fractionation, the paraffinicity values were very similar, indicating that the condensate liquids and oils had almost identical thermal histories, rather than the oils being of normal thermal aspect and the condensates mature or supermature. This suggests that most of the condensates sampled were formed by merely physical processes. Abundant gas, generated in the central supermature basin region is postulated to have caused entrainment of oil liquids (condensate) in solution, and to have migrated to cooler reservoirs, both vertically and updip. Apparent gas migration pathways are traceable in fluid property (GOR) data in the Chacon Dakota field.

Deuterium/hydrogen ratios were determined in methanes from Dakota and Mesaverde reservoirs in the high-rank, basin-center region. Although both formations contain Type III kerogen or coal, delta D (SMOW) values of -164‰ and -167‰, respectively, are compatible with those of other dry, mature petroleum gases. When considered in conjuction with the carbon isotope ratios, the values did not indicate derivation of the methanes from coal, though some admixture could have occurred.

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Foraminiferal Evidence for Sources and Timing of Mass-Flow Deposits South of Baltimore Canyon

Shallow seismic reflection surveying of the continental rise between Accomac and Baltimore Canyons shows stratified layers overlying an unstratified interval believed to be mass-flow deposits. Planktonic and benthonic foraminifera from 43 piston cores and grab samples, collected between 150 and 2,360 m (492 and 7,743 ft) depth, have been used to interpret the source and age of unstratified sediments along canyon axes.

Five mappable seabed faunal distributions characterize the outer shelf, slope, and upper rise. Multiple regression was used to relate Rose bengal stained assemblages as well as total sediment assemblages to water depth, median grain size, bottom temperature, and oxygen content in order to index the subsurface samples to these modern physical parameters.

Major lithologic and micropaleontologic contrasts characterize the sediment columns from the canyon axes: soupy, olive clays with foram assemblages similar to living populations overlie firm, gray to rusty-brown clays with Pleistocene planktonic foraminifera and benthics today found in upper slope areas. This, combined with the presence of sand layers bearing shelf forams, suggests that the mass-flow deposits are related to slope failures in response to glacially lowered sea levels.

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Depositional Environments and Sedimentary Processes in Chile Trench

The Chile Trench is a long, linear basin that concentrates clas-