and many of the trace elements within these shale members probably were coincident with areas of optimum trophism and biologic productivity. The paleogeographic relations suggest that the trophic regions were areas of upwelling in the Phosphoria sea adjacent to shoals near the eastern flank of the basin. The richest phosphorite beds, mostly pelletoidal, are near the base and the top of each shale member, and the organic carbon and the residual hydrocarbon contents of the phosphorite beds are low in comparison to the other strata. The beds richest in organic carbon are near the middle part of both members, where phosphorite content is low and residual hydrocarbon content is high. The deposition of both phosphorite and organic matter that is precursor to petroleum seems to be directly related to areas of inferred upwelling and biomass concentration, but the sediments have been differentiated into dominantly phosphorite beds and dominantly petroleum source beds by chemical or mechanical factors.

MAURRASSE, FLORENTIN, and ROBERT VISCONTI, Florida International Univ., Miami, FL

Radiolarian Biostratigraphy and Paleoecology of Eastern Part of Southern Peninsula of Haiti

Radiolarian taxa, which occur intermittently in Upper Cretaceous to lower Paleogene pelagic calcareous sediments in the southern peninsula of Haiti, are found to correlate with those of the equatorial-tropical realms. Like these assemblages the Haitian taxa show high species diversity, despite secondary alteration of their compositional make-up that may be due to post-depositional diagenetic dissolution.

A small fraction of these taxa appear to be cosmopolitan species that overlap with boreal assemblages. Occurrences of the colder water taxa are erratic through time and show a positive relation with the acme of the recurrent assemblages.

The apparent rhythmic pattern of Radiolaria occurrence throughout the time span investigated suggests that paleoecologic conditions over the southern peninsula were similar to those that prevailed over most of the Caribbean Atlantic province from Cretaceous to the Paleogene.

Similarly, it is surmized that periodic fluctuations in the prevailing climatic conditions induced recurrent variations in the oceanic circulation patterns, which then gave rise to intermittent radiolarian productivity. These relatively short pulses of radiolarian productivity are less pronounced in the Haitian deposits than in their deep-sea counterparts not only because of the superimposed effects of diagenetic dissolution, but also because of their relatively higher carbonate content. This is interpreted to represent paleobathymetric differences in the paleo-Caribbean sea, with the site of the southern peninsula being then at relatively shallower depth with respect to the CCD.

MCBRIDE, EARLE F., Univ. Texas at Austin, Austin, TX

Importance of Secondary Porosity in Sandstones to Hydrocarbon Exploration

Terrigenous sandstones in many basins owe their reservoir quality to secondary porosity that developed by the dissolution of detrital framework grains (chiefly feldspar) and cement minerals (chiefly calcite and evaporite minerals). This dissolution event is responsible for changing tight sandstones to porous and permeable sandstones slightly prior to the major episode of hydrocarbon migration. Dissolution of most non-evaporite minerals is accomplished by formation water containing carbon dioxide generated during the thermal or bacterial breakdown of hydrocarbons. Dissolution porosity is commonly well developed at 6,000 to 9,000 ft (1,829 to 2,743 m), but gradually is lost during deeper burial stages by recementation (chiefly by ferroan calcite, ferroan dolomite, and kaolinite). During sandstone burial, variations in the simple scheme of cementation → decementation → recementation is complicated in basins with complex "plumbing" systems and those that experience uplift. For example, dissolution porosity in some uplifted sandstones develops during invasion by meteoric water flowing downdip.

Dissolution porosity in sandstones can be suspected from certain log responses and water-saturation characteristics, but is best identified from clues visible in thin sections made of dyed, epoxy-impregnated perm plugs. Clues to secondary porosity in thin section include: (1) oversized pores formed where framework grains have been dissolved; (2) patchy distribution of carbonate or evaporite cement; (3) honeycombed feldspar grains; (4) fossil molds; (5) grains whose margins were etched by previous cement; (6) broken silicate grains that formed when rapid compaction followed removal of cement minerals; and (7) quartz grains that have been reduced to shards when calcite, which invaded quartz along hairline fractures during cementation, was dissolved. Secondary porosity is not likely to develop good reservoir quality in sandstones whose primary porosity was lost chiefly by compaction. Sandstones with abundant clay clasts, fecal pellets, glauconite, or micaceous rock fragments can lose all effective porosity by ductile grain deformation. A knowledge of sandstone composition is important to predicting reservoir quality.

MCCABE, PETER J., KEVIN L. MCCARTY, and SCOTT B. PLUIM, Univ. Nebraska, Lincoln, NE

Terrestrial Sedimentation Associated with Strike-Slip Fault Movement in Middle Carboniferous of Nova Scotia, Canada

The Carboniferous Minas basin of Nova Scotia developed along the dextral strike-slip Glooscap fault. During the early Namurian, the West Bay Formation was deposited in the Parrsboro area of this basin. This formation consists mainly of siltstone with symmetrical ripples and desiccation features and thin beds of detrital ferroan calcite and is interpreted as a playa lake deposit. To the northeast, lower Namurian lacustrine sediments of the Hastings Formation crop out over much of Cape Breton Island. The Hastings and West Bay Formations may have been deposited in the same lake complex, and the Parrsboro and Cape Breton areas, now 225 km apart, were probably adjacent.

During the middle Namurian, the West Bay Forma-