tains approximately the same amount of those hydrocarbons that may be recovered by n-heptane elution on silica gel columns.

The abundantly available Abasand samples were subjected to detailed analysis. These samples represent the lower portion of the McMurray formation, lying a few feet above the Devonian limestone. The bitumen was found to be a complex mixture of hydrocarbon and non-hydrocarbon compounds; the character of a few of which can be indicated. The bitumen was observed to be susceptible to contaminations by microorganisms; this required precautions during analysis. The chemical composition of the samples indicates that the Athabasca bitumen is basically a crude oil.

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Exploration in Llanos of Colombia

The Llanos of Colombia, comprising the eastern portion of the country, is an alluvium-covered, featureless, grassy plain that covers an area of about 75,000 square miles. Except for a short dry season from December to March heavy rains occur almost every day. Access to the area is difficult and for the major portion of the year special track equipment or helicopters must be used for exploration operations. Structurally the Llanos form an asymmetrical basin similar to that of eastern Venezuela or western Canada. There is a shelf area to the east with sediments dipping uniformly off the Guiana shield and increasing in thickness to the west to form a major trough in front of the thrust faulted Eastern Cordillera. The entire geological sedimentary column outcrops along the western border of the Llanos with excellent reservoirs, source rocks, and attendant oil seeps. Approximately 26,500,000 acres are held in the basin by six major oil companies at this time. To date the geology of the bordering Eastern Cordillera has been mapped in considerable detail, reconnaissance seismograph, gravity, and local magnetometer surveys have been run over the more attractive portions of the basin, and 22 wells have been drilled. Although some encouraging oil shows have been encountered in wells in the southern margin of the basin, no commercial oil has been discovered to date.

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Florida-Bahama Platform

The emerged and submerged Florida-Bahama platform covers 200,000 square miles and encompasses the Bahama Islands and most of the Florida peninsula and shelf. The 35,000 square miles of exposed surface has little relief; however, relief found in deep water channels on the submerged part of the platform in many places exceeds 6,000 feet. Geologically, the area is bounded by the Ocala uplift, the overthrust sheet of the Greater Antilles, the possibly faulted west edge of the Florida shelf, and the North American ocean deep.

Mesozoic and Cenozoic carbonates and evaporites form a southward thickening wedge of sediments that attain a maximum known thickness of 19,000 feet in the Cay Sal Bank area. The youngest Paleozoic rocks encountered have been identified as Devonian; however, most of the rocks directly underlying the Cretaceous in north Florida are clastics of Ordovician age. Total thickness of the flat-lying unmetamorphosed Paleozoic section is estimated at slightly more than 6,000 feet. Precambrian age determinations have not been made on any igneous rocks encountered in the province; however, in some places the igneous rocks probably pre-date early Paleozoic sediments.

Major structural features within the province are the South Florida basin and the Bahama basin; these are separated by a more stable area that may be the southeast extension of the Ocala uplift. Local structures in Mesozoic and Cenozoic sediments should be of the basin type as there are no indications of major post-Paleozoic orogenic movements within the province.

The Sunniland field in south Florida is the only producing oil field in the province and has produced about 6 million barrels of oil from a Lower Cretaceous bioclastic zone at 11,600 feet. Problems confronting the oil seeker include shallow high-velocity and cavernous formations that make seismic and core drill prospecting difficult.

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Recent Developments in Lower Cretaceous Trend of Mississippi

The discovery of oil at Bolton in Hinds County, Mississippi, and Citronelle in Mobile County, Alabama, heralded a fairway of Lower Cretaceous production from the Rodessa, Sligo, and Hosston formations in the intervening area. To date, oil production has been established in 10 fields in Mississippi. All of the fields are within the salt basin and salt movement is believed responsible for most of the producing structures. The structures increase in complexity with depth.

Regional structure maps delineate the configuration on top of the Lower Tuscaloosa (Upper Cretaceous) and base of Ferry Lake Anhydrite (Lower Cretaceous). Structure maps and cross sections of Bolton field in Hinds County; Magee field in Smith and Simpson counties; Martinville field in Simpson County; Raleigh field in Smith County; Soso field in Jasper, Jones, and Smith counties, Mississippi; and Citronelle field in Mobile County, Alabama, are included to illustrate that most of the accumulations are controlled by structure. Reservoirs discovered thus far are a prelude to other Lower Cretaceous fields that will, no doubt, be discovered in the future.

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Yamacraw Ridge, Pre-Cretaceous Structure beneath South Carolina-Georgia Coastal Plain

In the process of making alongshore and offshore seismic refraction studies of the geologic structure beneath the submerged Atlantic Coastal Plain from north of the Cape Fear arch in North Carolina to the vicinity of the Florida-Georgia boundary, it was noted that the measurements between Charleston, South Carolina, and Doboy Sound, Georgia, indicated that the basement (pre-Cretaceous) surface sloped towards the continent rather than towards the ocean. This reversal in the normal seaward slope of the basement surface was interpreted as being caused by a basement ridge, and named the Yamacraw Ridge of Meyer and Woollard. This past year it was possible to investigate this area