common in dark gray shales, siltstones, fine to very fine sandstones, and silty, calcareous mudstones deposited in basinal, slope, and deeper shelf setting below effective wave base. In the Lituolacea, the Hormosinidae, Lituolidae, Textulariidae, Trochamminidae, and Ataxophragmiidae include only a few late Paleozoic genera, which locally are abundant in dark to medium gray, silty shales, siltstones, silty sandstones, and carbonate wackestones and packstones; all deposited near wave base.

Miliolina: Late Paleozoic representatives are primitive (tubular, nonseptate) genera of Hemigordiopsidae, Fischerinidae, and Nubeculariidae. These occur mainly in shallow, warm water calcareous wackestones.

Fusulinina: These were the most taxonomically diverse of the late Paleozoic foraminifera and were adapted to a wide range of depth habitats. Parathuramminacea locally were very abundant in deeper water, dark gray calcareous wackestones formed in basins and slopes below wave base. Endothyracea (s.l.) included many genera and families that dominated most of the Early Carboniferous shallow water, calcareous depositional environments. Nodosinellidae preferred open shelf facies and may have extended to depths below wave base. Colaniellidae, Ptychocladiidae, Paleotextulariidae, Tetrataxidae, Tournayellidae, Endothyridae, Loeblichiidae, and Lasiodiscidae locally were common in shallow shelf, shoal, and lagoonal carbonate wackestones, packstones, and as displaced fossils in some grainstones, such as oolites. Bradyinidae were globose, had pseudoalveolar walls, and were widely scattered in a number of different lithologies suggesting a pelagic or planktonic habitat. Archaediscidae, which have recrystallized wall structure, were common in shallow water, carbonates and calcareous shales.

Fusulinacea, most of which probably had photosynthetic symbionts, were adapted to shallow carbonate depositional habitat at depths less than 15 to 20 m (49 to 66 ft). Carboniferous Fusulinidae and Ozawainellidae apparently occupied most of this depth range because of their adaptation to Middle Carboniferous cool surface waters. Permian Schubertellidae and Oazawainellidae became adapted to shallow, warm water lagoons and shelves. Verbeekinidae and Neoschwagerinidae were common in reef cores and upper flank deposits of Permian Tethyan reefs. Schwagerinidae also adapted to shallow to very shallow water carbonate environments, such as reef edges, shallow lagoons, tidal flat channels, margins of algal shoals and banks, and other shallow nearshore areas. For example, *Eoparafusulina* formed extensive skeletal grainstones in many cross-bedded, subtidal deposits.

Several globose lineages within the Fusulinacea possibly were pelagic, such as *Robustoschwagerina, Pseudoschwagerina, Verbeekina,* and many of the Permian Staffellidae.

ROTTENFUSSER, BRIAN A., Alberta Geol. Survey, Edmonton, Alberta, Canada

Regional Inventory of Peace River Oil Sands, Alberta, Canada

The Peace River oil sands of northwestern Alberta contain an estimated 92 billion bbl of bitumen trapped in an updip pinch-out of the Lower Cretaceous Bluesky and Gething Formations. The geologic reservoir characteristics of the Peace River oil sands are being mapped on a regional scale through the use of core and geophysical logs. Four wells per township are used wherever possible. A computerized data file on each well consists of basic well data, tops of the Bluesky and Gething Formations, and oil sand reservoir and the underlying pre-Cretaceous unconformity, and a coded lithology log. The lithology log is kept simple due to the limits of geophysical log interpretation but attempts to quantify sand, shale, interbedded sand and shale, oil, and water. Logs have been calibrated wherever possible with core control. Because the data are stored as a log of the well, a wide variety of useful maps can be generated by the computer. These include maps showing structure, sand/shale ratios, gross and net pay thicknesses, basal water, top water, lean zones, and uninterrupted pay.

Recognition of four major facies including continental, tidal flat, shoreline and shallow marine, and tidal channel deposits has led to the proposal of an estuarine model for sedimentation within the Gething Formation. Isopach maps from the top of the Bluesky and Gething Formations down to the pre-Cretaceous unconformity show a regional southeast to northwest drainage trend on the unconformity surface. Similar trends are seen in the main sand bodies. Coordination of computer-generated maps with the facies model highlights areas which satisfy specific criteria that may be critical in determining the applicability of a particular in-situ recovery method.

RYER, THOMAS A., and JOHN C. HORNE, RPI/Colorado, Inc., Boulder, CO, and MILES O. HAYES, Research Planning Inst., Columbia, SC

Depositional and Exploration Models for Cretaceous Lower Mannville Fluvial Sandstones of South-Central Alberta

Production of hydrocarbons from fluvial strata of the lower Mannville Formation in the Taber–Milk River area of south-central Alberta occurs primarily from combination structural-stratigraphic traps situated on subtle north-northwest trending anticlinal features. Lower Mannville sediments were deposited in a north-trending valley that formed when sea level lowered and shorelines receded to the edge of the continent during the Late Jurassic and Early Cretaceous. The river that cut this valley shifted eastward in response to rising of the Cordilleran highlands, producing a west-facing escarpment. We regard this escarpment as a southward extension of the Fox Creek Escarpment of west-central Alberta. In latest Neocomian or earliest Aptian time, the river system began to aggrade as a result of southward transgression of the Boreal sea. The basal aggradational valley fill, the Sunburst Sandstone, is generally the coarsest, best sorted, and texturally most mature of the sandstones in the Mannville Group. Stratigraphic traps in the area are the result of: (1) updip pinch-out of the Sunburst Sandstone against the north-trending Fox Creek Escarpment (e.g., Horsefly Lake field); (2) general eastward-thinning of the Sunburst Sandstone within tributary valleys east of the Fox Creek Escarpment (e.g., Chin Coulee field); and (3) updip interruption of blanket fluvial sandstone units by clay-filled, abandoned reaches of the river system that deposited the lower Mannville sandstones (e.g., Taber field). A logical exploration strategy both in the Taber–Milk River area and in areas to the north and south would be to pursue the trends of the Fox Creek Escarpment and its tributary valleys.

SABEL, JOSEPH M., Gulf Oil Co., Casper, WY

Sedimentology of Spearfish Formation

The Permo-Triassic Spearfish Formation of the southeastern Black Hills, South Dakota, consists of evaporite, clastic, and carbonate sediments which formed as the result of the complex depositional history.

The lithologies that occur as the result of primary deposition are (in decreasing order of abundance) gypsum, siltstone, shale, sandstone, conglomerate, limestone, dolomite, and a highly