km of the western Bahamas. Surficial sediment is composed of coarse sand and granules dominated by composite-ooid grains. Submarine cementation is active and has led to the development of coarser grain sizes during the depositional interval. Fine to medium-sized grains are cemented with fibrous aragonite and surficially coated at the tidally active margin. The resultant composite-ooid sediment is more hydrodynamically stable and is rapidly cemented into hardgrounds characterized by a smooth (tidally abraded) upper surface. Lithification is gradational through a thickness of 50-100 mm to an irregular lower boundary transitional with uncemented material. These hardgrounds are submarine discontinuity surfaces developed during inter-storm conditions of winnowing and bypass sedimentation along a depositional profile of equilibrium. Rock cores into the Pleistocene section have recovered sediments and submarine discontinuity surfaces identical to those in the Holocene. These are present in the two latest Pleistocene sequences representing the last major interglacial intervals. Both the Holocene and Pleistocene sequences have one or two cemented zones per meter in the upper section. The presence of these deposits throughout the preserved stratigraphic package indicates the persistence of characteristic leeward depositional processes during the late Quaternary and their importance in bank-margin growth. A combination of characteristics including typical microfacies, cements, and discontinuity surfaces (if seen in the ancient) should be good indicators of leeward-margin settings.

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Point-Bar Deposits and Analysis of Subsurface Reservoir Dimensions, Toolachee Formation, Southern Cooper Basin, South Australia

Point-bar deposits occur ubiquitously within the lowest facies association of the Upper Permian Toolachee Formation (+500 ft thick). The association represents deposition in a moderate to high-sinuosity, mixed-load, fluvial channel system in which lateral bar deposits constitute major hydrocarbon sandstone reservoirs. Bars may be simple or punctuated in their upward-fining, vertical facies transitions, but heterolithic lateral accretion surfaces of upper point bars may occasionally be preserved in cores.

Detailed facies studies of Association 1 in 17 cored wells reveal that pebbly thalweg lags locally include chaotic bank-collapse conglomerates. These basal point-bar deposits fine upward into cross-bedded sandstones. Ripple bedding is common in upper bar sequences. The bars are associated with a variety of abandonment fills, levees, and crevasse-splays, backswamp deposits, and autochthonous coals.

Paleohydraulic studies of point bars in the Moomba field demonstrate an average bankfull depth of the Toolachee channels of 14 ft and bankfull width of 320 ft. Empirical relationships indicate a maximum meander loop diameter of 1,650 ft with meander belt width at 3,650 ft. These parameters allow an evaluation of reservoir geometry, storage potential, and permeability barriers. The latter, generated by clay-plug abandonment fills, can restrict fluid migration within the field and produce overestimation of hydrocarbon reserves. Conversely, avulsive channel events may locally increase point-bar reservoir dimensions by partially, or totally, removing preexisting abandonment fills.

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New Deeper Exploration Frontiers in Bass Basin

The Bass basin is the sister basin to the Gippsland. Both are extensional basins in southeast Australia between Tasmania and the mainland, and both occupy areas in excess of 60,000 km^2. The Bass and Gippsland basins were resurveyed seismically by the Bureau of Mineral Resources to provide regional correlation and to penetrate seismic energy barriers caused by Eocene coals.

Analyses of these recent good quality deep seismic data, existing seismic data, and well information including thermal maturity, source rock richness, porosity, and permeability suggest that the Bass basin is not fully analogous to the Gippsland basin. Though stratigraphy is similar, there is a paucity of significant secondary faulting in Bass basin to act as paths for migration of hydrocarbons to thermally immature levels, as is the case in the Gippsland basin. Consequently, in spite of minor oil and gas in the thermally immature section, the hydrocarbon potential of Bass basin could be substantially limited to thermally mature levels.

Reservoir, seal, and source appear to be present in the Bass at thermally mature but rarely drilled levels within the deeper lower Tertiary and Upper Cretaceous lower Eastern View coal measures and in the rifted Lower Cretaceous Otway Group. Hydrocarbon leads at these levels are predicted from structural analysis, with synsedimentary transverse faults that developed during the extensional phase of the basin providing an important trapping component. Such leads are defined at drillable depths by seismic mapping. The Bass basin could thus ultimately emerge as a deeper hydrocarbon province.

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Red Mountain Unit, Piceance Basin, Colorado: Field Laboratory for Research and Development in Coal Bed Methane Production

The coal bed methane resource of the Piceance basin has been estimated to exceed 60 tcf. Two wells have been drilled in Red Mountain unit, Mesa County, Colorado, to develop and improve the technology required to produce gas from deeply buried coal seams via vertical wells. The objective at Red Mountain is the Cameo coal member, Williams Fork Formation, Upper Cretaceous Mesaverde Group, at depths of about 5,500 ft. The 1 Deep Seam was drilled with the objective of coring and evaluating reservoir properties of both the coal and bounding sandstones. A continuous section of more than 200 ft of 3-in. core was recovered. Pressure transient tests were conducted in the 20-ft thick coal seam and in the overlying sandstone unit. The 2 Deep Seam was drilled underbalanced with an air/foam mixture, resulting in minimal formation damage and excellent recovery of coal cuttings. Extensive reservoir and production testing has been performed for the purpose of designing artificial stimulation procedures. Subsequent drilling and production testing at Red Mountain may require five additional years and may include as many as 20 additional wells.

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Lewis Shale Reservoirs, Southern Wyoming: Turbidite Sandstones Deposited in Delta-Toe Settings

Depositional history of the Lewis Shale, Maestrichtian, south-central Wyoming, consists of a transgressive period followed by an interval of delta infill. Clastics are up to 760 m thick. The Lewis sea transgressed westward to areas of the Rock Springs and Wind River uplifts and opened eastward into the main part of the Interior Seaway. Transgressive shales are black, high in organic material, relatively silt-poor, and totally bioturbated. Depositional setting was a shallow, well-oxygenated shelf. Lewis clastics above the transgressive shale are coarser and are related mostly to deltas that entered the basin first from the northeast and later from the south. Sediments were deposited in delta-front, prodelta, deep-basin, and interdistributary areas. Lewis sandstones produce at Wamsutter and Hay Reservoir fields in addition to other areas. Wamsutter and Hay Reservoir sandstones were deposited beneath storm wave base by sediment gravity flows at the toe of the northern delta system. Sandstones may be thickly bedded and are commonly massive. Presence of fluid escape structures indicates that many thick beds underwent liquefaction during the final stages of deposition. Thinner sandstones are graded and many show Bouma sequences. Interbedded shales are unburrowed or are slightly burrowed by restricted faunas, indicating anaerobic to dysaerobic conditions and water depths of 150-200 m or more at times.

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Potential Hydrocarbon Traps Along Growth Faults of Rio Grande Rift, New Mexico

Major tectonic boundaries along the Rio Grande rift are mostly listric normal faults that controlled late Cenozoic sedimentation in the rift. Potential hydrocarbon source and reservoir rocks occur in Cretaceous, Jurassic, and Pennsylvanian units beneath presumably barren upper Cenozoic continental sediments. Largest of the grabens and half-grabens comprising the rift is the Albuquerque basin, which was explored during the last decade with several deep tests. Upper Cenozoic strata generally dip gently toward the basin center except near bounding faults where "reverse drag" has beds on the downthrown block dipping toward the growth faults marking the basin margins. Most bounding faults are covered with surficial sediments, but at a few localities with good, deep expo-