those that fall within the province of plate tectonic theory. Relations between several of these parameters are obvious, e.g., bathymetry and physiographic provinces, and paleomagnetic anomalies and seafloor age. New generations of model reliabilities will occur as further interrelations are found.

The current suite of theories describing overall geologic phenomena, e.g., seafloor spreading and marine sedimentation, are adequate in first order, basinwide terms. Second and third order accuracies are not possible without interpretation on a regional scale.

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Seismic Stratigraphy and Structure of Falkland Plateau

Multichannel and single-channel seismic reflection profiles and sonobuoy reflection and refraction measurements indicate that the Falkland Plateau is not a simple extension of South America, but largely owes its morphology to sediments deposited in a continental slope-ocean basin floor environment.

The western part of the plateau is a segment of oceanic crust over which has been deposited 4 to 6 km of sediment in a basin bounded by the Falkland Islands platform on the west, a narrow ridge associated with the Falkland Escarpment on the north, M. Ewing Bank on the east, and the North Scotia Ridge on the south. M. Ewing Bank, a subsided continental block sampled by D/V *Glomar Challenger* Leg 36, forms the eastern part of the plateau.

The sediments in the basin have been deposited in an oblique progradational-type of configuration. Widespread sheets of sediment dip southward from the Falkland ridge and are terminated updip by erosional truncation. They lap out against the Falkland Islands platform and M. Ewing Bank. The lower boundary of the depositional sequence has been disrupted through movement of the North Scotia Ridge toward the plateau, resulting in subduction of the lower sequence of sediment beneath the ridge and deformation and uplift of the upper sequence to outbuild the northern flank of the ridge.

Overall reflection geometry of sediments filling the basin suggests that they were transported from the north. This implies that they are largely continental slope deposits of pre-drift (>130 m.y. ago) age. Strong bottom currents evidently have caused erosion of significant amounts of the post-drift sediments. The drilling results of D/V *Glomar Challenger* Leg 71 will be discussed in interpretation of the depositional environment of the Falkland Plateau.

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Geology of Syncrude Canada Limited Mine Site, Athabasca Oil Sand Area

The Athabasca oil sand deposit covers 4.4×10^6 ha., of which 0.2×10^6 ha. are amenable to surface mining. In-place reserves of crude bitumen are estimated to be 114.5×10^9 cu m (720×10^9 bbl), of which 11.8×10^9 cu m (74×10^9 bbl) are within the surface minable interval of less than 46 m. The Syncrude mine site covers 2,850 ha., has in-place reserves of 0.24×10^9 cu m (1.5×10^9 bbl), and commenced production in 1978 with a plant design capacity of 20,500 cu m (129,000 bbl) of synthetic crude per day. The geologic complexities of the oil-bearing McMurray Formation and the overburden zone have had a major impact on engineering considerations at the Syncrude mine.

The Cretaceous McMurray Formation was deposited along a transgressive shoreline between two regional highlands and is interpreted to be mainly estuarine. Paleotopographic lows in the underlying Devonian limestone are filled with salt marsh clays and fluvial water sands. The overlying oil-bearing part of the McMurray Formation is subdivided into a basal fluvial sand, a middle thick estuarine unit with interbedded tidal flat clays, and an upper low-marine unit. Dipping beds contributing to possible highwall instability are associated with estuarine and marine channels.

The overburden zone ranges up to 30 m thick and is composed of marine mudstones and indurated siltstones of the Cretaceous Clearwater Formation and overlying Pleistocene tills, lacustrine clays, and glaciofluvial granular materials, all of which impact on the mine plan.

Detailed documentation of the depositional facies is a prerequisite in geotechnical consideration and mine planning of an oil sand mining operation.

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Depth Migration and Interpretation of Cocorp Wind River, Wyoming, Seismic Reflection Data

To better understand the effects of Laramide deformation, deep seismic reflection data in the Wind River (WR) Range area of Wyoming have been migrated using a 45° ω-Finite-difference depth migration. The algorithm allows velocity to vary laterally and with depth, contains the thin lens (or shifting) term, and correctly migrates energy in laterally varying media within the limits of a 20 algorithm and 2D dataset. Each migrated section shown is the best from a series of migrations.

Major structural features displayed in the migrated data are the Pacific Creek (PC) anticline and the WR thrust. The PC anticline is underlain by a thrust fault similar in geometry to the WR thrust. The base of the Green River basin sediments has a seismically observed vertical offset of 0.6 km. The intra-basement PC thrust reflections are as conspicuous as the WR thrust reflections, yet the movement along the PC thrust was 0.02 of that of the WR fault. The reflectivity of the PC fault is attributed to the change in seismic impedance of the fault-zone constituents. The thinning of sediments over the anticline in Late Cretaceous time (possibly Lewis, certainly earliest Lance time) indicates that the anticline is part of the Laramide deformation. The anticline continued to grow by faulting and buckling the lower 2 km and folding the upper sediments during the WR thrust deformation through latest Cretaceous and Paleocene time.

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Resin Rods and Woody Rod-Like Structures in Pennsylvanian Coal Beds of Appalachian and Illinois Basins

Coalified rod-like structures of plant origin have been discovered in fusain bands within bituminous coal beds of the Appalachian and Illinois basins. The rods have been found in the Allegheny, Conemaugh, and Monongahela Formations and Dunkard Group of southwestern Pennsylvania and central and northern West Virginia in coal beds ranging from the upper Freeport coal (uppermost part of the Allegheny) to the Washington coal (lower part of the Dunkard). In the Illinois basin, similar structures are found in the Springfield (No. 5) coal bed of Indiana and in the correlative No. 9 coal bed of western Kentucky in the Carbondale Formation. In 1914 Charles David White discovered similar oriented and disoriented rods in fusain partings in the No. 2 (Colchester) coal bed of Colchester and Exeter in western Illinois at the base of the Carbondale Formation. In the Illinois basin, the needle-like bodies are associated with coalified wood, cuticles, seed coats, and megaspores.

Under the scanning electron microscope, some of the needle-like structures found in West Virginia are noncellular and appear to be the remains of resin. Others are woody, cellular in cross section, and have cell walls with pits or pores 1 to 2 μ in diameter in longitudinal section. In polished cross sections of coal, the cellular rods would be described petrographically as sclerotinites. These rods have the appearance of minute match sticks in longitudinal section.

The preliminary work on the biostratigraphic distribution of the rods in coals indicates that they range from Middle to Late Pennsylvanian or younger in age. The association of the rods and highly resistant megaspores, seed coats, cuticles, and coalified wood in fusain bands indicates that they were separated from woody tissue during a period of oxidation of surficial plant matter or peat. *Cordaites* (a gymnosperm) and tree ferns, which are commonly associated in the partings of the coals, are probable sources of the resin rods.

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Comparison of Shallow-Marine Shelf Carbonate Mounds of Fort Payne Formation (Lower Mississippian) of Tennessee with Waulsortian Mounds of Western Europe

Although Fort Payne and Waulsortian carbonate mounds are similar, differences in sedimentary and diagenetic environments account for the development of porosity, permeability, and emplacement of petroleum in producing Fort Payne mounds. Waulsortian-type mounds, including the Fort Payne mounds, are characterized by: (1) similar mound morphology and alignment of mound trends, (2) distinctive microfacies and limited faunal diversity, and (3) limited stratigraphic and widespread geographic occurrence.

European Waulsortian mounds, exposed on the surface, range up to 300 m thick, are not generally porous, and contain little evidence of hydrocarbons. They occur on relatively rapidly subsiding shelf margins, at intermediate water depths, and were not subaerially exposed during buildup.

Fort Payne limestone mounds are low relief features (30 m thick) with initial dips less than 1°, containing primary and secondary porosity in bryozoan grainstones in multiple zones within dominant mud-supported microfacies. Mounds formed on a shallow slowly subsiding shelf (ramp) during transgression. Variation in rate of subsidence or eustatic sea-level changes are recorded either by minor zones bearing normal marine fauna or by zones bearing shallow-marine dolomite and evaporites. Periodic subaerial exposure and descending, dissolving, meteoric water probably enhanced secondary porosity development. Minor, but complex, synsedimentary solution collapse, fracturing, and brecciation during mound compaction occurred above evacuated evaporites, solution seams, and stromatactis cavities. After burial by Warsaw Formation clastics, subsurface (mesogenetic) diagenesis is documented by postlithification compaction features including stylolites, microstylolites, and multiple-fractured breccias. Pore-fill spar occlusion of some porosity, and emplacement of petroleum in permeable reservoirs were late mesogenetic events.

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Conveyer-Belt Tectonics and Geologic Evolution of Alaska's Eastern Interior

From the Coleen-Old Crow highlands south to the Yukon River, Alaska's eastern interior is a geologic collage of northeast-trending slivers which have been displaced in conveyer-belt fashion since the Jurassic along a trans-Arctic shear system which extends to the eastern end of the Arctic archipelago. Rock sequences of the region have remarkable affinities with the North Slope and Arctic island assemblages, suggesting a common origin in the Arctic Ocean region.

Pre-Cretaceous rocks can be attributed to four successive paleotectonic phases: (1) Cambrian through Lower Devonian carbonate rocks and shales are shelf-slope-basin sequences recording passive subsidence of an Atlantic-type shelf margin; (2) Middle through Upper Devonian siliceous black shales and turbidites document trench development and associated folding, uplift, and reworking of deep-sea sediments, a dramatic change ascribed to oceanic plate subduction; (3) Upper Paleozoic rocks are extremely varied and include acid intrusives and metamorphic rocks, as well as a spectrum of sedimentary deposits ranging from deep marine to fluvial. Collectively, they are attributed to a major period of orogenic uplift; and (4) early Mesozoic rocks are dominantly post-orogenic molassoid clastics.