Two types of roll-front deposits have been identified: (1) essentially tabular, low-grade, disseminated deposits located along the eastern flank of a large tongue of oxidized sandstones, and (2) narrow, higher-grade C-shaped deposits located along the western flank of the same altered sandstone tongue. These uranium deposits occur at the basinward limit of a large alteration system consisting of a series of oxidation cells that extend from the northern margin of the basin 50 km southward. Behind the roll fronts, alteration is characterized by broad zones of various iron-oxidation colors which merge with mineralization on the east and diverge by as much as 1.5 km from mineralization on the west.

The grade of uranium mineralization and the corresponding alteration characteristics apparently relate to the steepness of the Eh gradient across the roll-front interface. Steeper gradients and consequently higher-grade mineralization in the western part of the area are related to the greater abundance of carbonaceous material in intertonguing Wasatch mudstones. Alteration patterns have become somewhat obscured in this western area owing to probable re-reduction of altered sandstones.

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Experimental Compaction of Lime Sediment

More than 30 in-situ cores of modern lime sediments, including environments from tidal flat to shallow marine, have been compressed under loads simulating depths ranging from 280 to 14,000 m of burial. Cores 10 cm in diameter and 30 to 40 cm in length were reduced to between one-quarter to one-third of their original length, resulting in porosity reduction from an initial 70 to 80% to 30 to 45%.

Experimental compaction produced sedimentary structures common to many ancient limestones, including (1) wavy organic seams similar to horsetail or microstylolite swarms; (2) reorientation of randomly oriented fossils toward a more horizontal posture; (3) flattening of filled burrows; (4) complete obliteration of birdseye voids; and (5) color mottling in tidal flat sediments produced by collapse and flowage of oxidized sediment surrounding burrows.

These studies have shown that, during geologically instantaneous periods of compaction (up to 30 days), the bulk of porosity reduction occurred under conditions simulating less than 300 m of overburden. Although fossils generally are not crushed during compaction, the obliteration of birdseye voids indicates that early cementation or infill by evaporitic minerals was necessary for preservation of ancient birdseye or fenestral structures. Pellets in soft lime mud were obliterated, but slightly hardened pellets in Bahamian muds were preserved during experimental compaction. This observation suggests that well-preserved pellets in ancient limestone indicate predepositional hardening or synsedimentary cementation.

Heating of cores to 100°C during compaction has produced hydrocarbon effluents, suggesting that some ancient limestones may have been source rocks.

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Sedimentary Facies Relations and Inferred Dynamics of a Single-Barred Nearshore Environment, Atlantic Coast of Eastern Long Island, New York

Facies relations in a conglomeratic single-barred nearshore environment on the glaciated Atlantic Coast of eastern Long Island, New York, were determined by examination of 42 can cores, bed-form distributions, and sediment textures.

Two principal subtidal zones are recognized. The shoreface zone (0 to 10 m water depth) is composed of clean fine to coarse sand and consists of the planar parallel to megaripple-laminated upper shoreface facies, the massively bedded longshore trough facies, and the megaripple to parallel-laminated longshore bar facies. The inner shelf zone (>10 m water depth) is composed predominantly of organic-rich fine sand and consists of the parallel-laminated transitional facies and the bioturbated offshore facies. Scattered throughout this zone are coarse sand outcrops of megaripple-laminated inner shelf lag facies.

By deployment of dye tracer and by inspection of bed forms in the longshore trough (during low wave-energy, fair-weather conditions) little evidence of longshore or seaward flow could be found. Landward migration of bar deposits over trough deposits was observed over a 6-week period during fair-weather conditions. A core in the trough facies adjacent to the distinct bar-trough contact revealed an underlying bar facies. An equilibrium model of near-continuous fair-weather landward migration of the bar facies interrupted by high wave-energy pulses of seaward movement of trough sediment is believed to account for the stable position of the longshore bar.

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Geometry of Shelf Sandstone Bodies in Shannon-Equivalent Sandstone in Northern Black Hills, Montana and South Dakota

The Groat Sandstone Bed of the Gammon Member of the Pierre Shale (Campanian), equivalent to the Shannon Sandstone Member of the Steele Shale of Wyoming, crops out on the north flank of the Black Hills, where it has been mapped. Subsurface studies in Carter County, Montana, reveal a 3,900 sq km area in which sandstone thickness exceeds 23 m. This area of sandstone includes two small elongate lenses in T6 and 7S, R54 and 55E. The lenses trend northwest and are approximately 16 km long and 6 km wide. In adjacent outcrops, sandstone grades downward and laterally to the northeast into siltstone and then to shale. Sandstone units are less than 15 m thick; near the base they are fine-grained and mottled with clay grading upward into bioturbated medium to fine-grained sandstone, which then grades upward into medium to coarse-grained sandstone with large-scale, trough cross-bedding.

The Groat Sandstone was probably deposited 322 km from the strandline near an outer shelf margin. This interpretation is based on published strandline positions and on regional isopach maps of subsurface units within the Pierre Shale. Local thickening of shale marks the position of the shelf margin. Sandstone geometries may reflect ancient shelf features. Small-scale facies over 305 m may represent large sand waves such as are observed on modern shelves. The elongate northwest-trending lenses are similar in size and geometry to modern marine sand ridges, and the large area of sandstone may have been the site of close-spaced sand ridges.

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Mesozoic Accretionary Tectonics of Alaska

Most of Alaska represents an enormous mosaic of allochthonous tectono-stratigraphic terranes, each characterized by a distinctive pre-Tertiary stratigraphic and tectonic history. More than 40 terranes presently are recognized, ranging in size from thousands of square kilometers to unique tectonic blocks having outcrop areas of only a few square kilometers. With a single exception, all of these pre-Tertiary terranes evidently are allochthonous with respect to North America and to one another. Some are best interpreted as displaced parts of the continental margin, but others—particularly in southern Alaska—may be exotic to North America. Paleomagnetic studies show that some terranes such as Wrangellia, have been transported as much as 3,000 km.

Amalgamation of different terranes prior to final emplacement can be documented or inferred in a few places, but most of Alaska was tectonically assembled from individual lithosphere fragments and microplates during late Mesozoic time by complex accretion. Various schemes have been proposed for rotation and/or offset of northern Alaska into its present position. In south-central Alaska, southwest-trending terranes generally parallel the present-day Aleutian trench system. Outcrop patterns of rocks within these terranes point to mainly convergent late Mesozoic accretionary tectonics involving the development of nappes. Subsequent strike-slip faulting of these terranes is relatively minor, but original Mesozoic accretion of these belts may have involved large-scale transform displacement along the northwest-trending parts of the Tintina trench and ancestral Denali fault systems. Significant tectonic displacement continues only along the active strike-slip faults in southeast Alaska and accretion is limited to the mechanically related Aleutian trench system.

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Oswego Limestone, Aline-Lambert Fields, Oklahoma—Source, Reservoir, and Trap

The unitized Aline-Lambert field covers about 150 sq mi (241 sq km) in Alfalfa County, Oklahoma. Aline field produces oil from two or more porous zones in the Oswego Limestone whereas the Lambert field produces primarily gas but locally contains a thin oil column. Porous and permeable zones are discontinuous in this gas-solution drive reservoir. Gas-water and oil-water contacts in the field drop to the southeast at about 20 to 45° in the direction of regional dip. The trap is a porosity pinch-out.

The Oswego Limestone is composed of intercalated mudstones, wackestones, and packstones that range in thickness from 30 to 40 m. Maximum production in the field is from wells that penetrate a complex system of phylloid algal mounds. Distribution of the mounds is controlled by a break in slope from shallow shelf waters into a deeper water, northeast-trending embayment. Porosity values within the field range from 6 to 12%; permeabilities vary from 2 to 300 md. Porosity and permeability in non-producing wells in the area average 5% and 4 md. Five stages of cementation and partial dissolution have been recognized. Texture and isotopically light carbon values of the later stage cements suggest that they were in part formed during biochemical degradation of organics.

Initial correlation of hydrocarbons produced from the reservoir suggests that the Oswego was the source. Samples of the Oswego, juxtapositional strata, and oil and gas were processed and analyzed chromatographically for correlation studies. Organic extraction schemes involved the standard separation of alkane and aromatic fractions by column chromatography. Hydrocarbon fractions were analyzed by gas chromatography using glass capillary columns and flame ionization detection. In addition, total organic-carbon percentage in rock samples was determined by combustion and the resulting carbon dioxide was analyzed for its carbon isotopic composition. The resulting $\delta^{13}C$ values suggest a relation between indigenous organic matter and the later stage cements.

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Effects of Basalt Intrusions on Kerogens in Unconsolidated Oceanic Sediments in Guaymas Basin, Gulf of California

Pleistocene sediments in Guaymas basin, Gulf of California, have been intruded by sills. Their organic matter was thus subjected to thermal stress. Samples from DSDP/IPOD Sites 477, 478, and 481 and from unaltered material from Sites 474 and 479 were analyzed to characterize the lipids and kerogens.

The lipids of the thermally unaltered samples are derived primarily from algal and bacterial detritus. The samples near the sill contain the distillates; those closest to the sills contain essentially no lipids. The pyrograms of the kerogens from the unaltered samples reflect their predominantly autochthonous microbial origin. The pyrograms of the kerogens of the altered samples reflect the thermal effects by demonstrating a reduction in the complexity of the products, when compared with the unaltered samples. Kerogens adjacent to the sills produced little or no pyrolysis products.

The effects of intrusions into unconsolidated sediments resulted in in-situ pyrolysis of the organic matter as confirmed by these data.