Regional dispersal patterns indicate these beds accumulated within the midfan environment of a northward-prograding submarine fan complex. The upper 20-30% of the Fortress Mountain rests above a conspicuous angular discordance and is composed of upward-fining channel sequences of conglomerate, sandstone, and shale. This phase of deposition records progradation of fan-delta and fluvial environments. The regional depositional architecture of the Fortress Mountain records the buildup and sedimentologic evolution of the Cretaceous shelf, which ultimately allowed progradation of overlying deltaic and interdeltaic complexes of the Nanushuk Group and related strata.

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Crude Oil Chemistry and Classification, North Slope, Alaska

Detailed chemical analyses of crude oil from the North Slope of Alaska began with United States Bureau of Mines efforts about 35 years ago. The discovery of major commercial accumulations within the past 15 years has resulted in routine application of modern analytical techniques, with the resulting classification of North Slope oils into two chemically distinct, and presumably separately sourced, families. This report will review published analytical results obtained for North Slope oils to date, in light of data for nine specific North Slope oils analyzed by Union Oil.

The nine oils analyzed are from the National Petroleum Reserve in Alaska and Prudhoe Bay field, and include a condensate and at least four biodegraded oils. Gravity and sulfur content variations are 65-54.1° API and 0.01-1.85%, respectively. Carbon isotope ratios of total (untopped) oils vary between −29.4 and −25.3 ‰, and are a discriminating parameter for grouping these oils into two chemical families. Other distinguishing chemical attributes include vanadium, nickel, and sulfur concentrations, V/(V + Ni) ratios, carbon number distribution of the major 5(α), 14(α), 17(α), 20R-steranes, and i-C_{19}/i-C_{20} isoprenoid ratios. Using these distinctions, the oils are successfully grouped into two types. Type A oils, typified by the Prudhoe crude, are relatively high in vanadium, nickel, and sulfur content, isotopically light, and high in tricycle terpane content. Type B oils, typified by the Umiat and Simpson crudes, are low in sulfur and metals and contain relatively high concentrations of 5(α), 14(α), 17(α), 20R-ethylcholestane. Although little definitive published work on potential source rocks of maturities less than peak generation is available, the oil typing demonstrated here and elsewhere strongly suggests at least two distinct source sequences. Based on the biological marker geochemistry of the oil types, the nature of these sequences may be predictable.

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Geotectonics of the Bering Sea Area, Alaska

Plate tectonic interactions in the Bering Sea area have played a major role in its structural and geological history since Paleozoic time. The geotectonic style of different areas is similar due to the widespread influence of plate motions. Three major structural and depositional belts have been identified linking the Siberian area to Alaska across the Bering Sea. The northern belt, the Verkhoyansk-Chukotsk-Seward-Brooks, consists of early Mesozoic miogeosynclinal sediments. The middle belt, the Okhotsk-Chukotsk-Yukon-Koyukuk, consists of a Mesozoic magmatic arc and numerous accreted allochthonous terranes. These features were formed as a result of convergence/subduction of a southern oceanic plate. The southern belt, the Koryak-Anadyr-Peninsular, consists of terranes accreted during Cretaceous time and forms the southern limit of Mesozoic subduction.

During Late Cretaceous to early Tertiary time, rifting in the Atlantic caused these belts to be oroclinally bent southward and resulted in a shift of the Mesozoic subduction zone to a more southerly location. During formation of the oroclinal fold, subduction along the Bering Shelf margin changed from direct to oblique subduction, then to transform motion. Major movement along this margin ceased as the current Aleutian Island arc system began to form.

Late Cretaceous to early Tertiary structures within the Koryak-Anadyr-Peninsular area are potentially important for petroleum exploration because they could have formed concurrently with source and reservoir facies.

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The Paleogene Sequence on the Alaska Peninsula

Paleogene strata are exposed nearly the entire length of the Alaska Peninsula. They include continental and marine volcaniclastic rocks and a thick volcanic sequence. The strata are divided into the Tolstoi, Stepovak, Meshik, and Belkofski (in part) Formations in the southern part of the peninsula, and into the nonmarine clastic West Foreland Formation and the Hemlock Conglomerate in the northern part.

The Tolstoi Formation (Paleocene and Eocene), 670-1,380 m thick, consists mainly of continental quartz- and chert-rich sandstone and conglomerate, siltstone, and coal. Volcanic clasts and tuffaceous detritus increase in abundance upward. Neritic strata are present as interbeds in the type area. The formation overlies, with a major unconformity, strata ranging in age from Late Jurassic to Late Cretaceous. Partly coeval strata at the north end of the peninsula (West Foreland Formation) are mainly volcanic sandstone and conglomerate.

The Stepovak Formation, 1,800-2,000 m thick, represents two contrasting depositional environments—a lower dark siltstone and sandstone turbidite, about 975 m thick, and a shallow neritic sandstone and siltstone, rich in volcanic material, about 1,000 m thick. Locally, the upper part is deltaic sandstone, siltstone, and coal. An abundant megafauna of Eocene and Oligocene age is found in the neritic deposits. A thick coeval volcanic unit, the Meshik Formation, is present in the central part of the peninsula. Andesitic to basaltic lava, breccia, tuff, and lahars, as much as 1,500 m thick, have been K-Ar dated at 27-38 m.y. Similar rocks with interbedded sediment at the end of the peninsula are included with the Belkofski Formation.

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Lower Paleozoic and Proterozoic Rocks of Southern Brooks Range, Alaska

Lower Paleozoic or Proterozoic basement rocks occur in windows and thrust plates in several areas of the Brooks Range. Uranium-lead radiometric analyses of highly metamorphosed rocks from the Baird Mountains and Ernie Lake area have yielded Proterozoic ages. Structural, stratigraphic, petrologic, and isotopic evidence exists for Proterozoic(?) rocks in the schist belt; around the Chandalar, Arrigetch, and Igikpak plutons; and in the Cosmos Hills window. Fossiliferous, lower Paleozoic, low-grade metasedimentary rocks occur in the Romanzof Mountains, Doonerak window, and Baird Mountains, and may also surround the Chandalar plutons. Locally, the Lower Paleozoic rocks are unconformably overlain by Devonian to Mississippian metasediments and may stratigraphically overlie older, higher grade metamorphic rocks. Similarities in the stratigraphic settings and lithologies and in fossil ages and affinities allow correlation of the lower Paleozoic rocks in the southern Brooks Range.

Correlation of lower Paleozoic rocks exposed beneath the Endicott allochthon at the Doonerak fenster with coeval rocks in an overlying thrust plate to the south at Snowden Mountain is especially significant. A west-trending thrust fault, which is rooted in lower Paleozoic basement, along the north side of Snowden Mountain is postulated to account for these relationships. Apparently, the Endicott allochthon roots beneath the Snowden Mountain thrust fault. Evidence from conodont samples currently being studied by A. Harris may bear on the extent of the lower Paleozoic rocks in the upper plate of the Snowden Mountain thrust and in the Chandalar area.

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Llama-Supported Geologic Fieldwork in Brooks Range, Alaska

For the first time since their camelid ancestors migrated from Asia, across the Bering Sea land bridge, into the Brooks Range, and eventually south to the Andes during the Late Pleistocene, domestic llamas trekked through Arctic Alaska mountains. During August 1981, six llamas carrying 520 lb of gear supported a field party of eight people that traveled 80 mi over 11 days. The route followed left the Dietrich Trans-Alaska Pipe-