many paleocurrent data. In simple cases, trough-sets yield bimodal histograms bisected by trough axes (which must be distinguished from other bimodal causes). Asymmetry of troughs or predominance of readings from trough ends produce more complex histograms, which commonly are statistically random (*e.g.*, St. Peter Sandstone; certain Cambrian sandstones, Wisconsin; Meridian Sandstone, Mississippi). Trough-axis plunge azimuths provide a superior paleocurrent indicator; Hamblin's Franconian data and new data from Wisconsin show dispersions half as great as published results for cross-sets only. But oppositely plunging troughs associated in single outcrops and even doubly plunging single troughs discovered in Wisconsin may becloud trough-axis distributions. Double plunges probably reflect both oscillatory (wave?) flow and unidirectional current flow, which produced complex, coalescing, elongate dune forms between which doubly-plunging troughs formed.

Trough cross-stratification has no environmental significance. Long-standing eolian interpretations reflect early recognition of only 1 possible modern analogue, whereas subaqueous dunes with amplitudes up to 65 ft have been known for a century. Cambrian sandstones with complex trough cross-stratification probably reflect submarine dunes affected both by current and oscillatory flow like those of Georges Banks. Paleoslope has little if any influence on orientations of eolian and most shallow-marine cross-stratification; records of "rare" storms may mask "average" conditions. Therefore, independent dispersal indicators (*e.g.*, pebble or mineral trains) should be sought.

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PENNSYLVANIAN FUSULINIDS FROM SOUTHEASTERN ALASKA[1]

Fusulinids of Middle Pennsylvanian age were obtained from 4 sections measured in the west-central part of Prince of Wales Island in southeastern Alaska. Three assemblages can be recognized in ascending order: (1) *Millerella, Nankinella,* and *Pseudostaffella;* (2) *Nankinella* and *Fusulinella;* and (3) *Nankinella?, Fusulinella,* and *Fusulina.* Other Foraminifera including *Bradyina* and *Climacammina* are present in several of the samples. The species present show some affinities with forms from Japan and a close relation with the faunas from the Fort St. James area in north-central British Columbia.

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GEOLOGY AND OIL POTENTIAL OF CANADIAN ARCTIC ISLANDS

The Canadian Arctic Islands sedimentary basin covers an area of approximately 530,000 sq mi, has a land area of 306,000 sq mi, and contains an estimated 900,000 cu mi of sediment. Ultimate recoverable oil reserves are estimated to be 40 billion bbl.

The area consists of 4 major structural provinces: (1) shield-bordering Precambrian shield areas with structural arches extending into the basin, (2) Central Stable region, (3) Innuitian region, and (4) the Arctic coastal plain.

The Central Stable region includes several basins containing relatively flat-lying shelf carbonates of Ordovician-Silurian age, with thicknesses generally 5,000 ft within the basin areas thickening northward to a maximum of 15,000 ft.

The Innuitian region is a mobile belt, characterized by thick sedimentation, that was tectonically active from the Paleozoic to the Tertiary. It is comprised of (a) the Franklinian fold belt, a gently folded early Paleozoic geosyncline, approximately 1,500 mi long, containing up to 16,000 ft of Ordovician and Silurian carbonate, evaporite, and shale; up to 6,000 ft of Lower Devonian clastics; and 16,000 ft of Middle and Upper Devonian strata ranging upward from marine carbonates and clastics to nonmarine clastics; and (b) Sverdrup basin, a NE-SW-trending basin, approximately 600 by 200 mi, containing up to 40,000 ft of post-Devonian to Tertiary strata. Permo-Pennsylvanian rocks are dominantly carbonate and evaporite. The Mesozoic to early Tertiary was dominated by heavy and continuous terrigenous clastic deposition, generally characterized by basinal marine-shale facies and marginal-sandstone facies. The axis of the basin is characterized by numerous evaporite diapirs.

The Arctic coastal plain contains late Tertiary and Pleistocene strata, along the northwest edge of the Arctic Islands, bordering the Arctic Ocean in the position of the present-day continental shelf.

The Arctic Islands sedimentary basin has all the necessary geologic elements conducive to the entrapment of hydrocarbons in prolific quantities. There is a very thick, lithologically varied, stratigraphic succession representing every geologic period, adequate source beds, and abundant potential rocks. There is an abundance of diversified traps—large anticlines, reefs, evaporite domes, faulted homoclines, unconformities, and facies changes. A wide range of hydrocarbon shows, including oil sands, seeps, stain, and bitumen, are present in a large area. The Arctic Islands is an area of outstanding potential for the discovery of large oil fields.

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KEYSTONE VUGS IN CARBONATE BEACH DEPOSITS

Voids that are considerably larger than interstices and therefore termed "vugs" are present in ancient grainstone, in modern beachrock, and in loose carbonate beach sand. They are as large as 10 grains in diameter and are roughly spherical or lens shaped. The roof of the vug resembles a crude keystone arch. Similar vugs can be made in the laboratory by alternately draining and flooding loose carbonate sand in the manner characterizing the swash zone. During the flooding stage, bubbles of trapped air lift grains into the form of a keystone arch, which is stable after the bubble is gone. Keystone vugs in ancient rocks probably will prove to be useful indicators of beach deposition.

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DEEP-SEA DRILLING PROJECT—FUTURE PROGRAM

The Deep-Sea Drilling Project is now engaged in a 30-month program extension which will take the drilling vessel *Glomar Challenger* to the Atlantic, Pacific, and Indian Oceans. Drilling sites have been selected by advisory panels established by JOIDES (Joint Oceanographic Institution Deep Earth Sampling). During the first 18 months of operation the program directed its effort to testing the hypotheses of sea-floor spreading

[1] Publication authorized by the Director, U.S. Geol. Survey.