in the reservoir rocks (Craig via White), the impoverishment of B in the reservoir rocks (White), and the similarity of the Rb/K ratios of the brines to those of arkosic materials indicate the high degree of interchange between the host rock and the thermal waters.

The Cl ion either must be introduced at depth as juvenile Cl transported solely by diffusion in the gaseous phase from a magmatic source or must result simply from the concentration of meteoric interstitial water of the sedimentary fill. Strong evidence suggests that no Cl-evaporites are present at depth in the graben. The similarity of the Br/Cl ratio of the thermal brines to all of the meteoric surface and ground waters of the Imperial Valley area (Chevron Research data) and its complete dissimilarity to ratios found within Cl-evaporites suggest that the brines are merely the meteoric water of the graben fill concentrated many-fold. No exotic source is needed.

Hyperfiltration of relatively dilute hydrothermal solutions through electrostatic semi-permeable membranes, composed of abundant montmorillonitic and illitic clays in the sedimentary fill, and probable zeolites overlying and laterally bounding the thermal anomaly, provides the best mechanism for concentrating the brines as well as determining their relative composition and that of the surface effluent waters overlying the thermal anomaly.

Such high concentrations could be achieved only by a very large volumetric transfer of dilute hydrothermal waters through the membrane material due to the progressive decrease of hyperfiltration efficiency of semi-permeable membranes with increasing concentrations. Relative hyperfiltration of Ca with respect to Na and the relative increase of B, NH_4, F, I, and HCO_3 in solutions effluent from membranes has been observed by White in subsurface waters at lower temperatures. The relative increase of K/Na and Cs/K by selective membrane transport in a hyperfiltrated solution is consistent with the known behavior of solutions through ion-exchange columns where the smaller hydrated ion is adsorbed preferentially in the double layer, thereby permitting preferential membrane transport for the larger and less hydrated ion.

A steadily expanding dome-shaped zone of brittle, fractured rocks metamorphosed by the hydrothermal solutions ascending by convective transport from a high heat source at depth, presumably a silica melt, and surrounded by relatively unmetamorphosed membrane materials (zeolites and clays) is assumed as a model. Hyperfiltration would occur within the dome by passage of solutions through the bordering membrane materials. Brines whose composition would have increased steadily through time until reaching an equilibrium would be found in the dome within which a convection cell characterized by channel flow should exist. Relatively dilute effluent solutions of a particular chemistry would emerge continuously from the membrane material to form the dilute shallow waters of specific chemical composition that typically occur near the surface at the Salton Sea and other thermal anomalies. Occasional fractures would permit leakage of the concentrated brine outward from the dome where it would mix with effluent waters. Meteoric interstitial water of the sedimentary fill would mix with the membrane-effluent and leakage waters on the borders of this hydrochemical system.

BURK, C. A., Socony Mobil Oil Co., Inc., New York, New York

GEOLOGIC HISTORY OF ALASKA PENINSULA

The Alaska Peninsula area is of particular geologic interest because it is part both of the Aleutian volcanic arc and the continental margin of southwestern Alaska. Topographically, the peninsula is a ridge, rising above the general level of a broad marine platform consisting of the Bering Sea shelf and the Shumagin-Kodiak shelf. However, the structural and stratigraphic history of these shelves appears to be separate from that of the Alaska Peninsula. The islands of the Shumagin shelf consist largely of a thick flysch sequence of late Mesozoic turbidites and volcanic rocks containing ultramafic bodies and are intruded by earliest Tertiary quartz diorite plutons. Similar rocks comprise the Kenai and Chugach Mountains.

The oldest dated rocks of the Alaska Peninsula are Permo-Triassic carbonate and volcanic rocks and Lower Jurassic volcanic debris, both of which were intruded by an Early Jurassic granitic batholith. Uplift and erosion of these rocks caused the appearance of the Alaska Peninsula, and the accumulated arkosic debris now constitutes a thick Middle Jurassic to Lower Cretaceous sequence. Middle Cretaceous deformation was relatively small-scale, but rocks of this age are absent from the Alaska Peninsula. Uppermost Cretaceous strata constitute a thin, but widespread, transgressive sequence.

Marine and non-marine volcanic rocks and debris accumulated to great thicknesses throughout the early Tertiary, especially in the outer parts of the Alaska Peninsula; lesser amounts were deposited on the newly uplifted Shumagin shelf. These were deformed gently at the time of mid-Tertiary plutonic intrusions along the present Pacific shore. Miocene debris from older rocks, as well as new volcanic material, accumulated in great thickness, but Pliocene strata occur only as thin patches of volcanic rocks in the mountains and as isolated bodies of marine sediments near the present coast. Both the Pliocene volcanic and sedimentary rocks rest discordantly on older rocks. All of the prominent structural features of the Alaska Peninsula were formed by post-Miocene deformation.

The Alaska Peninsula thus may have existed as early as Middle Jurassic time. The Shumagin-Kodiak shelf was formed during the earliest Tertiary. The Aleutian volcanic arc and trench are no older than Tertiary, and the trench may be relatively young. The greatest thickness of Tertiary sediments accumulated in isolated depressions that were only partly controlled by earlier structure, *e.g.*, in the Gulf of Alaska, Cook Inlet, Bristol Bay, and at the outer parts of the Alaska Peninsula.

BYRNE, JOHN V., and KULM, L. D., Oregon State University, Corvallis, Oregon, and MALONEY, NEIL J., Instituto Oceanográfico, Universidad de Oriente, Cumaná, Venezuela

TEXTURAL TRENDS OF RECENT SEDIMENTS FROM RIVER TO ABYSSAL PLAIN OFF OREGON

Recent sediments from river to abyssal plain in the area of the central Oregon coast show distinct textural trends. Textural parameters were computed for more than 300 sediment samples from Yaquina River, Yaquina Bay, neighboring coastal beaches and dunes, and from the continental shelf, slope, and abyssal plain off Yaquina Bay.