Relation of Metallogenesis to Accreted Tectono-Stratigraphic Terranes in Alaska

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Alaska consists of a collage of about fifty fault-bounded tectono-stratigraphic terranes of regional extent, as well as numerous small blocks. Each terrane possesses a characteristic stratigraphy and structure that differ markedly from those of neighboring terranes. Their grossly different stratigraphic and structural histories imply juxtaposition by large-scale transport from diverse sites of origin in various parts of the Pacific basin. The resultant mosaic of terranes records a long and complex history of accretion to the continental margin of North America. Parts of the terranes have been substantially modified by post-accretion faulting, intrusion and volcanism, and metamorphism, principally during the Cenozoic. These fundamental differences between terranes imply corresponding differences in metallogenesis, because metallogenesis is directly related to the geologic history of the rocks hosting mineral deposits. Consequently, a metallogenic model can be constructed that predicts: (1) differences in mineral deposits that formed during the origin of various dissimilar terranes; (2) differences in mineral deposits that formed during the transport and accretion of various dissimilar terranes; and (3) similarities in mineral deposits that formed within adjacent terranes after accretion. Three studies illustrate this model relating markedly different syngenetic mineral deposits, in three dissimilar terranes, to the particular origin of each terrane. The three terranes and their syngenetic mineral deposits are: (1) the Mississippian shale, chert, and tuff of the Kagvik terrane of the northwestern Brooks Range, in Arctic Alaska, which hosts extensive stratiform zinc-lead-silver-barium sulfide deposits; (2) the late Paleozoic island-arc volcanic rocks of the Wrangellia terrane, in southern Alaska, which hosts volcanogenic copper-silver sulfide deposits; and (3) the Triassic silicic volcanic rocks of the Alexander terrane in southeastern Alaska, which hosts volcanogenic zinc-lead-silver-barium sulfide deposits.