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**Title: OROGENIC GOLD AND EVOLUTION OF THE CORDILLERAN OROGEN**

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**Abstract:** Economically significant orogenic gold deposits of Mesozoic-Cenozoic age are almost exclusively restricted to the circum-Pacific, within orogens that define the most active continental margins subsequent to Pangea breakup. As much as 200 Moz of this gold endowment is a part of the past production, new resources, and associated placer accumulations recorded within the North American Cordilleran orogen. These orogenic gold deposits formed between ca. 170 and 50 Ma and over a distance of more than 5000 km between Nome, Alaska, and the Sierra Foothills.

Ore deposits in the Cordilleran orogen older than about 170 Ma represent either products of hydrothermal systems that were active in the platform/shelf environment of the ancestral North America miogeocline or systems that develop in oceanic arcs and continental fragments distal to the craton. The initiation of compressional tectonism along the continental margin began with the late Paleozoic to Early Triassic thrusting of allochthons of oceanic crust and overlying sediment over the miogeocline. But it was not until the Late Triassic, when subduction first occurred along the margin and Cordilleran orogenesis was thus initiated, that a favorable tectonothermal regime was established for the generation of orogenic gold deposits at mid-crustal levels.

Within 10-20 million years of the onset of subduction and accretion, large areas of the mid-crust within the growing margin began to experience a significant rise in geotherms due to the complex interplay among a number of factors. These likely would include, to at least some degree, release of radioactive heat from accreted material, shear heating, heating from massive fluid flux, crustal thickening, ridge subduction, and slab rollback. Typical Barrovian P-T conditions, leading to a "deeper-later" metamorphic style, caused

release of enormous fluid volumes; perhaps as much as five volume percent of the accreted and/or underplated material was converted to a low salinity, C-O-H-N-S fluid during metamorphic reactions. These fluids, rich in As, Au, B, Hg, Sb, and W, were focused along deep crustal faults, commonly terrane-bounding structures in fore-arc regions, during seismic events associated with changes in regional stress fields. Resulting orogenic gold deposits formed throughout the Cordillera at depths of 3-20 km.

The oldest gold lodes are those of Middle-Late Jurassic in the Canadian Cordillera. Early Cretaceous ores characterize the Sierra Foothills, mid-Cretaceous deposits occur in interior Alaska, and Eocene ores are exposed along the present-day Gulf of Alaska. Orogenic gold deposits younger than 50 Ma certainly exist, but have yet to be unroofed. Mercury and antimony deposits with the Cordillera, which are characterized by anomalous CO<sub>2</sub> and <sup>18</sup>O concentrations, define shallow levels of the hydrothermal systems that may overlie productive orogenic gold lodes.