Orogenic gold deposits represent the main source of gold in deformed Phanerozoic metasedimentary or Precambrian metavolcanic terranes, typically having formed 20-200 million years after their host rock terranes. These deposits are characterized by (1) post-peak metamorphic timing, (2) changing far-field stresses in a dominantly subduction/active margin setting, (3) structural siting in a metamorphosed fore-arc or back-arc locations, (4) a broad thermal equilibrium with country rocks, as indicated by alteration assemblages and lack of telescoped zonation, (5) hydrothermal addition of K, CO$_2$, Au, As, Sb, Te, and/or W, (6) low base-metal contents, and (7) broadly similar over-pressured H$_2$O-CO$_2$-CH$_4$-N$_2$-H$_2$S ore fluids that commonly undergo phase separation. Differences in the Earth’s thermal budget and tectonic processes between the Phanerozoic and Archean explain the greater complexities of the latter, such as spatial overlap of orogenic gold with other deposit types, some giant orogenic gold overprinted by younger metamorphism, and a more episodic nature to ore deposition. Historically, these were relatively high-grade deposits, with gold-bearing quartz-carbonate veins mined underground at grades from 5 to $>$10 g/t. With any significant increase in gold price, many of these deposits are now mined by large open-pit operations, recovering both high-grade veins and surrounding lower-grade hydrothermally altered country rock that were previously considered waste, or just distal geochemical anomalies (i.e., <1 g/t).

Whereas our ability to measure many parameters of the ore-forming fluid for orogenic gold continues to improve, and a relatively consistent fluid chemistry continues to be recognized, the interpretation of these data remains equivocal. A magmatic hydrothermal model for orogenic gold, although recently coming back into favor in many studies, still is incompatible with geochronological data from many gold-rich regions. Similarly, large gold endowments in numerous juvenile oceanic terranes, indicates an enriched subcontinental lithospheric mantle cannot be the direct gold source in many regions. A crustal metamorphic model remains the most viable ore genesis model that can be applied globally, with sulfur and gold released from prograde metamorphism of pyrite at depth. In Phanerozoic terranes, metasedimentary rock sequences are well proven to be an important fluid and metal source; in Archean greenstone belts, it remains unclear as to whether the metasedimentary or metavolcanic rocks were the main source. The giant Cretaceous orogenic gold deposits in Archean terranes of the North China block indicate that, in some examples, the subducting slab or the fertilized mantle wedge must be a metal and ore fluid source.