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Mercury Deposits of the California Coast Ranges and Their Environmental Impacts

Mercury (Hg) deposits occur at sites throughout California's Coast Ranges: e.g., *New Idria* (the largest producer), *New Almaden* (west of San Jose), and *Clear Lake* in the Mayacamas Mining District (the second largest). The major Hg ore is red *cinnabar* (mercury sulfide) although a black variety, *metacinnabar*, also occurs (see NCGS November 13, 2010 Field Trip Guidebook: *Geology of the Abandoned Mount Diablo Mine*). Ores were deposited from hydrothermal ("hot spring") activity, generally along active faults and associated extension fractures in Jurassic to Cretaceous [~200 to 100 million year old (Ma)] Franciscan complex host rocks. These were altered by the hot waters producing a *silica carbonate* rock, commonly having a "lighter" or bleached appearance. Hydrothermal activity is younger than the host rocks, ranging from Miocene (~23 Ma) to Pleistocene (~2.6 Ma). Ore deposits typically occur as masses, veins, and disseminations ranging from =1,300 to =600,000 tonnes, grading from =0.23 to =0.65% Hg.

Except for the Almaden Quicksilver Historic County Park and its historic trail, few old Hg mines are readily accessible. Prior to European discovery and mining, the New Almaden mercury deposits were used by the Ohlone Indians as a source of the deep red cinnabar for pigment and paint. It subsequently became a busy mining center for more than 125 years, from 1845 until 1976, with seven mines producing nearly 84 million pounds of valuable liquid Hg used for amalgamating fine placer and lode gold, Civil War explosives, Victorian glass, and 20th century battery cells and thermometers. Mine wastes however, have contaminated the Guadalupe River drainage and San Francisco Bay with elemental mercury being biologically converted to toxic mono-methylmercury.

Biography

William E. (Bill) Motzer holds a Ph.D. in Geology from the University of Idaho. He is a registered California Professional Geologist (PG) and Certified Hydrogeologist (CHG), with PG registrations in five other states. Bill has extensive experience in conducting surface and subsurface water quality chemistry and environmental forensic investigations. He formerly was a minerals exploration/mining geologist with projects from Alaska to Mexico that included the search for hot spring-type mercury/gold deposits. Bill is a recognized expert in forensic geochemistry, with particular expertise in stable and other isotopic "fingerprinting" and age dating techniques, water quality/contaminants, and emerging contaminant geochemistry. He has conducted more than 400 environmental projects, including mine litigation support, throughout California and other western states. He is a current NCGS member, past President of the San Francisco Bay Branch of the Groundwater Resources Association of California, and the current Northern California Section Chair for the Society for Mining, Metallurgy, & Exploration (SME).