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The Relationship between Placer Gold Particle Shape, Rimming, and Distance of Fluvial Transport as Exemplified by Gold from the Klondike District, Yukon Territory, Canada

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Abstract

A semiquantitative study of various physical features of approximately 2,700 gold particles from 21 lode deposits and 36 placer deposits in the Klondike district, Yukon Territory, Canada, was undertaken. The shape parameters of roundness and flatness were determined using a classification method. There appears to be a systematic variation between these parameters and between the parameters and the distance of transport of the particle. These relationships were confirmed by quantitative measurements on critical samples. Rim characteristics were also estimated. They show a systematic relationship between one another, with the particle shape, and less clearly, with the distance of transport.

Gold particle shape data shows a smooth, well-defined relationship to distance of transport from the lode source of the gold. Both roundness and flatness show a rapid increase within the first 5 km from the lode source and a slower more linear increase beyond. This relationship seems to apply worldwide. The relationship between the shape of a gold particle and the rim characteristic supports the conclusion that rims are formed by the removal of Ag, Hg, and Cu, and not by the precipitation of Au. Thus, rim thickness and the associated high fineness is probably the result of the dynamic process of Ag removal in stagnant sediments (to create the rim) and abrasion in active sediments (to remove the rim). The composition of the rims represents the stable composition of gold in normal surficial environments. Together these observations place limits on the occurrence of new gold.

Hammering is the main cause of shape change in fluvially transported gold particles. Its principal effect is to flatten particles. Abrasion has its most marked effect on surface texture. Hammering and abrasion both decrease the mass (size) and increase the roundness of the gold particles. It is therefore possible to make a connection between hydraulic conditions during gold particle transport and its shape change.