W.K. Fletcher: Behavior of gold in stream sediments

Laporan (Report)

Prof. Dr. W.K. Fletcher of Geology Department, University of British Columbia, Vancouver, Canada, presented the above talk to a large audience of about 50 on the 11 December 1991 at the Department of Geology, University of Malaya, Kuala Lumpur.

Professor Fletcher began his talk by indicating to the audience that gold anomalies in drainage sediments are often erratic. This reflects both rarity of gold particles and hydraulic effects whereby gold is concentrated at favorable sites along the stream. Studies of gold in drainage sediments in British Columbia have shown that: (i) concentrations are controlled by hydraulic and sedimentological conditions that lead to its selective accumulation in high energy environments, and (ii) that this can result in concentrations of gold increasing downstream away from their bedrock source. These findings have important implications for the design and interpretation of stream sediment surveys and therefore need to be tested under a wide range of conditions.

Next, Professor Fletcher touched on investigation to evaluate gold in a small stream in NE Thailand. The Huai Hin Laep, a third order stream, drains a region of gently rolling hills 40 km east of Loei. Gold mineralization is thought to be associated with quartz veins in the stream's headwaters. Climate is monsoonal with a rainy season from May to October. Soils are laterites and podzols that developed under a mixed evergreen forest. However, the forest has been removed and land converted to agricultural use. Probably as a consequence of deforestation and increased soil erosion, stream sediments are clay-rich gravels containing only very minor amounts of medium to fine sand.

Bulk sediment samples, consisting of approximately 40 kg of -12 mm material, were collected from bar and pavement sites along an 8 km study reach. Samples were wet sieved into eight size fractions. The five fractions between 420 µm and 53 µm were then processed to obtain heavy mineral concentrates (SG >3.3). gold content of all fractions finer than 420 µm was determined by fire assay-atomic absorption.

Concentrations of gold in the heavy mineral concentrates typically range from 10,000 to 50,000 ppb (maximum 198,000 ppb) whereas the corresponding light mineral and -53 µm fractions generally contain <5 ppb gold. Within the heavy mineral fraction concentrations of gold generally increase downstream away from their supposed source and are higher at pavement than at point bar sites. Variations in abundance of gold between point bar sites can be related to stream characteristics (such as width, velocity and bed roughness) that are indicative of changing energy conditions and of the ability of the stream to winnow light minerals from its bed.

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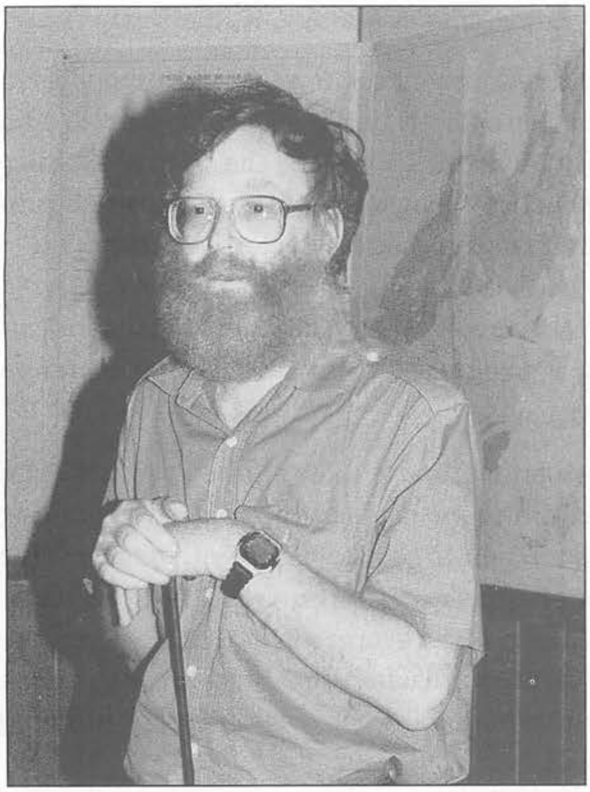
Estimates of the median number of gold particles in the heavy mineral concentrates increase from less than one at 212-420 µm to about three in the 53-106 µm size range. However, because of dilution by the light mineral and -53 µm fractions, the probability of a 30 g analytical subsample containing a particle of gold is so low that thirteen out of sixteen -150 µm sediment samples failed to detect the gold anomaly. Insofar as this results from dilution by large quantities of -53 µm sediment, failure of conventional sediment samples to reliably detect the anomaly is probably a consequence of deforestation and land usage.



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With respect to exploration it is apparent that use of heavy mineral concentrates from pavement and other high energy sites will be much more reliable than conventional sediment samples in detecting gold anomalies like that in the Huai Hin Laep. This has the advantage of requiring a low sample density but, because anomaly contrast may increase downstream, requires careful interpretation during follow-up.

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