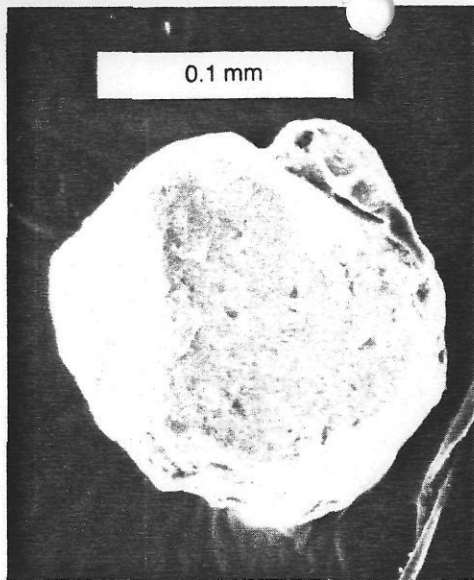


Watson Bar

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Supergene gold crystals at Stirrup Lake, BC

ABSTRACT. Panned concentrates obtained by ground sluicing have yielded between 75 and 100 whole or partial crystals of gold. Some of the crystal faces are mirror smooth and cannot have moved appreciably from their place of crystallization. These gold crystals must have been deposited from solutions which are thought to have been derived from the weathering of mineralized rocks carrying disseminated gold in micron sized particles.

INTRODUCTION. Three earlier papers (Warren and Delavault 1950; Trettin 1961; Warren and Hajek 1973) have described the geology of the area and also how and why continuing attempts have been made to discover gold ore of the Carlin Cortez type in the vicinity of Stirrup Creek.

Only a recent discovery of abundant gold crystals in a cut resulting from ground sluicing justifies some further remarks on an area marked by so much

interest and marred by so much disappointment.

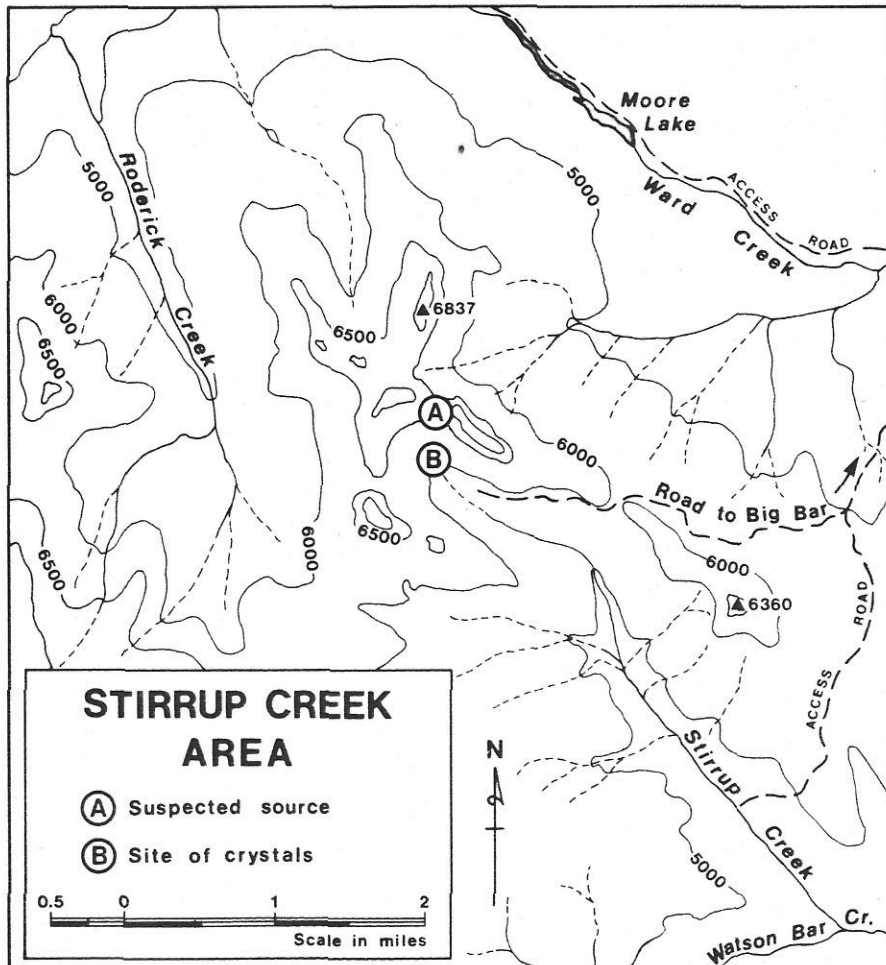
Anybody interested in further details may consult one or more of the above papers. This paper will report only enough data to enable those unfamiliar with the locality to evaluate the significance of the discovery of gold crystals, a discovery which possibly may help to elucidate the origin of at least some of the gold found in various placer deposits.

HISTORY. During World War I, placer gold was discovered on Stirrup Creek in the Clinton District of British Columbia. Stirrup Creek was originally referred to as the North Fork of Watson Bar Creek. In the next twenty-five years numerous placer miners between them recovered an amount of gold estimated to amount to upwards of fifteen thousand ounces.

One man, 'Bill' Trimble, attempted to find the sources of this gold, However in spite of sinking numerous shafts to bed-rock as well as a 60 foot-winze, digging many trenches, and driving at least four short adits amounting to some four hundred feet of rock work, all of which was done by hand, no 'mother lode' was found.

In 1942 the late NFG Davis and the author, working on behalf of Highland Bell Limited, and acting on the advice of Hartley Sargent of the British Columbia Dept of Mines, commenced new efforts to discover the source, or sources, of the placer gold in Stirrup Creek. After thirty-seven years of spasmodic attempts to solve 'the Riddle of Stirrup Creek' a plausible explanation for failure may have been found. Some of the placer gold may, in part, have originated from gold resulting from the mechanical weathering of the many small veins which are to be found on the left bank of Stirrup Creek and which range in width from one-tenth of an inch to as much as three inches.

However, because gold particles may still be seen in these veinlets in surface exposures, this gold probably could only



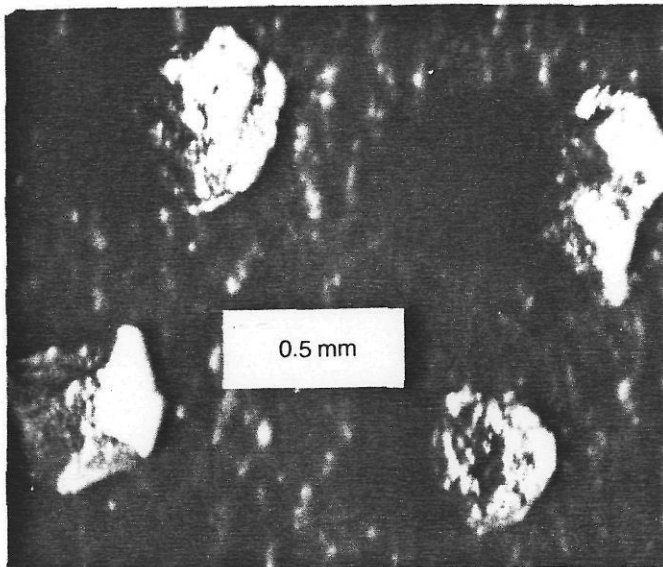


Fig 1. One of the first crystals to be discovered in overburden



Fig 2. Representative collection of crystals and crystal fragments. Octahedral faces readily recognizable

be made available to these placers by mechanical weathering and would contribute modestly, if at all, to the gold going into solution and then precipitating in crystal form and eventually becoming part of a placer deposit.

In 1970 MB Mehtens and JH Hajek found what was thought to be an exposure of bedrock, a sample of which ran 0.66 ounce of gold. Unfortunately this sample was found not to have been in place. Best described as a silicified slate, or tuff, this sample under the microscope was seen to contain micron-sized particles of gold and arsenopyrite. It is now postulated that it is from this type of mineralization that the gold crystals have originated.

LOCATION AND ACCESS. Stirrup Creek is only a little more than three miles in length with its head at approximately latitude $50^{\circ}07'$ and longitude $122^{\circ}14'$ within NTS 92-0-1. It runs in a south-easterly direction and enters Watson Bar Creek which flows for approximately seven miles in an easterly direction before joining the Fraser River.

By air it is twenty-seven miles west of

Clinton on the Cariboo Highway. By road it is a sixty-mile drive from Clinton via Kelly Lake, Jesmond, and the Big Bar Ferry crossing on the Fraser River. It lies in the eastern outskirts of the Coast Range Mountains. The gold crystals were taken from close to the headwaters of Stirrup Creek at an elevation a little below 5900 feet. The 'saddle' marking the divide between the headwaters of Stirrup Creek and the drainage leading to Ward Creek to the East is at an altitude of about 6500 feet. Stirrup Creek enters Watson Bar Creek at an elevation of approximately 4000 feet.

GEOLOGY. The headwaters of Stirrup Creek are occupied largely by a belt of sedimentary and volcanic rocks known as the Jackass Mountain, Group C Formation, which is of Mid Lower Cretaceous Age (Trettin 1961). These

rocks, in general, strike E-W and uniformly dip at between 10° and 25° N and are cut by numerous felspar porphyry dykes and sills that range from a few inches to as much as 500 feet in thickness. A stock of quartz diorite at least 1500 feet in diameter lies on the west side of Stirrup Creek. The intrusive rocks have not been dated but are believed to be related to the intrusive rocks which occur on Poison Mountain some sixteen miles to the west, and which are Tertiary in age.

The Jackass Mountain rocks are principally made up of green-grey medium to coarse grained greywackes which are composed of felspar, chert, and shale fragments in a fine grained arenaceous, and occasionally calcareous matrix. Interbedded with the greywackes are occasional beds of grey argillites some of which have been silicified. In 1970 MB

Fig 3. Placer gold with crystal faces barely recognizable

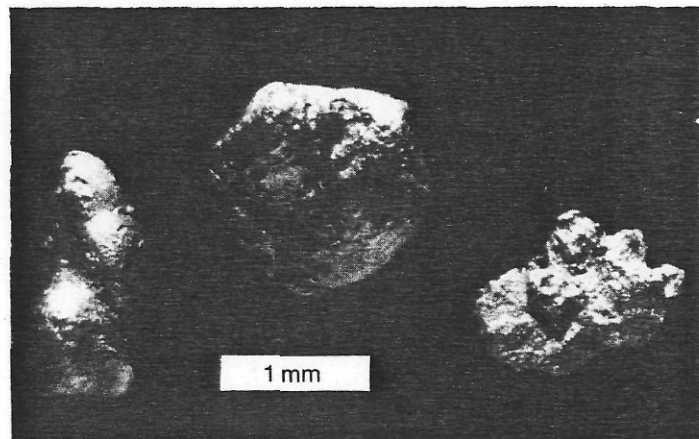
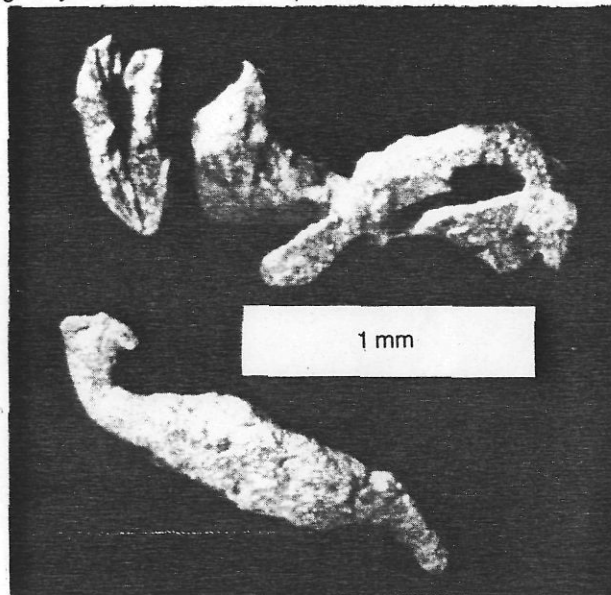


Fig 4. Placer gold in shapes presumed to have been deposited originally from solutions in shape of wire and 'horn' forms



Mehrtens and JH Hajek found a twenty pound sample of this silicified argillite which ran 0.66 oz of gold. Although this sample was originally thought to be in place it was found to be float. A great deal of effort so far without success, has been expended in attempting to find some more of this material in place. The rock in the field appears most unpromising: its gold content can only be determined by analysis. Polished sections have shown that the 'discovery' specimen contains many grains of gold and arsenopyrite of micron size. Unfortunately although much rock similar in appearance has been found none has been significantly auriferous.

Cutting all these rocks are numerous quartz veinlets which strike approximately N-S and dip nearly vertical. They are usually less than a quarter of an inch in width but contain quartz and pyrite crystals, the former of which occasionally give the veinlets a dog-tooth appearance. Gold particles can be seen infrequently. In one such veinlet it was possible to identify some two dozen fragments of the rare silver bismuth telluride wehrlite.

Antimony showings also occur in this area and consist of quartz-stibnite lenses in which the stibnite is present either coarsely crystallized or finely disseminated in quartz. Spasmodically associated with the stibnite is a small amount of arsenopyrite and rare specks of realgar. All the stibnite showings lie either within, adjacent to, or close to one

of the porphyry intrusions, suggesting that both porphyry intrusives and stibnite lenses were introduced along related zones of fracturing.

There are several major faults in the area. They run predominantly in an E-W direction and are characterized by intense carbonatization and brecciation. The carbonatization can readily be recognized by its associated yellow coloring. Gouge associated with these major faults varies in thickness from a few inches to as much as five feet. Gouge close to where the gold crystals were found was sampled and found to run between 0.01 to 0.08 oz of gold, suggesting that the fault was in contact with mineralization.

Occasional carbonate veins, varying in width from one or two inches to as much as two feet, and with dips ranging from 25° to 40°N and striking approximately parallel to the Jackass beds, are conspicuous in some of the cuts. Where uncovered they are deeply weathered and heavily iron-stained. In deeper cuts a few samples of unweathered vein material was examined. This was cream to pale buff in colour and contained less than one percent of metallic minerals of which galena, chalcopyrite, tetrahedrite, and wehrlite were identified, the latter two by X-ray powder photographs kindly identified by Dr RM Thompson. One of these veins was conspicuous in the cuts where the gold crystals were found: conceivably it may have played a part in precipitating the crystals.

ATTEMPTS TO DISCOVER GOLD ORE

The area of particular interest lies between elevations of 5400 and 6800 feet. Virtually all the area below 6500 feet is drift and vegetation covered, and rock exposures are lacking. Below the 6000 foot level on the left bank of Stirrup Creek, much of the bedrock is plastered with a false bedrock of glacial clay or hard pan from one inch to a foot in thickness. Its removal without machinery is exasperating in the extreme. With the aid of two small dams, one and one-quarter miles of ditching, dug by hand, it has been possible by ground sluicing and much pick and shovel work to expose bedrock in close to two miles of trenches. In addition, approximately two-hundred shallow pits have been dug to expose bedrock. No ore has been discovered as a result of this work. However, some facts have been established. No gold has been found in the soils on the right bank of Stirrup Creek, but cinnabar occurs in several localities: indeed more than 100 colours have been obtained from some pans of overburden. At two localities disseminated cinnabar has been found in place.

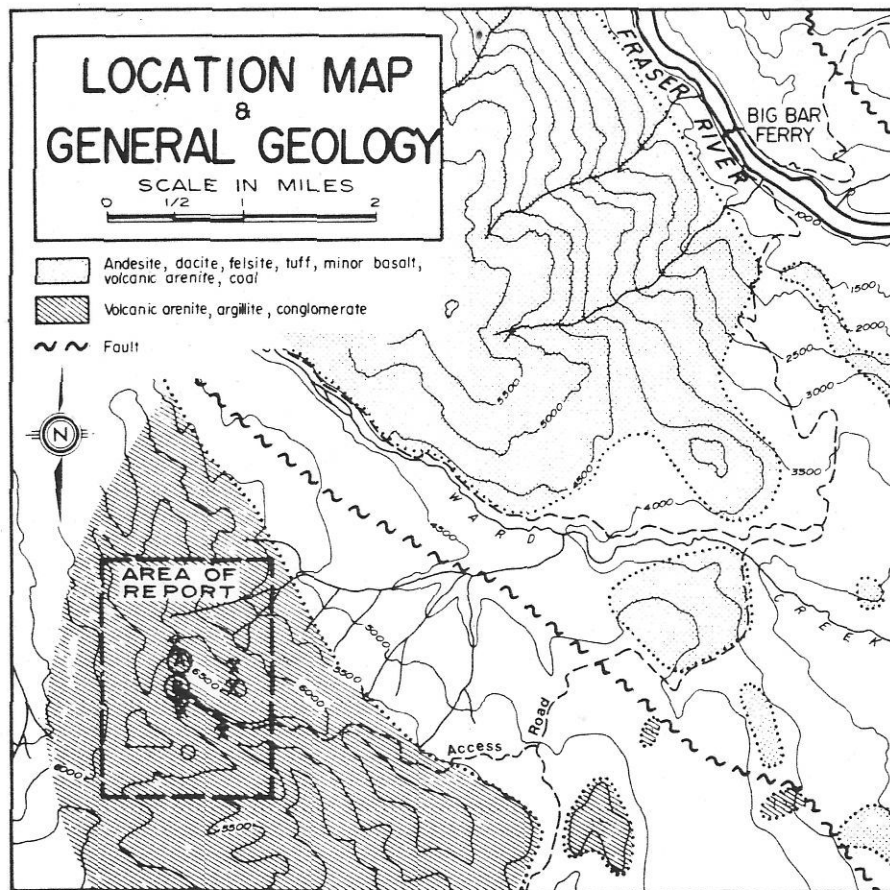
On the left bank of Stirrup Creek there are mercury anomalies but not one particle of cinnabar has yet been found. Only sparse erratic particles of gold have been found by panning the overburden below the 5800 foot contour on the hillside and above the benches which flank the left bank of the creek.

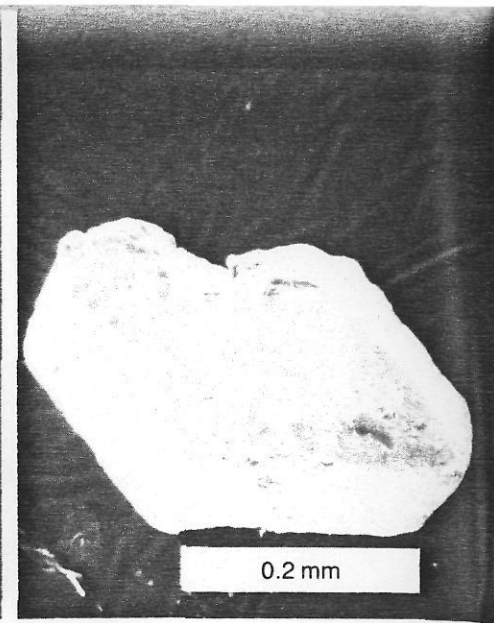
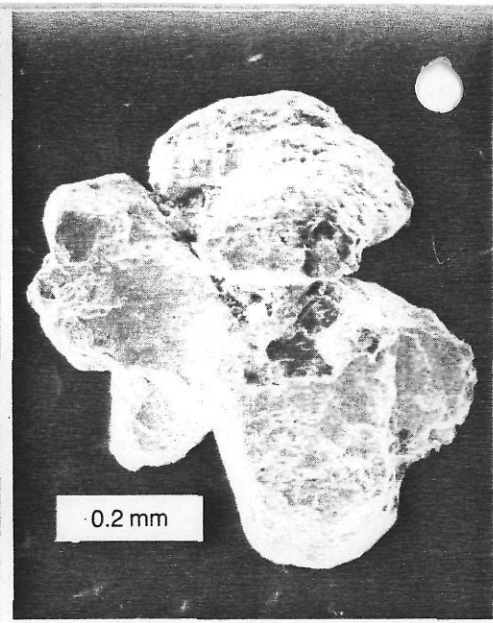
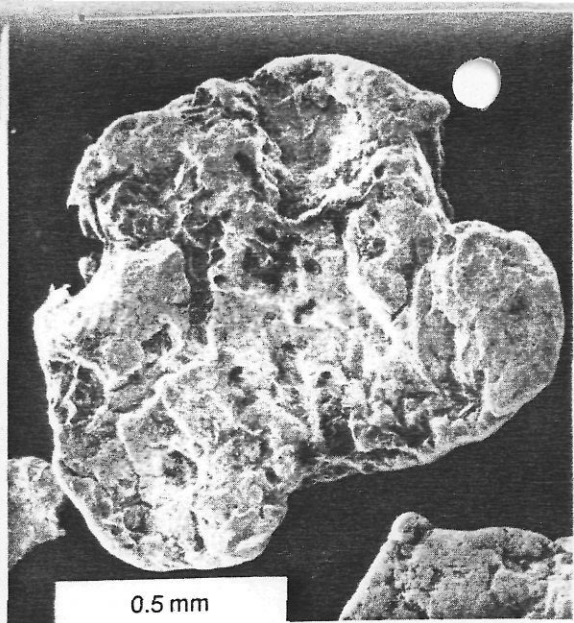
However colours were plentiful in panning obtained from two cuts which crossed the 5800 foot levels on the left bank of the creek approximately 2400 feet below the saddle of land dividing the head of Stirrup Creek from the headwaters of a tributary of Ward Creek to the east. It was from these two cuts that all the gold crystals have been obtained.

Prior to the discovery of these gold crystals some fifteen-hundred soil, and several hundred rock and vegetable samples had indicated the presence of a 3000 x 1000 feet area strongly anomalous in gold and arsenic, and less so in tellurium, mercury, and antimony. This anomalous area coincided, in part, with the saddle of land referred to in the preceding paragraph.

The geochemical data has led to nine percussion drill holes each of up to 200 feet in length, two 300 foot diamond drill holes, and 6000 feet of bulldozer trenches but have not resulted in the discovery of any ore.

The most promising locality in which the greater part of the above work was done, centred on an area of about 8 acres (3 hectares) at an elevation approximately 6500 feet around the saddle of land dividing the Stirrup and Ward Creek drainages which has been referred to in preceding paragraphs. In this area plant and soil anomalies showed anomalies of 50 and 60 times background respectively,



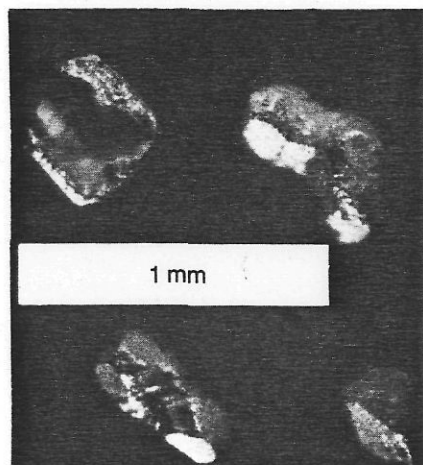
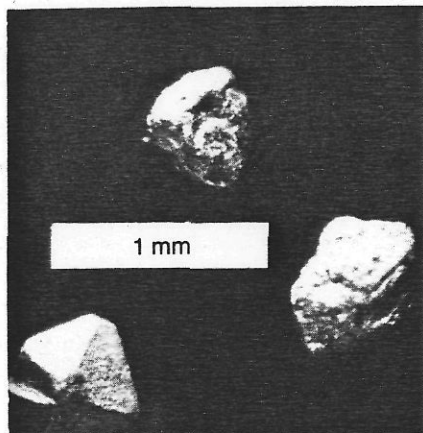


and occasionally even greater.

Nevertheless the best rock analyses only ran in gold as follows: 0.04 oz across 50 feet, 0.07 oz across 18 feet, and 0.10 oz across 10 feet.

It may be significant that in all the bulldozer cuts and the drilling the rocks encountered had undergone a great deal of alteration and in many places considerable shearing.

DISCUSSION. The finding of numerous gold crystals in the overburden on the left bank of Stirrup Creek at elevations of from 5800 to 5900 feet indicates that they



have been deposited from gold-bearing solutions. Geochemical data suggest that these gold bearing solutions originated from mineralization possibly from 2000 to 2500 feet distant and at elevations possibly from 500 to 700 feet above where the crystals were deposited.

As might be expected no gold deposits have yet been found in the gravels of Stirrup Creek. However some gold has been found in these gravels in shapes that are unlike any normal placer gold and that could not have travelled any distance. This would suggest that at least some of the placer gold in Stirrup Creek has been deposited directly from solutions.

Two principal questions that still remain unanswered are as follows. Is there an ore body of the Carlin Cortez type buried beneath the surface of the hill lying to the east of Stirrup Creek? Does the ore grade float found by Mehrtens and Hajek in 1970 and ore grade material reported to have been discovered in Trimble's winze merely flatter to deceive? The fact that vegetation and soil contain upwards of forty times their normal quota of gold and arsenic over substantial areas suggests that an ore body may yet be discovered.

The mechanism by which the gold is taken into solution is not known, but it is known that some plants secrete cyanide. Possibly some organic acids are also capable of absorbing gold. Micron sized gold particles would be much more susceptible to be taken into solution than coarse gold. Soil sampling has demonstrated that humus-bearing upper soil horizons contain more gold than the 'C' horizon.

Alas, honesty compels one to point out that four major mining companies have visited Stirrup Creek. All have found sufficient evidence to justify extensive work but with disappointing results. However the finding of many dozens of gold crystals in the overburden not far from the headwaters of Stirrup Creek does suggest that the disappointing re-

sults obtained by sampling near surface rocks may have been caused by supergene leaching of gold from the badly fractured and much altered rocks occurring beneath the anomalous soil and vegetation.

ACKNOWLEDGEMENTS. The companies and individuals to whom the author is indebted for being in a position to present this paper are far too many to identify by name. My sincere thanks are offered to all of them and to all my associates and friends who have provided many hours of pick and shovel work. Only in the last few years have mechanical supports become available. The author and his associates have a vested interest in trying to discover an ore body, but a sincere effort has been made to present the facts in as unbiased a manner as possible.

The author is indebted to 'Ed' Montgomery and Gordon Hodge for the microphotographs and the drafting, respectively.

Professor George Pohling, of the Department of Mineral Engineering, suggested that the author enlist the help of Professor D Tromans and Mr A Lacs of the Department of Metallurgy. To all of them collectively I am indebted for the scanning electron micrographs.

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