

III.—*On some Gold Occurrences.*

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SOME time since Prof. Ruskin kindly sent me a specimen of gold-quartz brought from New Zealand by Mr. H. A. Severn, giving me leave to cut thin slices for the microscope, and asking me to examine the same. The result seems to me of some interest, and Mr. Ruskin has kindly consented to my bringing it before the Mineralogical Society, together with a notice of a strangely beautiful gold occurrence, described by Mr. Severn as disclosed by blasting in one of the New Zealand gold reefs.

Moss-form Gold in Quartz.

The specimen first to be described came from the "Wham Mine," Thames District, Auckland, N. Z. Mr. Severn says "the gold here is largely alloyed with silver, *the two always running together*. The percentage of silver is about 32, the price paid for the gold varying from £2 to £3 per oz. The reefs in some of the mines present remarkable features, bands or layers of auriferous quartz being found of *great value*; thus, in one case 26,000 ozs. were taken out in a few days. Usually both above and below the quartz seam are parallel layers of Antimony and Mundic, the presence of these being always considered a good omen."

The sample of gold-quartz sent me by Prof. Ruskin, was rather more than 2 inches long by $1\frac{1}{2}$ inches to $1\frac{1}{4}$ inches across. Externally there was nothing to indicate the structure disclosed by slicing. The gold appeared finely disseminated in minute points and grains, giving a yellowish tinge to the richer portions.

Several thick slices ($\frac{1}{8}$ in.) were cut, and two very thin ones for microscopic examination. All these revealed a beautiful moss-like crystallization, but feebly represented in Fig. 1 Plate 1. The gold appeared in numerous fine lines at all angles with one another, and seldom more than the $\frac{1}{4}$ th of an inch in length, surrounded by shorter gold lines and fine dust, the whole presenting somewhat of a moss-like appearance. Some of the lines were thicker than others, and evidently

represented a more oblique section of the fine gold plates or laminae of which the finest lines were the transverse sections. In some cases indeed the gold laminae lay in the plane of the section, but seemed in no instances to be bounded by definite lines, rather to be minutely *fringed* out.

The moss-like growth ended in an irregularly rounded outline, tree or rather shrub-like in form, and the quartz above presented a milky appearance (in the $\frac{1}{2}$ in. slices), and was entirely free from gold in any form (see fig. 1). More recent quartz strings seem to have intersected the mass and they also were free from gold.

The thin slices viewed under the microscope gave no further information with regard to the gold, no distinct crystalline forms being observable.

The quartz was carefully examined for liquid cavities, but whereas the quartz of most quartz veins abounds in them, and they may be readily seen with a good $\frac{1}{2}$ -in. or $\frac{1}{4}$ -in objective, no single definite liquid cavity was discovered with a magnifying power of 660 diameters. The quartz is much traversed by fine cracks, and under polarized light presents the usual coloured mosaic representing separate crystalline portions. Minute semi-transparent granules are scattered about, and one instance was noticed of a slender transparent needle shooting out from a line of crack. There was nothing special to distinguish the quartz forming the secondary veins from that of the mass.

Tree-form Gold in Quartz Cavern.

The occurrence now to be mentioned was brought to my notice by Mr. Ruskin, and the following particulars are derived from Mr. H. A. Severn. The latter says,—“In the Caledonian Mine, (New Zealand), the gold found amounted to some 12 tons in as many months. A very beautiful specimen was disclosed by a blast; a small cavern was thus brought into view, the interior of which was covered with crystals, but from the centre of its floor grew a golden tree, the lovely and intricate golden branches spreading in all directions, its roots as if growing into the quartz. More singular still were many buds, like pin heads, attached here and there to the golden branches, and these on examination proved to be mundie crystals!”

From further inquiries, I learn from Mr. Ruskin, who saw some of the tree-like gold, that it “was just entangled enough to support itself, and no more, trembling with a breath, and not visibly crystalline anywhere to the naked eye.” From a pen and ink drawing given me in a letter from Mr. Ruskin, Fig. 2 Plate 1 is taken, to show the shaky

character of the gold thread-stems. Mr. Severn further writes that some of the threads were flat and bent over, that there was no earthy matter whatever in the small cavern, and that the mundic crystals at the ends of the golden threads were *perfect, of decided form, and belonging to the rhombic system*. Gold specks were disseminated in the rock beneath the cavern floor.

I leave the occurrences above-mentioned to the notice of mineralogists. That they are of interest in connection with the origin of gold can hardly be questioned. The laminar gold occurring in Moss-like form, embedded in quartz, free from liquid cavities (unless excessively minute), suggests whether the silica and associated gold could have been deposited in this case by hydro-thermal agency, the water playing a chief part? for if so, how does it happen that the quartz in the immediate neighbourhood of the gold does not show liquid cavities of the same degree of development as in most quartz-*veins*? Is it a usual or *unusual* thing, I would ask, for liquid-cavity bearing quartz to be in juxta-position with gold? Possibly this question yet requires working out, and had I the material to hand I would gladly do my quota towards the investigation.

Although the moss-form gold occurrence may be considered only doubtfully to support the theory of a watery deposition, yet the tree form occurrence seems hardly explicable on any supposition but that of crystallization from an aqueous solution. Its mode of growth within a small cavern or geode, the quartz crystals pointing inwards from all sides of the cavern, and even the gold disseminated in the floor, all seem to point to gold dissolved out of the surrounding rocks or carried up in solution from below, and then slowly crystallizing out from the solution within the cavern. It is impossible to conceive of the hollow being filled with igneously fluid matter from which the gold separated, the igneous mother-liquor wholly disappearing; and very difficult to imagine how the tree could be shot up from the floor of a *dry* cavern, or why it should so grow. On the other hand, on the aqueous theory of deposition, one might suppose that the pyrites heads at the end of the golden fibres represented the last metallic matter contained in solution, the last traces of gold being deposited with the pyrites.

There is so much to support the theory of an igneous deposition of gold (see especially Belt's views in this matter, in his "Nicaragua," pp. 99-102) that the meeting with an occurrence of the tree-form character described, is of special interest. Most likely, the precious metal owes its mode of occurrence to deposition under varied conditions, at one time igneous (fire the chief element), at another hydro-

thermal (water being the conspicuous element). So persistently does nature refuse sometimes to be limited to one hypothetically perfect method of action.

I have brought this matter before the Society with some misgiving, thinking that possibly after all, phenomena such as those described, are well known to mineralogists, though I have failed to meet with them described in books, or coming within the experience of many friends of whom I have made enquiry. I trust others may be induced to develop the subject, and follow it into regions beyond my reach.

Postscript.—Since writing the above, my friend Mr. Rutley has shown me a beautiful case (almost unique I believe) of gold upon selenite. Surely this must mean aqueous deposition. Mr. Ruskin has also shown me his beautiful collection of gold occurrences, which might well have a special memoir devoted to them.