

ior to the vein, but to the material of the country rock; and as to whether it is altered by vein influence and is within the bounding planes or exterior to it I could not say without close examination, which is impossible to make here. Outside that, the bulk of the exhibit is of pyrrhotite, with a good deal of chalcopyrite—that is in the specimen of the chalcopyrite. Here is also a considerable amount, a noticeable amount, of calcite. I should like also to say that in the first specimen (Exhibit No. 90.) there is calcite.

Q. I hand you Exhibit 93. A. Can I make what I said about country rock apply to all of the specimens later?

Q. Certainly you can if it does. A. There appears to be three types here, a country rock with very slight impregnation by metallic mineral, a pretty solid pyrrhotite ore with a little copper and the same mixture type in which there is considerable calcite, with pyrrhotite and chalcopyrite.

Q. When you speak of the country rock being altered in the veins, what is the alteration which you refer to? You might just describe it as simply as possible. A. It is a varying decomposition of the included country rock, which results prominently in the degradation of the feldspar, and in the uralization of the augites, and the development of the secondary biorite. The two former cases also proceed into the country rock, but in less degree, and the third case, that of the secondary biorite, is, so far as my examination has gone, characteristic of the included country rock, which I call vein matter.

Q. In Exhibit 94 what do you find? A. An exhaustive examination of this would take hours, of course, and perhaps days. I am only giving it in a cursory manner. This is the same mixture of country rock, containing disseminated pyrrhotite and chalcopyrite, more or less charged with calcite and solid masses of pyrrhotite. I will qualify those at the end by what my limitations are.

Q. What about Exhibit 95? A. This is a similar mixture, in which, however, the proportion of country rock is much less and the pyrrhotite and chalcopyrite much greater than in the previous sample.

Mr. Bodwell: That applies generally to the whole sample? A. That applies generally to the whole sample. That contains the two chief ore-bearing minerals and shows the country rock, (referring to one of the specimens.)

Q. What do you say about 96? A. This has more country rock in it. This is a similar mixture of country rock containing more or less calcite and carrying the ore minerals pyrrhotite and chalcopyrite.

Q. And what else? You said it is a mixture of country rock carrying so and so. A. Carrying the ore minerals pyrrhotite and chalcopyrite, together with solid masses of pyrrhotite and chalcopyrite, the latter always in less proportion. Do you want me to particularize, or can I say this is similar to the previous?

Q. I want you to say whether or not it contains pyrrhotite and chalcopyrite. A. Yes.

Q. Say that definitely, and then you can generalize as much as you like. A. This is a similar mixture of country rock, impregnated with the metallic minerals and of solid masses of pyrrhotite and chalcopyrite.

Q. What do you say about 98? A. A similar mixture of country rock, more or less impregnated with metallic minerals, the impregnation amounting

in places to a solid mass of the two metallic minerals.

Q. That is pyrrhotite and chalcopyrite? A. Pyrrhotite and chalcopyrite.

Q. What do you say about Exhibit 99? That is taken from 102 and 107 feet down? A. It is a similar mixture of country rock, pyrrhotite and chalcopyrite and iron sulphide.

Q. That is iron pyrites? A. No, which is probably iron pyrites mixed with a little chalcopyrite.

Q. What do you say about Exhibit 100, taken 112 and 117 feet down? A. It is a similar mixture of country rock, pyrrhotite and chalcopyrite, and is in part more silicified—apparently more silicified. It contains calcite as well.

Q. What do you say about Exhibit 101, taken at 123 and 127 feet down? A. It is a similar mixture of country rock, pyrrhotite and chalcopyrite.

Q. Is it possible to form any reliable opinion from looking at those samples which is the richer in value? A. I should suppose that the higher percentage of chalcopyrite would indicate a slightly greater contents of precious metal, but so far as the bulk of the ore mineral goes, which is pyrrhotite, there can be no determination made of relative values by looking at them.

Q. By merely an examination; that is what I want to get at? A. No. Since part of the values of the ore are in copper, the higher visible proportion of chalcopyrite means a higher value; but that pyrrhotite offers no guide.

Q. Now, are the values in veins, as a rule, uniform? A. Not at all.

Q. Just describe how values are frequently or usually found in that respect? A. The distribution of the valuable minerals within the material of a vein is most capricious and most irregular, and follows a very great number of types. Sometimes the values are all in certain layers of a banded structure; sometimes they are thinly distributed through a gangue stone; sometimes they are highly concentrated in the mud-seam of ore bodies, and sometimes one wall will carry more value than another. Sometimes in a mine whose vein consists of a vein stone of metallic minerals and of an impregnated companion zone exterior to the gangue stone, the plain exterior zone which may be due to silicification or even the presence of calcite, the exterior zone may carry a higher proportion of the precious minerals than the visible metallic minerals would show. In the case of veins of replacement the values may, and usually do, depend on the perfection of the pseudomorphism or replacement by the mineral as well as the original matter of the vein, and as that is a most capricious process, both values and the carrying mineral matter may cease at any time and re-appear in the most eccentric manner, and practically not until a great vein should be entirely worked out would it be possible to map the distinction of accompanying minerals or essential minerals.

Q. So that if, in following down a vein, you come to a place where the mineral rock constituting the vein, the filling, carried only a trace, what would you say of the precious metals; would you attach any importance to that? A. Only a commercial importance.

Q. But I mean as to the vein itself, or as to what might ultimately result in that vein? A. No, not at all.

Q. What do you say as to Exhibit 102, taken at a depth of 132 and 137 feet? A. That it was a similar