stibnite could be found in the specimen but jamesonite was positively identified as the steel-gray mineral veining dark sphalerite.

*Boulangerite.* Mayflower Claim, Rossland Camp, Trail M.D. Through the kindness of Dr. M. Hedley of the B.C. Department of Mines a specimen of ore from this claim was obtained from Mr. S. Bruce. The ore consists of galena, sphalerite, pyrite, pyrrhotite, and arsenopyrite. Associated with these minerals was a fibrous one, in large compact areas up to 30 mm., whose identity was uncertain: it proved to be boulangerite.

*Petzite, Hessite, Altaite.* Sweetner Vein, Hedley Monarch Property, Olalla Camp, Osoyoos M.D., B.C. This vein varies in width from $\frac{1}{4}$ inch to $1\frac{1}{2}$ inches and is sparsely mineralized with pyrite, chalcopyrite, sphalerite, galena, tetrahedrite, gold, petzite, hessite, and altaite for 130 feet. The erratic distribution of the microscopic telluride minerals and gold leads to erratic gold and silver values. In view of the tendency of the tellurides to rapid decomposition, further careful prospecting in this area is suggested.

## GOONGARRITE AND WARTHAITE DISCREDITED

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Goongarrite was first described by Simpson (*J. Roy. Soc. Western Australia*, **10,** 65, 1924) as a monoclinic lead bismuth sulphide from Lake Goongarrie, Comet Vale Township, Western Australia. It occurs as irregular to platy masses in part subfibrous and slightly radiating, in association with gold in a quartz vein in amphibolite. Analysis: Pb 54.26, Bi 28.81, S 15.24, rem. (Zn, Fe, Ag, Sb, Se) 1.63, total 99.94, giving the formula $4PbS \cdot Bi_2S_3$.

Dr. V. B. Meen of the Royal Ontario Museum kindly loaned a specimen labelled "goongarrite" (M14011) from the above locality. The specimen consists of a few silver-grey compact fibrous masses in white quartz. An $x$-ray powder photograph of these fibres yielded a complex pattern which proved to be that of a mixture of cosalite ($2PbS \cdot Bi_2S_3$) and galena.

Warthaite is the name given by Krenner (*Mat. Termés Ért.*, **42,** 4, 1926) to a sulphide of bismuth and lead from Vaskö, Hungary. Analysis: Pb 54.53, Bi 28.18, S 15.31, rem. (Ag, Cu, Fe) 2.23, total 100.25.

Dr. Meen also loaned a specimen labelled "warthaite" (M13912) for study. It consists of white crystalline limestone with grains of sphalerite, pyrite, and hematite, also sparse acicular to radial aggregates of steely-grey "warthaite." An $x$-ray powder photograph of a radial aggregate gave a pattern identical with that given by "goongarrite." An $x$-ray photograph of the needles alone gave the cosalite pattern.

Dana (*Syst. Min.*, 1944, p. 402) suggests that "warthaite" is identical with "goongarrite" but that adequate data are lacking to establish the relationship. These observations confirm this suggestion and indicate that both are intimate mixtures of cosalite and galena.

## LIQUID INCLUSIONS IN GEOTHERMOMETRY

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It was with considerable interest that I read the paper on "Liquid inclusions in halite as a guide to geologic thermometry" by Dreyer, Garrels and Howland in the January–February, 1949, issue of this Journal, but I am at variance with the interpretation put upon the results and the conclusions arrived at by the authors.

Some time ago a technique was developed in this department whereby the noise made by the breaking out (decrepitation) of liquid inclusions in minerals when heated, is used to indicate the point of complete filling by the liquid phase. This technique was described by Scott (*Econ. Geol.*, **43**, 637, 1948). Modifications have been made to the apparatus, particularly to the method of recording the onset of decrepitation, in an attempt to attain greater precision. In effect a curve is drawn, automatically, of the frequency of decrepitation against temperature. The inflection point in this curve is taken to indicate the temperature at which the fluid inclusions have just been completely filled by the liquid phase. This is described more fully elsewhere in this issue. In calibrating the apparatus and technique, synthetic mineral crystals grown under controlled conditions were used so far as possible, surprisingly close correspondence being obtained between the calculated temperatures of complete filling and those given by the apparatus. Among the minerals used was sodium chloride crystallized from a saturated aqueous solution at the temperature of the boiling point of the solution. Decrepitation gave a temperature in excess of this by 0.5° C. which is well within experimental error. Subsequently sodium chloride was grown from saturated aqueous solutions at temperature of 45° C. ± 2° C. and 80° C. ± 2° C. In both these cases decrepitation indicated temperatures of complete filling substantially the same as those of formation, certainly well within the possible experimental error.

In their paper, Dreyer, Garrels and Howland suggest that, since they obtained temperatures of formation of 70 to 100° C. for natural halite, using the direct observation-heating stage technique described by Inger-

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