zone therefore may reflect a similar underlying, northward-dipping shear which served as a feeder for the mineralization. Intersections of set (y) fractures with such a shear zone or with east-west contacts or other planar structures may have localized some of the ore.

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CANAM DEPOSIT*

by W. R. Bacon†

THE CANAM property is in southern British Columbia, 24 miles southeast of Hope. It is reached by 5 miles of road from Mile 26 on the Hope-Princeton Highway.

Between the years 1930, when the property was discovered, and 1938 development work by The Consolidated Mining and Smelting Company of Canada, Limited included some open-cuts and six adits totalling 2,700 feet in length. Canam Copper Company Ltd. explored the property intermittently from 1947 to 1955 by diamond drilling and underground work, including driving No. 10 adit. From surface down to the level of No. 10 adit, about 1,250,000 tons of ore has been outlined with an approximate grade of 1.25 per cent copper, 0.8 ounce silver per ton, and 0.01 ounce gold per ton. The ore in the upper part of the deposit also contains a little molybdenum and a little uranium.

In June, 1955 Canam Copper Company Ltd. made arrangements to have the property brought into production under the direction of Mogul Mining Corporation Ltd. of Toronto, and a new low level adit has been started.

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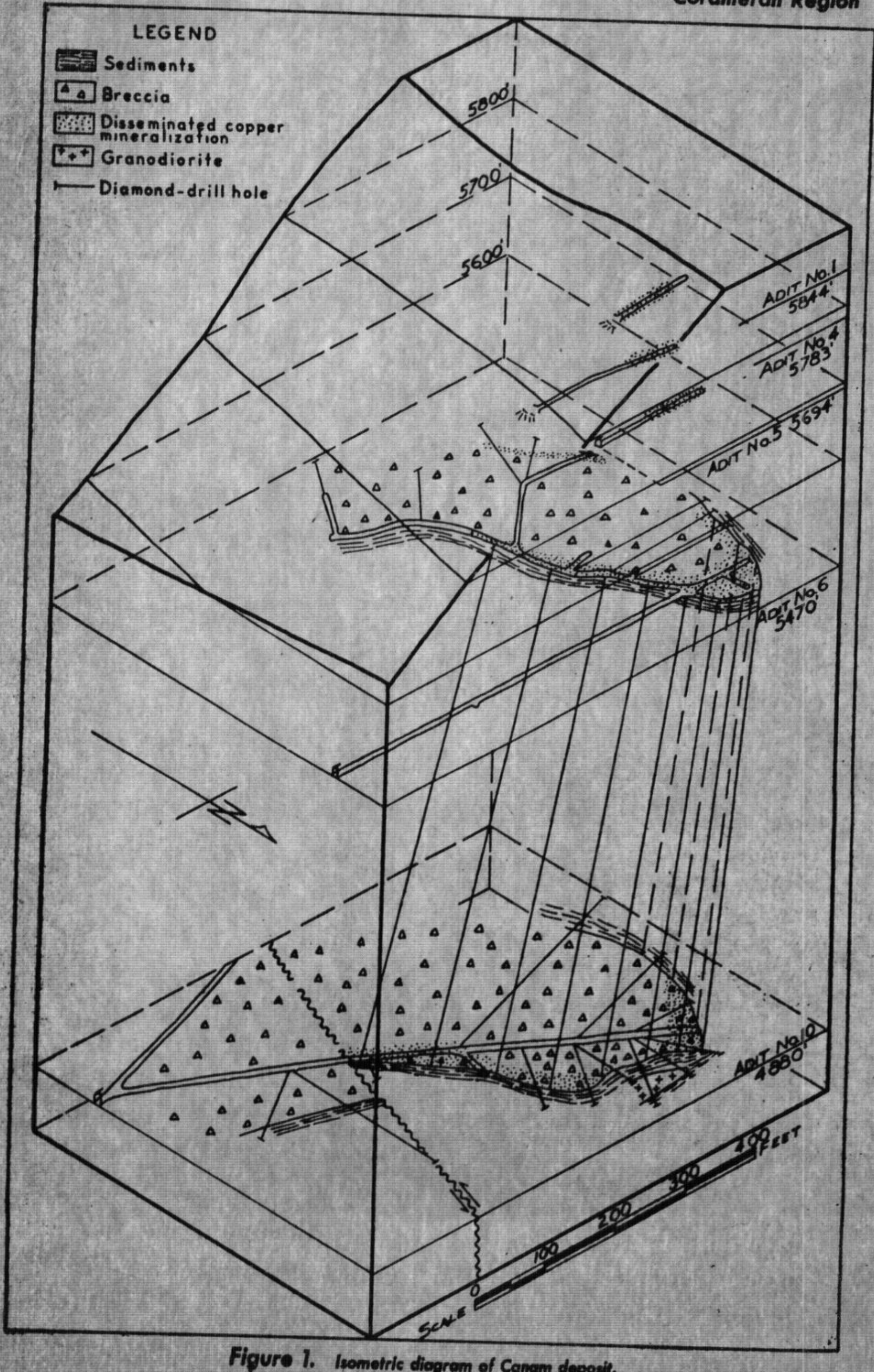

Figure 1. Isometric diagram of Canam deposit.

GENERAL GEOLOGY

The principal rocks on the Canam property are chert, cherty argillite, and argillite. They are considered to be Jurassic or Lower Cretaceous in age. Although massive bands to 150 feet in thickness occur, these rocks are in general thinly bedded. Conformable bands of pyrrhotite, a fraction of an inch in thickness, are not uncommon in the well-bedded rocks, and fine tourmaline can be observed in various places.

The sediments strike slightly west of north and dip quite steeply, generally eastward; however, sharp divergences from this general attitude are fairly common.

Dark grey dioritic sills, in which slender prismatic crystals are conspicuous, are fairly common in the sediments. In general the sills are less than 25 feet in thickness, but a few are as much as 100 feet thick. Under the microscope the sills are seen to consist largely of amphibole (pargasite) and plagioclase (near An50).

The Invermay quartz diorite stock outcrops 2,000 feet north of the workings. It intrudes the sediments. Tourmaline occurs in joints and fractures in the quartz diorite and is particularly conspicuous where the intrusive is brecciated.

A steeply dipping mass of granodiorite is exposed in the No. 10 adit, between 1,640 feet and 2,215 feet from the portal. Between 1,640 feet and 1,800 feet this rock is strongly sheared. Tourmaline occurs in some of the fractures.

Breccia outcrops of reddish brown to brown colour are a prominent surface feature. The area of breccia outcrops is roughly elliptical; the longitudinal axis trends northwestward and is about 1,100 feet long. The lesser axis is about 450 feet. Exploration has been carried to a point where it seems reasonably safe to assume that this area is largely, if not entirely, underlain by breccia.

The breccia consists of angular to subrounded fragments of sedimentary rock in a matrix of secondary minerals. The fragments are of sedimentary material identical with the rocks that surround the breccia outcrop area. Approximately 90 per cent of the fragments are less than a foot in length, and many measure less than 6 inches. Of the remainder, few are more than 3 feet in length, but several larger blocks of unbrecciated rock within the brecciated zone have been partly exposed by the underground workings.

The subrounded outline of certain of the fragments is clearly the result of replacement. Light grey to greenish alteration rims are fairly common around darker cores. Some of the smaller fragments are fractured and veined by minerals of the matrix. Tourmaline occurs sporadically in matrix and fragments.

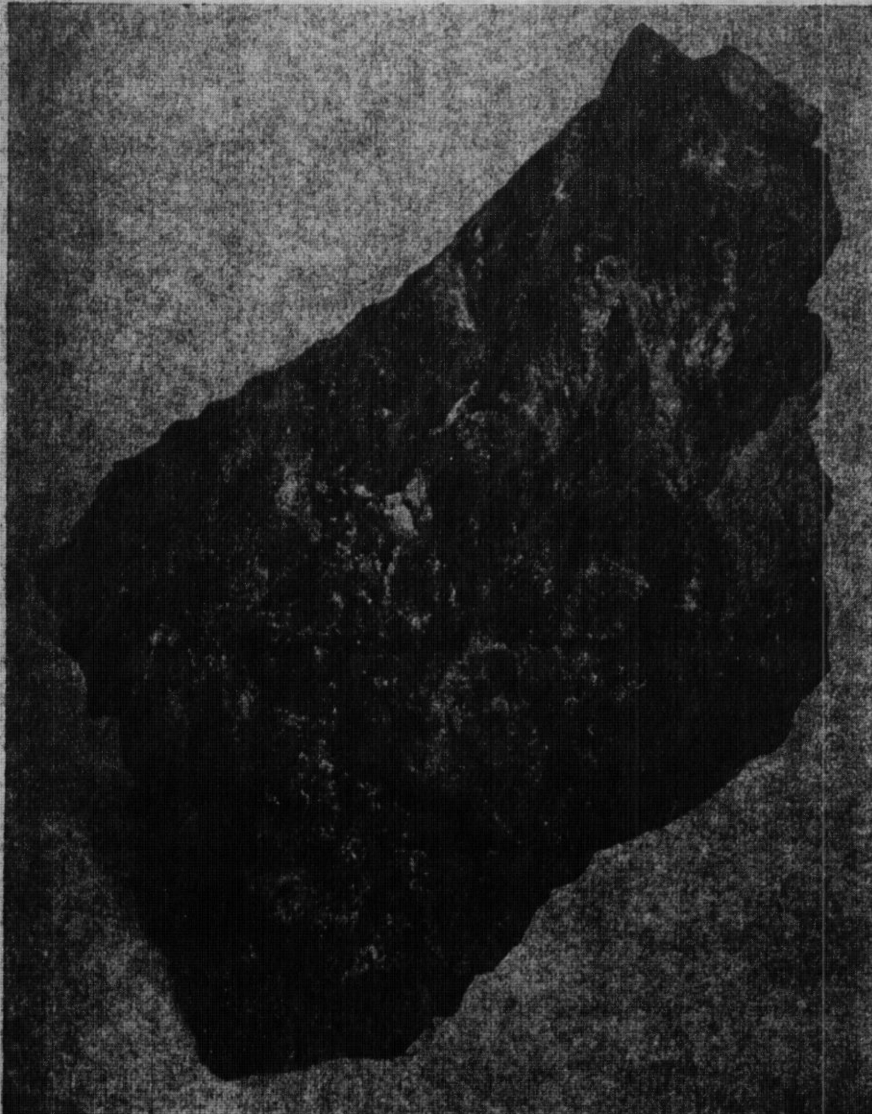

Figure 2. *Canam ore. Sedimentary fragments are rimmed by tourmaline (dark). Shiny interstitial material is largely chalcopyrite. (B.C. Govt. photo.)*

The matrix presents a variable appearance. In the upper adits (Nos. 1 to 7) it is commonly light grey in colour and appears to consist largely of quartz, chlorite, carbonate, alkali feldspar, white mica, and kaolin. In the

No. 10 adit, however, the matrix is generally dark green, due to a predominance of chlorite.

THE DEPOSIT

The breccia is the host rock for the Canam deposit. Chalcopyrite, pyrrhotite, and pyrite are the most abundant minerals. Smaller amounts of magnetite, molybdenite, uraninite, dark brown sphalerite, and arsenopyrite, and minute amounts of galena and scheelite occur sporadically. With the exception of arsenopyrite, these minerals are confined to the matrix of the breccia. Arsenopyrite occurs mainly in the matrix, but at the northern extremity of No. 10 adit it was found within fragments. Although clearly an introduced mineral, the magnetite is not closely associated with the sulphides.

The molybdenite and uraninite are closely associated spatially.

Some of the better grade ore has a striking appearance. Black tourmaline may be found rimming the barren fragments, accentuating the brecciated nature of the host rock, and the interstitial material consists largely of chalcopyrite and pyrrhotite. These sulphides are intimately associated, the chalcopyrite veining and replacing pyrrhotite.

Although mineralization has been found elsewhere in the breccia, the main Canam deposit occurs in the northwestern part of the breccia mass, around its periphery (*see* Figure 1). The mineralization gradually weakens toward the centre of the breccia, much of which is essentially barren. The deposit is roughly U-shaped in plan; the outer margin is sharply defined, being the abrupt contact between barren unbrecciated sediments and mineralized breccia, whereas the inner boundary of the deposit is an "assay wall".

STRUCTURAL CONSIDERATIONS

Because economic mineralization has been found only in the breccia, it is important, particularly with respect to possibilities at depth, to consider the probable origin of the breccia. The following facts should be taken into account:

1. The apparent outline of the breccia strongly indicates a pipelike form.
2. The breccia fragments are of sedimentary material identical with the sediments that enclose the breccia mass in plan.
3. Where exposed, the contact between breccia and surrounding sediments is sharply defined.
4. There is no diminution in brecciation toward the periphery of the breccia mass; on the contrary, abundant fragments can be noted in several places within inches of the periphery.

5. Where it can be observed, the bedding in the sediments adjacent to the deposit parallels the periphery of the breccia.
6. Brecciation in the Invermay stock, crushing of the granodiorite tongue in No. 10 adit, and the presence of innumerable faults in the workings all testify that great stresses have been operative, not only in the vicinity of the deposit but in the area as a whole.

Although the form of the breccia mass might suggest a mode of origin related to explosive igneous activity, the evidence is inadequate to substantiate this theory, and facts 3, 4 and 5 are hardly compatible with such an origin.

Fact 2 does not suggest that a distinct horizon in a layered sequence alone yielded by brecciation during folding. It is obvious, however, that the shape of the breccia mass has been modified by deformation.

Because of the occurrence of slickensides along parts of the breccia-sediment contact and of a great many faults in the workings, a theory of origin related to faulting merits consideration. It would be difficult, however, to reconcile such a theory with the rather smooth horizontal outline of the breccia as it is known, or with the conformability of breccia and adjacent sediments.

The theory of origin that would seem to be consistent with most of the evidence involves an originally fragmental horizon, i.e., a sharpstone conglomerate or intraformational breccia. Possibly the breccia mass is a fanglomerate or fossil talus slide. Such a theory is entirely acceptable, however, only if the conformability of breccia and sediments is either overlooked or considered accidental in the few places where it is possible to observe this feature.

Deformation in the area has been intense and, although the breccia as a whole is not considered to be a product of deformation, there is evidence that a minor amount of fragmentation was caused by stresses. Innumerable faults, in addition to fractures in the matrix of the breccia, are evidence of considerable adjustment to stresses.

Whatever the precise origin of the host rock, the Canam is an example of a widely recognized type — the breccia-filling deposit. The locus of the mineralization indicates that parts of the contact between breccia and sediments formed an important channelway for the mineralizing solutions. There is no obvious concentration of mineralization along any of the known faults.

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