PRELIMINARY REPORT

ON

IRON ORE DEPOSITS ADJACENT TO YOGO PEAK

JUDITH BASIN COUNTY, MONTANA

by

G. E. Goodspeed and P. J. Fitzsimmons

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ABSTRACT

The Blue Dick mine and a few other iron prospects near Yogo Peak in the Little Belt mountains of central Montana were examined. The ore mineral is magnetite which occurs along and near a contact between limestone and syenite. Molybdenite, scheelite, pyrite, and chalcopyrite are minor constituents of the ore. The latter two often constitute as much as 10 percent of the ore. There are approximately 1,200 tons of indicated ore and 95,000 tons of inferred ore with perhaps 55 to 65 percent Fe. A magnetometer survey across the contact of the limestone and syenite may disclose other magnetite bodies.

INTRODUCTION

A few visits were made to the Blue Dick mine and a few prospects adjacent to Yogo Peak in the Little Belt Mountains of central Montana by the writer, assisted by Mr. J. P. Fitzsimmons, during the summer of 1943. An additional 3 days were spent in mapping the surface and underground workings of the Blue Dick mine. Numerous specimens were collected and thin sections and polished sections were studied to determine the paragenesis of the ore minerals and the mode of formation of the deposit. No samples for assaying were taken because careful sampling would have been beyond the scope of a preliminary iron ore investigation.

GENERAL GEOLOGY

Yogo Peak is a northeasterly-trending mountain about 4 miles long and 1 mile wide. The highest point, which is the western peak, has an altitude of 8,625 feet. This mountain, in the central part of the Little Belt Range, is about 26 miles by road southwest of Stanford, and about 16 miles by road east of Neihart. (See fig. 1.) As mapped

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GEOLOGICAL SURVEY

STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP

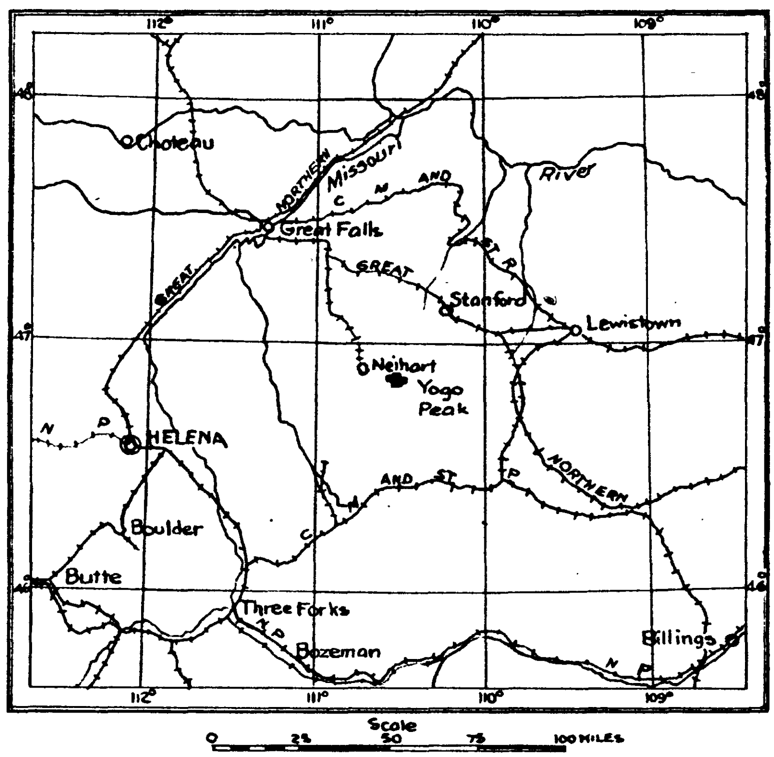

Figure 1 Index map of north central Montana showing location of Yogo Peak

by Weed 1/, the western part of the mountain is shown to consist of shonkinite, the central part monzonite, and the eastern part syenite. Weed states that the monzonite grades into shonkinite to the west and into syenite to the east, and he considers the intrusion to be stock-like in form rather than laccolithic. North of the pass between Lion Creek and Elk Gulch, the strata of Madison limestone dip into the intrusive mass of Yogo Peak, but to the south in Elk Gulch, the limestone dips to the east away from the Yogo Peak intrusive body. More detailed mapping is necessary to determine accurately the structural character of this intrusive mass, but it may well be of a chonolithic type rather than a true stock.

Likewise, although Pirsson 2/ has given excellent petrographic descriptions of the plutonic igneous rocks of the Yogo Peak region, the writer believes that, in order to explain adequately the mode of origin of these igneous rocks, Pirsson's interpretation of the mechanism of magmatic differentiation as of an earlier crystallized basic periphery with a later formed acid center needs revision and amplification.

The practical application of such studies might aid in the interpretation of the source of the hydrothermal solutions that formed the adjacent ore deposits. Weed 3/ stated that the alteration of limestone to crystalline marble is in no case intense, and that the zone of metamorphism is rarely over a few hundred yards wide and generally only a few yards.

There is little contact metamorphism in this area. At one locality south of the western part of Yogo Peak, an epidote garnet zone, from 5 to 10 feet wide, is traversed by intersecting veinlets of magnetite with some sulphides, chiefly pyrite. At another locality on the New Deal property, about half a mile east of the Blue Dick mine to the southeast of Yogo Mountain, some garnet-epidote rock was noticed on the dump of a caved tunnel.

The lack of extensive contact metamorphism indicates that there was not an excessive penetration into the surrounding sedimentary rock by emanations from the crystallizing shonkonitic, monzonitic, or syenitic magmas. However, the abundance of biotite in a facies of the shonkinite and the reaction effects, so clearly evident under the microscope, such as the replacement of olivine by iddingsite, suggest that some of these magmas were by no means devoid of volatile constituents.

In the Blue Dick mine it seems evident from the exposures in the tunnels that post intrusive fracturing and shearing afforded channels for ascending hydrothermal solutions. These solutions may have come from the end stage of crystallization of a more deeply seated basic

1/ Weed, Walter Harvey, Little Belt Mountains, Mont., U. S. Geological Survey Folio 56, p. 11, 1899.

2/ Pirsson, L. V., Petrography of the Igneous Rocks of the Little Belt Mountains, Mont., U. S. Geol. Survey Twentieth Annual Report, Part III, 1898-99, pp. 463-581, 1900.

3/ Weed, W. H., Geology of the Little Belt Mountains, Mont., U. S. Geol. Survey. Twentieth Annual Report, Part III, 1898-99, pp. 271-461, 1900.

magma. This mineralization apparently occurs at a relatively few scattered localities adjacent to the igneous mass of Yogo Peak. It would be expected that if tectonic forces continued subsequent to the intrusion, the loci of failure would be somewhere along the border of the structurally stronger igneous mass and the weaker sedimentary strata. Since the dominance of magnetite as an ore in these deposits indicates that the solutions were iron-rich, it is reasonable to expect such solutions as one of the final products of the differentiation of a basic magma. It seems evident from field and petrographic studies that the monzonitic and syenitic rocks were derived from a shonkinitic magma. If this is true, concentration of iron, either in an ultra basic magma or in iron-rich hydrothermal solutions might be expected. The presence of ultrabasic dikes in this region suggests the former explanation, whereas the magnetite sulphide deposits suggest the latter explanation.

More detailed mapping of structures such as the deformation due to the igneous intrusion and of post-intrusive structural features would be necessary before definite suggestions could be made as to the lateral extent of the ore bodies adjacent to Yogo Peak.

BLUE DICK MINE

During the summer of 1943 the most active mining property in the vicinity of Yogo Peak was the Blue Dick mine. This mine is on the southeastern slope of Yogo Peak about 4 miles east of the high western summit of this mountain, and about a mile and a half by road down from East Yogo Pass. It is on the western slope of Elk Gulch at an altitude of approximately 7,400 feet. According to Weed, this property was worked in 1893 for gold and silver, the ore being crushed and amalgamated in an arrastre at the Yogo settlement. The mine is about 28 miles by road from Stanford and 35 miles from Hobson via Yogo Creek, and is owned by a stock company of which Mr. N. B. Mathews of Stanford is manager and secretary.

The topography and the location of tunnels, tramway, and buildings are shown on Plate I. The principal rock types are limestone and syenite, and though lack of outcrops prevents the accurate determination of contacts, Yogo Peak syenite is probably north of the syenite exposures noted on the map, whereas limestone prevails to the south and east.

The iron ore (magnetite with chalcopyrite, pyrite, and a little molybdenite and scheelite) is exposed in two tunnels (Plate II) and on the dump of a caved cut 300 feet north of the portal of the lower tunnel. The ore was to be trammed on a long, inclined-rail tram to a small mill about 1,400 feet to the east and 500 feet lower than the workings. This mill, which is but a short distance from the Elk Gulch-Yogo Creek road, was designed to concentrate the sulphides for their copper content and values in gold and silver. No provision (summer of 1943) was made to save the scheelite, molybdenite, or magnetite content of the ore.

The syenite which crops out along the road from 100 to 200 feet east of the Blue Dick workings is a fine-grained, gray rock composed chiefly of feldspar with hornblende and a few flakes of biotite. Under the microscope the texture is seen to be hypidiomorphic granular, with turbid orthoclase averaging 0.4 millimeters in size as the chief constituent. The chief accessory mineral is green hornblende in euhedral to subhedral crystals, some of which are 1 millimeter in length. A little brown biotite is present and some of this mineral is included in the hornblende. A few crystals of oligoclase are 0.7 millimeters in size. The minor accessories are magnetite, apatite in slender prisms, and a uniaxial, negative mineral of very high refringence and low birefringence, probably corundum. Some of the magnetite is distinctly primary, occurring as subhedral or euhedral grains either associated with the feldspar aggregate or included in the hornblende, whereas some is apparently secondary, occurring in small irregular grains associated with a serpentine-like alteration mineral. This magnetite may have been one of the alteration products of an original pyrogenic mineral such as olivine. A small amount of interstitial quartz is present. Aside from the turbidity of the orthoclase and an occasional patch of a serpentine-like mineral with secondary magnetite, this rock is not altered.

The syenite, though fine-grained in texture, is distinctly plutonic and could be termed a hornblende-syenite. Its crystallinity is of interest because the specimens just described came from within a few feet of the contact with the limestone. They do not exhibit a microcrystalline groundmass like the syenite porphyry from near the contact of the igneous and sedimentary rocks in the vicinity of Woodhurst Mountain. The presence of corundum in this syenite suggests, perhaps, a magmatic consanguinity with the basic sapphire-bearing dikes 10 miles to the southeast. From an economic standpoint, the lack of alteration might indicate that the hydrothermal solutions that formed the Blue Dick ore body did not come directly from the adjacent magmatic mass.

The sedimentary rock from near the portal of the upper tunnel is a bluish crystalline limestone or marble. In thin section it is seen to be xenoblastic in texture, the average size of the calcite anhedrons being 2.5 by 1.5 millimeters. There are a few subhedral grains of what is probably tremolite, a few smaller, indeterminable grains of a mineral of high refringence, and an occasional minute grain of sulphide. A very little intergranular limonite is present.

A specimen of a dark, very fine-grained rock from the lower tunnel was seen in thin section to consist chiefly of augite with a little biotite, chlorite, and a very little orthoclase and plagioclase. A few irregular grains of later magnetite are present, as well as some vein-like, zeolitic material associated with sulphides. This rock is probably similar to other basic dike rocks in this vicinity, some of which have been classed by Weed 4/ as augite minettes.

The Blue Dick deposit consists in general of two, well-defined, altered and mineralized shear zones roughly parallel to the contact of

4/ Op. cit.

the syenite and crystallized limestone, a relatively thick body of magnetite (with later sulphide veinlets) at the contact, and magnetite-sulphide veinlets in brecciated syenite beyond the contact. As illustrated in Plate I these shear zones and the magnetite body dip steeply to the west toward the syenite mass of Yogo Mountain. In the lower tunnel, slightly more than 100 feet from the portal, there is an exposed anticlinal fold in the limestone with the axis in a north-south direction.

The first shear zone 67 feet to the west, in altered fine-grained, soft, crystalline limestone, is 10 feet wide and dips 63 degrees to the west. The altered limestone is traversed by numerous intersecting slickensided surfaces coated with a pale greenish, chloritic material which has locally pervaded and replaced the limestone. Under the microscope this rock is seen to be very fine-grained (anhedral calcite mostly under .05 millimeter) and to have a crushed appearance. The green, nearly isotropic, chloritic material occurs in irregular, minute, curving veinlets and also spreads through the fine intergranular calcite. Finely divided chalcopyrite is associated with the chlorite and is also sparsely disseminated in other parts of the thin section.

The second shear zone which is in a fractured fine-grained igneous rock (an augite minette, previously described) is exposed in the lower tunnel about 60 feet to the west of the one just described. It is 11 feet wide and consists of dark chloritic material filled with intersecting veinlets of sulphides and a few parallel, steep westerly-dipping veinlets of calcite $1\frac{1}{2}$ to 2 inches wide.

In this tunnel the next 14 feet to the face is in finely-granular magnetite traversed by small veinlets of chalcopyrite and with disseminated chalcopyrite and pyrite. There are also numerous tabular inclusions of calcite, and in the face the iron ore has a roughly layered appearance with a north-south strike and a dip to the west.

Near the portal of the upper tunnel the limestone dips to the east in conformity with the attitude noted in the eastern part of the lower tunnel. In the eastern part of the upper tunnel are numerous gouge seams parallel to the bedding of the limestone. At 90 feet from the portal the limestone is soft, altered, and apparently oxidized, with numerous showings of malachite. From 90 to 110 feet from the portal the limestone is nearly flat-lying and contains bands of what appears to be rusty magnetite parallel to the bedding. At the first cross-cut to the south the altered limestone has a westerly dip. Here on the south wall of the tunnel may be seen about 2 feet of limestone along the floor, above which is half a foot of gouge, then half a foot of oxidized slickensided material, and 3 feet of iron ore to the roof of the tunnel. From here the iron ore extends westward along the tunnel for 38 feet. Beyond this to the face of the tunnel the predominating rock is a fractured, altered, fine-grained, gray syenite. Locally there are numerous veinlets of chalcopyrite and pyrite with some disseminated sulphides and near the face there are intersecting veinlets of magnetite. In this part of the tunnel is a zone of dark chloritic, micaceous, slickensided material which may have originally been similar to the augite minette found in the lower tunnel and may represent another dike of this type of rock. Alteration and shearing of both this darker material and the syenite confuse the actual boundaries of this rock and the altered syenite.

The syenite in this tunnel is distinctly finer in grain size than that in the surface outcrops on the rock just east of the mine. In thin section this rock is seen to have a micropoikilitic texture. Anhedral orthoclase (2 by 3 millimeters in size) includes numerous subhedral crystals of altered hornblende and augite (1 by 0.5 millimeter) and an occesional subhedral oligoclase crystal (0.8 by 0.5 millimeter) with frayed borders partially replaced by the orthoclase. A few grains of quartz (0.2 millimeter) are present, and minute grains of zircon and prisms of apatite, as well as a little sphene form the minor accessories. The alteration products associated chiefly with the hornblende and augite are chlorite (antigorite), epidote, zoisite, actinolite, and interstitial calcite. This particular thin section contains a considerable amount of a micaceous (perfect basal cleavage) mineral slightly lower than quartz in index of refraction, of high birefringence, uniaxial, negative, and negative elongation. Optically this mineral most closely conforms to the rare mica pholidolite, which is found in Sweden in contact zones. Pyrite and chalcopyrite are present as irregular grains (0.5 millimeter) replacing the other minerals, or in irregular, discontinuous, narrow veinlets. Irregular borders between the sulphides and other minerals, as well as numerous penetrating veinlets parallel to cleavage cracks, indicate that replacement has played a dominant role as a mechanism of formation. Some of the sulphides are associated with, and appear to have partially replaced, the peculiar micaceous mineral noted above.

Some of the massive magnetite has a rudely banded structure due, in part, to included remnants of calcite or to later sulphide veinlets, or to a variation in grain size from very fine to medium-coarse. Numerous idiomorphic crystal faces of magnetite are discernible. Other parts of the massive magnetite exhibit irregular open vugs half an inch across, lined with small quartz crystals or smaller drusy cavities bordered with chalcedonic quartz. Locally a little molybdenite is present and a few specks of fluorsecent mineral, probably scheelite. Parts of the magnetite contain conspicuous hexagonal-shaped plates of a green, micaceous mineral, either in rough bands parallel to or included in the bands of calcite or locally irregularly distributed in the magnetite. A thin section of the iron ore shows euhedral boundaries of the magnetite against turbid calcite, quartz and chlorite and irregular projections of magnetite into these minerals. Most of the chloritic material is platy but some has a radial fibrous habit. Optically some of the chloritic material appears to be penninite and some delessite. Chalcopyrite is distinctly later than the magnetite, surrounding grains of the iron ore and occurring in minute transecting veinlets. Polished sections show finely granular magnetite including some minute specks of specular hematite which appears to have replaced turbid calcite since there are projections of magnetite parallel to the cleavage of the calcite and well-formed crystal faces of magnetite against the calcite. Later sulphides, chiefly chalcopyrite, form a coarse network of veinlets in the magnetite. One polished section revealed a pyrite crystal that is probably of earlier origin than the magnetite.

RESERVES

With the small amount of development work at the Blue Dick mine, tonnage estimates do not have the necessary factual data to give them a high degree of accuracy. However, using a factor of 8 cubic feet to the ton, a block of magnetite ore having dimensions of 38 by 25 by 10 feet would contain 1,175 tons of ore. This figure could be used as a conservative estimate of the indicated iron ore at the Blue Dick mine. Likewise, a block of magnetite ore having a width of 38 feet, a strike length of 100 feet, and a depth of 200 feet would contain 95,000 tons of ore, and this figure is used as the estimated amount of inferred ore at the Blue Dick mine.

Chalcopyrite and pyrite are conspicuously associated with the massive magnetite and may constitute at least 10 percent of this ore. Lack of data prevents accurate estimation of amounts present. Molybdenite was noticed in some of the pieces on the dump and, since molybdenite is commonly associated with tungsten minerals, a portable ultraviolet light was obtained from the Spokane Regional Office of the Geological Survey. With this light a slight amount of fluorescence appeared on the north wall of the lower tunnel at the first shear zone and was apparently confined to a 6-inch streak parallel to the dip of the shear zone. At the second shear zone in the lower tunnel a very pronounced fluorescence appeared in about the middle of the zone. Here on the south wall were patches of highly fluorescent material 8 to 10 inches in diameter, as well as numerous scattered areas over the roof and on the north wall. Fluorescence was also prominent in soft, altered material in the southernmost upper tunnel just west of the connecting cross-cut. Specimens from here showed small (one-fourth inch) fragments of scheelite crystals. Scheelite with some associated molybdenite was also found in the second (most westerly) shear zone in the lower tunnel. Here coarse, granular masses of gray, vitreous scheelite nearly a cubic inch in size, were obtainable, although most of the material was in a finely divided state. One of these masses with a small amount of molybdenite was attached to a cleavage fragment of calcite 1 3/4 by 1 by 3/4 inches in size.

Under the ultraviolet light this specimen of vitreous, gray scheelite showed partly yellowish and partly blue fluorescence. The blue fluorescent part (nearly pure $CaWO_4$) appeared along the borders of the crystal and as irregular vein-like masses penetrating the material having a yellowish fluorescence. Another granular scheelite crystal showed an irregular mixture of blue and yellowish fluorescence. Powdered material from this specimen was checked with the scheelite fluorescence analyzer furnished by the Geological Survey and appears to show fluorescence approaching the known standard of 2.4 percent Mo.

Due to the crushed and broken nature of the shear zones, it was impossible to obtain specimens underground to show clearly the paragenesis of the ore and gangue minerals. However, a specimen 6 by 4 by 3 inches from the dump of the lower tunnel revealed the association of scheelite, magnetite, chalcopyrite, pyrite, molybdenite, and calcite.

This specimen probably came from a wide part of the narrow calcite veins which were noted in the westerly shear zone in the lower tunnel. One part of this specimen is bounded by a narrow strip of highly altered, chloritized rock which may represent an altered, basic igneous rock, perhaps the altered equivalent of the augite minette. About one-half of the specimen consists of a very coarsely granular calcite. The interlocking anhedral calcite crystals, as shown by the cleavage surfaces or the cleavage cracks in sawed sections, are several inches in size. Magnetite, sulphides, and scheelite are concentrated in the other half of the specimen, but polished sections show their relationship to the calcite gangue and to each other. By far the greater amounts of the calcite is the earliest mineral; however, as seen in the sections, a small amount of later calcite is present in minute veinlets.

The pyrite occurs as fairly well-formed crystals: pyritohedrons, cubes, and octahedrons, ranging from one-half millimeter to 15 millimeters in size. The smooth boundaries between the pyrite and the calcite coupled with lack of any visible pressure effects indicate that these minerals were contemporaneous in formation.

Most of the scheelite has a similar relation to the calcite in that smooth crystal boundaries occur against the calcite. However, the fractures in the scheelite suggest that they may have been influenced in part by the cleavage in the calcite. There are also a few inclusions of calcite with ragged boundaries in the scheelite and a thin section shows long, very thin inclusions of calcite arranged parallel to the cleavage directions of the surrounding earlier calcite. Thus it would appear that this scheelite has replaced calcite. A small part of the scheelite is of later origin extending into the adjacent minerals in the form of small interlocking veinlets. From sections viewed under ultraviolet light this later scheelite appears to have a lower molybdenum content than the earlier scheelite, and is seen to transect the minerals (magnetite and chalcopyrite) which have replaced the earlier scheelite. The later scheelite also occurs in minute intersecting veinlets in the earlier, larger, scheelite crystals, and along the peripheries of these crystals. This later scheelite is commonly associated with molybdenite and since this scheelite is relatively molybdenum free, it is probable that here most of the molybdenum has been concentrated in the molybdenite.

Magnetite occurs in grains 0.5 millimeter to 10 millimeters in size and some exhibit fairly well-formed crystal faces against the calcite. Some of the magnetite forms thin projections parallel to the calcite cleavage cracks, and some grains of magnetite have peripheral inclusions of calcite. The calcite interstitial to the magnetite has the same crystallographic orientation (as shown by the cleavage) as the larger, magnetite-free calcite crystals. Hence it seems to be clear that the magnetite has replaced the calcite. The central portions of some of the magnetite are appreciably coarser grained than the borders. Polished sections when examined under vertically reflected, polarized light show in the central portions of the magnetite a few grains of a gray, anisotropic mineral which is probably specular hematite. The magnetite has also replaced pyrite and scheelite. Chalcopyrite appears to be later in formation than the minerals that have just been described. Although the chalcopyrite does show some smooth crystal outlines against the calcite, there are numerous penetrations between the calcite crystals and along cleavage cracks. The chalcopyrite surrounds grains of magnetite and penetrates them with minute, irregular veinlets, some of which appear to follow the crystallographic structure of the magnetite. Some minute, rounded masses of molybdenite are included in the earlier scheelite, but most of the molybdenite appears as the latest formed sulphide occurring along the borders of the magnetite, and as replacement embayments in the chalcopyrite and also intimately associated with the later scheelite.

Magnetite and scheelite are commonly considered to be high temperature minerals, although occurrences indicating that these minerals have not been formed at high temperatures have been described. This association with calcite as the gangue mineral, and the absence of any lime silicates, are indicative of formation at a low temperature. Even the massive magnetite in the Blue Dick mine is associated with chalcedonic quartz, which is suggestive of a not too elevated temperature.

The sulphide content of the Blue Dick magnetite would probably detract from its ordinary use as an iron ore. However, if the magnetite could be economically separated as a by-product from sulphides, and haulage costs were low, the material might be of commercial value.

Since the mineral sequence and association at the Blue Dick mine are somewhat unique, and since two minerals, i. e., molybdenite and scheelite, had not been reported previously from the Yogo Peak region, the foregoing detailed data are believed to be pertinent. Without the use of ultraviolet light, the presence of scheelite often escapes notice, and other contiguous deposits which were not examined may possibly contain scheelite. It is unfortunate that so little development work has been done on the Blue Dick ore body. The vertical distance between the tunnels is slight, and little exploratory work to determine the strike length of the ore body has been done.

MISCELLANEOUS PROPERTIES

New Deal Property

About a quarter of a mile northeast of the Blue Dick is a small property called the New Deal. The principal development work on this property consists of tunnels, one of them caved, and the other cribbed, for 75 feet from the portal. Owing to the condition of the workings it was not possible to obtain accurate data regarding the shape and size of the iron ore body, but geologically it appeared to be similar to that of the Blue Dick. It consists of magnetite with sulphides and some copper stains. Inspection with the ultraviolet light revealed only one small speck of fluorescent material. However, in contrast to the Blue Dick, the material on the dump of the lower (caved) tunnel contained numerous fragments of crystalline limestone with conspicuous contact-metamorphic minerals, brown garnet, green epidote, and finely granular white woolastonite.

A specimen of the latter showed rude bands of slightly pinkish silicate minerals, having both sharp and gradational contacts with the medium-gray, crystalline limestone. A thin section taken across the contact of the wollastonite and crystalline limestone showed that the limestone has a xenoblastic texture, the average size of the anhedral calcite crystals being 0.5 millimeter. This mineral is slightly turbid owing to minute dust-like inclusions of minerals of high relief. Also present are numerous, small, slightly elongated minerals of high relief, averaging 0.04 millimeter in size. Most of these are probably wollastonite, diopside, and epidote, but a few with rectangular outline appear to be zoisite. These minerals are most prevalent between the calcite crystals, some occur along cleavage cracks in the calcite, and a few are included in the central parts of the calcite crystals. Under the microscope the crystalline limestone adjacent to the contact shows a progressively greater development of intergranular, fine-grained wollastonite, epidote and diopside, and in the silicate area numerous relics of calcite are present. This crystalline aggregate consists chiefly of subhedral wollastonite 0.2 millimeter in size, with some anhedral diopside and epidote 0.05 millimeter or less in size. In this fine-grained aggregate are some roughly radiating aggregates of zoisite 0.5 millimeter in diameter. It is of interest that this specimen shows only the effects of pyrometasomatism and not of hydrothermal alteration, which was apparent adjacent to the magnetite.

Properties near Yogo, West Peak

A few feet north of the road just west of the western peak of Yogo Mountain is a filled prospect shaft with a few pieces of magnetite on the dump. This fine-grained magnetite is traversed by numerous, irregular veinlets of pyrite and chalcopyrite. This deposit is adjacent to the contact of a basic syenite and crystalline limestone.

About 500 feet south of the road is a lens of magnetite 3 to 4 feet wide in syenite, and a contact zone 5 to 10 feet wide, consisting chiefly of garnet and epidote with intersecting veinlets of magnetite and some sulphides, chiefly pyrite. Crystalline limestone may be seen farther down the hill to the east.

These deposits near the West Peak of Yogo Mountain are apparently too small to be of value as iron ore deposits.

CONCLUSIONS AND RECOMMENDATIONS

As previously noted, the exploratory work in the Blue Dick mine is insufficient to determine the possible vertical or horizontal extent of the ore. Since magnetite is a dominant mineral of this deposit, a magnetometer survey might provide information indicative of possible additional reserves.

Yogo Peak is one of the larger intrusive masses of the Little Belt Mountains, and it is probable that local post intrusive fracturing adjacent to this plutonic mass is the controlling structural feature of some of the ore deposits. Since magnetite is commonly present in these deposits it is possible, although perhaps remotely, that a systematic magnetometer survey on traverses across the probable igneous-sedimentary contact (concealed) might disclose the presence of additional bodies of magnetite.