CHAPTER VI.—ECONOMIC GEOLOGY

INTRODUCTION

The Antler Creek area is an important source of lode and placer gold. The Cariboo Gold Quartz and Island Mountain mines at Wells have produced more than 32 million dollars in bullion from 1932 to the end of 1954. Placer-mining has probably produced an equivalent amount, although only 15 million dollars is officially recorded because accurate statistics were not kept until thirteen years after the original gold-rush of 1861. Current yearly lode-gold production (1954) has a value greater than 1 1/2 million dollars, whereas current placer-gold production ranges between one-tenth and one-fiftieth of this figure.

This report is limited to lode. Placer was not studied because Bowman's maps of the placer creeks (1895) and Johnston and Uglow's report are accurate and thorough, and little could be added to them. This chapter contains much information drawn from earlier reports on lode properties and obtained from the staffs of the operating mines.

HISTORY OF LODE-MINING

The history of lode-mining in the Cariboo District is one of repeated unsuccessful ventures from the early 1870's until 1933, and since then of pulses of intense activity followed by periods of quiescence. In the years following the peak placer production of 1863, interest became directed for the first time to the many quartz veins in the area. Many of the large veins were examined and tested in the 1870's. These were chiefly veins striking parallel to the foliation of the surrounding rocks (the A veins of Johnston and Uglow). In 1877-78 much prospecting was done, principally on the following veins: Bonanza, Steadman, Pinkerton (see Cariboo Gold Quartz, p. 74), Black Jack (see Westport, p. 91), Proserpine, Island Mountain, and the Perkins, and others on Mount Burns adjacent to the present map-area. The weathered and enriched upper parts of some of these veins yielded encouraging assays: but work at depth did not. Below the zone of surface weathering the gold was largely contained in pyrite, and was not recoverable by the milling practice of the time. Not until the development of modern milling methods were any of the veins, large or small, in reality ore.

Little work was done from 1878 until 1886, when a period of activity started that lasted until 1891, partly as a result of the building of a custom mill at Barkerville by the Provincial Government and partly stemming from Bowman's geological survey. Bowman made the first systematic geological study of the area and examined and sampled most of the known veins. He delimited the area of gold-bearing placers and veins and pointed out the spatial relation between them. The veins already mentioned were the chief ones tested in this period, the most successful exploration being at the Black Jack.

From 1891 until 1922 almost the only work was the systematic testing of most of the veins in the district by C. J. S. Baker and A. J. R. Atkin, starting in 1902, and by E. E. Armstrong in 1916.

In 1922 Uglow examined the veins of the district, and his report (Johnston and Uglow, 1926, p. 187) did a service to the miners of the area by recognizing two types of veins and drawing attention to the difference in value between these types. He called A veins those with a strike essentially parallel to the foliation of the enclosing rocks, and B veins those cutting the foliation at from 45 to 90 degrees. The A veins are the larger and more conspicuous, but commonly contain relatively small amounts of sulphide minerals and gold; the smaller B veins may be well mineralized.

A small number of prospectors, including E. E. Armstrong, C. J. S. Baker, T. Blair, J. J. Butts, A. W. Sanders, F. J. Tregillus, and Fred M. Wells, prospected from Island Mountain to Mount Proserpine with an intensity increased by the knowledge gained from Uglow's work. In 1927 The Cariboo Gold Quartz Mining Company Limited was formed to develop veins on Cow Mountain, first by adits from Lowhee Creek and in later years...
by a long adit from Jack of Clubs Lake. A favourable exchange rate and a revaluation of gold in 1932 spurred general activity in the Cariboo District, and the Cariboo Gold Quartz mine was brought into production in January, 1933. The Aurum group, which had been held for a long time by C. J. S. Baker and had been optioned by several companies, was finally purchased by Newmont Mining Corporation, which formed Island Mountain Mines Company Limited in 1933. Development work revealed a new type of ore—gold-bearing pyrite replacement of limestone. A mill was built, and production started on November 1st, 1934. In 1933–34 Hanson mapped the “Barkerville Gold Belt” in detail and studied the mineral deposits. Numerous underground workings had been opened since Uglow’s mapping, and with this advantage Hanson was able to classify the quartz veins more accurately. He divided the veins into four groups—(1) transverse veins, (2) diagonal veins, (3) strike fault veins, (4) bed veins; (1) and (2) were together equivalent to Uglow’s B veins, and (3) and (4) to the A veins (Hanson, 1935, p. 13; see also p. 66). Hanson’s work was of great assistance to mine operators and prospectors, and if his recommendations had been fully carried out (1935, p. 18), significant replacement ore might have been found at the Cariboo Gold Quartz mine earlier than it was.

In the years prior to 1942 the two mines increased production and, along with other companies, continued developing the prospects in the area. In 1940–41 the Cariboo Gold Quartz Mining Company drove the main haulage level to the B.C. vein and sank the old B.C. shaft to meet it; Island Mountain purchased the Myrtle and Shamrock groups and extended the old Shamrock adit; and Privateer Mine Limited did much stripping on the Proserpine Gold Mines property and extended the Warspite adit. By 1942 the full effect of the war began to be felt; production fell and prospecting virtually stopped.

A new round of development and prospecting started in 1945, when Barkerville Mining Company did detailed geological mapping and intensive prospecting on its extensive holdings on Proserpine Mountain, and Canusa Cariboo Gold Mines, Ltd. started to sink a shaft. In 1946 Canyon Cariboo Gold Mines Limited and Williams Creek Gold Quartz Mining Company Limited started the examination of their properties. During these two years extensive development work was done at the Cariboo Gold Quartz and Island Mountain mines. The Cariboo Gold Quartz main shaft was sunk to 550 feet below the main haulage level, and at the Island Mountain mine the lower levels were developed from the shaft that had been deepened to 1,450 feet below the main haulage level in 1942. By 1948, however, this burst of activity was over; the camp was quiet and the mines sustained financial losses because of the steady increase in costs. In 1952 Island Mountain suspended all active exploration and development, and in 1954 the mine was sold to the Cariboo Gold Quartz Mining Company.

It is hoped that the consolidation of Island Mountain mine and the Cariboo Gold Quartz mine may return prosperity to the camp. The new arrangement increases efficiency by milling all ore at the Cariboo Gold Quartz mill and provides deep access to both the Cariboo Gold Quartz mine and its Mosquito Creek property. The search for new replacement ore is being carried on vigorously.

CHARACTERISTICS OF LODE DEPOSITS

The lode deposits of the Antler Creek area are gold-bearing pyritic quartz veins and bedded replacements. These two types of orebodies are related in origin, but they will be treated separately because of their different form. Lodes have been found only within the Cariboo group.

QUARTZ VEINS

Quartz veins are common and are widely distributed in the Cariboo group. Although some veins are very large, most are small and in some places are closely spaced. In general the sulphide content is low, but in certain areas they contain a fairly consistent quantity of pyrite with attendant gold.
A pattern of occurrence of quartz veins has long been recognized. Bowman, Uglow, and Hanson all noted this pattern. Hanson (1935, p. 12) named four types of veins:

<table>
<thead>
<tr>
<th>Type</th>
<th>Strike Relative to Foliation</th>
<th>Dip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagonal</td>
<td>Diagonal (i.e., easterly)</td>
<td>Steeply southeastward.</td>
</tr>
<tr>
<td>Strike fault</td>
<td>Subparallel</td>
<td>Steeply southeastward.</td>
</tr>
<tr>
<td>Bed</td>
<td>Parallel</td>
<td>Steep.</td>
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</tbody>
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Hanson's general classification of veins is substantially correct in the mine area, but the writer eliminates “bed” veins because they are insignificant and includes them with the strike veins. Veins of an additional type are recognized—the northerly veins. These veins were deposited in the northerly striking faults and were brecciated by subsequent movement. They are not drag ore as is commonly supposed. The writer therefore proposes the following classification:

<table>
<thead>
<tr>
<th>Type</th>
<th>Strike</th>
<th>Dip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse</td>
<td>North 30°–55° east</td>
<td>70° southeast to 70° northwest.</td>
</tr>
<tr>
<td>Diagonal veins</td>
<td>North 70°–90° east</td>
<td>Steeply southeast.</td>
</tr>
<tr>
<td>Northerly veins</td>
<td>North-north 20° east</td>
<td>45° to 80° east.</td>
</tr>
<tr>
<td>Strike veins</td>
<td>North 40°–60° west</td>
<td>Steeply southwest to 60° northeast.</td>
</tr>
</tbody>
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The first three types of veins are related to the pattern of faults and joints described on pages 53 to 55 and shown on Figure 13. Ideally, transverse veins fill the AC joints (extension joints), diagonal veins fill the minor easterly striking faults, and northerly veins occur in the northerly striking faults. The vein pattern and vein characteristics indicate the filling of a conjugate fracture pattern. The strike veins are not related to this pattern, and contrast with the other types of veins in a number of respects. The strike veins are essentially parallel to the regional foliation.

Veins commonly occur in clusters that branch and ramify from one orientation to another both along strike and down dip. This is especially characteristic of diagonal and transverse veins (see Fig. 19).

In the Wells mining camp two controls in the distribution of veins are particularly clear—a relation to northerly faults and to lithology. The northerly faults antedate vein formation but have been subject to post-vein movement. These conclusions are drawn from the following facts: The veins are clustered about the northerly faults but those in one wall do not match those of the other, the density of veins decreases sharply a few hundred feet from the faults, and veins occur in the fault planes but are brecciated. The vein clusters are normally restricted to one rock type, which most commonly is Snowshoe micaceous quartzite, and rake down dip within these strata.

Transverse veins strike north 30 to 55 degrees east and most commonly dip 70 to 90 degrees southeast. In the Cariboo Gold Quartz mine they are vertical or dip steeply northwest. They are the smallest veins and are by far the most numerous. There are countless fractures, thousands of veinlets, and hundreds of known veins with the transverse attitude. Mineable veins are commonly less than 100 feet long and 1 foot wide and are mineable only because they occur in clusters. The veins cut sharply across the country rocks, and although they may be shattered they are not crushed or folded. They fill tensional openings that are ideally AC joints and are most numerous adjacent to northerly faults. Some of the larger veins may be formed along several closely aligned fractures; these fractures may have been slightly en echelon on dip, and the vein group as a whole normally has a steeper dip than the individual fractures. Diagonal veins commonly fray out into a group of transverse veinlets both along strike and down dip.

At the Island Mountain mine the transverse veins are normally too small to mine except in positions adjacent to diagonal veins or east of the Jack of Clubs fault. At the
Cariboo Gold Quartz mine they are somewhat larger and are more closely spaced; they provide 60 to 75 per cent of the quartz ore. In both mines they are generally the highest-grade veins. Normally an entire vein is considered as one oreshoot and usually is mined as one of a group by selective cut and fill methods.

Diagonal veins strike north 70 to 90 degrees east and dip steeply southward. Diagonal veins are fewer, more widely separated, and larger than transverse veins. Some known diagonal veins are about 5 feet wide and extend 250 feet horizontally and vertically, although the average vein is probably less than 150 feet long. Not uncommonly the diagonal veins occupy fractures that are minor faults with small left-hand displacement. The diagonal fractures and veins occur predominantly adjacent to major northerly striking faults. Commonly the diagonal veins have a great number of tributary transverse veins. Not rarely where a transverse vein joins a diagonal a streak of pyrite in the centre of the transverse vein will continue into the diagonal vein, probably indicating that the sulphide mineralization is younger than the quartz mineralization of the diagonal veins.

The diagonal veins are about a fifth as numerous as transverse veins at the Cariboo Gold Quartz mine. At Island Mountain mine only the diagonal veins normally are mineable. In general the diagonal veins are lower in grade than the transverse, and there is a suggestion that the grade of a diagonal vein is related to the number of tributary transverse veinlets. Commonly not all of a diagonal vein is of mineable grade.

Northern veins commonly strike between north and north 20 degrees east and dip 50 to 70 degrees eastward. They occur within the northerly striking faults and commonly are completely crushed by subsequent movement. They are not well known because they are relatively rare and difficult to explore. In the Wells camp they invariably occur in ground that is nearly impossible to mine because of dilution and difficulty of support, but a few have been mined nevertheless. In the Yanks Peak-Roundtop Mountain area, the largest veins are of this type (Holland, 1954, p. 40).

Strike veins are subparallel in strike to the regional foliation, namely, north 40 to 60 degrees west. Most veins dip more steeply northeastward than the foliation, and some dip steeply southwestward. It is not clear whether the veins fill a group of minor fractures or faults, but in some instances there has been some minor post-vein faulting parallel to the walls. Wisps and inclusions of country rock and irregular bulges in the veins probably indicate that replacement was important in their formation. They are cut by northerly and easterly striking faults (see Fig. 17).

Strike veins are the largest in the area but are relatively few in number. They are prominent features and were the first veins to be investigated. The B.C. vein is the largest known; it is 2,400 feet long, as much as 42 feet wide, and has been developed to a depth of more than 900 feet. The Canusa vein is longer than 500 feet and is 9 to 11 feet wide.

Strike veins are normally sparsely mineralized or barren of sulphide minerals but may contain large isolated masses of pyrite. These masses carry little gold. Uglow stated that oreshoots were likely only at junctions with transverse veins, and Holland (Minister of Mines B.C., Ann. Rept., 1948, p. 90) indicated that the higher gold values in the Canusa vein occurred near minor crosscutting faults. The only strike vein to have been mined is the B.C. vein, from which three oreshoots containing visible gold have been mined.

Replacement deposits have been found to date only in the Wells camp, and there only at limited horizons and localities. Most deposits are in the Baker limestone beds of the Snowshoe formation, between the Rainbow fault and the northwest boundary of the Island Mountain property. Other thin limestone members intercalated in the Snowshoe formation are common, but have not yet been very productive. Some rare bedded orebodies replace argillaceous rocks.

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The replacement deposits consist of massive fine-grained pyrite which has entirely or selectively replaced the rock. Coarse grey ankerite commonly forms an envelope surrounding a deposit and may occur as streaks within it. Siliceous replacements and other sulphide minerals are rare.

Replacement orebodies may be pencil-shaped or tabular, the form depending chiefly on the fold structures of the host rock.

Pencil-shaped orebodies lie along the crests of folds and plunge with them at 20 degrees toward north 55 degrees west. The cross-section of an orebody may be of the order of a hundred square feet, but the length may be over a thousand feet (see Fig. 22). Pencil-shaped orebodies are localized in the crests of antclinal folds and less commonly in synclines. The largest and most continuous body occurs in the crest of the major dragfold in Island Mountain mine. Pencil-shaped orebodies have been found only in this mine.

Tabular orebodies normally have a dip length slightly greater than strike length, the maximum dimension being of the order of 150 feet. The bodies occur on planar limbs of folds. Tabular bodies are characteristic of the Cariboo Gold Quartz mine but also occur at Island Mountain mine. At the former mine it has been found that commonly several orebodies are stacked in a group at slightly different horizons, with only minor overlapping in vertical projection (see Fig. 20). In such cases the limestone is particularly thick (as great as 100 feet) and may be isoclinally folded, although no folds can be seen and there is no evidence that ore may be localized on fold crests.

It would seem from the distribution of the different shaped orebodies in different settings that the folds have controlled the migration of ore-forming fluids. These fluids appear to have migrated chiefly up plunge where constrained to do so by impervious phyllite hoods and up dip where not constrained.

A relation exists between faults, veins, and replacement deposits. The relation to faults is not too well defined, but so far all bodies are within "ore making range" of major northerly faults. The relation to veins is more obvious; transverse veins appear to be the feeders from which the mineralizing fluids spread. Benedict (1945, p. 768) states that in Island Mountain mine:—

No diagonal vein has been found extending into the limestone replacement horizon, but a fair proportion of the stronger transverse veins do so. Specific examples of massive sulphide replacement in the limestone at the intersection with such (transverse) veins have been noted.

It seems clear that at least some proportion of the solutions forming the replacement orebodies entered the limestone via the (transverse) veins.

At the Cariboo Gold Quartz mine transverse veins commonly extend to the base of a replacement body and may continue through it with replacement ore extending outward like wings. Such bodies are locally called replacement flippers. On the fringes of some orebodies minor transverse veinlets are common, from which thin pyritic streaks extend in a Christmas-tree pattern into selective laminae of the limestone.

In both Cariboo Gold Quartz and Island Mountain mines the gold content per ton of replacement ore is commonly more than double that of quartz veins, chiefly because of the greater concentration of pyrite in the replacement ore rather than a higher value of the pyrite. Benedict (1945, p. 755) states that at Island Mountain mine to the end of 1944 replacement ore averaged 0.83 ounce per ton, compared to 0.34 for quartz ore. At Island Mountain approximately 25 per cent of the ore milled has been replacement ore. The corresponding figure for the total production of the Cariboo Gold Quartz mine is near 4 per cent, but replacement ore is currently contributing a percentage considerably greater than that.

**Mineralogy**

The mineralogy of the quartz veins and replacement bodies is similar. Gold is the mineral of value. Silver is relatively unimportant because the ratio by weight of gold to silver in both types of ore is approximately 10 to 1. The precious metals are chiefly contained in pyrite, the dominant and commonly the sole sulphide mineral. A number
of other minerals occur in minor amounts, including galena, sphalerite, cosalite, bismuthinite, scheelite, pyrrhotite, arsenopyrite, and chalcopyrite.

Pyrite is sparsely distributed throughout most veins but also occurs concentrated in streaks along the walls, in the centres of veins, or as irregular masses. Streaks of pyrite not uncommonly are associated with transverse veins, and at vein intersections the pyrite streaks may continue from the transverse into diagonal or strike veins. Commercial veins normally contain 15 to 25 per cent of pyrite which assay 1 to 2 ounces per ton or better. In general, fine-grained pyrite has a higher assay than coarse. The gold is contained chiefly in small fractures in the pyrite. Visible gold occurs erratically, normally in fine particles. Together with cosalite and bismuthinite it is commonly associated with those parts of veins which have vugs containing well-terminated quartz crystals. Needles of cosalite and blebs of bismuthinite both commonly contain very finely divided interstitial gold. High-grade ore may be intensely mineralized with pyrite, or be less pyritic and contain cosalite, bismuthinite, free gold, and vuggy quartz.

Minor minerals in veins include galena, sphalerite, and scheelite, which occur erratically in moderately large blobs; arsenopyrite, pyrrhotite, and chalcopyrite, which are rare; and ankerite and muscovite, which, in addition to quartz, are the common gangue minerals.

Replacement ore normally consists of massive fine-grained pyrite with but few other minerals, except near the margins of orebodies. Commonly the finest-grained pyrite is the most auriferous and may assay as much as 5 ounces per ton. Even after dilution a replacement stope commonly averages better than 0.8 ounce per ton. The ore may be massive, but commonly contains bands of ore separated by bands of grey ankerite or, more rarely, phyllite. Toward the fringes of the orebodies, ankerite becomes dominant and pyrite becomes more sporadic and coarser grained. There may be some silicification near the fringes and also minor amounts of galena, sphalerite, arsenopyrite, and scheelite.

AGE OF MINERALIZATION

Johnston and UgIow (1926, pp. 20, 38-39) believed the gold mineralization was earlier than the deposition of the Slide Mountain group because a specimen of Guyet conglomerate was thought to contain placer gold, some quartz veinlets in Proserpine intrusives contained traces of gold, and no gold-bearing veins had been found in the Slide Mountain group. Some years later a prospector (J. Doody) took forty bulk samples of Guyet conglomerate and only three assayed as much as a trace in gold. The gold in these, as in Johnston and Uglow's samples, may possibly have resulted from inadvertent "salting" from surficial deposits. The gold-bearing veinlets in the Proserpine sill could be of any age later than the sill and not necessarily related to it. The third reason lacks conviction when it is considered that vein and placer gold is extremely rare in the Caribou group adjacent to the Slide Mountain group.

The gold mineralization is believed by the writer to be later than the formation of quartz veins. The veins are later than most of the northerly fault movement because they are concentrated beside the northerly faults, they occur in a conjugate set of fractures related to the faults, and they actually occur within the faults themselves. The major faulting and the vein formation took place later than the major folding of the Cariboo group and after the deposition of the Slide Mountain group. The mineralization is older than the gold-bearing Tertiary gravels. Therefore, on the evidence in the map-area the gold mineralization may have occurred between the Carboniferous and Early Tertiary. Outside the map-area auriferous quartz veins occur in the Quesnel River group (Late Triassic to possibly Early Cretaceous). It is not unlikely that those of the map-area are of Mesozoic age.

DISTRIBUTION AND GENESIS OF VEINS

Quartz veins are found in the Cariboo group throughout the district, but there are several places where they are especially abundant. Not all are gold-bearing, but where
 veins are abundant they normally are gold-bearing. Veins are predominantly small, and in general it is only where they are abundant and closely spaced that they can be mined.

It was pointed out by Bowman (1889, pp. 29–30c) that there is a restricted area in which placer gold is found, and that although quartz veins occur throughout the district, they are most numerous in this restricted area. Bowman’s general ideas are probably more nearly correct than Hanson’s specific concept of a Barkerville Gold Belt. This concept was of one particularly favourable stratigraphic horizon, the “Rainbow member,” which dipped and faced northeastward and was not known to be repeated by folding. Much energy was expended in prospecting this “horizon” and looking for its extensions beyond Island Mountain and Grouse Creek. Hanson’s idea was valuable inasmuch as it concentrated attention on a particularly rich area, but its rigid application led to the belief that prospecting beyond the “Rainbow member” was useless. It is now known that the “Rainbow member”—i.e., the lower part of the Snowshoe formation—is repeated by folding in many places although not with the same wealth of veins. The existence of favourable strata is not sufficient reason for the occurrence of mineable veins.

A possibility exists that the quartz veins may be of more than one origin and that the gold-pyrite mineralization may not be directly related to the formation of the veins. The evidence is suggestive rather than conclusive, but it can be stated strongly that not all quartz veins in the area are of hydrothermal origin.

Many quartz veins, widely distributed throughout the area, have the characteristics of locally derived secretions. Typically, these veins occur in quartzites or micaceous quartzites. They are barren veins almost devoid of minerals other than quartz. Some have irregular form, but most are regular and fit the fracture pattern. Many of the veins that appear secretional are strike veins, but not all strike veins are demonstrably of this type; alternatively, some are mineralized and others occur in schistose argillaceous rocks. However, the mineralization in strike veins is definitely closely related to transverse fractures or veins, and many of the veins in argillaceous rocks may be extensions of veins occurring in and derived from quartzose rocks. Veins of secretional type are abundant at Mount Burdett, Roundtop, Antler, and Bald Mountains, where they are found in all the classified orientations but dominantly the strike direction.

Most other quartz veins have some characteristics similar to those of secretional veins and some features that are significantly different. They also are largely restricted to the quartzites and micaceous quartzites. They may be barren of hydrothermal minerals in some places but not in others. The greater frangibility of the quartzites has been invoked to explain the localization of these veins in quartzites, but many of the micaceous quartzites are very fissile and no stronger than the phyllites. Also it is strange that if these veins were deposited from hydrothermal solutions, the adjacent limestones were not silicified. In contrast to the secretional type of vein, the close spatial relation of the other veins to northerly faults and related fracture patterns would seem to indicate such veins were more likely of hydrothermal origin.

The gold-pyrite mineralization may be younger than and only indirectly related to the main mass of veins, whatever their origin. Many veins are barren, except adjacent to transverse fractures or veins. In transverse veins the pyrite commonly occurs in streaks that suggest the filling of reopenings, and where such veins meet diagonal or strike veins the streak of pyrite will commonly continue in the same orientation through the other vein. Transverse veins are also judged to be feeders of the replacement deposits, which have essentially no siliceous envelopes such as should be present if the deposition of quartz were synchronous with the gold-pyrite mineralization. It appears that the mineralization is younger than the quartz veins and has largely followed the same conduit system and been distributed chiefly via the transverse fractures.

The principal features which may be used as guides in the search for ore deposits are the northerly striking faults and the presence of readily fractured rocks. The northerly striking faults occur throughout the area, and, although they appear to be particularly numerous in the vicinity of the mines, that may be because work has been concentrated
there. Careful search may turn up many more faults elsewhere. Quartzites and siltstones which may be readily fractured are common throughout the area and commonly contain quartz veins. Many of the veins are barren, and it is obvious that still other factors have been vital in creating or controlling orebodies. Very commonly mineralized veins are associated with a relatively steep plunge of folds. The significance of the steep plunges may simply be that intense faulting has occurred, for the plunge is compensated by faults (see p. 55), and it is the faulting that is important. Rock alteration by bleaching or, less commonly, silicification occurs in the same general locality as veins, but is related to the northerly faults rather than to the mineral deposits and thus forms only a general target for exploration. Ankeritization is also common near veins, but is so regionally distributed and so intense near some dykes that it is of little use as a guide to mineralization. Probably the most important general guide is the spatial relation between placer and lode distribution. However, it must be remembered that the placer concentration is the result of erosion of veins and not an indicator of veins that have not been exposed. Veins are found more readily than replacement deposits, and search for the latter orebodies should be pressed in areas of numerous mineralized veins.

The relation between gold-bearing lode deposits, numerous veins, and rich placer deposits is best illustrated in the area between Island and Proserpine Mountains. Creeks draining this area include many of the most productive in placer gold in the Cariboo District, e.g., Williams, Lowhee, and Mosquito Creeks, and Stouts and Conklin Gulches. Part of this area has altered rocks and steep plunges which, though not directly related to the veins, are related to the vital northerly faults. Other localities in which placer deposits, numerous veins, large plunges, and alteration are all present include Antler and Nugget Mountains in the vicinity of the Antler fault, and upper Cunningham Creek and Peter Gulch in the Antler and the Yanks Peak-Roundtop map-areas.