PORCUPINE-BEATTIE GOLD BELT

by

Frank A. Cunnington

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PORCUPINE-BEATTIE GOLD BELT

HISTORICAL FOREWORD:

The land area known as the "Porcupine-Beattie Gold Belt" is located in northeastern Ontario and northwestern Quebec. The western boundary of this belt is the Porcupine District, in the townships of Tisdale and Whitney, Jessop, Murphy, Hoyle and Matheson; its eastern boundary lies in Hebecourt and Duparquet townships in northwestern Quebec.

The Porcupine District was the first part of this belt of townships to be prospected and surveyed. As early as 1896 Mr. E. M. Burwash examined the country along the Algoma-Nipissing boundary line which traverses the southeast corner of Whitney township. In 1899 Mr. W. A. Parks reported on the geology of the portage route from the Mattagami River to Night Hawk Lake by way of Porcupine Lake. He noted gold occurrences in some quartz veins, and remarked that the region showed good promise for prospectors. Earliest geological descriptions of the Porcupine District and adjacent areas can be found in the reports of the Ontario Bureau of Mines for 1903, 1904 and 1905 by Messrs. Kay, McMillan and Kerr.

The earliest prospecting done in this area was in 1906 on a vein near Miller Lake - the present site of the Hollinger Gold Mines. In 1908 claims were staked on the east shore of Porcupine Lake, but in the following year, discoveries on what is now the Dome Mines, caused a rush to the district, and the whole area was staked out in mining claims.

A. G. Burrows' report in 1911 for the Ontario Bureau of Mines, was the first complete geological report on this area.

Ten miles east of the Porcupine District is the Night Hawk Lake Area, situated in Cody and Macklem townships. Visible gold was found in this area in 1907. Prospecting has been carried out in and around the Night Hawk Lake Area ever since, but owing to water and overburden, and the more promising Porcupine District to the west, progress was slow. In 1923 the Night Hawk Peninsular Mine went into production and at that time was the only producing mine in the area. Mr. P. E. Hopkins' report in 1923 to the Ontario Bureau of Mines was the first geological report on this area.

East of the Porcupine District and Night Hawk Lake Area is the German-Currie Area. It consists of the townships of German, Stock, Macklem, Bond and Currie and it lies approximately twenty-five miles east of the producing region of the Porcupine District. Early work on this area dates back as far as 1896 and may be found in reports of the Ontario Bureau of Mines. Due to the vast extent of overburden in this area, prospecting was discouraged from the start. Gold is known to occur in several places, but no discoveries of economic importance have been made, except on Gold Island in Night Hawk Lake. Mr. H. C. Laird's report to the Ontario Bureau of Mines in 1931 cites the gold occurrences, but up to the present day this area has not interested prospectors to any great extent.

East of the German-Currie Area lies the townships of Bowman, Hislop and Guibord which make up the greater part of the Ramore Area. The situation of this area is of special interest because it lies between the two great gold camps, Porcupine and Kirkland Lake. Gold occurrences are widely distributed even though the number of rock exposures are small and widely scattered. This fact seems to indicate that there may be gold-bearing formations concealed beneath the stratified clay and silt depos-

its that cover the greater part of this area.

The earliest geological work done in the Ramore Area was in 1904 by G. F. Kay. In 1911 Burrows mapped Munro and part of Guibord townships, and in 1915 Hopkins mapped and reported on the "Beatty-Munro Gold Area".

In 1935 the Ross Mine of Hollinger Consolidated Gold Mines came into production in Hislop township and in the same year the Vimy Mine also came into production.

Adjacent to the Ramore Area, and to the east, is the Beatty-Munro Area. Gold was discovered in this area as early as 1900. The area consists of the townships of Beatty, Munro and part of Guibord. In 1911 Burrows mapped Munro and a small part of Guibord township, while in 1915 Hopkins' map and report appeared. The numerous gold discoveries in this area stimulated prospecting throughout the Ramore Area and the area to the east of Beatty-Munro townships.

In Munro township the Croesus Mine was the most important discovery in the area. Properties in the southern part of Munro township contained gold-bearing veins but none were of economic importance. The Gold Pyramid Mining Company was operating a mill in 1911 in Guibord township which adjoined that of the Munro Mines to the north. The area has already witnessed intensive prospecting of the extensions of known gold deposits. Further prospecting may be largely confined to probing in and adjacent to the drift-covered carbonate zones occurring in the strike-faults and associated fractures.

J. Satterly's Preliminary Report in 1944 and H. S. Armstrong's Report in 1945 gives the latest information on the geology of this area.

East of the Beatty-Munro Area lies the Lightning River Area. This area includes Garrison, Harker, Holloway and part of Marriott townships, and was explored as early as 1907 and 1908. Cryderman, Cooper and W.

Woodney are listed as the earliest prospectors in this area. In 1917 Howey, Cochenour and Williams discovered a gold-bearing quartz vein at the southwest corner of Holloway township. This deposit became known as the Cochenour claim of the Lightning River Gold Mines Limited. It was this discovery that caused the Ontario Bureau of Mines to have a report and a survey made by A. G. Burrows and C. W. Knight. Gold occurrences were also found on the Meridian claim in Harker township and the Seagers claim, four miles north of Cochenour. Gold has also been discovered along the Teddy Bear Valley in Holloway township. On the whole the majority of gold occurrences in Lightning River Area have never advanced beyond the prospect stage.

The townships of Hebecourt and Duparquet in northwestern Quebec form the eastern boundary of the Porcupine-Beattie Gold Belt. General geological reconnaissances were made in these townships by Walter McOuat for the Geological Survey of Canada in 1872, by J. F. E. Johnson in 1909, by W. J. Wilson in 1910 and by M. E. Wilson in 1910 and 1911. In 1924 Messrs. Wright and Segsworth made a private reconnaissance and suggested, in a published paper, the extention of the Porcupine gold-bearing zone into Quebec. In 1925 and 1926 B. S. W. Buffam mapped the geology of this area in detail, and some work was done in these areas by W. F. James and J. B. Mawdsley. Buffam's work can be found in the Summary Report of the Geological Survey of Canada for 1925.

The Beattie Mine in Duparquet township is the most important producer in this area. The original Beattie claims were staked by John Beattie in 1910. These claims were subsequently diamond-drilled and developed. In 1930 Beattie made a new discovery 1000 feet west of the old workings. This discovery developed into the present Beattie Gold Mines. Since then other mines have developed in this area, and at present extensive work in diamond drilling is being conducted to locate

possible extensions of the Beattie gold-bearing zone.

Geological and prospecting activities in the Porcupine-Beattie Gold Belt began as early as 1850 and have been increasing ever since. General geological reconnaissance by the Geological Survey of Canada did much at the outset to stimulate interest in this area, and the more detailed reports by local provincial governments have kept this interest alive. At present the large mining companies are conducting extensive diamond drill programs, which will, indirectly, supplement the government reports in those areas where prospecting and geological surveying has been difficult. The activities of prospectors, either working alone, or for private mining companies, cannot be overlooked in the development of this area. Private initiative, in this respect, is largely responsible for the position that the mining industry holds today.

INTRODUCTION:

The preceding paragraphs have indicated the belt of townships under discussion and attention has been drawn to the early and most recent work, both in prospecting and geological surveying, that has been done in these areas.

This thesis is a study to correlate published information on the belt of townships between the Porcupine District on the west, and the Beattie Mine Area in Duparquet township on the east. Most of the information has been compiled from Annual Reports of the Ontario Department of Mines. The sources of such information will be listed in the bibliography.

Dr. Willet G. Miller, Provincial Geologist of Ontario, prior to 1920, drew attention to the relation of gold deposits of northeastern Ontario to belts of conglomerate, greywacke, and slate of the Timiskaming series. Gold producers have for many years considered the possibility of a structural break extending from the Porcupine District to the Beattie Mine Area in Quebec, somewhat similar to the Kirkland Lake, Larder Lake Areas.

As early as 1924 Cyril W. Knight suggested that two east-trending gold-bearing zones extended across northeastern Ontario into western Quebec. The southern break, known as the Kirkland Lake - Larder Lake - Rouyn Malartic zone follows the course of a great fault zone known as the Larder Lake - Rouyn Lake Cadillac fault. The number and the location of productive mines along this fault zone, with deposits either actually in the major fault or in structures known or believed to be subsidiary to them, supports the hypothesis that the loci of mineralization were controlled by this structure.

The Porcupine-Beattie zone to the north crosses Tisdale and Whitney townships. In this area it is known as the Porcupine Creek fault

and has been traced by Hurst as far east as the southern end of Porcupine Lake. According to Hurst it is a shear zone fault and occurs between the main syncline and anticlinal structures in this area. Hurst reported as follows regarding the possible extension of this zone eastward:(1)

"Similar faults occur in the Hollinger and Dome Mines and there are indications of faults of this type in the Gold Centre section and along the south greenstone-sediments contact between Bobs Lake and Three Nations Lake."

The eastward extension of the Porcupine-Beattie fault zone through Cody, Macklem, and Bond townships is not known. Its suggested location as indicated on the map will be discussed later in the text.

In all probability this shear zone reappears in Beatty-Munro townships. This zone is thought to continue through Guibord and Michaud townships and is fairly well defined in Garrison, Harker, Holloway, Marriott, Hebecourt, Duparquet and Destor townships. The Porcupine-Beattie zone is not so well defined as the Kirkland Lake - Larder Lake - Rouyn Malartic zone. Evidence that the Porcupine-Beattie belt lies along a fault zone similar in extent to the Larder Lake - Rouyn - Cadillac break is gradually being accumulated.

The Destor fault, a strongly sheared zone, thought to be the eastern extension of the Porcupine break, trends west-northwest across Destor township. It has been located south of the Beattie Mine in Duparquet township and northwest of Hebecourt Lake, in Hebecourt township, a similar sheared zone was located in diamond drill holes.

The westward extension of this sheared zone is described by J. W. Ambrose in his Descriptive Notes on Preliminary Map 44-29, Duparquet-

(1) Hurst M. E. Recent Studies in the Porcupine: C.I.M.M. Bul. No. 291 - July 1936 Pgs. 454-455

Larder Lake Rouyn Region, as follows:(2)

"Farther west on the strike, across the northern parts of Holloway and Harker townships along the valley of the Mattawasaga River, the rocks are greatly sheared and the course of the shear is marked in places by carbonate zones similar to those found along the southern break."

He further points out that with this information it is possible to trace a major west-trending shear zone from Destor to Garrison townships. The western extension of this shear zone disappears under the drift covered plains in the western part of Garrison township. A possibility exists that it reappears in the Beatty-Munro Area, and in all probability it is continuous with some fault zone in the Porcupine District. An attempt has been made to trace this shear zone from the Porcupine District to the Beattie Mine Area (See enclosed Map of Porcupine Beattie Gold Belt).

The repeated occurrence of exposures of conglomerate, greywacke and slate of Timiskaming age - or assumed to be of Timiskaming age - seems to indicate that a belt of these sedimentary rocks follows the course of the Porcupine-Destor fault zone for the greater part of it's length.

Beginning at the Dome Mines in the Porcupine District a belt of these sediments - conglomerate, slate, and greywacke of Timiskaming age - strike eastward for sixteen miles, the last known outcrop being in German township. Continuing eastward for another twenty-seven miles these rocks are entirely drift-covered; then another belt of similar sediments, ten miles in extent, occurs in the Croesus Gold Mine Area in Munro township. East of the Croesus belt, the sediments are drift-covered for a distance of twenty-two miles. They again appear in the Lightning River Area in Garrison, Harker and Holloway townships.

Outcrops of conglomerate, greywacke and slate are known to appear

(2) Ambrose W. J. "Descriptive Notes" Preliminary Map 44-29 Duparquet-Larder Lake-Rouyn Region

along the strike of the shear zone in western Duparquet and to extend into the northern parts of Holloway and Garrison townships.

Gold occurrences have been reported in all places across the belt where the Timiskaming sediments occur. These occurrences will be dealt with later.

GENERAL GEOLOGY - PORCUPINE-BEATTIE GOLD BELT

The general geology across the Porcupine-Beattie Gold Belt is somewhat similar to the geology of the Porcupine Area - the western extension of the belt. The rocks in the Porcupine Area, the Night Hawk Lake Area to the east, the Ramore Area, the Beatty-Munro Area and the Lightning River Area are generally similar. This would seem to indicate a similarity across the belt with the rocks of the Porcupine District. In many places across the area the intrusive rock bodies differ in size and composition, and this factor has influenced ore deposition.

All the consolidated rocks of the Porcupine-Beattie Gold Belt are pre-Cambrian in age. The principal formations across the belt consist of lava flows and sediments, which in many places have been tightly compressed into anticlinal and synclinal folds.

Acid and basic intrusives, younger in age, and of relatively small extent are associated with these rocks.

The bedrock surface of a large proportion of the area is covered with a mantle of glacial drift.

The following geological table is similar to that found in the Porcupine District, the Ramore Area and the Beatty-Munro Area - and may be taken as representative of the Porcupine-Beattie Gold Belt.

TABLE OF FORMATIONS:

QUATERNARY:

Recent:- Alluvium along streams

PLEISTOCENE:

Glacial drift and stratified gravel, sand, silt, and clay lake beds

Great unconformity

PRE-CAMBRIAN:

Keweenawan - Quartz Diabase Dikes

Cobalt Series: Conglomerate, Arkose and Greywacke

Unconformity

Matachewan: Quartz Diabase, Gabbro, and Diorite Dikes

Intrusive Contact

Algoman: Lamprophyre Dikes

Hornblende syenite dikes and plugs

Quartz monzonite and allied granitic intrusives and porphyries (i.e. Quartz and feldspar porphyry dikes and diorite porphyry plugs and stocks.)

Granite and Granodiorite

Albitite dikes

Intrusive Contact

TIMISKAMING:

Conglomerate, Banded Arkose, Greywacke and slate

Unconformity

KEEWATIN:

Quartz porphyry dikes, sills and stocks

Rhyolite, agglomerate, tuff, iron formation

Greywacke, slate

Dacite, andesite, basalt, diabase, epidiorite, interflow sediments, iron formation

The most important formations are the Keewatin lava flows, the Timiskaming sediments and the Algoman intrusives. The Cobalt series of conglomerate, greywacke and slate in many places cannot be differentiated from the Timiskaming formations.

KEEWATIN:

Across the belt, basic and acid lavas and sediments of Keewatin age are the oldest formations. Moore[3] states that in the Porcupine and Ramore Areas fourteen such flows, ranging from basic to acidic in composi-

[3]Moore E. S. Geology and Ore Deposits of the Ramore Area Forty-fifth Annual Report of Ont. Dept. Mines Vol. XLV Pt. VI 1936 - Pg. 5

tion, have been counted and there are probably many more, The earliest flows are of intermediate and basic composition, and are thought to have been errupted from fissures of considerable extent. Erosion followed this period of volcanic activity.

This period of erosion was interrupted by the ejection of acid flows and pyroclastics. After this eruption, erosion again set in and the Timiskaming sediments of conglomerate, greywacke and slate were laid down. Faulting and folding probably occurred during the deposition of the Timiskaming sediments and continued intermittently during the following period of volcanic intrusion.

The oldest basic rocks have the composition of dacite, andesite or basalt which have been considerably chloritized and carbonatized. Pillow structure, vesicular and spherulitic textures are frequently present in these lavas across the belt. Many of the flows show good grain gradation, being fine grained at the base, coarsely crystalline a little below the centre and fragmental at the top. In many places thin lenses of carbonaceous slate occur between the flows. These incompetent beds commonly have been sheared and drag-folded.

M. E. Hurst(4) states that in the Porcupine Area, a massive granular greenstone, which is overlain by pillow lavas and underlain by amygdaloidal pillow lavas, is the key to the structure.

The Keewatin rocks in the vicinity of Night Hawk Lake are largely rusty-weathering carbonate schist, serpentine-chlorite-carbonate schists and greenstone schists. The ore occurs in the rusty-weathering carbonate.

Dark grey to green lavas occur in German and Currie townships. In Bond township these lavas are closely sheared in an east-west direction.

(4) Hurst M. E. Recent Studies in the Porcupine: C.I.M.M. Bul. 291 July 1936 Pg. 449

In Macklem township several outcrops of fragmental volcanics occur.

In Murphy, Hoyle, and Matheson townships altered basic lavas of Keewatin age are most abundant. The Keewatin rocks in this area have been tightly folded and intruded by granite and diabase.

The Keewatin lavas again occur in Beatty, Munro, Guibord and Michaud townships and continue on through Holloway and Harker townships to the Quebec border and into the Beattie Mine Area in Duparquet township.

SEDIMENTS:

The important group of sediments across the Porcupine-Beattie Gold Belt are the Timiskaming sediments of conglomerate, slate, greywacke and in places, arkose.

The Timiskaming sediments on the western boundary of the belt outcrop at the Dome Mines in the Porcupine Area. These sediments continue eastward for sixteen miles where they disappear under the drift in German township. For twenty-seven miles eastward they are drift-covered. They appear again in Munro township in the Croesus Mine Area and extend eastward for another nine miles. East of the Croesus belt, the sediments are drift-covered for twenty-two miles. Scattered occurrences of Timiskaming sediments are known in Guibord, Holloway, Harker and Marriott townships. They again make their appearance in eastern Duparquet township in the Beattie-Mine Area.

In the Porcupine Area sediments of conglomerate, slate and greywacke were reported by Burrows(5) as Huronian in age, but since then, sediments of both Keewatin and Timiskaming age have been described, and one of the problems in unravelling the structure is to distinguish between these two groups of sediments.

(5) Burrows A. G. The Porcupine Gold Area: Twentieth Annual Report, Ont. Dept. Mines Vol. 20 Part II Pgs. 17-18

Sediments of Keewatin age, consisting of interbedded slates and greywacke, fill the central part of the syncline west of Porcupine Lake. Regarding the age of these sediments Hurst reported as follows:(6)

"In view of the easterly pitch of the syncline, it would appear that these sediments overlie the acid flows and pyroclastics which outcrop immediately to the west. However, no evidence which would clearly establish the age relationship between these two groups of rocks has yet been found." He further states: "Other considerations lead the writer to venture the opinion that these sediments are older than the acid volcanics and that, in the central part of the syncline, the latter may overlap the marginal edge of the sedimentary series. It is thought that both formations were quite restricted in areal distribution and that the acid volcanics only partially covered the sedimentary series."

Northwest of Porcupine Lake these sediments are about 1000 feet thick and approximately a mile to the east in Whitney township, they have been completely eroded, and sediments of Timiskaming age rest unconformably on the lower Keewatin volcanics.

Hurst further indicates that in all probability there are similar embayments between the Keewatin greenstones and Timiskaming sediments along the north greenstone-sediments contact, in which the Keewatin sediments and the acid volcanics have been partially preserved. This explanation of the Keewatin sediments has been partially verified by exploration carried out on the Poulet Vet property east of the Porcupine River.

Whether or not these sediments are of Keewatin age is still a

(6) Hurst M. E. Recent Studies in the Porcupine Area: C.I.M.M. Bul. No. 291 - 1936 Pgs. 449-450

matter of conjecture, but Hurst's theory explains the unconformity that exists between these groups of sediments. The limited areal distribution of both the Keewatin sediments and acid volcanics, which supports the idea of sediments of both Keewatin and Timiskaming age occuring in this area, is explained by the unconformity already described, and the occurrence of sediments of both Keewatin and Timiskaming age might be accepted for this reason.

The unconformity between the Timiskaming series - classified as such by Hurst[7] - and the older sediments and acid volcanics is well exposed northwest of Porcupine Lake in Tisdale township. Here, Keewatin sediments of interbedded slates and greywacke are overlain unconformably by a bed of conglomerate about 100 feet thick. This contact is thought to mark the base of the Timiskaming sediments, and this conglomerate is the basal conglomerate referred to by Burrows[8] in his report on the "Porcupine Gold Area".

The slate and greywacke north of the contact strike N 65°-70°W; dip 80°N; and face south. The conglomerate on the south side of the contact strikes N 70°E and stands vertical. According to Hurst:[9]

"This angle is thought to represent the approximate difference in dip of the two formations at the time the conglomerate was laid down."

If this is true the slates and greywackes were tilted or folded before the deposition of the conglomerate.

[7] Hurst M. E. Recent Studies in the Porcupine: C.I.M.M. Bul. 291 - 1936 Pg. 451

[8] Burrows A. G. Ont. Dept. Mines Vol. XX Pt. 2 - 1911, Pg. 18

[9] Hurst M. E. Recent Studies in the Porcupine: C.I.M.M. Bul. 291 - 1936 Pg. 452

This basal conglomerate probably extends from the Dome Mine northeastward along the north greenstone-sediment contact to the Pamour Mine. West of Porcupine Lake the basal conglomerate is displaced by the Burrows-Benedict fault, the east side being moved 1500 feet north.

The largest exposures of Timiskaming sediments occur in the vicinity of Three Nations Lake. Here the basal conglomerate is overlain by greywackes, arkoses, and thin beds of slate. The beds in this locality face south and are overturned to the north at angles of 70° to 85°. They strike from N 70° E to N 85° E.

The south margin of the sedimentary belt between Porcupine Lake and Night Hawk Lake is covered by overburden. The sheared condition of the rocks in this area, and the presence of a scarp, indicate that this contact may have been the locus of faulting. This contact has been located further east by drilling near the south end of Three Nations Lake. Regarding the extent and distribution of the basal conglomerate Hurst reports the following:(10)

"The basal conglomerate which extends along the north contact has not been recognized on the south side of the belt; in fact it is not known how far south the Timiskaming sediments extend or whether remnants of Keewatin sediments occur along the south contact."

Sediments that Hurst has classified as being of Keewatin age occur south of the proposed southern contact zone in Cody township, as indicated on the map. The extension of the Timiskaming sediments to the south is not known. The location of the southern contact zone as indicated on the map is conjecture on the part of the author. The occurrence of Keewatin sediments along the southern contact zone or south of it could be explained as similar to those that occur at the unconformity west of

(10) Hurst M.E. Recent Studies in the Porcupine: C.I.M.M. Bul. 291 - 1936 Pg. 452

Porcupine Lake.

The relations at the points cited indicate that the main belt of sediments, traced northeastward from the Porcupine district, rest unconformably on the Keewatin rocks, and that the sediments are classified as Timiskaming in age. At these points the sediments have been classified as Timiskaming in age by Burrows, Hopkins and Hurst at different times and it is apparent that no controversy exists over this classification. The sediments that occur around the Dome Mine, north of the unconformity, have been doubtfully classified by Hurst as Keewatin in age.

The Timiskaming sediments continue eastward along the shores of Night Hawk Lake for ten miles and consist largely of greywacke which strikes east and west and dips 85° north. They occur on the northeast shore of the lake and are cut by olivine diabase dikes of Keweenawan age.

In Bond township to the east small outcrops of conglomerate and greywacke occur. These sediments stand vertical and strike east-west. The greywacke is altered and cut by diabase dikes. Regarding the age of these sediments H. C. Laird states the following:(11)

"There is some reason to believe that these sediments may be Timiskaming in age and a part of the Timiskaming sedimentary belt of the Porcupine area, but the evidence is so meagre that the writer, tentatively at least, prefers to place them in the Keewatin Series."

He does not state his reasons for classifying these rocks as Keewatin. These rocks might well be classified as Timiskaming because they have the same general trend as the Timiskaming belt in the Porcupine Area. However, this is merely conjecture on the part of the author. East of Night Hawk Lake, in German township, Timiskaming sediments are known to occur. The best exposures, however, occur along the shore of Night Hawk Lake in Cody township.

(11) Laird H. C. German-Currie Area, District of Cochrane Fortieth Annual Report Ont. Dept. Mines Vol. 40 Pt. 3 - 1931 Pg. 11

These exposures represent the eastern extension of the Timiskaming sediments, thought by Burrows to extend from the Porcupine Area.

The townships of Taylor, Stock and Carr lie between the exposures of the Timiskaming sediments in the Porcupine Area and similar exposures in the Beatty-Munro Area. These townships are almost entirely drift-covered and the few outcrops of sediments that occur do not give enough evidence to indicate age relationships.

The assumption that the sediments occupy the area between two major faults is based on the few outcrops, scattered drill data and geophysical results. Sedimentary rocks have been intersected in drill-holes along most of the sediments-volcanics contact section near the Carr-Wilkie township line. Several outcrops occur in the northeastern part of Carr township at some distance from the volcanics contact. Except for these few outcrops the area is drift covered.

The sediments that appear in Beatty-Munro townships have not been definitely classified as Timiskaming in age. J. Satterly reports on these rocks as follows:(12)

"The terms Keewatin and Timiskaming will not be used for the volcanics and sediments until further work indicates whether or not they are applicable."

H. S. Armstrong seems to agree with this in his Preliminary Report on the same area for 1946.

However, Cyril W. Knight,(13) in his report on the Lightning River Area, refers to the belt of sediments in the Croesus Mine area as Timiskaming in age. Also in 1915 P. E. Hopkins suggested that the Croesus belt

(12)Satterly J. Preliminary Report on part of Beatty-Munro Area 1944 - Page 2

(13)Knight C. W. Lightning River Gold Area: Thirty-third Annual Report Ont. Dept. Mines Vol. 33 Pt. III 1924 Pg. 44

of sediments might be continuous with the Timiskaming belt of sediments in the Porcupine. The reports consulted by the writer, other than Knight's, are not definite on the age of these rocks. However, as Knight relates them to rocks in the Lightning River Area that have been classified by him as Timiskaming in age, they will be here referred to as such.

In this area the sediments consist of bedded greywacke, arkosic quartzite and slate, with thin interbeds of conglomerate. J. Satterly states that these rocks may be the oldest in the area.

The sediments that extend in a broad belt from southern Munro township into Guibord township to the south, are thought to be Timiskaming[14] in age. These rocks are arkose, slate and greywacke and strike from N 70° W to N 45° W, and dip 45° to 60° southwest. In Guibord township the contact between the Keewatin volcanics and the Timiskaming sediments is covered with drift, as a marked depression follows this contact.

The contact reappears a short distance north of the boundary in Munro township. A short distance to the southwest, however, the sediments and Keewatin volcanics dip northeast. This fact has caused much speculation regarding the age of these rocks. There is strong evidence, however, that these sediments are along a fault and that the sediments are of Timiskaming age. The distinctly banded character of the rocks is similar to that of the Timiskaming in many other places.

In Guibord township, at the Talisman Mine, arkose and greywacke are exposed over a small area, and this is regarded as the extension of the main body of the Timiskaming sedimentary rocks to the southeast. Here the sediments strike N 80° W and dip 70° South.

On the north side of Guibord hill the conglomerates and greywackes strike east-west and dip 68°N. This outcrop probably lies on the south

(14) Moore E. S. Geology and Ore deposits of the Ramore Area: 45th Annual Report Ont. Dept. Mines Vol. (XLV) Pt. 6 - 1936 Pg. 7

limb of a large syncline, as the dip is in the opposite direction to that in the outcrop near the north boundary.

Conglomerate outcrops on the McIntyre property in Hislop township, but it has not been definitely established whether these rocks are Timiskaming or Cobalt in age. The age of this conglomerate is the key to the structure in this region and for this reason it is important.

East of Hislop township, at the north end of Harker and Holloway townships, several outcrops of conglomerate, greywacke and slate occur. Regarding the age of these rocks Cryil W. Knight reports as follows:(15)

"These rocks probably belong to the Timiskaming series, and are younger than the Keewatin lava flows. Owing to heavy overburden, the extent of these sediments is not known. They strike westward and dip at steep angles."

Knight does not amplify this statement, but the distinctly banded character of the rocks in this area is similar to that found in the Timiskaming series in other areas.

A belt of schistose rocks, consisting of Timiskaming sediments and Keewatin basalts greatly sheared, runs in an east and west direction through the north end of Holloway and Harker townships. This belt of rocks extends along its strike for about four miles and then disappears beneath the drift to the west. In a general way this belt occupies the valley of the Teddy Bear River. The discovery of the Timiskaming sediments in this area, raised the question as to the relationship of gold deposits to the Timiskaming belt of sediments. This relationship will be discussed later in the text.

Marriott township is largely covered with drift, and the exposures consist of acid and basic volcanics of Keewatin age.

A band of altered sediments of tuff and greywacke, thought to be

(15)Knight C. W. Lightning River Gold Area: Ont. Dept. Mines Vol. 33 Pt. 3 - 1924 Pg. 43

of Keewatin age, occurs at the mouth of Duparquet River in Hebecourt township. The only sediments classified as Timiskaming that occur in this area form a closely folded syncline. These rocks occur in the Beattie Mine Area in Duparquet township. They are mainly deformed conglomerates accompanied by slate, arkose, greywacke and quartzite that grade into one another. These strata rest unconformably on the Keewatin volcanics and resemble those, that to the south have been assigned to the Timiskaming.

INTRUSIVES:

The intrusive rocks that occur across the Porcupine-Beattie Gold Belt are numerous and quite extensive. Only the more important exposures will be dealt with.

The quartz porphyry intrusions in the Porcupine Area are of great importance because the principal vein systems in this district are structurally related to them.(16) Regarding the genesis of the quartz porphyry bodies that occur in the vicinity of Pearl Lake and south of the Dome Mine Hurst states the following:(17)

"The bodies of quartz porphyry are believed to mark the vents from which the acid flows and pyroclastics were erupted. It is thought that, when volcanic activity ceased, the lava in the vents solidified in the form of plugs or stock - like masses of quartz porphyry; minor outlets branching from the main vents were occupied by tongues or smaller satellitic bodies of similar material; and narrow dikes and sheets of quartz porphyry were injected into the adjoining greenstones." Hurst states further that, "It has been clearly established that the quartz porphyry bodies, with the exception of sills intruded between flows, cut across the contacts between the lower Keewatin flows."

(16) & (17) Hurst M. E. Recent Studies in the Porcupine C.I.M.M. Bul. No. 291 1936 Page 451

Around the margins of some of the quartz porphyry bodies are zones of fragmental material consisting chiefly of quartz porphyry and Keewatin lavas. These zones are similar in composition and appearance to the agglomerate horizons in the Gold Centre and Hollinger Tailings area. This ressemblence is accounted for by Hurst as follows:(18)

"In the writer's opinion, the agglomerates represent fragmental materials erupted with explosive violence onto the surface, whereas the peripheral breccias represent the debris left behind in the vents or broken from the wall during the final injection of the quartz porphyry plugs."

The quartz porphyry bodies have been since considerably deformed at their margins, and it is thought that this movement may have aided in the formation of peripheral breccias.

Hurst believes that the principal vein systems in the Porcupine Area were structurally related to the quartz porphyry bodies, but he goes on to say:(19)

"In the writer's opinion, these intrusions were not the source of the gold-bearing mineralization. They were however, accompanied by emanations which caused extensive carbonatization of the surrounding greenstones and which gave rise, along lines of structural weakness, to zones and veins composed of ankerite."

A controversy exists among observers as to whether the quartz porphyry intrusions are older or younger than the sedimentary formations overlying the Keewatin volcanics. The majority are of the opinion that the quartz porphyry intrusions are younger than the sedimentary formations, and probably Algoman in age. Hurst's observations on the other hand, confirm the conclusions reached by Graton and McKinstry(20) that they are pre-Timiskaming

(18) & (19) Hurst M. E. Recent Studies in the Porcupine C.I.M.M. Bul. No. 291 1936 Pg. 451

(20) Graton L. C. and McKinstry H. E. Outstanding Features of Hollinger Geology C.I.M.M. Bul. No. 249 - 1933

in age.

It should be noted that if the Keewatin sediments are older than the acid volcanics, the quartz porphyry intrusions would cut them.

The relationship of the gold-bearing deposits of the Porcupine Area to granite or pegmatite dikes was also suggested by C. W. Knight after he noted the occurrence of feldspar in a vein on the Miller-Middleton claims. This occurrence, he states, had been noted in the main Hollinger and other veins. Regarding this relationship Burrows reported as follows:(21)

"It is possible that the quartz veins, quartz-feldspar veins and aplite dikes are but differentiations from the same magma."

In further support of the theory of the relation of the quartz veins of the Porcupine to granite intrusions Burrows mentions the following:(22)

(1) "The irregular occurrence of the quartz in many of the deposits, in lenticular masses, ressembling pegmatite dikes."

(2) "The occurrence of feldspar and tourmaline in the quartz in several deposits."

(3) "The great pressure at which the quartz has been deposited, indicated by the presence of liquid intrusions and gas bubbles. These are frequently seen in quartz in granites."

(4) "The frozen contacts of quartz and enclosing rock. The free walls seen at some properties indicate a secondary movement in the quartz since these walls are slickensided. Where free walls exist they may be either the hanging or foot-wall, while the other wall is indistinct - grading into country rock."

(5) "The occurrence of narrow aplitic dikes, frequently cut by minute veinlets of quartz which represent the final solidification of

(21) Burrows A. G. The Porcupine Gold Area. Ont. Dept. of Mines Vol. 20 - 1911 - Pg. 19

(22) Burrows A. G. The Porcupine Gold Area. Ont. Dept. Mines Vol. 20 - 1911 Page 20

the aplite magma and frequently carry gold values as on Night Hawk Lake."

The granites which have been referred to above by Burrows have been classified by him as Laurentian in age. In this respect he does not agree with Hurst, Graton and McKinstry.

Bearing on the age and origin of the quartz porphyry intrusions at the Hollinger Mine, Graton and McKinstry report the following significant features:(23)

(1) "The porphyry masses are as thoroughly schistose as the surrounding country rock. The direction of the schistosity is aligned with that of the general region and passes uninterruptedly across porphyry contacts."

(2) "The bodies of porphyry are elongated in the direction of regional pitch; this elongation is especially pronounced where the rock is strongly schisted."

(3) "Although the longer directions of the porphyry masses are in a general way parallel to the structure of the flows, margins of porphyry masses definitely cross-cut flow contacts at numerous places, and no porphyry bodies occupy a consistent stratigraphic position throughout its length."

(4) "The porphyry bodies are at many places bordered by fragmental material consisting mainly of porphyry with subordinate Keewatin volcanics. The fragments vary in shape from angular to well rounded. These fragments have everywhere suffered elongation through the deformation that produced the regional schistosity; where this deformation is strongest, the fragments, whether porphyry or other rocks, are elongated to a remarkable degree. This

(23) Graton, McKinstry and Others, Hollinger Geology. C.I.M.M. Bul. 249 - 19
Pg. 6

material, we are thoroughly cohvinced, is a fragmental rock more or less deformed. Some of it strongly suggests conglomerate, and it may be that in places conglomerates containing acid porphyry are interbedded with lavas, but it is difficult to explain most of this porphyry-bearing fragmental as other than a breccia, probably formed during or subsequent to intrusions of the nearby porphyry masses."

These facts, and others to be discussed, lead Graton and McKinstry to believe that the quartz porphyry was intruded into the lava at shallow depth. Graton and McKinstry further state:(24)

"There is strong evidence that this took place before the deposition of the Timiskaming, and in any case it antedated the regional compression which developed schistosity and still further antedated the ores."

According to Graton and McKinstry the ores of the Porcupine District are the type deposited under conditions of high temperature and pressure, and great depth, by solutions emanating from an igneous source.

The source of the gold-bearing solutions is believed to be genetically related to the known intrusive rocks of the region.

Regarding the age of the quartz porphyry intrusions Graton and McKinstry point out the following:(25)

"It is clear that the porphyry bodies were in place before the region experienced that period of stress which developed schistosity and elongated all structural features in the direction of the pitch, and there is nothing in the shape or contact relations of the porphyry to indicate that it may not have been present before the main period of folding. There is, indeed, evidence all but conclusive that the quartz porphyry was intruded prior to the deposition of the Timiskaming. We say this fully realizing that the

(24) & (25) Graton and McKinstry and Others, Hollinger Geology C.I.M.M. Bul. 249 - 1933 Pg. 7 and Pg. 15

quartz porphyry has formerly been believed to intrude the Timiskaming."

The evidence referred to by Graton and McKinstry in the above, which supports the idea of the quartz porphyry being intruded prior to the deposition of the Timiskaming sediments, is to be found in the contact relations between the Timiskaming sediments and the quartz porphyry. All such contacts examined by them could be interpreted as non-intrusive contacts. Further, definite dikes of quartz porphyry were examined that cut the Keewatin flows and terminated abruptly at the contact with the Timiskaming sediments.

From their study of the Hollinger gold-bearing deposits, Graton and McKinstry concluded that the quartz porphyry in the Porcupine District was intruded long before the introduction of the ore, and before ore-bearing Timiskaming sediments had been deposited. This fact lead them to believe that the quartz porphyry intrusions were not the fource of the ore. Regarding the source of the ore they state as follows:(26)

"There is, on the other hand, ample reason to consider the quartz monzonite as derived from a magma younger than the quartz porphyry and intruded during or after regional folding and schisting but before ore deposition."

This, if true, relates the gold-bearing deposits of this region to the same magma which furnished the quartz monzonite intrusions. In many respects these conclusions agree with those arrived at by Hurst, and in all probability are correct regarding the source of the gold-bearing deposits and the age of the quartz porphyry intrusions.

Masses of serpentine occur in various parts of the Porcupine Area. They intrude the Keewatin lavas and in turn are cut by Algoman granite intrusives. These rocks are thought to represent a highly altered phase

(26) Graton, McKinstry and Others, Hollinger Geology C.I.M.M. Bul. 249 1933 Pg. 17

of some basic rock, probably peridotite. In places the serpentine bodies contain networks of fractures that contain asbestos. These fractures generally occur near granite intrusions and appear to be genetically related to them.

The Keewatin-Timiskaming rocks in the Porcupine Area are flanked and probably underlain by batholithic masses of granite. Offshoots of these batholiths occur across the belt in the form of dikes, and small stocks. These bodies are of Algoman[27] age and are usually referred to as Algoman granites. The largest exposures of Algoman granite occur to the south of Bobs Lake.

Diabase dikes, ranging from a few inches to 150 feet in width are the youngest intrusions in the area. These bodies cut the gold-bearing veins and all other formations.

These intrusions are divided into two groups, Matachewan consisting of quartz diabase and Keweenawan consisting of olivine diabase. The earlier formations are Matachewan in age. The quartz diabase dikes strike north-south while the olivine diabase usually strike northeast.

Diabase dikes of Keweenawan[28] age occur in the Night Hawk Lake area but are not very extensive. East of Night Hawk Lake, in Bond, Currie and German townships, the Keewatin lavas are intruded by granite dikes of Algoman age. In this area these rocks have been highly metamorphosed and are known as amphibolites. Many dikes of acidic material of Algoman age have intruded the Keewatin rocks. These are in turn intruded by olivine diabase dikes of Keweenawan age. These olivine diabase dikes are the youngest rocks in this area. They are post-Algoman[29] in age and,

(27) Hurst M.E. Recent Studies in the Porcupine. C.I.M.M. Bul. No. 291 - 1936 - Pg. 453.

(28) Hopkins P.E. Night Hawk Lake Gold Area Ont. Dept. of Mines Vol. 33 Pt. 3 - 1924 - Pg. 31

(29) Laird H. C. German-Currie Area. Ont. Dept. of Mines Vol. 40 - Pt. 3 - 1931 - Pg. 15

accompanied with quartz diabase dikes, make up a large part of the exposures in Bond and Currie townships.

East of Bond and Currie townships in the Beatty-Munro Area three types of intrusive rocks cut the volcanic and sedimentary formations. The oldest intrusive rocks in this area are ultrabasic to basic in composition. These rocks are classified as Pre-Cambrian[30] in age by Satterly. They may be Algoman in age but due to the lack of definite evidence, this fact is vague.

The largest body of the above mentioned intrusives is a differentiated sill-like mass consisting of peridotite which has been largely altered to serpentine. Isolated outcrops of diorite in the southern part of the property may indicate a sill or dike. This body is 100 feet wide at the Stewart-Abate property.

Feldspar and quartz porphyry outcrop in several small exposures in Beatty township. These rocks are in places shattered and altered and mineralized with sulphides. Carbonatized lamprophyre dikes cut both sedimentary and volcanic formations. Rusty carbonate, white to green in colour, often replaces the sediments and volcanics. This formation usually occurs as narrow stringers or lenses along fractures.

The youngest[31] pre-Cambrian rocks are dikes of quartz diabase and gabbro. The largest outcrop occurs in Beatty township and trends N 60° E.

In the townships of Bowman, Hislop, Guibord, Michaud and Garrison fairly extensive exposures of Algoman intrusives have been found. This area lies south and south-east of Beatty-Munro. The Algoman intrusive rocks in these townships range in composition from acid to basic.

[30] Satterly J. Preliminary Report Beatty-Munro Area. Ont. Dept. of Mines 1944 - Pg. 3.

[31] Satterly J. Preliminary Report Beatty-Munro Area. Ont. Dept. of Mines 1944 - Pg. 4.

E. S. Moore, in his report on this area, states the following regarding these rocks:(32)

"The Algoman intrusives in this area, as around Kirkland Lake, comprise a considerable variety of rocks. They range in composition from very acid to nearly basic, and it is believed that they have all been derived from a common magma, which must have underlain the whole of the Ramore Area in Algoman time. It is impossible to determine the age relations of all the members of the series because they have not been found in contact with one another, except in the case of the syenite and lamprophyre. The latter cuts the former and is, therefore, apparently the youngest of the series of intrusions."

The question has been raised as to whether the Matachewan diabase does not belong to this series. Regarding this point Moore reports as follows:(33)

"The occurrence of diabase earlier than the ore and later than the other Algoman intrusives at Kirkland Lake, and the petrographic relations of Haileyburian, Algoman, and Matachewan intrusives, as worked out by Derby in the area lying southwest of Kirkland Lake, seem to point to the possibility of the Algoman having closed with diabase intrusions. The diabase found in the Ramore Area, and mapped as Matachewan, so distinctly cut the Algoman and intermediate intrusives in many places, that there is no doubt concerning the relative ages of these two groups of rocks." He further states: "The Matachewan diabase also cuts some of the quartz veins, and it is believed that whatever the relation of the diabase to the magma from which the Algoman rocks came, the diabase is later than the period of ore deposition."

However, some doubt still exists on this point, as many dikes in the Ramore Area have been displaced and altered, while the Lake Shore dike in

(32) & (33) Moore E. S. Geology and Ore Deposits of the Ramore Area Ont. Dept. of Mines Vol. 45 Pt. 6 - 1936 Pg. 9

the Kirkland Lake Area does not appear to be.

The first of the Algoman intrusives to be intruded was granite, large bodies of which are exposed in Garrison and Michaud townships. Smaller exposures are also found in Bowman and Guibord townships.

Granite and granodiorite also occur in this area. The smaller granitic intrusions are more acidic and usually fine grained. In Guibord township quartz monzonite is exposed over small areas. Hornblende syenite, in the form of dikes and plugs is widely distributed throughout this area. This rock is usually porphyritic.

The lamprophyres are the youngest dikes of the Algoman series. These dikes are usually small and occur near ore deposits, they vary in composition and in colour.

Gabbro and diabase dikes of the Matachewan series occur in this area. They are coarse grained and often porphyritic. The general trend is north-south. These diabase dikes are rarely associated with mineral deposits.

Intrusions of feldspar porphyry and quartz porphyry cut the Keewatin and Timiskaming rocks in Harker and Holloway townships. Masses of syenite and granite occur in Harker, Holloway and Marriott townships. These intrusives are of Algoman age and similar in composition to those found in the townships immediately to the west. In the townships of McCool, Lamplugh and Frenchville occur the largest exposures of pre-Algoman diabase and Gabbro.

The extension of the Porcupine-Beattie Gold Belt into Quebec includes the townships of Hebecourt and Duparquet.

In Hebecourt township around the northeast and northwest shores of Hebecourt Lake occur exposures of quartz diorite, correlated as older gabbro. These intrusives belong to the pre-Huronian series. Quartz porphyries of the same series, in the form of stocks occur north of Hebecourt Lake.

In Duparquet township, the most important intrusive is the syenite porphyry that occurs in the Beattie Mine Area. Quartz porphyry and quartz diorite also occur in this area.

In Hebecourt and Duparquet townships the Keewatin strata are intruded by small and large bodies of different types of rocks all of which are believed to be post-Timiskaming, with the possible exception of some of the porphyries; but whose ages relative to one another are in most cases unknown. What are believed to be the oldest intrusives are small irregular bodies of quartz diorite, the so called older gabbro. They occur mainly near Duparquet Lake in Hebecourt township. Syenite porphyry occurs in scattered exposures throughout the area, the age, relative to the other granitic rocks is unknown. It is thought that the syenite porphyry is related to that in the south which is more extensively developed. Small dikes and bosses of quartz porphyry occur in the south cutting the Keewatin strata. The quartz porphyry is not known to be related to the syenite porphyry.

Additional small exposures of syenite and quartz porphyry have been uncovered around Duparquet Mine Area.

STRUCTURAL GEOLOGY:

The structural geology of the Porcupine-Beattie Gold Belt varies from place to place across the belt. A series of interrupted anticlines and synclines occur continuously, and these folds are generally associated with faults and shear zones. The structural geology of the Porcupine Area has been studied in more detail than any other area in the belt.

In the Porcupine Area, slight folding of the Keewatin lava flows probably occurred during the intrusion of the quartz porphyry bodies. The main period of folding occurred however, after the deposition of the Timiskaming sediments. This deformation caused two major folds, a syncline and an anticline, whose axes trend N 65° E and a north-south cross anticline which interrupts the syncline between the Hollinger and Vipond Mines. Minor drag-folding occurred at the same time along the limbs of the syncline. Differential movement also occurred between individual beds or flows.

After the folding, shearing occurred in the vicinity of Pearl Lake and along a zone extending in a northeasterly direction across Deloro township and beyond Porcupine Lake. This shear zone is 1600 feet wide in the vicinity of Pearl Lake and the foliation strikes N 65° E and dips 75-80°N. The shear zone is strongest along porphyry contact zones, flow tops and incompetent beds.

Faulting occurred at several stages in the history of the region. The major faults occurred first along shear zones parallel to the major axes of the folds, and secondly in a direction cross-cutting the strike of the formations. The shearing along the folds developed after the folding of the Keewatin-Timiskaming rocks, and before the introduction of the gold-bearing quartz veins. The Porcupine Creek Fault is the most continuous fault of this type, and extends northeast across Deloro township to Porcupine Lake. It occurs between the main syncline and an anticlinal structure to the south. Similar faults of a few hundred feet displacement occur in the

Hollinger and Dome Mine Area. Other faults of this kind occur in the Gold Centre Area and along the south greenstone-sediment contact, between Bobs Lake and Three Nations Lake.

The cross-faults developed after the introduction of the gold-bearing veins. The trend is in a northerly direction across the strike of the Keewatin-Timiskaming rocks. The most continuous fault of this type is the Burrows-Benedict fault. The horizontal displacement along this fault is at least 1500 feet in places.

The vein material in the area is thought to have been introduced when the compressional stresses, which gave rise to the folding and shearing of the Timiskaming and Keewatin rocks, were released. Successive movement along the planes of structural weakness developed fractures that became places for vein formations. Vein introduction probably occurred simultaneously with structural adjustment.

The anticlinal, synclinal structure that is known to exist in the Porcupine Area is thought to extend eastward and northeastward into the townships of Murphy, Hoyle, Matheson, Cody and Macklem. A general survey of the accompanying map indicates this fact.

Regarding the structure in this area Rose reports as follows:[34]

"The few isolated outcrops of bed rock are distributed in a way which suggests that the major structure of the area is that of a large syncline whose axes trends in a general northeast-southwest direction and whose trough is occupied by rocks of the Timiskaming series, while the arms are flanked by Keewatin rocks."

A general survey of the accompanying map will show this three-band distribution of the rocks. The Keewatin rocks on the northwest limb of the syncline are located in the north part of Murphy township, while on

(34) Rose B. Murphy, Hoyle and Matheson townships: Ont. Dept. of Mines Vol. 33 Pt. III - 1924 Pg. 54

the southeast limb they extend from the southeast part of Murphy, across the southern half of Hoyle township, to Matheson township, where only Keewatin rocks have been found.

Rose further states:(35)

"Between these two bands, the rocks of the Timiskaming series occupy the trough of the syncline, in the east central part of Murphy township and in the north half of Hoyle township. If this interpretation be correct, the major structure is similar to that in Tisdale and Whitney townships to the south where a syncline of Timiskaming rocks flanked by Keewatin rocks lies in a nearly parallel position."

While neither the Timiskaming or Keewatin sediments were found in contact, it is assumed that there is an unconformity between these two series. This assumption, however, is based on the nature of the contacts that Rose observed in nearby areas. The general strike of the rocks of both series is the same, parallel to the axis of the assumed syncline. This supports the idea of a major fold to explain the distribution of the rock and may be accepted for this reason.

The Porcupine Creek Fault has been traced northeast as far as Porcupine Lake. In all probability this fault continues northeastward along the southern contact of the Timiskaming sediments. Evidence to support this claim, however, is still lacking. No faults of any extent have been located in this area due to the depth of overburden.

The structure to the east of this area in Stock, Taylor, Bond and Currie townships is difficult to determine due to the absence of outcrops. However, in Bond township a small outcrop, consisting of greywacke and conglomerate occurs. These beds are vertical and strike east-west. Regarding the age of these sediments Laird reports as follows:(36)

(35) Rose B. Murphy, Hoyle and Matheson townships: Ont. Dept. of Mines Vol. 33 Pt. III - 1924 Pg. 54

(36) Laird H. C. German-Currie Area, District of Cochrane, Ont. Dept. of Mines, Vol. 40 Pt. III - 1931 Pg. 11

"There is some reason to believe that these sediments may be Timiskaming in age and a part of the Timiskaming sedimentary belt of the Porcupine Area, but the evidence is so meagre that the writer, tentatively at least, prefers to place them in the Keewatin series."

Laird does not explain why he prefers to classify these sediments as Keewatin in age. These outcrops are so small in size that their importance in determining the structure in this area is doubtful.

Timiskaming sediments(37) occur on the north shore of Northeast Bay, Night Hawk Lake. Here the sediments strike east-west and dip 85° N. This fact seems to indicate a large anticlinal structure as traced by Byers and indicated on the map. This outcrop represents the eastern limit of the Timiskaming sediments as traced by Burrows from the Porcupine Area.

Twelve miles to the east in Carr township, the structure is still difficult to determine. Here the sediments are the oldest rocks and occupy an anticlinal position in the central part of the township.(38) The sediments are flanked by the younger and overlying volcanic series. Except for the very few outcrops of sediments, the outcrops in Carr township afford no evidence of the structure. Only in one case, well-developed fracture cleavage along with some evidence in the banded sediments that the tops are toward the north, and though the dip is to the south, indicate what is probably an overturned anticline plunging to the east. In any case, as the major structure in this northern section is known to dip northward, this is taken only as a minor fold. It should be noted that to the east in the Beatty-Munro Area, the major structure is overturned, similar to this minor fold in Carr township.

(37) Hopkins P. E. Night Hawk Lake Gold Area: Ont. Dept. of Mines Vol. 33 Pt. 3 - 1924 Pg. 31

(38) Prest V. K. Geology of the Carr Township Area, Preliminary Report Ont. Dept. of Mines 1945 - Pgs. 2 & 3

Outcrops in the adjacent townships indicate a major anticline structure with the sediments and volcanics series being in structural conformity. This evidence is based on pillow structure and flow breccia contacts in the volcanics, and coarse cross-bedding in the sediments. This structure is similar to that immediately to the east in the Beatty-Munro Area.

Diamond drilling along the northern sediments-volcanics contact has revealed dips of 60° to 65° north, with the sediments facing north. This contact is usually marked by faulting movements, but some drill core sections indicate that the faulting movement has taken place wholly within the volcanics. In these places there is a transition from the typical sediments - tuff, agglomerate and argillaceous-looking rocks into the lava flows and breccias. All evidence points to conformable stratigraphical relations between the sediments and volcanics with a narrow transition zone of explosive material and some interbedding. It is also possible that during the main period of sedimentation there was some explosive volcanic activity as certain fine sediments appear to have been derived from volcanic ash.

There is less information on the southern contact relations in Carr township, but drilling here also indicates that tuffs and agglomerates also occur along the shear zone at the sediments-volcanics fault contact.(39) In the volcanic outcrops in lot 1 and 2 concession II, Taylor township, there are pillow lavas with the tops facing south. The flows here dip 30° to 45° south. Diamond drilling along the fault-contact zone, north of these volcanics show sections of sediments from the north side of the fault that show gradational bedding, indicating that the tops face south, and the dip is similar to that of the flows mentioned above. These two series, therefore, appear to be in structural conformity. The fault

(39) Prest V. K. Geology of Carr Township Area. Preliminary Report Ont. Dept. of Mines - 1945 - Pg. 3

zone at the sediments-volcanics contact is known to dip at 45° to 70° south near to the Carr-Taylor township line.

Two major faults traverse this area in a general east-west direction, one along the south and one along the north contact of the sedimentary belt. The southern fault zone is generally regarded as being the eastward extension of the Porcupine fault. The northern fault zone is known as the Pipestone Fault.

In Carr township the Porcupine fault zone has been probed by drilling only in lot 12 concession III, but it has been drilled to the west for some distance into Taylor township. Drilling results show a considerable width of soapstone developed from volcanic rocks lying immediately on the south of the well banded sediments. Carbonated lavas lie on the south side of the soapstone zone. The fault proper probably lies between the soapstone and carbonated lavas, where there is considerable cavernous ground. The sediments do not appear to be very much altered, even adjacent to the soapstone.

The Pipestone Fault zone has been drilled for a length of five miles. Study of the core showed that this fault zone could be considered as a band of soapstone which occurs in a tuff-agglomerate zone lying between the sediments and lava series.

Younger cross-faults, common throughout the Porcupine belt, probably displace the Porcupine-Destor, and Pipestone faults, but there is no definite evidence to support this contention.

Carr township has potential economic importance because it belongs to what is known as the eastern extension of the Porcupine gold belt. The Porcupine fault traverses the southern part of the township. There is still considerable controversy as to the relationship of such major breaks to gold deposits, nevertheless, a potential gold deposit may somewhere exist in the general area of these breaks, though the fault zone, itself, is not generally

a locus of deposition.

The writer at this point wishes to point out that the structural geology of Carr township as outlined above, has been interpreted thus by V. K. Prest in his Preliminary Report on the Geology of Carr Township Area, Ont. Dept. Mines - 1945. Much of the mapping in this area was done by geophysical method, and Prest has placed his own interpretation of the structure on these results. In the "Introduction" to his report Prest states the following:(40)

"During the summer of 1945 geological mapping of Carr township was carried out by the writer, and magnetometer lines were run utilizing the services of a geophysical party under the direction of Dr. A. Brant. Drill cores from a number of drill-holes along the northern volcanics-sediments contact were studied in some detail. The writer has correlated all the available information and placed his own interpretation on the data at hand." He further states that: "Dr. Brant is in no way responsible for the writer's interpretations of many of the magnetic anomalies."

In view of these facts, this report has a doubtful value. However, pending the gathering of further data, it may serve to throw some light on this section of the Porcupine-Beattie belt.

The structure in Beatty-Munro township to the east is similar to that just mentioned. In this area top determinations of the sediments and the flow structure of the volcanics indicate that the major structure may be an anticline with the north limb exposed.(41) In Guibord township the axis of this anticline trends N60°W. A syncline is indicated in the northeast cor-

(40) Prest V. K. Preliminary Report. Carr Township Area, Ont. Dept. of Mines, 1945 - Pg. 1

(41) Satterly J. Preliminary Report Beatty-Munro Area, Ont. Dept. of Mines, 1944 - Pg. 4

ner of Munro township, the synclinal axis trending N70°W. These major structures are complicated by regional strike-faulting and cross faulting.

In this area the sedimentary and volcanic rocks have been highly folded and faulted. The sedimentary and volcanic formations trend N60°W in Guibord and Munro townships, and curve to strike east and west in southeastern Beatty township. The tops of the sedimentary formations face north to north-east and dip steeply to the south. This indicates that these sedimentary formations must have been overturned.

The rocks of this area have been broken up by numerous faults. Only the larger ones have been recorded on the map. The most important type of faults are the strike faults. The trend of these faults in Munro township is N-60°-W. A second type of faults are the cross-faults that strike northeast, and displace the formations and the strike-faults.

Two strike-fault zones, one at the contact of the sedimentary and volcanic formations, and the other within the volcanic formations have been mapped. In Munro township the sediments-volcanics contact is well exposed, with the volcanic rocks relatively undeformed. The sedimentary formations for 200 feet south of this contact, however, are shattered, with quartz stringers filling the fractures. This contact is interpreted as a strike-fault. The amount of displacement is not known, but drag folds indicate that the block on the north side of the fault moved east.

A branch fault, south of the contact zone occurs in the sediments in Munro and Guibord townships. This fault, and the one above may be the eastward extension of the Porcupine-Destor fault.

The cross faults trend north to northeast. These faults are indicated by displaced marker horizons and contact zones. In places these horizons have unequal displacement and this fact seems to indicate that

the faults may be rotational.

To the east, in the township of Hislop, Guibord and Bowman, the structure is similar. The flow tops generally face south and the strike has been changed from east-west to northeast-southwest and northwest-southeast.

Regarding the structure in this area Moore reports as follows:(42)

"Wherever it has been possible to distinguish the top from the bottom of a lava flow in the Ramore Area, the top is towards the south. The lava flows must have originally overlapped one another from north to south, and whatever folding has occurred since has not changed this condition on a large scale, although local deflections of the flows have occurred, and in some places the strike has changed from almost directly east-west to northwest-southeast or northeast-southwest."

In the northwestern part of Guibord township, a large syncline is thought to underlie the drift. Here the Timiskaming sediments strike N 65° W and dip 60° southwest. Farther south, on the north side of Guibord hill, the dip is reversed. This evidence indicates a synclinal structure. This structure extends N 65° W into the Beatty-Munro Area. The Timiskaming sediments indicate the major structural features in this area. Farther south in northern Playfair township the Timiskaming sediments indicate another syncline. E. S. Moore(43) believes that this syncline is a small subsidiary of the larger syncline in the northern part of Guibord township.

In that part of the Ramore Area where the Timiskaming rocks do not occur, the formations have two distinct trends. One is east-west and the other is northeast-southwest. These intrusives have been, in places, squeezed into a series of local folds, and the stress seems to have or-

(42) & (43) Moore E. S. Geology and Ore Deposits of the Ramore Area, Ont. Dept. of Mines Vol. 40 Pt. 6 - 1936 Pg. 14

iginated in the northeast and southwest.

The Keewatin volcanics and Timiskaming sediments have been sheared in many places.

The greatest disturbance has taken place in the area of the Ross Mine. Here the trend of the formations change from east-west and N 70° E in the southwestern part of Hislop township, to north-south and northwest-southeast. In the eastern part of the outcrop at the mine, the strike is north-south and in the western part, northwest-southeast.

Faults are few in this area. At the Ross Mine a normal fault strikes north-south and dips from vertical to 72°W. This is probably a cross-fault related to the main shear zone. In the central part of Guibord township several small faults have been traced. These faults have a northeast-southwest trend and a small displacement. The fault along the contact of the Timiskaming and Keewatin rocks in Munro township strikes S 60° E, and probably extends into Guibord township. This fault must have considerable displacement, but in Guibord township it is entirely concealed. It may be the eastward extension of the Porcupine-Destor fault.

A continuous series of synclinal and anticlinal structures underlie the area between Beatty township and Guibord township. Faulting has taken place in many parts of this area, and in some places it has been very intense. The main shear zone throughout this area has not been definitely located, but it is thought to be the eastward extension of the Porcupine-Destor fault.

To the east, in the southern parts of Harker and Holloway townships, the flows dip steeply to the south and strike west. A belt of schistose rocks strike east and west through the north end of Harker and Holloway townships. This belt consists of Timiskaming sediments and altered Keewatin basalts. In a general way it occupies the north side of the valley of the Teddy Bear River.

To the east in the Beattie Mine area in Duparquet township the dominating structure is a closely folded easterly plunging syncline that strikes in a general east-west direction. Regarding this structure J. J. O'Neill reports as follows:(44)

"The centre of the syncline is occupied by Timiskaming sediments, and these are bordered on the north and south by Keewatin lavas and greenstones."

The contact between the Timiskaming sediments and Keewatin lavas have developed zones of shearing, that in most places in this area are more pronounced in the lavas. Due to the relatively incompetent Keewatin lavas, drag folding has developed in many places along the contact.

Most of the intrusive rocks in this area occur at or near the Timiskaming-Keewatin contact where they were intruded after the folding had been completed, for they conform to the general structure. Two large bodies of quartz porphyry occupy drag-folds along the southern contact.

Shearing along east-west lines occurred later than the syenite and quartz porphyry intrusions. Most of the shearing has taken place along lines parallel to the structure.

Two sets of joints occur in this area. One set strikes at right angles to the shearing, and the other set strike N 20° W to N 10° E. The joints of the first set are of different ages. The earliest contain quartz veins and pegmatites and they follow two principal directions; in the neighbourhood of Beattie Mine they strike about N 35° E; and farther east, on the Duparquet property, the strike is N 40° W. The latter veins are themselves cut by a quartz-diabase dike, which strikes N 50° E.

(44) O'Neill J. J. Beattie-Galatea Mines Map-Area, Annual Report, Quebec Bureau of Mines 1933 - Part C - Pg. 94

The other set of "fault-joints"(45) cut the north ore-body of the Beattie Mine toward its east end and offsets it about 30 feet horizontally.

Regarding a structural unconformity between the Keewatin and Timiskaming rock, O'Neill reports the following:(46)

"A structural unconformity between the Keewatin and Timiskaming bedded rocks is not obvious in detail, perhaps because of shearing along the contact, but the strike of groups of beds in the Keewatin is at an angle of about 15° to the strike of neighbouring Timiskaming, and different Keewatin groups come in contact with the later sediments in such a way as may not be accounted for by an erosional unconformity."

Because of the lack of definite marker horizons either in the Timiskaming or Keewatin rocks it is impossible to work out the structure in detail.

The shear zone, which in this area is known as the Destor fault, and which extends westward into Hebecourt township, is probably the eastern extension of the Porcupine-Destor Fault zone.

The structure in Hebecourt township is not as well known as that in Duparquet township. It is thought however, that the syncline in Duparquet township extends westward in Hebecourt township.

(45) & (46) O'Neill J. J. Beattie-Galatea Mines Map-Area Duparquet township, Annual Report Quebec Bureau of Mines - 1933 Pt. C - Pgs. 95-96

PORCUPINE-DESTOR FAULT ZONE

A major structure across the Porcupine-Beattie Gold Belt is a sheared zone that, in the literature, is known as the Porcupine-Beattie break and the Porcupine-Destor fault zone. Throughout the areas previously mentioned it has been referred to many times. In the eastern part of the Porcupine-Beattie Gold Belt it is known as the Destor fault zone and is fairly well defined. In the central part of the belt its location is not so well known, due to lack of structural evidence because most of the bedrock is covered with overburden. In the western part of the belt this fault zone has been traced as far as Porcupine Lake and here it is known as the Porcupine Creek Fault.

The strike of the Porcupine-Destor fault zone is generally in an east-west or northeast-southwest direction; nearly parallel to the trend of the major fold axis across the area. (See Map) The author believes that this fault zone is generally located at the southern contact of the Keewatin volcanics and the Timiskaming sediments. Hurst[47] points out that in the Porcupine Area the southern extension of the Timiskaming sediments is not known, and the contact has never been located. Similar conditions exist in the areas to the east. However, Prest[48] claims to have located the southern contact zone by drilling and geophysical methods in southern Carr township. This zone in his opinion, represents the eastward extension of the "Porcupine break". The sediments and volcanics, according to Prest, are in structural conformity along the southern contact zone.

Where this sheared zone has been located across the belt it consists largely of carbonate schists, soapstone schists, chlorite schists, rusty-weathering carbonates, breccia, quartz fissure vein deposits, minor drag

[47]Hurst M. E. Recent Studies in the Porcupine C.I.M.M. Bul. 291, 1936 Pg. 453

[48]Prest V. K. Preliminary Report Carr Township Ont. Dept. Mines - 1946 Pg. 4

folds and other structural evidence that indicates deformation and movement.

The sheared zone does not always lie along the sediments-volcanics contact. Of the two series, the sediments are more competent, and in many places the shearing is more intense in the Keewatin volcanics away from the contact. The Porcupine-Destor fault zone is interrupted in many places across the belt by cross-faults, some of which have been described in the preceding pages. The general consensus of opinion at present is that the more favourable loci of mineralization are not in the shear zone itself, but at the intersections of the major shear zone and the local cross-faults. Fault-fissure vein deposits are the most general type of gold-bearing deposits across the belt. These deposits, and the cross-faults are of the same age, and occurred after the deformation that caused the major shear zone. The intensity of the deformation along the major shear zone is thought to have been too intense for the formation of fissure-vein deposits at the time of shearing. However, deposits do occur in the major shear zone, and these deposits probably originated from circulating aqueous solutions, that were present at the time the cross-faulting occurred. Wall rock alteration along the contact of the major shear zone and these deposits indicate that the solutions were injected into the open fissures at moderate temperatures only.

At present, an intensive prospecting program is underway along the eastern extension of the Porcupine-Destor Fault. The part of the fault zone under examination stretches from the town of Matheson for a distance of 30 miles east to the Quebec border.

Two years ago W. C. Martin, Hoyle Mining Company's geologist, focussed attention on this area with a map he drew up showing his interpretation of the easterly extension of the Porcupine-Destor fault, through a line of townships, extending east from Matheson through the Lightning River Area to

the Quebec border.

According to Martin's map, the Porcupine-Destor fault zone cuts across the northeast corner of Hislop township, continues eastward through the centre of Guibord and Michaud townships, and swings northward into Garrison township. From Garrison township this fault zone continues east across the northern end of Harker and Holloway townships and into Marriott township and the Beattie Mine Area in Quebec. In Martin's opinion, the main shear zone is a favourable location for ore deposits, due to the fracturing associated with the faulting and the intrusions of syenite and granite that occur along this zone. The information at the present time seems to indicate that wide zones of medium grade deposits occur along the main shear zone, while narrow, high grade deposits occur away from the main shear zone.

The approximate location of the "main break" as interpreted by Martin is shown on the map.

If Martin's interpretation is correct this shear zone in all probability continues westward into Carr township and forms a part of the "Porcupine Fault Zone" as located by Prest and shown on the map. The westward extension of this zone from Carr township to the Porcupine Area, as shown on the map, is the author's interpretation of its location.

Hopkins[49] interpretation of the eastward extension of the Porcupine main break, follows a line from the southern end of Porcupine Lake northeast to the north end of Three Nations Lake, eastward through the southern end of Matheson, German and Stock townships, in Carr township where it follows the southern contact zone located by Prest. From here it continues southeast into the southern part of Beatty township, cuts the southwest corner of Munro, swings east in the northern parts of Guibord, Michaud, Garrison and Harker townships. In the Porcupine Area this location follows approxi-

[49]Hopkins P. E. Lightning River Area, Ont. Dept. of Mines Vol. 33 Pt. III 1924 - See Insert Map

mately the assumed northern contact of the Keewatin and Timiskaming sediments. In the Beatty-Munro Area it follows the course of the fault zone that trends northwest through these townships. In northern Guibord township it swings eastward and continues through northern Michaud township where it joins with the westward extension of the Destor fault zone as located by Ambrose on Preliminary Map 44-29 of the Duparquet-Larder Lake-Rouyn Region.

Hopkins locates the "main break" farther north than Martin. Evidence to support Martin's interpretation does not appear to be available, but he must have some evidence to support his claim.

However, due to the lack of definite evidence, the exact location of the "main break" across the Porcupine-Beattie Gold belt, must await the further accumulation of information.

ORE DEPOSITS

The ore deposits across the Porcupine-Beattie Gold Belt are numerous and the types are varied. In the Porcupine Area the gold-bearing deposits have been classified largely as fissure vein deposits. The gold is associated with quartz solutions which circulated through the fissures in the Keewatin and younger rocks. The irregular fissuring has produced a great variety of quartz structures. These quartz structures vary from tabular to lenticular bodies, a few inches to several hundreds of feet in length. Dome-like masses of quartz often occur. These quartz structures appear to be broad lenticular masses which have filled lateral fissures in the country rock. The most conspicuous are those at the Dome Mine.

Although gold is distributed widely over the Porcupine District, three distinct districts have been noted where the fissuring has been more pronounced. One area extends from the southeast end of Miller Lake in a northeasterly direction for three miles and includes the Hollinger, McIntyre and Miller-Middleton veins. The average strike of these veins is northeast-southwest. Another series of veins which include the Davidson, Crown-Chartered and Bannerman, have a general east-west strike. In the southeast part of Tisdale township occurs the third of this group. They include the Dome and Dome extension veins and strike southwest. In these disturbed zones the country rock is generally schistose.

The principal vein systems in the district are structurally related to quartz porphyry bodies, but in Hurst's[50] opinion these intrusions were not the source of the gold bearing mineralization. The intrusion of the quartz porphyry intrusives were accompanied by emanations which caused carbonization of the greenstone and which along lines of structural weakness gave rise to zones and veins composed of ankerite.

The relation of the ore deposits of this area to the granitic intru-

[50]Hurst M. E. Recent Studies in the Porcupine. C.I.M.M. Bul. 291 - 1936

sives as interpreted by Burrows, Hurst, Graton and McKinstry, has already been discussed. These three authors all agree that the deposits in the Porcupine are the fissure vein type; they disagree regarding the genesis of these deposits. These points were discussed in the earlier part of this work.

In Cody and Macklem townships to the east, the genesis of the gold-bearing deposits are indicated by Hopkins as follows:(51)

"As pointed out by Burrows, there is apparently a genetic relationship between these acid dikes and the auriferous quartz veins which represent the final solidification of the porphyry magma. (This has been questioned by Graton and McKinstry.) It must not be overlooked, however, that the serpentine may have had some bearing on the genesis of the ore deposits. No. 1 deposit of the Night Hawk Peninsular mine occurs along the contact of serpentine and carbonate schist."

(Graton's and McKinstry's studies of the Hollinger deposits show that the serpentine rock was a more favourable host for gold-bearing deposits, but the serpentine is in no way genetically related to these deposits.) The author is inclined to accept this view. However, Hopkins, in further support of his theory that the deposits in this area may have been genetically related to the serpentine states the following:(52)

"Gold may be obtained on assay frommineralized serpentine. If the basic rock were originally a peridotite, there would be an increase in volume when it changed into serpentine, causing movement in the serpentine and the formation of schist in the adjoining rocks. The serpentine and carbonate solutions would also extend into the adjoining rocks for

(51) & (52) Hopkins P. E. Night Hawk Lake Gold Area Ont. Dept. of Mines Vol. 33 Pt. 3 Pg. 31

hundreds of feet, which has been the case. Therefore, the serpentine may have been responsible for some of the gold in this area."

This appears to be a reasonable conclusion as Graton and McKinstry found definite evidence that the gold deposits at the Hollinger are hypothermal deposits, formed at great depth and high temperature. They do point out, however, that the mineral composition of the serpentine rock is such that it acts as a better precipitant for gold, and in this way the serpentine forms a better host rock for gold-bearing deposits than either the quartz porphyry or the sediments.

The ore deposits in this area are similar to those in the Porcupine Area. They are thought by Hurst to be genetically related to the quartz porphyry intrusions and the serpentine and carbonate schists.

In this area the Night Hawk Peninsular Mine is the only important producer. However, the Gold Island claims aroused much interest at the time of staking. The McLeod, McEachern and O'Connor claims were staked around the Night Hawk Peninsular Mine. Gold was found on all three, and some diamond drilling was done, but these claims never advanced beyond the prospect stage.

Gold deposits to the east, in the townships of German, Stock, Macklem, Bond, Currie and part of Cody are similar to those in the Porcupine Area in many respects. In these townships the deposits are genetically related to some phase of the Algoman intrusives,(53) which in this area, is largely confined to dikes of aplite, syentie porphyry, quartz and feldspar porphyries and quartz stringers.

In Macklem township the most important prospect is that of Gold Island. Here the gold is associated with narrow quartz stringers cutting red aplite dikes and rusty carbonate rocks. The greater part of the gold

(53) Laird H. C. German Currie-Area, Ont. Dept. of Mines. Vol. 40 Pt. III 1931 - Pg. 20

in the ore is present as native gold.

Most of the gold-bearing deposits east of Currie, Macklem, and Bond townships, in the Beatty-Munro Area occur in quartz veins or in mineralized rock adjacent to quartz and quartz-carbonate veins. In some cases mineralized feldspar porphyry has been mined. Many of the deposits are typical fault fissure veins, the minerology of which is fairly simple. The sulphides include pyrite, pyrrhotite, chalcopyrite, arsenopyrite, sphalerite and galena. The sulphide mineralization is often confined to the wall rock or to fragments of wall rock within the vein matter. In general the veins are narrow and discontinuous, and the gold values erratic.

The failure of the producing mines in this area to maintain values seems to suggest that the quartz-fissure vein type of deposits may be of minor economic importance. It is thought(54) that more favourable deposits may be found in zones adjacent to strike-faults where carbonatization has occurred.

In Beatty township, the three producers of any importance were the Hill Mine, the Blue Quartz Mine and the Aljo Mine. All these properties are closed down. In 1944-45 however, interest was revived and extended drilling programs were conducted on these three properties.

In Munro township the most important producer was The Croesus Mine. It ceased operation in 1936.

In the townships of Bowman, Hislop and Guibord, immediately south of the Beatty-Munro Area, gold is the only metal of economic importance. Very small quantities of galena, chalcopyrite and sphalerite have been found, but these are of little significance. The gold occurs largely as native gold or associated with sulphides, mostly pyrite. Pyrrhotite has

(54) Armstrong H. S. Preliminary Report Beatty Township, Ont. Dept. of Mines 1946-1 Pg. 4

been found near Guibord hill and is most commonly associated with the Matachewan diabase intrusions.

The source of the gold-bearing deposits seems to have been the Algoman magma,(55) because the deposits are closely related to the intrusions of this age. Ore deposits in this area have not been found close to the large granitic intrusions, but they occur in or close to syenite and porphyries of the intermediate type.

The gold occurrences that have been attracting most attention since 1936 lie in a zone that runs northeast across the southern and east-central part of Hislop township. This zone lies between two large areas of granite and contains many small intrusions of syenite porphyry. This zone has been the centre of considerable disturbance. This evidence is well displayed in the outcrop at the Ross Mine, where faulting and fracturing can be observed.

The most important property in the above-mentioned townships, is the Ross Mine in Hislop township. This property consisted of two ore bodies, which are both associated with the main fault on the property. The east ore body consists of quartz and carbonate lenses, veins and stringers containing auriferous pyrite, and country rock impregnated with sulphide.

The west ore body consists of a stockwork of narrow veins and stringers, mostly in tuff. The boundary of this ore body are assay boundaries. This deposit carries considerable chalcopyrite and a little galena. Both ore bodies occur in tuff, which is highly impregnated with quartz carbonate, sericite and pyrite.

The McIntyre property in Hislop and Guibord townships is another prospect on which gold has been discovered. The outcrop on this prospect consists of sheared greenstone in which two small bands of conglomer-

(55) Moore E. S. Geology and Ore Deposits of the Ramore Area. Ont. Dept. of Mines - Vol. 45 Pt. 6 - 1936 - Pg. 15

ate and tuff were found. The band of tuff is highly sheared and is similar to that at the Ross Mine. Little quartz has been found in this part of the outcrop, and it is thought that the gold is associated with the sulphides and carbonates of the shear zone.

Another outcrop on this property consists of a highly silicified fine-grained felsitic rock. This rock proved to be fine-grained rhyolite. Running through this outcrop is a syenite dike about twenty feet wide. Native gold was found along the contact of the syenite dike and the rhyolite.

Other prospects in Guibord and Hislop townships include the Vimy Gold Mines and the Golden Arrow property. The Vimy Gold Mines installed a small mill but production was suspended due to milling difficulties.

In Guibord township the most important prospect was the Talisman Mine. Most of the surface exposures on this property consist of banded arkose, greywacke and slate of Timiskaming age. Lamprophyric dikes cut across the strike of the Timiskaming formations. These dikes consist largely of orthoclase, biotite and plagioclase and approach a fine-grained syenite in composition. It could be considered a syenitic lamprophyre. The quartz veins that occur on this prospect seem to run parallel to these dikes. The gold bearing deposits on this property consist of white quartz which contains chalcopyrite and tetrahedrite. The wall rock of the deposits contain disseminated pyrite and chalcopyrite in which gold has been found.

The gold deposits in Garrison, Harker and Holloway townships are as follows:-(56)

(1) Gold-bearing quartz veins in altered basalt

(2) Gold-pyrite in sheared zones in basalt

(3) Gold-pyrite in fault breccia zones in basalt

(4) Gold-pyrite along the contacts of syenite and feldspar porphyry

(56) Burrows A. G., Knight C. W., Hopkins P. E., Parsons A. L. - Ont. Dept. of Mines Vol. 28 Pt. 2 Pgs. 44-52 - 1919

dikes with greenstone schists

(5) Gold-pyrite in sheared and altered Timiskaming sediments

The most important prospects in this area are the Seagers and Meridian Claims. On the Seagers Claim, in the northwest corner of Holloway township, the gold occurs in narrow quartz veins. Here the gold occurs as native gold and is not associated with other metallic minerals. On the Meridian Claim at the southwest boundary between Harker and Holloway townships, the ore body is a shear zone in basalt which has been impregnated with pyrite and fine native gold. Very little quartz is to be seen in this deposit. The rocks adjacent to the deposit appear to be slightly silicified, and impregnated with a little rusty-weathering iron carbonate. A little finely divided native gold was found in the pyritic zone.

East of the Lightning River Area the only known gold-bearing deposits of economic importance occur at the Beattie Mine in Duparquet township. The main features of the deposits at and around the Beattie Mine are as follows:[57] The ore deposits are of the disseminated sulphide replacement type, formed at moderate temperatures and pressure, and the minerals were deposited along sheared or fractured zones in a silicified bostonite porphyry and tuffs, which had been intruded along the north contact of a body of syenite porphyry with Keewatin schists. The ore solutions are thought to have saturated the whole body of broken rock, making the mass remarkably uniform in value. Gold is the only metal of economic importance and it is closely associated with finely crystalline pyrite and arsenopyrite. A second large ore body occurs south of the one described above. It closely ressembles the first in character and mineralization.

The Springer group of claims, lying east of the Beattie Mine, is a promising prospect in this area. The syenite porphyry mass on the Beattie

[57] O'Neill J. J. Beattie-Galatea Mines Map Area. Que. Bureau of Mines - 1933 Part C - Pgs. 95-97

property does not extend eastward on to this property but masses of bostonite porphyry occur along the strike, and a narrow body of ore, similar to that on the Beattie, was found at the north contact of the bostonite, near the north boundary of the group of claims.

Other mines in this area that at present show promise are the Donchester, a subsidiary of the Beattie Mine, the Duquesne and the Dumico.

RECENT WORK

At present, many of the producing mines of the Kirkland Lake and Porcupine mining camps are conducting an extensive exploration program to locate the extension of the Porcupine gold-bearing zone eastward. This program, according to the Northern Miner, is the biggest ever undertaken in Canada. The part of the Porcupine Beattie Gold Belt now under observation stretches east from Matheson for a distance of thirty miles to the Quebec border. Through most of this area the overburden is 100 to 200 feet deep and the exploration is being done by diamond drilling.

This exploration program was stimulated by W. C. Martin's map, drawn up two years ago, showing his interpretation of the easterly extension of the Porcupine break. This has been approximately plotted on the enclosed map. The results of the present exploration program to date have been very encouraging. A good drill hole was established on the Wright-Hargreaves property, and Hoyle's Marchaud Mines established gold values. Gold values of commercial grade have been identified along a strong sheared zone which is the probable extension of the Porcupine-Destor Fault.

In the southeast quarter of Michaud township Moneta Mines located a hole that is thought to have intersected the Porcupine shear zone. Northeastwards, at the west boundary of Garrison township, the Broulan Mines have intersected the same sheared zone. This zone probably crosses Garrison Creek Gold Mines where a recent drill hole intersected a wide carbonate zone. To the east, this zone was again located in a diamond drill hole at Dale Gold Mines.

Due to the heavy overburden, and the few rock outcrops, identifying the Porcupine shear zone is a matter of much conjecture. It is commonly recognized as a wide carbonate zone with evidence of strong

fault movement. The Dome Newfield drilling showed a width of 200 to 300 feet of talc chlorite schist with wide zones of quartz carbonate intruded by a series of dikes of syenite, syenite porphyry and associated rocks.

Marchaud Gold Mines in Michaud township intersected a brecciated zone in syenite. This sheared zone has been drilled for 1200 feet and to a depth of 300 feet. This zone, however, is considered to lie north of the actual Porcupine break.

In Barnet and Thackery townships, south of Michaud and Garrison, a mild staking rush has developed. The north half of both townships have been staked solid. Gold finds were reported this summer in Stoughton township at the eastern end of the belt adjacent to the interprovincial boundary.

The prospecting that is now in progress on the Porcupine extension from Matheson to the Quebec border, is the most extensive of its kind ever undertaken in this area. The results of this program will decide whether or not the geological information gained will be of value in determining the structure and locating new ore deposits.

The exact location of the above-mentioned prospects were not available to the author and consequently are not located on the map.

ADDITIONAL WORK NEEDED:

The attached map has been compiled from the most recent maps and reports of the Ontario Department of Mines, the Quebec Bureau of Mines and the Geological Survey of Canada. Many of the important, but small outcrops of Timiskaming sediments, that occur across the belt have not been shown because the scale of the map is too small. These small exposures are important in tracing the extension of the Timiskaming belt of sedimentary rocks, because of their relationship to gold deposits. Detailed geological mapping on a larger scale is generally needed in the drift covered areas across the belt.

Additional work in geological mapping, geophysical surveying and prospecting might produce valuable results in the townships of German, Macklem, Stock, Bond and Currie. Attention was first directed to this area in 1907 with the discovery of native gold on Gold Island in Night Hawk Lake, this prospect is now being developed underground. However, prospectors have paid little attention to this area as it is heavily covered with drift material and the rock outcrops are small and scattered.

The importance of this area is realized by the fact that it lies directly in the northern gold belt which extends from the Porcupine Area to the Lightning River Area. This idea is based on the occurrence of deeply infolded sediments of Timiskaming Age that outcrop in small exposures in this area and at such widely scattered points as the Dome Mine, Northeast Bay at Night Hawk Lake, the Croesus Mine Area, and the Lightning River Area. If the Timiskaming belt of sedimentary rock occurs continuously throughout these townships, future prospecting may be rewarded by the discovery of important gold deposits.

The townships of Bowman, Hislop and Guibord are of special interest because they lie between the Kirkland Lake and the Porcupine mining

camps. Gold in this area is widely distributed, and the number of occurrences in connection with the relatively small number of rock exposures over large sections of the area, conveys the idea that there may be many more hidden deposits. The possibility exists that the gold-bearing formations, due to their higher quartz content, are more resistant to erosion than others and therefore produce more outcrops. Nevertheless it seems probable that many such deposits are concealed beneath the drift that covers the greater part of Bowman, Hislop and Guibord townships.

The source of the gold in these townships probably was the Algoman magmas, as the deposits are closely related physically to intrusions of this age. The ore deposits occur in or close to syenite and porphyries of the intermediate type, and lamprophyre dikes nearly always occur in the vicinity of gold deposits. As most of the exposures in Bowman, Hislop and Guibord are Algoman intrusives, additional prospecting among the syenite and lamprophyre dikes might bring valuable results.

In 1936, gold occurrences in a zone running northeast across the southern and east-central part of Hislop township attracted considerable attention. This zone, located between two large areas of granite, included many intrusions of syenite and syenite porphyry. Further prospecting in this area would probably prove worthwhile.

In the central part of Guibord and Michaud townships occur outcrops of Timiskaming sediments. These sediments are related to the shear zone that, according to Martin, is the eastward extension of the Porcupine-Destor Fault. This area is overlain by a heavy mantle of drift, and prospecting is difficult. Diamond drilling and geophysical mapping might produce good results, when more detailed geological mapping has been done.

The northern parts of Harker and Holloway townships included a sheared zone that lies along the possible contact of the Timiskaming sedimentary

rocks and the Keewatin volcanics. This zone, according to Ambrose,(58) is thought to be the westward extension of the Porcupine-Destor Fault, and structurally it is a favourable area for gold deposits. The presence of Timiskaming sediments along a sheared zone in contact with Keewatin volcanics seems to indicate this fact. Gold-bearing deposits in other parts of the Porcupine-Beattie Gold Belt have been indicated by this structure.

Although the occurrences of gold in Harker and Holloway townships have not advanced much beyond the prospect stage, this area is unquestionably worthy of further and more intensive prospecting.

Attention has always been drawn to the relationship of gold deposits to belts of conglomerate, greywacke, and slate of the Timiskaming series. Burrows pointed to this relation in his report on the Porcupine Area, and Knight and Hopkins indicated a similar relationship in their respective reports on the Lightning River Area. The author is inclined to believe that the importance of the Timiskaming sediments has possibly been overrated in this respect.

Graton and McKinstry's study of the Hollinger deposits, and Hurst's studies in the Porcupine Area, drew attention to the genetic relationship of the gold-bearing deposits to some phase of the Algoman intrusives. This relationship should not be overlooked.

It is true that areas of deposition of the Timiskaming sediments appear to be favourable localities for the occurrence of gold-bearing deposits, but it is not necessarily true that where the Timiskaming sediments do not occur, gold does not occur. In emphasizing the broad general relationship between belts of Timiskaming sediments and gold deposits, it should be pointed out that the Timiskaming sediments are important, from a

(58) Ambrose J. W. Descriptive Notes. Preliminary Map 44-29 Duparquet-Larder Lake-Rouyn Region

structural point of view, for the occurrence of gold-bearing deposits. Generally speaking, the contact of Timiskaming sediments and Keewatin volcanics is usually a zone of shearing and faulting. These zones are favourable for deposition from gold-bearing solutions. However, of more importance, is the source of such solutions.

Graton and McKinstry have inferred that quartz monzonite may have been the source of the gold-bearing solutions at the Hollinger Mine. Hurst relates them to emanations that accompanied the quartz porphyry intrusions. In any case, both agree that the gold-bearing solutions were injected into the overlying rock at high temperature and pressure. These injections would occur in any rocks that were intruded by the gold-bearing phase of the Algoman intrusives.

The author believes that the areas across the belt where Algoman intrusives occur, irrespective of the occurrence of Timiskaming sediments, may be favourable localities for gold-bearing deposits.

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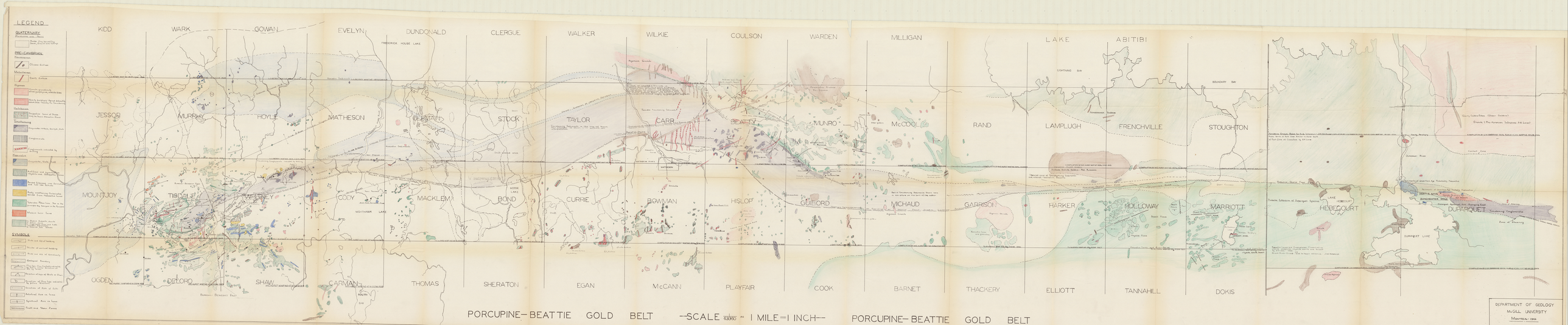

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