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DEPARTMENT OF MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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PAPER 39-2

PRELIMINARY REPORT

OPAWICA LAKE AND LEWIS LAKE MAP-AREAS, ABITIBI TERRITORY, QUEBEC

BY
George Shaw

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Geological Survey of Canada
by
Dr. E. Poitevin
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Preliminary map—Opawica Lake.

Preliminary map—Lewis Lake.

Opawica Lake and Lewis Lake Map-areas, Abitibi Territory, Quebec

INTRODUCTION

Opawica Lake map-area and Lewis Lake map-area adjoin one another and embrace an area of approximately 360 square miles. Opawica Lake, in the southern part of the western area, is about 100 miles northeastward of Senneterre, which is on the Canadian National Railways transcontinental line where it crosses Bell River.

The canoe route to Opawica Lake is from Senneterre by way of Bell and Wedding Rivers, Wedding and Esther Lakes, Duplessis Creek, and Lakes Puskitamica, Malouin, and Lichen. Lewis Lake may be reached either from Opawica Lake by Dalime Brook or from the large lake to the south by way of Lac Relique. Aircraft flying from bases at Senneterre are frequently used in preference to canoe to reach the areas.

GENERAL GEOLOGY

The consolidated rocks of the two map-areas are of Precambrian age and may be divided into five groups:

Proterozoic (Late Precambrian)
- Quartz diabase

Archæan (Early Precambrian)
- Granitic intrusives
- Anorthositic intrusives
- Basic intrusives
- Volcanic rocks

VOLCANIC ROCKS

A belt of greenstone extends from Bell River northeastward for 60 miles to Opawica Lake, thence in a direction slightly south of east for 50 miles to Surprise Lake, at which point it turns northeasterly. The belt is 20 miles wide at the west side of Opawica Lake area, but narrows to the east and is split into two bands by bodies of anorthositic and later granitic rocks. In general the volcanic rocks strike slightly north of east to northeast. An exception to this is the greenstone band south of the anorthosite in Lewis Lake area, in which the rocks strike southeast parallel to the anorthosite contact.

The volcanic rocks, with the exception of some rhyolites, are considerably altered and their original compositions are not known. They can be arbitrarily assigned, however, to three main types: andesites, trachytes, and rhyolites. Minor amounts of tuffs are interbedded with the flows.

The andesites are dark green, highly chloritic, commonly schistose, and only rarely porphyritic or agglomeratic. Locally the andesites exhibit a

definite granularity, such types being considered as coarse-grained phases of rather thick flows. Some exhibit pillow structure, but the pillows are usually so greatly deformed as to be of no use in determining the attitude of the beds. The andesites have been less resistant to erosion than the other volcanic types, and as a result are, on the whole, poorly exposed. They outcrop chiefly in three bands, the limits of which are only imperfectly known. The northern band crosses Waswanipi River 2 miles below the outlet of Opawica Lake. At this point it is 1,500 feet wide, but broadens somewhat to the southwest and northeast. It is limited on both sides by younger basic intrusives. The middle band is parallel to and 4 miles south of the northern band. It outcrops on the southern part of Gull Island and the peninsulas to the east and west. Eastward this band divides, one part extending eastward north of the anorthosite body and the other part forming the narrow band that crosses Lessard Lake south of the anorthosite. The southern band underlies the peninsula that extends southwestward in the large lake south of Opawica Lake.

The rhyolites are best developed on the south shore of Opawica Lake just north of the middle andesite band. They are light-coloured, brittle rocks, which are either fine grained or porphyritic with phenocrysts of glassy quartz up to one-quarter inch in diameter. Some bodies of porphyritic rhyolite crosscut the adjacent rocks and are intrusives thought to be of approximately the same age as the flows.

Elsewhere in the area the volcanic rocks are varieties of pale green to grey trachyte with only occasional small outcrops of andesite and rhyolite. The trachytes occasionally show pillow structure, but do not exhibit the schistosity common to the andesites. The trachytes may be either uniformly fine grained or porphyritic with phenocrysts of altered feldspar. Both varieties are locally agglomeratic, the fragments being usually of a slightly lighter colour than the matrix and best seen on fresh surfaces. An exception to this is agglomerate outcropping on the hills southeast of Shortt Lake and which contains fragments of banded chert, diorite, andesite, and a few rounded nodules of pyrite. The distribution of the fragments in the agglomerates is very erratic, and where lacking the rocks grade into normal trachytes in a distance of a few feet.

Dark, well-banded tuffs with occasional ¼-inch to 1-inch bands of feldspar crystals outcrop on the north shore of Opawica Lake south of Shortt Lake. They may possibly be related to the agglomerates to the north. Lighter coloured tuffs outcrop in narrow bands along the southeast shore of the lake in the northwest corner of Opawica Lake area, are interbedded with andesites of the middle andesite band, and occur at Sturgeon Falls on Waswanipi River.

BASIC INTRUSIVES

The basic intrusives are mainly developed in three band-like areas, which, however, are not exclusively composed of these intrusives but include large and small masses of the volcanic rocks into which the basic masses have been injected. Small bodies of the basic intrusives also occur in the large areas of volcanic rocks. The basic intrusives include a variety of types that are not mapped separately. These are: (*a*) a coarse diabasic gabbro varying greatly in grain size and feldspar content, with many feld-

spar-rich segregations and occasional quartz grains; (*b*) a medium-grained, light-weathering gabbro; (*c*) pyroxenite and amphibolite. In all types the feldspar, when present, is altered to epidote, zoisite, and sericite or kaolin, and the original pyroxene to a green, pleochroic amphibole. The relative ages of the various types are not known, but it is thought that (*c*) is younger than (*b*). A short distance northeast in Opemisca map-area similar rocks occur as sills in greenstone. The bodies in the Opawica Lake district may also be sills or some may be more irregular bodies.

ANORTHOSITIC ROCKS

The anorthositic rocks form a single body split in two by a broad band of granite. In the western part of the mass the rocks show considerable alteration, the feldspars being changed to epidote, zoisite, and sericite, and the original pyroxene to a green, pleochroic amphibole. The altered rocks weather to a light colour and are best exposed on the shores of the large lake northwest of Lessard Lake. The unaltered rocks, which underlie the hills north of Lessard Lake, are much darker, the feldspar having a grey colour with a bluish tint. The composition of the feldspar in the fresh anorthositic rocks is $Ab_{25}An_{75}$ to $Ab_{20}An_{80}$.

The rocks of the anorthositic mass range from types made up almost entirely of feldspar (anorthosite) to types containing 70 per cent pyroxene. These latter or gabbroic types vary considerably in feldspar content and show a tendency to an increase in pyroxene content northward. The gabbroic rocks are found in the northern part of the intrusive mass, whereas the anorthosite is confined almost exclusively to the southern part of the mass. In the fresh gabbroic rocks a definite ophitic texture can be observed. The rocks are very coarse grained, the average grain size being about one-half inch. Dykes of the gabbroic rocks cut the greenstones adjacent to the intrusive body.

The anorthosite is, on the whole, much coarser grained than the gabbro, having an average grain size of about 1 inch, although locally crystals of feldspar 8 inches long have been seen. The feldspar individuals are roughly equidimensional with the corners somewhat rounded. There appears to have been no crushing of the crystals, but some strain of the twin lamellæ can be seen in thin section.

The line of demarcation between the anorthosite and gabbroic rocks of the intrusive mass is very poorly defined. The only locality where it can be seen is on the southeast shores and adjacent islands of the large lake northwest of Lessard Lake. In this place there appears to be a transition from gabbroic rocks on the north to anorthosite on the south. This seems to indicate that the gabbroic and anorthositic types are differentiates of a magma that differentiated in situ.

A finer grained gabbro or diorite cuts the anorthosite on one of the small islands in the large lake northwest of Lessard Lake. The rock, where seen, is too much altered to permit determination of its composition. On the southwest shore of Gull Island similar rocks containing quartz cut the greenstones.

Immediately north of the anorthositic mass in Lewis Lake area is a narrow band of altered pyroxenite. The rock is dark brown to black and

is quite massive, with a grain size commonly less than one-sixteenth inch. Most of the original pyroxene has been altered to amphibole. A few outcrops of gabbro similar to the gabbroic phase of the anorthosite occur within the pyroxenite area, but their relation to the pyroxenite is not known.

The contact between the anorthositic body and the bounding greenstones was seen in only one locality; on the lake shore south of Gull Island, where the contact is sharply defined. The anorthosite is fine grained and has a slight foliation or banding parallel to the contact. The adjacent greenstones are schistose.

The northern part of the anorthositic body consists of gabbro and the southern part of anorthosite, and the two types grade into one another. The volcanic rocks lying, respectively, north and south of the anorthositic body strike parallel to the edges of that body and dip vertically. Pillowed andesite in the north band of volcanic rocks, south and southwest of Lac Relique, face north. The attitudes of the greenstones of the southern band are unknown. If, as seems reasonable, they also face northward then the available evidence would indicate that the anorthositic magma invaded the volcanic strata when they were approximately horizontal and that the invading body had the form of a laccolith about 5 miles thick at the thickest part. Differentiation took place in this body and apparently was the result of gravitational settling of crystals, with the result that the gabbroic differentiate gathered in the upper part of the body and the anorthositic differentiate in the lower part. After invasion and differentiation had taken place, the anorthositic body and the bounding volcanic rocks were tilted through about 90 degrees to their present positions.

GRANITIC ROCKS

The granitic intrusives occur as batholiths north and south of the greenstone belt and as stocks within the older rocks. They underlie about 40 per cent of the two map-areas. The northern batholith, with the exception of a small body of syenite, is composed of oligoclase granite (tonalite). The syenite is a coarse-grained rock containing microcline and amphibole. It forms a band one-half mile wide bordering the volcanic rocks north of Lewis Lake and extends for 4 miles westward from the fault north of the lake. The adjacent volcanic rocks have been altered to hornblende schist with a foliation parallel to the contact. The relation between the syenite and the oligoclase granite (tonalite) is not known. The granite of the northern batholith is a porphyritic variety containing phenocrysts of oligoclase up to one-half inch long. Amphibole is the principal dark mineral, although some biotite may be present. The rock contains minor amounts of microline, and quartz is present in varying amounts ranging up to about 15 per cent. Towards the margin of the mass the rock loses its porphyritic character and becomes richer in amphibole and poorer in quartz and grades into a diorite border phase.

The stock intrusive into the greenstone at the junction of Waswanipi and Chibougamau Rivers and the stock that cuts the anorthosite east of Lessard Lake are made up of rocks like the northern batholith, and like it have a diorite border phase.

The two small stocks near the west end of Opawica Lake and the stock on the east side of Lac Relique are of about the same composition as the border phase of the northern batholith. The volcanic rocks adjacent to these stocks have been silicified and otherwise altered to black, brittle rocks containing occasional knots of epidote. Near the mineral prospect on Opawica Island the volcanic rocks have been recrystalized to a medium-grained diorite-like rock.

The large, dyke-like granite body that divides the anorthositic body in two, differs from the granitic body lying to the east, along Opawica River, in that it contains more quartz and the feldspar is a zoned plagioclase ranging in composition from albite at the margins to andesine at the centres of the crystals.

The southern batholith occupies the southernmost part of Opawica Lake area and the southwest corner of Lewis Lake area. It is also an oligoclase granite (tonalite), but in it biotite exceeds amphibole in amount. It is not porphyritic except for a border phase that is characterized by 'eyes' of bluish opalescent quartz up to one-quarter inch in diameter.

QUARTZ DIABASE

A dyke of diabase with occasional grains of quartz extends northeastward across Opawica Lake area and into Lewis Lake area just north of the lake northwest of Lessard Lake. The dyke varies in width from 100 to 200 feet. The margins of the dyke are chilled against the older rocks, but the centre is very coarse grained with a pronounced ophitic texture. Other small diabase dykes that cut the anorthosite are seen on the shores of the large lake northwest of Lessard Lake.

STRUCTURE

Intense shearing, contortion, and carbonatization of the volcanic rocks occur along the south shore of Opawica Lake and on the north shore and adjacent islands of Lac Relique. The direction of shearing is north 65 to 70 degrees east and possibly indicates a fault along Opawica Lake extending northeastwards through the northern part of Lac Relique and possibly continuing to Lac Lapparent. A possible displacement of the greenstone-granite contact southeast of Lewis Lake suggests a movement eastward of the rocks on the south side of the fault. A similar movement is indicated by drag-folds in the volcanic rocks on the south shore of Opawica Lake. No displacement of the volcanic rocks can be observed, as they strike parallel to the assumed fault.

The fault in the northwest corner of Lewis Lake area displaces the granite contact to the left for about three-quarters of a mile. Shear zones parallel to the fault have been formed in the nearby, altered, volcanic rocks. Several small faults parallel to this, and with a movement in the same direction, displace the gabbro-greenstone contact immediately west of Shortt Lake and quartz veins in the gabbros north of Shortt Lake.

In the southeast corner of Lewis Lake area the volcanic, anorthositic and granitic rocks have been displaced by a northerly trending fault. The fault probably continues northward along the lake.

The volcanic rocks and basic intrusives are probably closely folded, with the axes of folding trending in a northeasterly direction. More determinations of the attitudes of the beds in various parts of the areas are necessary before the axes of folding can be located with any degree of accuracy.

MINERAL DEPOSITS

Gold was first discovered in this region in 1932 by Phil St. Paul, who panned gold from weathered, silicified and carbonatized volcanic rocks on the west side of Opawica Island. Between 1932 and 1936 prospecting in the region was active and several small showings were discovered. Since 1936, however, very little work has been done either on development or exploration. The known showings occur in the southwestern part of Opawica Lake area in both altered volcanic rocks and basic intrusives, and are of two types—replacements and vein deposits. Although all the known deposits are in the vicinity of Opawica and Shortt Lakes, the pre-granitic rocks elsewhere in the two areas should not be neglected in prospecting. Attention should be paid to fracturing and shearing that follow a northeasterly or northerly direction. Exploratory trenches may be necessary, due to heavy overburden in many parts of the two areas.

The Opawica Island showing consists of a strongly silicified and carbonatized zone in recrystallized volcanic rocks. The zone is 100 feet long, varies in width from 4 to 10 feet, and strikes slightly east of north. Careful sampling of the fresh material blasted to a depth of 6 feet returned only low assays in gold, although gold may be panned readily from weathered material along north-trending fractures. The nearby showing on the mainland is very similar to that on Opawica Island. Trachyte agglomerate is strongly sheared over a width of 6 feet along a direction slightly south of east. Extending northward from this shear is a fracture zone 4 feet wide. The rocks at the intersection of the shear and fracture zones have been replaced by quartz and ferruginous carbonate. Pyrite is disseminated throughout the replaced zone and a few specks of free gold have been reported. The replacement extends some 15 feet along the fracture zone, but does not pass south of the shear. Very little work has been done on the prospect.

A showing 1,000 feet north of Shortt Lake consists of two parallel, vertical, quartz veins 2 to 8 inches wide and 6 feet apart. The veins trend in an easterly direction and have been traced for 100 feet. The wall-rock is very coarse gabbro, which has been sheared over a width of about 6 inches on each side of both veins. Both veins have been displaced to the left along several small faults, the strikes of which vary from north to northeast. Near one of these faults the southern quartz vein has been strongly fractured roughly parallel to the fault and coarse, free gold occurs along the fractures. Elsewhere in the two veins and in the sheared wall-rock only very low assays in gold are reported. Gold is also found 800 feet north of the showing just described. In this northern showing are two intersecting quartz veins, one striking northeast and the other east. The coarse gabbro adjacent to both veins has been strongly sheared over widths up to 2 feet on each side of the veins. Highest gold values are reported

from the sheared gabbro on the northwest side of the northeasterly trending quartz vein. There is some gold in the adjacent quartz, but values in the easterly vein and shearing are negligible.

A quartz vein containing ferruginous carbonate and chalcopyrite lies in intensely sheared, acid volcanic rocks on the north shore of Gull Island. It has a width of 4 feet and can be traced under water for a distance of 50 feet. The vein materials when panned have yielded gold. No work has been done on the prospect.