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PRELIMINARY REPORT ON DE FRENEUSE LAKE AREA (WEST HALF), NEW QUEBEC

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GEOLOGICAL SURVEYS BRANCH

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PRELIMINARY REPORT

ON

DE FRENEUSE LAKE AREA (WEST HALF)

NEW QUEBEC

BY

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PRELIMINARY REPORT

ON

DE FRENEUSE LAKE AREA (WEST HALF)

INTRODUCTION

The west half of the Freneuse Lake area covers approximately 160 square miles. It is bounded by longitudes 69°15' W. and 69°30'W. and by latitudes 58°15'N. and 58°30'N. The centre of the area is located 40 miles northwest of Fort Chimo airport.

The area was mapped during the field season of 1956. It lies immediately north of an area mapped by Bergeron (1) in 1954.

Most of the area is 550 to 900 feet above sea level. The topography generally is low and rolling, especially in the northeast. However, where thick gabbro sills or lavas alternate with softer sedimentary rocks, steep ridges are present.

Most of the area is underlain by folded and metamorphosed sedimentary and volcanic rocks injected by numerous gabbro sills. All these rocks are part of the "Labrador Geosyncline" or "Labrador trough" and are of Precambrian age. The metamorphic grade of the rocks in this area is higher than to the southwest. Granitic gneisses, possibly belonging to the "crystalline basement" of the Labrador trough, occupy a very small part of the area.

GENERAL GEOLOGY

Granitic Gneisses

Medium- to coarse-grained, grey and pink gneisses outcrop in the core of a northwest-plunging anticline in the southeastern corner of the area. They consist mainly of quartz, microcline, sodic plagioclase, biotite, and muscovite. The micas are variable in quantity, and some rocks are almost devoid of them. A little aplite is found with the gneisses.

It is not clear whether the contact between the gneisses and the metasedimentary rocks is a fault or an unconformity. However, the suggestion here is that the contact is unconformable, and that the gneisses belong to the "crystalline basement" on which the metasedimentaries of the "Labrador Geosyncline" were deposited. The reasons follow.

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(1) Bergeron, Robert: Thevenet Lake Area (west part), New Quebec; Quebec Dept. Mines, Preliminary Report No. 311, 1955.

The gneisses are exposed in the core of an anticline. It is difficult to correlate formations on the two limbs of this fold owing to scarcity of exposures on the northeastern side. However, distinctive actinolite schists have been found on both limbs, and it seems probable that all the metasedimentary formations recognized on the western limb occur also on the northeastern limb. Also, the bedding-schistosity of the metasedimentary rocks is probably parallel to the contact.

Table of Formations

Recent and Pleistocene		Till, sand, gravel.
Precambrian	Intrusive rocks	Metagabbro and metadiabase, chlorite schist, amphibolite, garnet amphibolite, partly fresh gabbro. Serpentine-rich rock. Blotchy gabbro (mottled gabbro, leopard rock)
	Volcanic rocks	Pillow and massive lavas. Blotchy lava.
	Sedimentary rocks	Muscovite-chlorite schist and phyllite, biotite-muscovite schist, quartz-plagioclase-biotite-muscovite schist, garnet-biotite schist. Quartzite. Iron formation, grunerite schist. Dolomite, dolomitic phyllite, actinolite-schist.
	? Major Unconformity ?	
	Basement (?) rocks	Pink and grey granitic gneisses.

Sedimentary Rocks

Carbonates are among the oldest rocks of the sedimentary series. Beds of dolomite, up to two feet thick, are found with phyllites and dolomitic phyllites in the core of an anticline in the southwest corner of the area. Thin carbonate beds are present in biotite-muscovite schists near the southeast corner of the map-area. White, tremolite marble also is exposed in the southeast corner. It is more than 100 feet thick, with the base as exposed less than 15 feet above the granitic gneisses. Some distance above this white dolomite is a green actinolite-rich schist, possibly derived from a very impure carbonate rock.

Most of the metasedimentary rocks of the area consist of phyllites and schists. Medium to dark grey, biotite-muscovite schists are the most abundant. Chlorite-muscovite phyllites are common only in the southwestern corner of the map-area; chlorite-biotite schists of sedimentary origin are rare. The grain size of the schists generally increases eastward. Some garnet-biotite schists are present in the south and southeastern part of the area.

Thin to thick quartzite beds and quartzite members are found at a few places among the schists. They are abundant on the west shore of Phillips lake and again west and south of Enish lake, both occurrences being fairly close to the iron formation.

The main bands of iron formation are found near Enish lake, Phillips lake, and southwest of Lizotte lake. They consist mainly of ferruginous, magnetic shales and grunerite schists. They grade into pyritiferous shales, carbonate-bearing shales, and other less ferruginous shales or schists. Some bands of relatively iron-poor schists may separate bands of ferruginous schists. It seems probable, however, that all the ferruginous bands are found within a restricted stratigraphic interval and that the three main occurrences belong to the same formation. A few occurrences of grunerite schists do not belong to this formation. They are not associated with magnetic shales but commonly with pyritiferous schists found a short distance below the base of the volcanic sequence.

Volcanic Rocks

Three main belts of volcanic rocks are found in the area and are believed to be parts of the same unit. The lavas are green and composed mainly of clinozoisite-epidote, sodic plagioclase, actinolite, and chlorite. Some of the most sheared lavas have been transformed into green, biotite-chlorite schists and amphibolites.

The massive lavas are much more abundant than the pillow lavas, especially in the lower part of the lava sequence. They are generally very fine-grained. Many medium-grained igneous rocks are found within the lava belts; these may be thick flows or sills. A few glomeroporphyritic (blotchy) lavas are seen, especially near the base of the volcanic succession. They consist of whitish clusters of former plagioclase crystals now altered to sodic plagioclase and clinozoisite. The clusters are sparsely disseminated and average $\frac{3}{4}$ to 1 inch in length.

A few scoriaceous and brecciated flow tops were seen. As they are poorly exposed, thicknesses of flows can seldom be determined. Some flows are a few tens of feet thick.

Ellipsoidal lavas are locally abundant. Many contain primary tabular cavities that formed horizontally in the upper parts of pillows at the time of their formation; thus, they are very useful for determination of the strike, dip, and top of the flow. Most pillow lavas are one foot to five feet long. Many appear nearly round in a "top-view" but a few are markedly elongated. Scoriaceous material is commonly present between pillows but only in very small amount. A few ellipsoidal lavas show slight concentric zoning.

As mentioned above, many medium-grained rocks found in the lava belt may be sills or flows. On the map, they have not been separated from the volcanic rocks.

The volcanic rocks are younger than all, or nearly all, the metasedimentary rocks of the area; the only known possible exception is the quartz-biotite-muscovite schist in the northeastern part of the area. Their relationship to these later rocks is uncertain.

Intrusive Rocks

Metagabbro and metadiabase sills are common throughout the area except in the northeastern part. In many instances the original texture has been partly preserved. Most of the gabbros are medium-grained, but some schistose amphibolites are very fine-grained.

The mineralogy of the gabbros is varied. Some gabbros have partly resisted metamorphism and contain as primary minerals olivine, ortho- and clino-pyroxene, calcic plagioclase, magnetite-ilmenite, and small amounts of quartz. Most gabbros, however, are metamorphosed; the olivine is replaced by serpentine, chlorite, or tremolite-actinolite; pyroxene has changed to chlorite and actinolite or hornblende; a mixture of sodic plagioclase and clinozoisite-epidote has replaced the calcic plagioclase. Sphene, biotite, and, in the southeastern part of the area, garnet are commonly found in small amounts.

The sills vary in thickness from a few feet to a few thousand feet. Compositional changes, as outlined below, are very common in the thick ones. A very light-coloured, medium-grained metagabbro generally makes up the lower part. The middle and upperparts are commonly darker and contain some pegmatitic gabbro. A medium to very dark green gabbro is common near the top. Metamorphosed quartz diorite or metagranodiorite is also present at some places near the top of the sills. Gabbros, only partly altered, were found toward the middle of thick sills such as are exposed northeast of Lacasse lake and of Phillips lake.

Meta-ultramafics occur as lenses in the middle parts of the thicker (2,000-4,000 feet) sills on each side of Lacasse lake. Similar

rocks form the main parts of sills that are only a few hundred feet thick, as those exposed on the shores of Lacasse lake and on the east shore of Anderson lake. The ultramafics are easily recognised by a characteristic reddish-brown weathered surface and a green fresh surface. They are mainly composed of serpentine with a variable amount of tremolite-actinolite and some magnetite.

In sills with thickness of only a few hundred feet the base and the top generally consist of a green, actinolite-rich, mafic metagabbro. A fairly typical, 300-foot sill at the southern end of Lacasse lake has a gabbroic base about 30 feet thick and a gabbroic top about 70 feet thick; the middle part is made up of serpentine-rich rock. At places, the contacts between the serpentinous rocks and the actinolite-rich metagabbros are sharp, at other places they are gradational.

Blotchy gabbro (mottled gabbro, leopard rock) is found on the eastern side of the main lava belt. A small occurrence is also found among the volcanic rocks west of Phillips lake. The rock consists of abundant, white, plagioclase-rich patches set in an amphibole-rich matrix. The patches are about one inch in size and are slightly elongated in the schistose rocks. The original texture is largely destroyed but the rock is undoubtedly the same as the blotchy gabbro found near Gerido lake and Leopard lake to the southwest of the area. In these places, the blotchy gabbro is less metamorphosed and is recognizable as a glomeroporphyritic gabbro. To the southwest of the map-area, the blotchy gabbro is nearly always found at the base of the volcanic sequence. In the present area, the relationships are much obscured by intense shearing, but one top determination from pillow lavas suggests that here again the blotchy gabbro may be at the base of the volcanic succession.

A wide band of medium to very dark green, commonly schistose, very fine-grained amphibolite outcrops west of de Freneuse lake. This rock is mainly plagioclase and hornblende. Amphibolite and hornblende-biotite schist are found east of de Freneuse lake. They occur mainly in bands a few tens of feet wide separated by grey, quartz-muscovite-biotite schists. In a few places, the amphibolite bands, only a few inches in width, are interbanded with very fine-grained quartzo-feldspathic gneisses. Fine-grained amphibolite is also present along the eastern edge of the main volcanic belt. The amphibolites probably come mainly from gabbro, but some, especially along the edge of the volcanic belt, may be metamorphosed lavas.

Metamorphism

There is a general eastward increase in metamorphism in the rocks of the trough near latitude 58° north. Most of the rocks of the Gerido lake area (immediately to the southwest of the present area) belong to the chlorite zone. Biotite appears (in the metasedimentary schists exclusive of iron formation) only near the eastern edge of this area, and all the rocks of the present area are in the biotite zone of metamorphism or in zones of higher grade.

Garnets are found in metasedimentary schists on the east shore of Phillips lake and to the south and southeast of this place. The

largest and most abundant garnets are in the southeast corner of the area, near the gneisses. They are also common in the amphibolites in the same part of the area. Garnets were not found in the northern part of the area.

The schistosity is more pronounced in the northeastern part of the area than in the southwestern part. In the former part, gabbros and lavas have been largely transformed into schistose amphibolites, and the metasedimentary rocks are medium-grained, very contorted, plagioclase-quartz-muscovite-biotite schists.

Structure

From west to east, the main structure of the area is as follows. A southeast-plunging anticline occurs in the southwest corner of the area. A very important longitudinal fault is present west of Phillips lake. This fault transects a small syncline in the lavas to the west and the sedimentary rocks at the base of the thick gabbro sill to the east. The fault is believed to have a large displacement and to have caused the repetition of the lavas and the iron formation. The lavas south of Lizotte lake are in a south-plunging syncline; the gneisses in the southeast corner of the map-area occur in a northwest-plunging anticline. Traced northwestward, these two folds converge slightly, and apparently decrease in amplitude to pass gradually into a homoclinal structure. The structure of the main belt of lava is not clear owing to intense shearing in the northeastern part. However, the structure believed most likely is that of a syncline or small synclinorium, probably complicated by longitudinal high-angle thrust faults. No major structure was recognized in the schists northeast of de Freneuse lake. There, a multitude of small, tight folds are present, most of them plunging gently to the southeast.

Many small transverse faults and shear zones are present. Their displacement is commonly negligible but some have a displacement of a few tens of feet. Some of the shear zones are partly replaced by carbonate. A wide, transverse zone of sheared, shattered, and carbonatised gabbro is present east of the middle part of Phillips lake, where the syncline and anticline found in the southeast part of the area appear to merge into the homoclinal structure.

Economic Geology

The blotchy gabbro is of interest because in or near it is found most of the chalcopyrite mineralization around Gerido lake. As mentioned above, the blotchy gabbro is present east of the main volcanic belt but, unfortunately, outcrops are not abundant in that part of the area. Very rusty zones carrying pyrite were found with the blotchy gabbro near the northwest corner of the area. A few specks of chalcopyrite were seen here and there in the gabbros and lavas in the south-central part of the area.

The iron formation in this area is poorly exposed in many places. However, it appears to be thin, relatively poor in iron, and to consist mainly of grunerite schists with some magnetic members.