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Preliminary report on Thévenet lake area (east half), New Quebec

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GEOLOGICAL SURVEYS BRANCH

PRELIMINARY REPORT

ON

THEVENET LAKE AREA (EAST HALF)

NEW QUEBEC

BY

LÉOPOLD GÉLINAS

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INTRODUCTION

The Thévenet Lake Area, East Half, comprises 160 square miles bounded by latitudes 58°00' and 58°15' and by longitudes 69°00' and 69°15'. It is some 30 miles west of Fort Chimo, and includes the eastern margin of the Labrador geosyncline or "Trough". The area was mapped by the writer during the summer of 1956.

The area may be reached by float plane from Fort Chimo or from such more distant bases as Roberval, 700 miles to the south.

The topography is controlled largely by the rock formations. Zones underlain by gneiss tend to be uniform in elevation. Those characterized by alternating bands of amphibolite and schist are more irregular, with ridges coinciding with amphibolite and valleys with schist. The highest point is about 925 feet above the sea.

GENERAL GEOLOGY

The area is underlain by metamorphic rocks of Precambrian age resting in a series of anticlines and synclines. The synclines are occupied by biotite schists, amphibole, pillowed amphibolite, carbonate rocks, and "granitic" gneiss. Including possibly the "granitic" gneiss, the rocks of the area all belong, or are related, to the rocks of the "Labrador Trough". The youngest consolidated rocks are pegmatite dykes.

Table of Formations

Pleistocene and Recent	Till, sand	
Precambrian	Pegmatite	
	Amphibolites of Igneous Origin	Amphibolite Garnet amphibolite Amphibolite with pillows
	Schists of Sedimentary Origin	Biotite-muscovite schist Calc-silicate rock Biotite-garnet schist Garnet-staurolite schist Marble
	Gneisses	Pink gneiss, grey gneiss

Gneisses

The gneisses are grey to pink and rich in feldspar. They are generally medium- to fine-grained. Grey colour and pronounced banding are prominent near contacts with dolomite or mica schist. Here, layers containing quartz, feldspar, and biotite alternate with layers in which biotite is dominant. Away from these contacts the gneisses are generally pink. West of Ferguson Lake the gneissic structure is barely visible.

Much of the gneiss east of Renia lake and west of Boulder Lake contains bands one-half to one foot thick composed mainly of medium- to coarse-grained granitic material.

The predominant minerals of the grey and pink gneisses are, in order of decreasing amount, quartz, microcline, plagioclase, biotite, muscovite and epidote. The plagioclase varies from oligoclase to andesine, with oligoclase the most common. The accessory minerals are hornblende, chlorite, calcite, diopside, sphene, zircon and apatite. Garnet is present in some of the pink gneisses.

Microcline may occur among grains of quartz and other feldspars. It may also form small ellipsoidal agglomerations of grains or porphyroblasts. Plagioclase

and quartz are usually equigranular, although elongated quartz grains are common. Many plagioclase grains have minute inclusions of epidote and muscovite. Dark brown biotite is usually associated with epidote, sphene and apatite; rarely, it is associated with chlorite. Muscovite is less conspicuous than biotite.

Irregular masses of augen gneiss occur locally in the gneissic complex, particularly west of Boulder lake where four zones have been recognized. The contacts between these and the ordinary granitic gneisses are gradational.

Many bands of dark green, fine- to medium-grained, schistose amphibolite occur in the granite gneiss parallel to the gneissosity. Also, two occurences of massive amphibolite were noted in the gneiss east of Renia lake.

The origin of the gneisses is not clear. Suggestive of sedimentary origin is the fact that, in the grey gneiss, gneissic structure is prominent. Possibly, this represents bedding. However, in most of the area primary structures have been obliterated by regional metamorphism and indications of origin are lacking.

Mica Schists

Mica schists are widely distributed and usually occupy valleys. The grain size varies widely within the schist as a whole, and is quite variable even within any of the various types.

The essential constituents of the biotite-muscovite schists are, in order of decreasing amount: quartz, plagioclase, biotite, and muscovite. The accessory minerals are chlorite, epidote, sphene, and pyrite. East of Vezina lake the schist is medium-grained and contains numerous fractured quartz veins and lenses. At a few places the schistosity cuts the bedding at a slight angle. Minute grains of euhedral garnet occur locally in the schist.

The biotite-garnet schists are coarser-grained than the other schists. They occur on the west side of Ferguson lake, on both sides of the syncline in the central portion of the area, and in the southeast corner of the area. All occurrences are near gneisses.

A relatively thin band of staurolite-garnet-mica schist is present in the central part of the area. Staurolite is also found west of Renia lake.

Carbonate Rocks

Dolomite marble is found in contact with gneisses in the northwestern and southwestern parts of the area. Gradations from dolomite marble to calc-silicate rocks to pure marble and to biotite schist may be seen southwest of Renia lake.

The dolomite marble weathers brownish-orange. It is composed of interlayered equigranular dolomite and actinolite with minor phlogopite. Crystals up to 3 inches long occur in radial aggregates.

The calc-silicate rocks are composed mainly of diopside and actinolite, with plagioclase, carbonate, and quartz as accessory minerals. Epidote, sphene, and pyrite or pyrrhotite are minor constituents.

Conglomerate or Breccia

"Conglomerate" composed of flattened "pebbles" or fragments of quartz and feldspar in a matrix rich in amphibole and epidote is exposed north of Fox lake. Most fragments are less than one foot long, and are about 2 inches thick. This rock is associated with mica schist and pure quartzite. Its origin is uncertain.

Amphibolite

Three types of amphibolite are recognized in the area (only the first two are shown on the accompanying map): (1) that derived from gabbro sills, (2) from lava, and (3) from impure dolomite.

The ortho-amphibolites are dark green, usually massive, and fine- to medium-grained. They are easily distinguished from the amphibolite derived from dolomite by a much darker colour, the sharp contact with surrounding rocks, minor to no carbonate, and the presence of hornblende instead of tremolite-actinolite.

Pillowed amphibolites are present in the northeastern and northwestern parts of the area. East of Vezina lake, some pillows are stretched to a length of 10 feet. The scoriaceous material between pillows is characterized by a darker green colour. Basal protrusions, characteristic of pillows of less metamorphosed flows to the west, are not definitely visible in the pillows of the present area.

Amphibolites derived from gabbro may be confused with those derived from thick, massive volcanic units. However, the latter commonly show pillow structures, and may be distinguished on this basis. Also, the thicker units derived from gabbro vary vertically in mineral composition with their tops notably high in felsic minerals. Amphibolites of gabbroic origin are most common in the mica schists, where they generally parallel the bedding.

Where shearing has been intense or where the pillowed amphibolites become thinner, the mode of origin is not so obvious. It is possible that the pillowed amphibolite near Fox lake reaches the eastern boundary of the area or beyond. However, east of Fox lake the pillowed amphibolites become thinner and the shearing more intense. Here, they cannot be differentiated with certainty from the amphibolites derived from gabbro sills. Thick bands of amphibolite southeast of Vezina lake are on strike with pillowed amphibolite farther east. It is assumed that these amphibolites are of volcanic origin.

The most characteristic and abundant mineral in the ortho-amphibolites is green to greenish-black hornblende with inclusions of calcite, epidote, biotite and sphene. Plagioclase, ranging in composition between oligoclase and andesine, is the second most abundant mineral. Flakes of muscovite and prisms of epidote form inclusions in the plagioclase. Plagioclase and quartz are usually in small, xenoblastic grains. In a few places (mainly in the gneisses) thin layers of quartz and plagioclase alternate with layers composed mainly of hornblende. Biotite is common, and wedge-shaped grains of chlorite are generally associated along its cleavages. Porphyroblasts of garnet are present in the amphibolite near the contact with the gneiss west of Ferguson lake.

A massive, ultramafic rock (amphibole?) was noted at three localities: at the base of a thick band of amphibolite west of Ferguson lake; in a few exposures in the gneissic complex east of Renia lake; and at the southern limit of the area, close to granitic gneiss. The rock is green, and weathers reddish-brown and rough. It consists almost exclusively of fine-grained, acicular amphiboles.

Two exposures of "blotchy" amphibolite have been found north of Fox lake. These are characterized by white, lenticular patches one inch or less in length. The patches are made up of clinozoisite and plagioclase in a matrix of mainly amphiboles and biotite. In the adjacent areas of less intensely metamorphosed rocks, the equivalent of this type of rock is referred to as "blotchy gabbro", mottled gabbro, or leopard rock.

Pegmatites

The pegmatites consist mainly of feldspar and quartz. Biotite, white mica, tourmaline, garnet, and hematite are common. Some pegmatite dykes in the northeast corner of the area are more than one mile long. The thicker ones are more resistant to erosion and form ridges that are easily recognized on the aerial photographs. The dykes cut the schistosity generally at a small angle. Similar dykes in the southeast corner of the area cut granitic gneiss at right angles to the gneissic structure. Three dykes have been traced in the central part of the area, north of Racine lake.

METAMORPHISM

Medium-grained biotite-muscovite schist is the typical rock of the northeastern part of the area. West of Vezina lake, biotite becomes dominant and, along with quartz and feldspar, is in coarser grains. Garnet appears in tiny grains in the biotite-muscovite schist west of Ferguson lake. It increases in size and quantity as the gneiss is approached; porphyroblasts one inch in diameter were noted at a few places. Also, near the contacts with the gneiss, the quartz grains aggregate in lenses 3 to 4 inches long.

The schists north of Racine lake, in a belt between the two central zones of gneiss, seem to be more highly metamorphosed than those just described. The schists in the middle of this belt are fine-grained, but become coarser as the gneisses are approached. Garnets up to ¼ inch in diameter are common close to the contact, with the garnet-bearing zone being wider on the north side of the belt than on the south. Staurolite also is found over a wide zone on the north side, but appears to be absent to the south.

Variation in mineralogy is shown also in the amphibolites. In these rocks, garnets are larger toward the gneiss.

Field evidence suggests that, in the gneisses west of Boulder lake, mica increases in quantity westward and potassic feldspar decreases as the contact with the dolomite and mica schists is approached. Also, foliation in the gneisses is more clearly developed near the contact with the schists.

STRUCTURAL GEOLOGY

The rocks of the area form a series of anticlines and synclines with northwestward-trending axes. The folding is shown best in the central and southwestern parts of the area where bands or zones of different types of rock alternate.

The gneisses around Boulder and Hall lakes form an anticline. This structure is suggested by the northeasterly dips of schistosity and gneissosity near the northeast boundary of the gneisses, and the southwesterly dips at the southwest boundary. However, more conclusive evidence has been found in adjacent areas. The anticline is doubly-plunging or "canoe-shaped". Its northwestward-plunging nose has been mapped by Sauvé (1956) in the Frenesue Lake area to the north, and its

southeastward-plunging nose was mapped by the writer in 1957 in the Gabriel Lake area to the east. At these noses, the gneisses are overlain by gently- to moderately-dipping schists.

South of this anticline, the structure is more complex, and two possible interpretations are suggested:-

First: The schists near Racine and Fox lakes could belong to a syncline, as the lithology of the rocks on both sides of the belt is similar. The middle part of the belt, made up of mica schist with a few amphibolites, is bordered on both sides by garnet schists containing several bands of amphibolite. A thin, irregular band of carbonate and calc-silicate rock occurs on both sides between these schists and the gneisses. Furthermore, the distribution of the conglomerate, or breccia, indicates the presence of at least a small syncline.

Second: The second interpretation is that all the schists near Racine and Fox lakes belong to the north limb of the relatively open syncline lying west of Fox lake, and mapped by Bergeron (1956). This syncline plunges toward the southeast, with the axis perhaps passing near the northern end of Renia lake. If this second interpretation is correct, the gneiss around Renia lake lies above, and is younger than, the schists west and southwest of Renia lake and northeast of Fox and Racine lakes. These schists are considered as belonging to the "Labrador Trough".

Few faults have been recognized. Most are transverse. The one most clearly defined cuts across the central syncline near the western boundary of the area, offsetting the formations 1,000 feet or less.

The attitude of schistosity and gneissic structure generally parallels bedding and trends of formations.

Contact Between Gneiss and Other Rocks

The contact between the gneisses and other rocks is generally marked by narrow depressions. Dolomite, up to 40 feet thick, is surprisingly persistent near the contact, and has been seen in contact with the gneiss at two places. However, biotite-garnet schist or fine-grained quartzite was seen in contact with the gneiss here and there. Bands of actinolite up to 4 inches thick are common in the dolomite-marble. They probably represent bedding. Breccia, and shear or flow structures appear to be absent.

The gneiss near contacts with schist commonly contains bands rich in feldspar and quartz interlayered with bands rich in biotite. Near the contact, also, the foliation of the gneisses is parallel to that of the schists and to banding in the dolomite. Neither shear structures nor breccia was noted in the gneiss near the contact.

In recent years, the eastern contact of the "Labrador Trough" has been regarded by many geologists as a fault. A fault contact would explain the dissimilarity between the schists of the "Trough" and the "granitic" gneiss to the east, and also divergences in strike in certain places (De Romer, 1956) on either side of the contact.

However, in the present area there is little divergence in strike close to the contact and no other reason to suspect a fault. Rather, two other possibilities are suggested: (1) that the contact is a major unconformity originally separating a gneissic basement from the sedimentaries of the "Trough" (this, of course, would not apply to the gneisses around Renia Lake if they are younger than the schists to the

west and southwest); or (2) that the gneisses represent an arenaceous sedimentary unit similar in metamorphic rank to the schists. Both belong to the "trough". In a few places, a sedimentary origin for the gneisses in strongly suggested.

GLACIATION

Striae and boulders not far removed from their sources show that the direction of latest movement of continental ice across this area was approximately N.20°W. Striae are best displayed on the exposures of gneisses and amphibolites.

Much of the northeastern quarter of the area is covered by sand marked by kettle lakes and kames. The kames are up to 30 feet high and are either cone- or ridge-shaped. They consist mainly of sand.

ECONOMIC GEOLOGY

The iron formation present in this area is in thin layers or lenses generally low in iron. Small amounts of sulphides were noted in some amphibolites, particularly west of Ferguson lake.

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