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PRELIMINARY REPORT, GEOLOGY OF DUNPHY LAKE AREA, NEW QUEBEC TERRITORY

DEPARTMENT OF NATURAL RESOURCES

Honorable DANIEL JOHNSON
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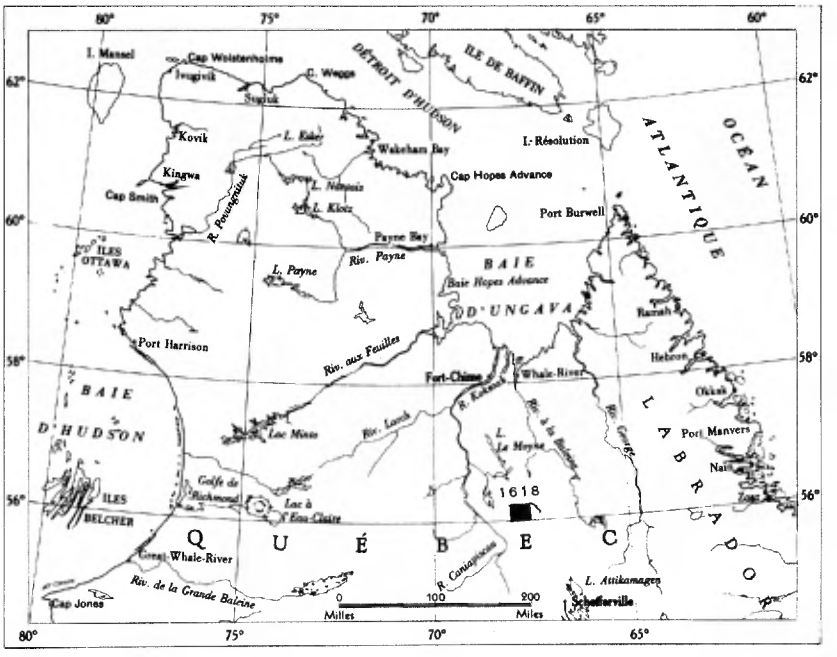
Geology of DUNPHY LAKE AREA

NEW QUEBEC TERRITORY

PRELIMINARY REPORT

by

Erich Dimroth



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GEOLOGICAL EXPLORATION SERVICE

ROBERT BERGERON, Director

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INTRODUCTION

Location and Access

The Dunphy Lake area is 95 miles north of Schefferville, in central New Quebec. The area covers approximately 325 square miles and is bounded by latitudes 56°00' and 56°15' and by longitudes 67°30' and 68°00' respectively.

All the larger lakes of the area are accessible by floatplane in summer or by skiplane in winter. The only practical waterways are Dunphy, Romanet and Effiat lakes. Overland travel is easy.

Topography

The southwestern and central portions of the area form a highland of an average altitude of between 1,500 and 2,000 feet. The highest point of the highland, situated in the northwestern portion of the area, is 2,400 feet above sealevel. Pronounced cuestas, with a local relief between 100 and 400

feet, dominate the highland. One- or 2-mile-wide depressions of an altitude of 1,000 feet follow a line between Dunphy and Effiat lakes, and between Dunphy and Romanet lakes. These depressions divide the highlands into three separated regions.

The northeastern portion of the area is undulating lowland with elevations between 1,100 and 1,200 feet. Only a few hills are higher than the general level of this peneplain.

The major topographical subdivisions as well as most of the small topographic features are due to the bedrock structure.

Vegetation and Fauna

Most of the area is covered by lichen and by subarctic woodland; only the hilltops and the area above 1,700 feet altitude are barren. Caribou and bear are relatively numerous in the region; otter, beaver, martin, mink, and lynx were observed and traces of wolf were seen as well. Porcupine and squirrel appear to be the only abundant mammals. Duck geese, loon, partridge and, on elevated country, ptarmigan are common. Gray and speckled trout occur in the lakes and rivers.

Field Work

Field work started June 30, 1965, and was completed September 16. Extensive photo-geological preparations preceded the field work. The distance between traverse lines varies between two miles and a few hundred feet, according to the geological conditions. In many cases it was preferred to follow contacts instead of traversing across them. In this way, it was attempted to map all outcrops of major importance.

The outcrops were located directly on aerial photographs on the approximate scale of 1/2 mile = 1 inch. An enlargement of the map of the Topographical Survey of Canada (sheet Dunphy lake, 24 B/4 on a scale of 1:50,000) on a scale of 1/2 mile = 1 inch served as base map.

General Geology

General Statement

The stratigraphic sequence is very simple in most of the area. Red beds and a stratigraphically reduced sequence of rocks of the Knob Lake Group (stromatolitic limestone of Dunphy river, calcaro-argillitic sequence of Bouleaux Point) are cut by sills of gabbro and are overlain by a very thick sequence of Doublet Group basalts. The basalt flows are regularly interlayered with sedimentary rocks (slates, black quartzites). Basalts underlie more than 80% of the surface of this portion of the area.

The geology of the northeastern corner of the area is much more complex. The red beds, equivalents of which have been detected in the Romanet Lake area, are overlain by a stratigraphically more complete sequence of the Knob Lake Group (dolomites, quartzites, slate and phyllite). Gabbro sills are absent and Doublet Group amphibolites are not very abundant.

Two local discordances seem to be present in the area. In the southwest the Doublet Group basalts overlie rocks which have been correlated with the lowermost formations of the Knob Lake Group. East of Wheeler river a quartzite sequence, which has been correlated with the Wishart Formation*, overlies the gneisses. A discordance is therefore present below the Wishart Formation in the area east of Romanet lake. A second discordance, below the Doublet Group, exists in the southern portion of the area.

All the rocks of the area have been affected by the Hudsonian orogeny. The massive and competent basaltic rocks in the southwest and center of the area were only slightly folded and were cut by regional thrust faults, whereas the less competent sedimentary rocks in the northeast of the area were strongly folded. The structures are everywhere complex; folds are in two directions in the southwest of the area and the structures become more and more complicated to the northeast. East of Romanet lake four, and locally even five, generations of folds and cleavages were observed.

All the rocks are slightly metamorphic. They belong with the greenschist facies in the western and central portions of the area, and with the epidote-amphibolite facies in the east.

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* Subsequent field work has shown that two quartzite formations are present in this zone of the Labrador Trough; one of these is within the Attikamagen Formation, the other correlates with the Wishart Formation. Lithological similarities suggest that the quartzites occurring in the northeastern part of the Dunphy Lake area correlate with the quartzite in the Attikamagen Formation.

The rocks of the northeastern portion of the area were described on a purely petrographic basis, although the stratigraphic position of most rock units has been established relatively well. The rocks of the southwestern and central portions of the area were described in stratigraphical order.

TABLE OF FORMATIONS

Southwest and center (formations in stratigraphic order)			Northeast (formations not in stratigraphic order)
Pleistocene and Recent			
Discordance			
Precambrian	Doublet Group	Metabasalt Agglomerate Black slate and quartzite Subgraywacke Metagabbro Amphibolite	Amphibolite Phyllite
	Knob Lake Group	Calc-argillitic sequence of Bouleaux Point	Phyllite Slate
		Green argillite	Dolomite and stromatolitic dolomite
		Stromatolitic limestone of Dunphy river. Metamorphosed limestone	Metaquartzite, metaarkose, metaconglomerate, dolomitic metaquartzite (Wishart Formation)
	Red beds		Arkose and conglomerate (present only in the Romanet Lake area)

Subwest and Center of the Area

(formations in stratigraphical sequence)

Red Beds

Red beds form the bedrock in a small area west of Larabel lake and in the center of the Dunphy lake basin. These rocks probably correspond to the upper member of Formation 6 defined east of Chaconipau lake (Dimroth 1965-b).

West of Larabel lake strongly recrystallized dark grey quartzites are exposed. These quartzites are obviously equivalents of the red beds outcropping 1 mile to the northwest in the Otelnuk Lake area. They have been strongly metamorphosed at the contact of a gabbro sill.

On the islands of Dunphy lake (lat. 56°02', long. 67°42') angular blocks of well bedded red, arkosic sandstones are very common. These blocks are very large and angular, although the rock is quite friable. It is therefore presumed that they are of local origin.

Knob Lake Group

The Knob Lake group comprises all marine, geosynclinal rocks of the Labrador Trough. This group is strongly reduced in the southwest and center of the area, where it contains only two formations: pink stromatolitic limestones, and a formation of interlayered slate, argillite, sandstone and limestone. Both formations are provisionally regarded as equivalents of the Attikamagen Formation.

Pink Stromatolitic Limestone

This formation is well exposed at the northern shore of Dunphy river near the western boundary of the area. It is equivalent to Formation 7 of the Otelnuk Lake area. The pink color of the limestone is produced by a little hematite dust, occurring finely dispersed in the limestone. The pink color vanishes during the recrystallization of the rock. The metamorphic equivalents of this limestone are therefore either

gray or gray and red mottled. The limestone contains a few sand grains (1mm. diameter) at the western boundary of the area, where it is also interlayered with thin beds of a dark red siltstone. The proportion of this psammitic material decreases to the east.

The metamorphic limestone which crops out here and there north of Effiat lake, probably belongs to the same formation. This limestone is medium grained and white or gray. It is commonly strongly sheared. Porphyroblasts of actinolite are fairly common at some localities, elsewhere the limestone has been converted into a talc-schist.

Calc-Argillitic Formation

A calc-argillitic formation, composed of argillites, sandstones, quartzites, and limestone, overlies the stromatolitic limestones. The argillites and gray, brown weathering limestones, in beds varying from some inches to one foot in thickness, predominate in the lower portion of this formation. The higher portion of the formation consists of dark gray quartzites (beds between 2 inches and one foot thick), of argillite, calcareous sandstone and limestone. Quartzite and argillite predominate in the upper portion of the formation. Effects of the metamorphism are visible in a zone of more than 50 feet above and below the contacts of gabbro sills.

Green Argillite

Some outcrops of a green laminated argillite were observed on an island in Larabel lake. These rocks show no trace of cleavage. They appear to be correlated with the calc-argillitic sequence described above.

Doublet Group

The Doublet Group is made up of about 30 basalt flows of a thickness varying between 50 and 400 feet, interlayered with between 10 and 50, less commonly 100-foot-thick beds of sedimentary rocks (slate, black quartzite, subgraywacke). Very small quantities of agglomerate, and of metamorphic tuff were also observed in this group.

The slightly dipping basalt flows cause the development of cuestas between 100 and 400 feet high. The sedimentary rocks crop occasionally out at the base of these cuestas and it is assumed that a layer of sedimentary rocks is present below all of them.

Intrusive rocks (metagabbros) are closely associated with the metabasalts. Both rock types are very similar from a petrographic point of view and can be distinguished mainly by their geological associations.

The metabasalts form a very regular concordant sequence of flows of quite constant thickness (generally below 400 feet). They are very homogeneous; pre-metamorphic aplitic and pegmatitic veins are, for the most part, absent. It was rare that traces of contact metamorphic effects were observed in the sediments below basalt flows. Pillowed flows, tuffs and agglomerates are present, although in minor quantity; a number of flows, however, have a vesicular facies at their upper contacts. It therefore appears evident that this whole sequence is of extrusive origin, even if this hypothesis cannot be verified for all of the numerous flows.

The metagabbros, on the other hand, form a much more irregular sequence of sills, which, on the average, are considerably thicker than the basalt flows. Some of the sills are composite; others branch in an anastomosing way; they seem therefore not to be strictly concordant. Contact-metamorphic effects are quite strong, and were observed in the rocks below and above sills. The meta-gabbros generally contain many pre-metamorphic aplitic and pegmatitic veins and schlieren and the pegmatitic veins and schlieren often grade into metaquartz-gabbros.

Metabasalts

All of the metabasalt flows have the same characteristics. They are fine grained at the contacts and their grain size increases towards the centers of the flows. The grain size of the flows is therefore, in part, a function of their thickness; there are, however also very pronounced individual variations in the grain size of the flows. Most of the flows are medium grained (between 1 and 5 mm.), except for some thin (<60') fine-grained flows, and two very thick (>300') coarse-grained flows. The metabasalts are very homogeneous rocks. The

characteristic violet-brown color of the metabasalt cliffs makes it possible to recognize them from a considerable distance. This color, moreover, is neither derived from the rocks nor from the lichen, which, in part, covers them, but comes from a mixture of colors from the fresh and weathered rock and various lichens.

The fine-grained metabasalt is pale or dark greenish gray and weathers greenish black or rust. Individual minerals are not visible. The rock is cut by numerous joints and therefore easily eroded. The outcrops of fine-grained metabasalt are therefore more rounded than those of medium-grained metabasalt and outcrop is less common in this rock.

The medium-grained (<5 mm.) or coarse-grained (>5 mm.) metabasalt is green on the fresh surface. The weathered surface exhibits white feldspar laths, whereas the hornblende remains black. The medium and coarse-grained metabasalts commonly show a well developed ophitic texture. Several regional joint systems, the most important vertically dipping, cut the rocks. Prismatic columnar joints were observed south of Dunphy lake at lat. 56°01', long. 67°49'.

The metabasalts are massive and little deformed north of Dunphy lake; they are jointed intensively east of this lake. South of Dunphy lake finally, they have been strongly folded. There the rocks are cut by numerous faults and shear zones of ¼ inch thickness. The degree of the deformation of the metabasalts increases strongly towards the Dunphy - Otelnuk thrust.

Agglomerate, tuff

Agglomerates were observed south of Dunphy lake (lat. 56°02', long. 67°45' and lat. 56°02', long. 67°51') and south of Bertin lake (Dimroth 1965-a). They are composed of angular fragments of a very dark basalt set in a matrix of a somewhat paler, yellowish weathering basalt. The diameter of the fragments is below one inch.

Greenschists, probably derived from basalt tuff, were observed northwest of Dunphy lake (lat. 56°07', long. 67°42').

Sedimentary rocks

Beds of interstratified black slate, of quartzite and of subgraywacke crop out here and there at the base of the metabasalt scarps. The lower contacts of these sedimentary interbeds were only rarely observed; they seem to be concordant. The upper contacts are generally concordant.

The black slate is commonly well laminated. A slaty cleavage is present, and locally also a fracture cleavage. Pyrite porphyroblasts were observed at a number of localities.

The black slate grades into a black quartzite, composed of rounded grains of blue quartz ($<$2 mm. diameter) set in a paste of graphitic shale. The quartzite is gray, more or less dark according to its quartz content. The rock is hard and massive. The individual beds are between 2 inches and 6 feet thick.

Subgraywackes are less common. They are softer than the quartzites. The brownish grey alteration and the sandy and micaceous weathered surface are characteristics of this rock.

Metagabbros

The distinction between metagabbro and metabasalt is based on the geological association of both rocks. Both rock types are very similar from a petrographic point of view and it is impossible to distinguish them in specimen. A detailed description of the metagabbro is thus unnecessary.

The metagabbros form commonly very thick, often composite, sills. They are medium grained and a fine-grained contact facies is developed in a thin zone (10 feet) at their contacts.

Amphibolites

The amphibolites are much more recrystallized than the metabasalts and metagabbros, from which they are derived. They are green, dark on the fresh, and light on the weathered surface. They are commonly sheared and ophitic textures are

rarely preserved. They are less homogeneous than the metabasalts and contain numerous aplitic veins and segregations. Graphitic phyllites interstratified with the amphibolites were observed east of Foisy lake.

Northeast of the Area

Dolomitic rocks

Two formations of dolomitic rocks seem to be present in the northeastern portion of the area: a white, and a brown weathering dolomite respectively.

The white dolomite is exposed at the western shore of Romanet lake. This rock is well bedded; stromatolitic structures were locally observed. The color of the weathered surface, as well as the relative absence of quartz veins are characteristic of this formation and distinguish it from the brown dolomite. It is probable that it corresponds stratigraphically to the pink stromatolitic limestones of Dunphy river on the one hand, and to the white weathering bedded dolomite exposed south of Ronsin lake (Romanet Lake area) on the other.

The brown weathering dolomite is exposed south of Ledran lake and north of Foisy lake. The rock is dark gray on the fresh surface. It is massive or well bedded, and always contains numerous quartz veins. A few sand quartz grains are commonly present, producing a sandy surface upon weathering. A formation composed of this dolomite interbedded with equal amounts of phyllites is exposed at a few localities north of Foisy lake and was mapped separately.

Quartzitic Rocks (Wishart (?) Formation)

A well defined group of quartzitic rocks makes up a large portion of the area east of Romanet lake and seems to correspond stratigraphically to the Wishart Formation. This group was subdivided into three formations as follows:

3. Upper sericite-schist
2. dolomitic quartzite
1. meta-arkose, meta-conglomerate and metaquartzite (lower sericite-schist).

The lower formation is composed of meta-arkose, metaconglomerates and arkosic metaquartzites which are commonly strongly sheared and metamorphosed. The rocks are pale gray on the fresh surface and weather commonly somewhat pinkish or greenish. A schistosity, commonly folded, is always present as well as one or several fracture cleavages. The rocks are composed of quartz, more or less sericitized feldspar, and muscovite; dark minerals are lacking. The structure is porphyroclastic. The diameter of the porphyroclasts varies between 1 mm. to several cm. The rocks are strongly recrystallized.

The dolomitic quartzite is a dark gray massive rock. It weathers to a dark rusty brown and the surface is sandy. A schistosity may be indicated by narrow quartz stringers. Bedding is rarely visible in the quartzite itself, but is shown by layers and lenses of brown weathering dolomite.

Conglomerates composed of gneiss boulders (up to 3 inches diameter) in a groundmass of dolomitic quartzite were locally observed in this formation. East of Romanet lake blocks of another conglomerate with pebbles of grey dolomite, quartz and feldspar in a similar groundmass were also detected. These conglomerates, however, are only locally present and do not form a defined stratigraphic horizon in the formation.

The upper sericite-schist is a fine grained gray, white weathering rock. The schistosity is always well developed and one or several fracture cleavages are commonly present. The schist contains between 1 inch and 1 foot thick dolomite beds, especially in its upper portion. The lower and upper contacts of the formation are gradual.

Insufficient outcrop did not permit this group south of 56°12' to be subdivided. Most outcrops and blocks observed north and east of Ledran lake are coarse-grained arkosic quartzites. Medium-grained arkosic quartzites are equally present whereas dolomitic quartzites are rare. Most of the terrain seems therefore to belong to the lower sericite-schist. The quartzite outcrops south of Ledran lake are composed of dolomitic quartzite and of sericite-schist and probably belong to the higher formations of this group.

Slate and Phyllite

Slates crop out west of Romanet lake at the northern boundary of the area. The rock is laminated and cleaved. One or several fracture cleavages may also be present.

The slate overlies the bedded dolomites southeast of Ronsin lake (in the Romanet Lake area). It is therefore younger than the white dolomite of Romanet lake, and older than the quartzites.

Biotite bearing phyllites are here and there exposed east of Romanet lake and on the point within the lake. The phyllites are gray (quartz phyllites) or black (graphitic phyllites). Beds of brown weathering dolomite are common. The relations east of Romanet lake seem to indicate that the phyllite overlies the quartzitic group and that it correlates with the Ménihek Group.

Correlation of the formations

The table below gives the probable correlations of the formations of the area with those of the Romanet and Otelnuk lake areas and of the southern Labrador Trough. All correlations are still tentative.

Structural Geology

The region is subdivided into several blocks and tectonic units characterized by their individual fold styles and separated by faults. These are the following units:

1. The Larabel block between Swampy Bay river (Otelnuk lake area) and Dunphy river, separated by a first thrust fault from the ...

2. Dunphy block. This block extends from Dunphy lake to Romanet and Ledran lakes, and is subdivided into two units (Derbuel syncline and unit A) by an anticlinal zone trending north-south and following the depression between Dunphy and Romanet lakes. A thrust fault and imbricate structures separate it from the ...

3. Romanet lake anticlinorium in the northeast of the region.

All these units are characterized by an individual fold style, whereas the general style of the microstructures, and the relations between microstructures and macrostructures remain comparable. This seems to indicate that all the aforementioned units have been subjected to the same orogenic forces.

TABLE OF CORRELATIONS

Southwest and center and Otelnuk Lake area (Dimroth 1965-b)	Northeast and Romanet Lake area	Southern Labrador Trough	
Doublet Group			
Discordance		Discordance (?)	
Formation 11	slate and phyllites more or less dolomitic	Knob Lake Group	Ménihek Sokoman Ruth
Formation 10	dolomite		
Formation 9	quartzite and conglomerate		Wishart
	local discordance		
	brown weathering dolomite		Denault
Formation 8 argillite	slate		Attikamagen
Formation 7 calc-argillitic sequence stromatolitic limestone	white or cream weathering dolomite		
	slate		
Formation 6 (red beds)	arkose and conglomerate (Romanet lake only)	Seward	

It is possible to distinguish two "tectonic niveaux" in the Larabel block, a lower unit (west of Larabel lake, in the Otelnuk Lake area), with very simple structures, and an upper unit (east of Larabel lake), consisting of two roughly triangular basins overturned to the southwest and west. A first-order thrust fault (Dunphy-Otelnuk thrust) follows the Dunphy lake valley more to the northeast.

The Dunphy lake block above this thrust fault is subdivided into two units by an anticlinal zone trending north-northeast and following the northern bay of Dunphy lake (Septentrionale Bay anticlinal). The portion of the Dunphy lake block west of this anticline has been called Derbuel syncline, and is folded into shallow folds trending northwest, north-northeast and east-west. Two complex systems of normal faults cut this unit in the area. The region east of the anticline mentioned above consists of an anticline in the west, and of a syncline further east, both trending north-northeast. A second anticline follows the depression north of Effiat lake.

The Romanet lake anticlinorium is very complicated structurally. Complex folds with northwesterly trends predominate and folds in north-south and east-west directions are superposed on them. These superposed folds are principally important for the microstructures, but they also produced some larger folds, i.e. the syncline of the Vaudry Point (plunging north) and an east-west trending basin extending into the Effiat Lake region at lat. 56°12'.

Economic Geology

Traces of metal mineralization were detected during prospecting by various mining companies at the following localities:

1. Zinc (sphalerite)
   Southwest of Dunphy lake (lat. 56°02', long. 67°49')

2. Copper (chalcocite, chalcopyrite)
   a) northwest of Dunphy lake (between lat. 56°04', long. 67°42' and lat. 56°03', long. 67°47');
   b) north of Effiat lake (lat. 56°01', long. 67°31');
   c) northeast of Dunphy lake (lat. 56°05', long. 67°37');
   d) north of Maugue lake (lat. 56°10', long. 67°37')

The metalliferous minerals were found in calcite veins, in breccias or finely dispersed in the rocks. They are mainly present within sedimentary rocks.

The mineralized outcrops are restricted to tectonically well defined localities:

1. In the Dunphy-Otelnuk thrust zone.

2. In the anticlines trending north-south and separating the units of the Dunphy lake block.

3. Northeast of the faults separating Dunphy block and Romanet anticlinorium.

The mineralized outcrops are thus all along the boundaries of the tectonic units described above. These zones are favorable for mineralization in the whole region and not only in the Dunphy Lake area.

The rocks of these zones are strongly deformed, and outcrops are rare. Most of the mineralization, and probably its more important portion, is likely to be in areas covered by till. It is therefore suggested that systematic prospection of these favorable zones by geochemical and geophysical methods will reveal the presence of mineralization at many localities. Such prospecting obviously would have to be accompanied by drilling aimed at exploration of the geology of the covered bedrock.

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