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

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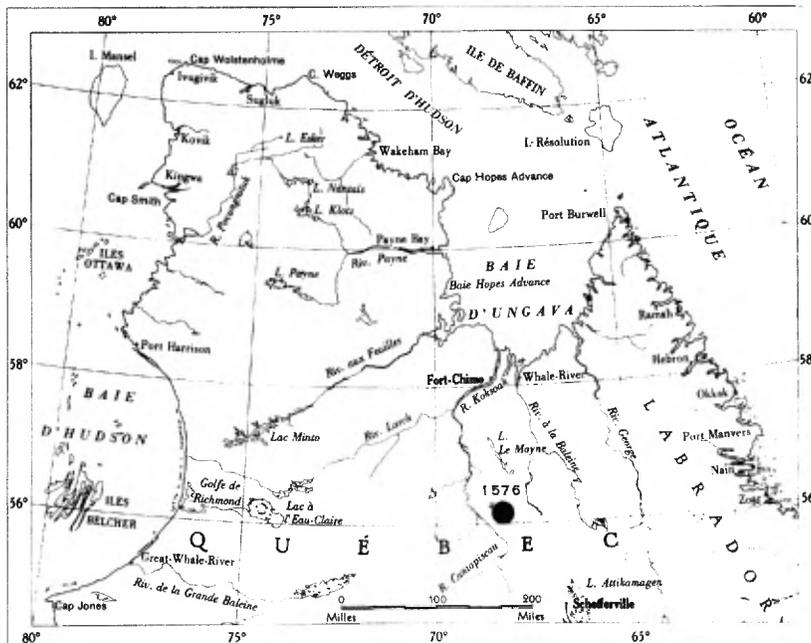
Geology of OTELNUK LAKE AREA

NEW QUEBEC TERRITORY

PRELIMINARY REPORT

by

Erich Dimroth



QUEBEC

1965

QUEBEC DEPARTMENT OF NATURAL RESOURCES

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GEOLOGICAL EXPLORATION SERVICE

H.W. MCGERRIGLE, CHIEF

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OTELNUK LAKE AREA

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PRELIMINARY REPORT

on

OTELNUK LAKE AREA, NEW QUEBEC

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ERICH DIMROTH

INTRODUCTION

Location and Access

The Otelnuke Lake area is 110 miles north-north-west of Schefferville in central New Quebec. It is bounded by latitudes $56^{\circ}00'$ and $56^{\circ}15'$, and by longitudes $68^{\circ}00'$ and $68^{\circ}30'$, respectively, and comprises 325 square miles.

All the larger lakes of the area are accessible by floatplane or skiplane. The larger lakes are convenient waterways, whereas falls and rapids hamper travel on Swampy Bay river. Overland travel is easy. The historical canoe route from the north shore of the St. Lawrence Gulf to Fort Chimo follows Swampy Bay river.

Topography and Drainage

A gently undulating lowland in the west and a highland with prominent scarps in the east are the broad topographic subdivisions of the area. Elevations in the lowland are between 650 and 1,250 feet above the sea, and local relief rarely exceeds 200 feet. The highest point of the highlands, just 1 mile east of the area, has an elevation of 2,400 feet above sealevel.

The area is in the drainage basin of Ungava bay.

Natural Resources

Most of the area is covered by lichen and subarctic woodland (trees scattered) and only the highest hills are barren. Caribou and bear are plentiful, and otter, beaver, marten and porcupine were observed. Geese, ducks, partridge and, in elevated land, ptarmigan are common. Lake trout and pike are common in the lakes and rivers.

Swampy Bay river drops 300 feet within the area and has considerable reserves of hydro-electric energy. The woodland is not suited for economic exploitation.

Field Work

Field work started on May 22 and was completed September 3, 1964. Traverses were spaced at 1/2-mile intervals. A hydrographic plan at a scale of 1/2 mile to 1 inch, prepared in 1957 by Photo Air Laurentides for the Department of Hydraulic Resources, served as the base map. Traverses were planned on RCAF aerial photographs with a scale of approximately 1/2 mile to 1 inch. Most geological boundaries are based on aerial photo interpretations.

GENERAL GEOLOGY

General Statement

The Otelnuke Lake area is in the western part of the Labrador Trough. Gneisses are exposed in its southwestern corner, and are the oldest rocks present. They are unconformably overlain

Table of Formations

Pleistocene and Recent		Sand, gravel, till and swamp deposits			
P R E C A M B R I A N	K A N I A P I S K A U S U P E R G R O U P	Foreland Zone	Central Area	Northeastern Area	
		Group A	Meta-gabbro (Possibly consanguineous to Group D meta-basalts)		
			Intrusive contact to Group B		
		Formation 5 Iron sandstone, jaspilite	Group C	Group D Meta-basalts, interbedded shale, quartzite and dolomite breccia	
		Formation 4 Gray quartzite, gray shale some black chert	Formation 11 Flysch-type slate-graywacke sequence		
		Formation 3 Light gray coarse dolomitic sandstone, red sandstone and siltstone	Formation 10 Gray and black slate		
		Formation 2 Green siltstone and sandstone gray argillite	Formation 9 Dolomite, limestone, gray dolomitic quartzite, interbedded shale		
		Formation 1 Red, coarse-grained calcareous sandstones	Formation 8 Gray shale and quartzite		
			Fault contact	Fault contact	
			Group B		
			Formation 7 Pink limestone, calcarenite and calc-sandstone		
		Unconformity	Formation 6 (red beds) Red sandstone, siltstone, arkose and conglomerate	Base unknown	
Migmatitic amphibole-biotite gneiss					

by sedimentary and volcanic rocks of the Kaniapiskau Supergroup. Gabbro sills cut Kaniapiskau sedimentary rocks in the eastern part of the area.

The Kaniapiskau rocks were deposited in a north-west-trending geosyncline. They are subdivided into four groups of formations, clearly distinguished by their sedimentary facies. Rocks of different groups appear nowhere in stratigraphic contact.

The southwestern part of the area is underlain by a group of epicontinental sandstones, siltstones and argillites, the Group A of this report. Iron sandstones are the youngest rocks of this group. These rocks were laid down in the western marginal zone of the Labrador geosyncline, not far from its western shore.

Two groups of rocks are present in the center of the area. The older, Group B, has red sandstones, arkoses and conglomerates at the base, and pink limestones and calcarenites on top. The red sandstones, arkoses and conglomerates were deposited in a terrestrial basin. The limestones at the top of the group are the oldest marine sedimentaries in this portion of the Labrador Trough.

The rocks of Group C (miogeosynclinal limestones, dolomites, shales and quartzites and a flysch-type slate-gray-wacke sequence on top) are younger than those of Group B. They probably correlate in part with the formations of Group A, but were deposited in deeper water and farther from the coast.

Volcanic rocks (Group D), mainly meta-basalt flows interbedded with subordinate slate, quartzite and local dolomite breccia, underlie the northeastern corner of the area. The gabbro sills that intrude the red sandstones of Group B in the east are probably consanguineous with the basalts.

The Kaniapiskau Supergroup was folded, faulted, and slightly metamorphosed during the Hudsonian Orogeny. The rocks are only slightly deformed in the southwestern corner of the area but the degree of deformation abruptly increases towards the northeast.

Terminology

Formations and groups are not named so as not to prejudice future correlations between this area and the Scheffer-ville area. The distinction of Groups A, B and C is not practical for broad correlations, but is convenient in the present area.

The following rock terms need explanation because of confused usage:- The term calcsandstone is used for rocks composed of quartz sand cemented by calcite, whereas, calcarenites contain calcareous sand. The term graywacke is restricted to gray shaly sandstones containing macroscopically visible rock fragments. Subgraywackes do not contain macroscopically visible rock fragments and are commonly finer grained than graywackes.

Pre-Kaniapiskau Rocks

Migmatitic Amphibole-biotite Gneiss

Migmatitic amphibole-biotite gneiss is exposed on the southwestern shore of Concession lake. It is medium to coarse grained and granodioritic to granitic. It contains layers, lenses and schlieren of medium-grained gray biotite gneiss; of medium-grained, dark green plagioclase amphibolite; and of amphibole gneiss. The rock is granoblastic in texture and well foliated.

Kaniapiskau Supergroup

GROUP A (epicontinental sediments of the southwestern foreland of the Labrador geosyncline)

Formation 1 (red calcareous sandstone); 200-300 feet thick

The unconformity below the Kaniapiskau rocks is not exposed, but can be traced by boulders of red sandstones. Similar red sandstones are exposed on the points and islands of Concession lake.

The sandstone is pale to deep purplish and weathers dark red. The sand grains of up to 2 mm. diameter are cemented in part by a quartzitic, in part by a calcareous matrix. It is commonly a quartz sandstone, but fragments of chert and slate were locally observed. The rock is thickly bedded and cross-laminated.

Formation 2 (Lace Lake Formation); 675 feet + -

This formation is the Lace Lake Formation of Perrault (1953). It consists mainly of green siltstone and gray argillite, with minor sandstone, calcsandstone and limestone.

The best section is east of Lace lake, where the sequence is as follows in descending order (the thicknesses are approximate):-

	(feet)
c) Argillite member	200
gray, laminated argillite with a few 2- to 3-inch beds of gray, brown weathering silty limestone and some 2- to 6-foot beds of green siltstone	
b) Upper siltstone-argillite member	285
5) green, and green and pink, laminated siltstone, grading into 4	50
4) same siltstone with 2-inch to 6-foot beds of gray, brown weathering crossbedded calcareous sandstone ...	60
3) gray, laminated argillite with a few 2- to 6-foot beds of green siltstone and fine-grained sandstone ..	150
2) red siltstone	10
1) red medium-grained sandstone, with minor disconformity at top	15
a) Lower siltstone-argillite member	190
4) green, fine-grained sandstone	6
3) gray argillite; some 2- to 4-inch beds of gray laminated limestone and 1-foot to 2-inch beds of green, laminated siltstone	30
2) laminated gray limestone	5
1) same as 4, but with more siltstone	150
(base not exposed)	

A 10-foot bed of gray, brown weathering, pisolitic limestone is present approximately 35 feet below the red sandstone (b1) north of Concession lake. This limestone probably corresponds to bed a2. Below this limestone follows approximately 150 feet of gray argillite with some beds of green siltstone and, at the base, a sequence of green, green and pink, and, finally red, laminated siltstone.

The thick siltstone beds (a4, b1, b2, b4, b5) are good marker horizons, whereas the argillites are rarely exposed. The alternation of green laminated siltstones, and gray, brown weathering calcareous sandstones is characteristic and allowed recognition of the formation at Swampy Bay river 2 miles south of Castignon (Chakonipau) lake.

Formation 3; 500 feet + -

Formation 3 is well exposed in the cliffs northeast of Lace lake, approximately 2 miles west of the boundary of the area. This formation consists of a repeated cycle of red and gray sandstones. The type section is as follows:-

	(feet)
b) Upper cycle	
2) Upper gray sandstone	150
light gray, brown weathering medium- to coarse-grained calcareous sandstone; white, partly calcareous quartzite; some black or yellow chert; little yellow, coarse-grained calcarenite and white stromatolitic limestone	
1) Upper red sandstone	100
interbedded red sandstone, siltstone and quartzite, and pink chert and red chert pebble layers	
a) Lower cycle	
2) Lower gray sandstone	150
as b2, but more white quartzite. Quartzite and sandstone somewhat finer grained than in b2	
1) Lower red sandstone	100
as b1, but less chert	

The gray sandstones are up to 15 feet thick and commonly crossbedded. The red sandstones are thinly bedded. The gray sandstones are the only well exposed rocks of this formation and serve as marker horizons.

Formation 4; 150 feet + -

A formation of dark gray quartzites and shale over-

lies the gray sandstones of Formation 3 and is well exposed north of Concession lake.

The shales of this formation are slightly quartzitic. The quartzites are fine grained, and massive or indistinctly bedded. Beds 3 to 6 feet thick of black, massive chert occur with the quartzite.

The lower part of the formation seems to be predominantly shale. The main portion of it is dark gray quartzite, with chert beds and lenses in the central part. A second shale bed, not more than 15 feet thick, was locally observed below Formation 5, but seems to be missing at other places.

Formation 5 (iron-formation); 750 feet + -

A thick bed of iron sandstones is the youngest formation of this group. Exposure in all but the highest portions of the iron-formation is excellent. The detailed stratigraphic section through the iron-formations northeast of Concession lake is as follows:-

	(feet)
4) Upper black iron sandstone	200
c) black calcareous iron sandstone	
b) black calcareous jaspilite	
a) as 4c	
3) Upper red iron sandstone	200
2) Lower black iron sandstone	200
e) black iron sandstone	
d) red iron sandstone bed (local)	
c) as 2e	
b) black jaspilite (local)	
a) as 2e	
1) Lower red iron sandstone	150

The facies changes within the iron-formations are considerable.

The rocks of this formation are not homogeneous and consist of layers and lenses of sandstone, quartzite, chert, and dolomite, and of metallic layers and veins. The sand grains in the red sandstones are red chert; those in the black quartzites, black

chert. Iron oölites and pisolitic beds were observed. The jaspilites consist dominantly of chert with thin sandstone beds and metallic layers and veins. Some carbonate is present in all members of the formation, especially in the upper black iron sandstone. The iron is present mainly as magnetite and hematite.

GROUP B

Formation 6 (red beds); 2,000-3,400 + -

Red sandstones, siltstones, arkoses and conglomerates, with some beds of pink calcarenites and limestones, underlie large parts of the area between Castignon and Otelnuke lakes, and northeast and southeast of Otelnuke lake. The best sections through this formation are east of Castignon lake and northwest of Otelnuke lake, where the following sequence is exposed:-

	(feet)
3) Upper sandstone member	
b) interbedded red arkosic pebble conglomerate, medium-grained sandstone, a little siltstone...	1300-1500
a) well bedded fine-grained red sandstone and siltstone	0-300
2) Boulder conglomerate	
coarse gneiss boulder conglomerate	500
1) Lower sandstone member	
b) interbedded red arkosic pebble conglomerate, medium-grained sandstone, arkose, a little red siltstone	0-400
a) well bedded fine-grained red sandstone and siltstone	700

The siltstones and fine-grained sandstones are dark red and well bedded. They contain little feldspar. The coarse- and medium-grained sandstones are pink or salmon colored and somewhat arkosic. The pebble conglomerates contain 30-50% of rounded gneiss and sandstone fragments in a matrix of arkosic sandstone. The pebbles have a diameter of less than 2 inches. Individual beds of pebble conglomerate alternate with crossbedded,

coarse- and medium-grained, commonly arkosic, sandstone. The gneiss conglomerate contains up to 50% of rounded gneiss and sandstone boulders and pebbles in a coarse-grained arkose matrix. The diameter of the boulders is up to 2 feet northwest of Otelnuke lake and up to 1 foot east of Castignon lake. A few beds of a pink limestone were observed in member 3b east of Castignon lake.

It was not possible to correlate the red beds east of Otelnuke lake with the sequence described above. They were therefore mapped as a separate unit.

A few outcrops of a medium-grained, salmon-colored sandstone are present northeast of Otelnuke lake. Red sandstone and arkose, pebble conglomerate with beds of pink or salmon-colored calcarenites, sandy limestones and stromatolitic limestones are poorly exposed east of Otelnuke lake. This heterogeneous sequence is lithologically similar to the upper sandstone member of the Castignon Lake section.

The red beds have been intruded by thick gabbro sills east of Otelnuke lake. The sedimentaries are metamorphosed in an approximately 50-foot-wide contact zone. The red sandstones were converted to white or light pink quartzites, the calcarenites and limestones to talcose schists. The sedimentaries are strongly epidotized in a 5- to 10-foot wide zone at the contact. Quartzite inclusions in the gabbros are similarly affected.

Boulders of Kaniapiskau rocks, except for red sandstones derived from this formation, are absent from the red beds. This suggests that this formation is at the base of the Kaniapiskau Supergroup. The red beds were deposited in a terrestrial basin and the stromatolitic limestone and calcarenites of its upper member mark the first marine ingressions into this area. It is therefore probable that the red beds are older than the marine-epicontinental red sandstones of the foreland zone.

Formation 7 (pink limestone); 1,300 feet +

Two horizons of pink limestone flank the red beds in the eastern part of the map-area. The northerly bed follows the northeastern shore of Argencourt (Little Otelnuke lake) bay. It consists of thickly bedded pink or salmon-colored stromatolitic limestone with a few beds 2 inches thick of red siltstone in the east, and grades into sandy limestones and calcarenites with irregular lenses of medium-grained salmon sandstone towards the northwest.

The southern bed is exposed a mile northeast of

Swampy Bay river near the southern boundary of the area. It consists of sheared and brecciated pink sandy limestone. The bed apparently continues below Oteluk lake and crops out again on the rocky islands south of Oteluk island, where pure, massive, pink limestone is exposed. The facies change between the red limestones and the red sandstone and conglomerate is gradual, and both formations are geologically associated. The structure northeast of Argencourt bay suggests that the red limestone concordantly overlies the red bed sequence.

GROUP C (miogeosynclinal rocks of the Labrador geosyncline)

Formation 8 (shale-quartzite sequence); 500 feet + -

Gray quartzite and slate underlie the area between the iron-formations in the west and the stromatolithic limestone in the east. Exposure within this formation is poor and is as a rule restricted to a section of approximately 500 feet below the stromatolithic limestone. This section is well exposed at Swampy Bay river:-

	(feet)
4) bedded gray slate, a little gray quartzite	100
3) thickly bedded gray quartzite, a little slate	100
2) bedded gray slate, a little gray quartzite	100
1) gray quartzite, some slate	

The glacial deposits in the depression between the stromatolithic limestone and the iron-formations consist largely of blocks of gray quartzites, and a considerable thickness of this rock apparently underlies the section exposed at Swampy Bay river.

The quartzites of this formation are dark greenish gray, fine grained, and homogeneous. They are commonly well bedded (1" to 5") or massive with partings more than 6 feet apart. The shales are gray, commonly well bedded, and cleaved.

The contact between this formation and the iron-formations is not exposed. Stromatolithic limestones seem to overlie this formation conformably.

Formation 9 (limestone-dolomite sequence); 600-1,000 feet + -

A limestone-dolomite sequence underlies a north-northwest-trending zone 1 to 2 miles wide west of Oteluk and south of Castignon lakes. A continuous cross-section through this formation is nowhere exposed. The best sections are southeast of Castignon lake, north of Swampy Bay river at latitude $56^{\circ}06'$ and longitude $68^{\circ}21'$, and southwest of Oteluk lake at latitude $56^{\circ}02'$ and longitude $68^{\circ}16'$. A subdivision of this formation into a lower limestone member, an argillitic member, and an upper dolomitic member was everywhere recognized.

The lower member consists commonly of 300 to 600 feet of gray, stromatolithic limestone. Southeast of Castignon lake it has light gray massive or crossbedded quartzite and dolomitic quartzite at the base and contains several beds of dolomite and of gray argillite.

The argillitic member is poorly exposed. Southeast of Castignon lake it consists of 50 feet of black shales at the base overlain by approximately 200 feet of red laminated siltstone. Gray laminated argillites are exposed on the rapids of Swampy Bay river. Elsewhere only the topmost section of this member is exposed and consists of black shale (more than 20 feet), dolomitic quartzite (0-6 feet), black chert (3 feet), black chert with dolomitic lenses (3-6 feet) overlain by dolomitic quartzite and dolomite.

The upper member consists of gray dolomitic quartzite or gray, brown weathering dolomite. Dolomitic quartzite predominates north of Swampy Bay river; dolomite predominates farther south.

Formation 10 (slate); 1,000 feet +

Slates overlie the dolomites northeast of Swampy Bay river. The best section through this formation is exposed in the gorge below Hautes Chutes (High Falls) on Swampy Bay river. There the formation consists of lower graphitic slates and upper gray slates.

The slates are fine grained and well cleaved. Bedding has not been preserved. The graphitic slates contain abundant pyrite porphyroblasts in certain layers. These pyrite-rich layers weather to a white or brown powder. The gray slates contain a few 1-inch-thick beds of graphitic limestone.

The contacts of this formation are not exposed. There is no reason to assume the presence of faults below it or above it.

Formation 11 (flysch-type slate-graywacke sequence); 3,000 feet +

A flysch-type slate-graywacke sequence underlies the basin northwest of Otelruk lake. Outcrop in this basin is poor.

The slates of this formation are commonly gray and well bedded, rarely black. The subgraywackes are brownish gray, fine grained, and micaceous. They are crossbedded and show oscillation ripple-marks, slumping, load casts and synsedimentary folds. Graywacke dikes were observed in slates below subgraywacke beds. Gray, thickly bedded lithic graywackes containing slate fragments up to 1 inch long are common. Two cleavages and a bedding parallel fissility are present in the slates.

This formation has been subdivided into the following members:-

- 1) slate; consisting mainly of slate with subordinate subgraywacke and graywacke
- 2) slate-graywacke; consisting of regularly alternating beds of slate and graywacke in approximately equal quantity
- 3) graywacke; consisting predominantly of subgraywacke and graywacke with minor slate
- 4) laminated slate and graywacke

The contacts between these members are not exposed. Close folding prohibits the determination of their sequence or thickness.

GROUP D (meta-basalts and interbedded sedimentary rocks)

Meta-basalts

Meta-basalts, interbedded with slates, quartzites, and, locally, with dolomite breccia underlie the northeastern part of the map-area. They continue into the areas to the east, northeast and north.

All flows of meta-basalt have a fine-grained contact facies and the grain sizes gradually increase towards their centers. The contact facies is commonly only a few tens of feet thick. Some flows, however, are fine grained throughout. Poorly developed pillows are restricted to these fine-grained flows.

The meta-basalts are homogeneous rocks. Fine-grained varieties are dark greenish gray and weather dark green or olive green. Medium-grained and medium- to coarse-grained varieties are dark greenish gray, and consist of black amphibole and white weathering plagioclase. Ophitic textures are common in coarser varieties.

Meta-basalts with grain sizes below approximately 5 mm. have been mapped as medium grained; those with larger grain sizes are medium to coarse grained. Grain sizes are not so large as in the coarse-grained flows of the Romanet Lake area (Dimroth, 1964).

Coarse-grained schlieren and possible dikes 2 to 20 feet thick were observed at one locality. Aplitic veins, one-half inch thick, spaced at regular intervals of 1 to 2 feet and dipping approximately 20° northeast, were observed in the lowest basalt flow northeast of Otelnuke lake. Sharp-edged inclusions of a white quartzite which are macroscopically indistinguishable from contact metamorphic red sandstones were observed at two localities northeast of Otelnuke lake. They are restricted to layers approximately 100 feet thick.

The lowermost basalt flows are sheared at the northern boundary of the area.

Sedimentaries interbedded with basalts

Sedimentary rocks interbedded with basalts are poorly exposed in this area. They occur at the base of the basalt cliffs, and it is probable that a sedimentary bed is present below all the cliffs. Gray and graphitic slates are the most common sedimentary rocks. The slates are well bedded and may contain several cleavages besides a bedding fissility. They grade into black quartzites containing 1 mm. grains of blue quartz. A bed of buff weathering dolomite breccia was observed below one of the basalt flows. No traces of contact metamorphism were observed in these rocks.

Spotted Slate

A 30-foot bed of spotted slate lies between two basalt flows northeast of Argencourt bay. This greenish gray rock is well bedded, and has a perfect fissility parallel to the bedding. Dark green prismatic porphyroblasts are concentrated in some laminae 1 to 5 mm. thick. The prisms are now chlorite and sericite aggregates. In a few cases hour-glass structures of former andalusite are still preserved. Other pseudomorphs are probably derived from cordierite.

The contacts between this rock and the overlying and underlying basalts are concordant. The porphyroblasts were formed before the regional metamorphism of the rocks and are due to contact metamorphism by the basalts.

Intrusive Rocks

Meta-gabbros

Meta-gabbros underlie most of the area between Argencourt bay and Swampy Bay river, where they form thick sills in red beds. Two generations of meta-gabbros are present; the older one is medium grained; the younger, coarse grained.

Medium-grained meta-gabbros underlie most of the meta-gabbro area. It is dark green, and commonly homogeneous. Grain sizes are normally below 5 mm. The texture is ophitic. The meta-gabbros are cut by many closely spaced aplitic veins. They are intensely faulted, with striated fault planes commonly only a few inches apart. Fault planes and joints are epidotized. Coarse-grained schlieren of gabbro and quartz gabbro are locally present and grade into gabbro pegmatites in some places.

The gabbro is fine grained, yellowish green, and strongly epidotized through a 10-foot zone at the contacts with sedimentary rocks.

Contacts between meta-gabbro and sedimentaries are commonly concordant. Discordant contacts appear to be present at latitude $56^{\circ}06'$ and longitude $68^{\circ}11'$. The contact metamorphic zone in the sedimentaries is approximately 50 feet wide. The red sandstones have been converted to white quartzites and the limestones and calcarenites to talc schists directly at the contact. Epidote veins are common in a 5- to 10-foot-wide zone. Contact metamorphism was observed below and above gabbro sills. Inclusions of white metamorphic quartzites, probably derived from red sandstones, were observed at two localities.

The coarse-grained meta-gabbros fill dikes or sills within the medium-grained facies. Grain sizes of this rock are commonly about 1 inch. The contacts with the medium-grained facies are sharp, and contact effects are absent. Inclusions of medium-grained meta-gabbro in the coarse-grained facies were observed at one locality.

Pleistocene and Recent

Most of the area is thinly mantled by unsorted ground moraine, which commonly contains boulders of gneiss and of the underlying Kaniapiskau rocks. Some of the basins west of Otelnuke lake are characterized by "annual moraines", - irregular ridges spaced at intervals of approximately 1/8 mile and in which local boulders predominate. These moraines form arcs with the concave side to the south and flanked on both sides by higher ground. Glacial striae are north or N.10°E., and movement of the ice sheet to the north is indicated by the distribution of gneiss boulders.

Two east-west-trending, early post-glacial valleys west of Otelnuke lake are cut approximately 30 feet in the moraine landscape and contain numerous winding channels cut into the valley bottom. They are underlain by gravel and boulders up to 2 feet in diameter. Flood plains underlain by coarse boulders are present south of Argencourt bay and in the southeastern corner of the area.

Eskers were observed east of Otelnuke lake, southwest of Argencourt bay and along Swampy Bay river.

The delta of Swampy Bay river consists of fine sand and silt deposited on coarse gravel and till. Small peat bogs are found in numerous minor depressions.

CORRELATIONS

Correlations with the Romanet Lake area and with the southern Labrador Trough are still tentative. The following table gives the correlations most probable at the present time.

Table of Correlations

Southern Labrador Trough		Otelbuk Lake		Romanet Lake (Dimroth, 1964)	
		Southwest	Center and East		
Doublet Group			Group D	Basalt Group	
KNOB LAKE GROUP	Menihek		Formation 11	Slate and black quartzite	
			Formation 10	Slate and/or dolomite	
	Sokoman	Formation 5	Missing	Missing	
	Ruth	Formation 4			
	Wishart		b2	c White quartzite	
	Denault	Formation 3	bl	Formation 9	b Slate
			a2		a Brown dolomite
	Attikamagen		a1	Formation 8	Slate and gray quartzite
		Formation 2		Formation 7	Buff dolomite
	Seward	Formation 1		Formation 6	Arkose and conglomerate

STRUCTURAL GEOLOGY

All the rocks of the area, except for the Pre-Kaniapiskau gneisses, have been affected by the Hudsonian Orogeny. The intensity of rock deformation increases sharply from southwest to northeast. Folds and thrust faults are in several directions; longitudinal folds and faults trend southeast or south-southeast; and transverse folds and faults trend north-northeast, northeast, or east.

Three northwest-trending structural zones are clearly outlined. These are the foreland zone in the southwest, the frontal zone southwest of Otelnuke lake, and the axial zone, comprising the remaining two-thirds of the area. The axial zone is subdivided into four blocks separated by important faults.

The foreland zone comprises most of the terrain underlain by rocks of Group A. An important fault, probably a thrust, bounds it in the east and north. Bedding generally dips 50°-15° northeast. A weak cleavage is locally present in shaly rocks and dips approximately 30° northeast. Flat, open folds plunging approximately 10° to the east and to the north-northeast are superposed on these structures.

The frontal zone comprises the limestone-dolomite sequence southwest of Otelnuke lake and south of Castignon lake, as well as some underlying rocks. Its boundary to the axial zone appears to be stratigraphic. Northwest, north-northwest, and north-trending en echelon thrust faults and imbricate structures dominate in this zone. The dolomites are repeated by imbrication at the southern boundary of the area, whereas the limestone and iron-formation are repeated north of Mallard and Véronot (Otter) lakes. Bedding dips 25°-35° east or northeast, and cleavage dips somewhat steeper in the same direction. Minor folds are longitudinal and transverse; longitudinal folds and lineations plunge flatly north-northwest between Otelnuke and Castignon lakes.

Only a portion of the axial zone is within the area. It consists of four blocks: the Castignon block underlain by red beds between Castignon and Otelnuke lakes at the northern boundary of the area; the Otelnuke block comprising the area underlain by slates and graywackes of formations 10 and 11 south of Castignon lake, west of Otelnuke lake, and along Swampy Bay river; the southwestern block with gabbros and red beds between Argencourt bay and Swampy Bay river; and the Derbuel block northeast of Otelnuke lake and Argencourt bay.

The dominant structures of the Castignon block are concentric folds plunging northwest or southeast. The Castignon-

Otelnuk fault system bounds this block to the south. It consists of two branches south of Castignon lake: one separating red beds and dolomitic quartzite; the other separating the limestone-dolomite sequence from slates of formation 10. Both are steep thrust faults with movement to the south. The limestone-dolomite sequence in between forms a narrow syncline plunging northeast and overturned to the southeast.

The Otelnuk block is a synclinorium. Longitudinal chevron folds, slightly overturned to the west or southwest, with flat axes, are the dominant major structures. Small-scale folds and lineations are longitudinal or transverse. Two cleavages are everywhere present in the slates.

A zone of thrust faults and imbricate structures bounds the southeastern block northeast of Swampy Bay river. A large syncline in this block is broken by thrust faults trending east and northeast. Bedding commonly dips northeast.

The Derbuel block forms a wide southeast-trending syncline, which continues into the areas farther east, northeast and north. Flat open folds trending north and east-northeast are present in this block in the Romanet Lake area (Dimroth, 1964), but are not conspicuous in this area.

The cross faults in the northeast corner of the area are limb fractures related to a transverse anticline trending from the north shore of Otelnuk lake towards Derbuel lake (in the Romanet Lake area). The boundary of the Derbuel block northeast of Otelnuk lake is concealed by overburden for most of its length. Strong shearing of the lowermost basalt layers at the northern boundary of the area suggests large movements at this boundary.

The style of the structure of these zones and blocks is clearly a function of the facies of the rocks. Soft slates yielded to the orogenic forces by folding and cleaving; the thick red beds by concentric folding; the massive limestones and dolomites by thrust faulting. The thick and massive sheets of basalt and gabbro are little deformed, but have been thrust over their foreland for a considerable distance. The contrasting structural styles of the zones and blocks thus reflect the different mechanical properties of the rock units.

ECONOMIC GEOLOGY

Iron

The iron-formation was prospected by Norancon Exploration Co., Ltd. before 1954. No direct shipping ore was found. However, the iron-formations contain many beds of low-grade iron ore assaying 27-54% iron. These beds constitute a significant portion of the three lower members of the formation. The rocks of the upper member are of much lower grade. The whole formation is somewhat metamorphosed. Iron is mainly in magnetite and hematite. The following analyses serve as examples of their composition:-

Table of Assays

	1	2	3	4	5	6	7	8	9	10
Fe	32.6	27.9	29.14	32.88	54.56	27.31	39.23	53.12	50.07	44.68
Mn	2.79	3.16	3.48	2.24	0.51	4.63	0.50	1.04	0.08	0.39
Si	34.31	36.13	33.02	14.24	18.70	38.93	36.66	16.99	28.93	35.62
Al						0.24	0.07	0.19	0.14	0.15
P.	0.056	0.049	0.053	0.049	0.034	0.007	0.013	0.009	0.013	0.010
S.						0.07	0.01	0.03	0.006	0.007

These facts and the present field work allow the following conclusions:- A very large tonnage of iron ore, averaging approximately 30% iron, and possibly some higher-grade ore are present in the area. These ores are at the surface and can be mined by open-pit methods. They are fine grained and require beneficiation.

Lead

Dispersed sphalerite was reported in stromatolithic limestones just west of the area.

Copper

Copper mineralization was noted northeast of Otelnuke lake and east of Castignon lake.

Dispersed chalcocite, chalcopyrite, malachite and pyrite were observed in gray carbonaceous quartzites of lower Formation 9 east of Castignon lake at latitude 56°12' and longitude 68°26'.

The location is south of the fault separating red beds from the limestone-dolomite sequence. The showing is not in itself important but indicates the possibility of copper mineralization outside of the area underlain by basalt and gabbro.

Dispersed chalcopyrite and pyrite in basalts and sedimentary rocks are present at several localities northeast of Otelnuke lake, especially in the zone below the basalt flows. A cliff at the point separating Otelnuke lake and Argencourt bay at latitude 56°10' and longitude 68°11' exposes intensely fractured gray volcanics with flow-banding containing chalcopyrite, malachite, azurite and pyrite in fractures and disseminations in the rock. This zone below the basalt flows, with important showings north and east of the map-area, deserves more attention.

GEOCHEMISTRY

About 350 samples of river sediments were collected during field work, and were later analysed for copper, zinc, lead and molybdenum. The samples consisted mostly of organic material, and were taken at, or a few inches below, water-level. Only small rivers were sampled.

The normal trace element contents (background values) are as follows:

Normal trace element contents in p.p.m.

in areas underlain by:

	Dominantly sedimentary rocks		Dominantly gabbro and basalt	
	Range	Most common values (p.p.m.)	Range	Most common values (p.p.m.)
Cu	0 - 60	10 - 20	0 - 60	20 - 30
Zn	15 - 125	20 - 60	10 - 125	80 - 100
Pb	0 - 60	0 - 10	0 - 50	0 - 10
Mo	0 - 12	2	0 - 12	2

Anomalous trace element contents are up to 220 p.p.m. copper and up to 600 p.p.m. zinc. The anomalous zones seem to be elongated parallel to the strike of the formations and commonly coincide with zones of visible traces of mineralization.

The following anomalous zones were outlined (from west to east):

1) A zinc anomaly near the presumed contact between formations 5 and 8 in the southwestern corner of the area. This zone is deeply covered by till.

2) Two small copper and zinc anomalies in formation 9 west of Otelnuke lake.

3) A copper and zinc anomaly southeast of Castignon lake. Showings of chalcopyrite are present in this zone.

4) A copper and zinc anomaly east of Swampy Bay river at the southern boundary of the area. A copper showing is present 1 mile farther southwest.

5) Some small zinc anomalies in the gabbro area between Petit Otelnuke lake and Swampy Bay river.

6) Some zinc and copper anomalies in and below the lowermost basalt layers northeast of Otelnuke lake. Traces of copper mineralization were observed in this zone.

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