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BRANSSAT - DAINE AREA, ABITIBI-EAST COUNTY

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GEOLOGICAL REPORT 64

BRANSSAT-DAINE AREA

ABITIBI-EAST COUNTY

by

J.-E. GILBERT



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MAP AND ILLUSTRATIONS

Map

No. 1028.- Branssat-Daine area (in pocket)

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BRANSSAT-DAINE AREA

ABITIBI-EAST COUNTY

by J-E. Gilbert

INTRODUCTION

Location and Means of Access

The Branssat-Daine area, described in this report, is 65 miles due west of Chibougamau lake, and about 125 miles northeast of Senneterre, Abitibi county, a town on the Quebec-Cochrane line of the Canadian National railway. It is bounded by latitudes 49°45' and 50°00'N., and by longitudes 75°30' and 76°00'W., thus embracing an area of close to 400 square miles and including most of the townships of Branssat, Daine, Kreighoff, and La Ribourde, with narrow strips of Montalembert and Davost to the west, and of Saussure and Guettard to the east.

The area is readily accessible by air from hydroplane bases at Senneterre, Amos, or Rouyn. Inconnu lake, in the western half, lies about 120 miles from Senneterre, and La Trêve lake, which covers a part of the eastern half, is approximately 125 miles from the same town. The flight from Senneterre normally occupies from an hour to an hour and a half, and landings can be easily made on La Trêve, Inconnu, Renault, and La Ribourde lakes. Because of its shallowness and its generally rather strong current, that stretch of Chibougamau river included in the southeasternmost section of the map-area does not afford safe landing for loaded hydroplanes. The writer made one landing on La Trêve river immediately below the point where it is joined by Caupichigau river, in the north-central part of the area, but does not recommend this stretch of the river as a landing place except at times of very high water and with a very light load.

A road under construction from Senneterre to Bachelor lake, which lies 16 miles south-southwest of Renault lake, will be of considerable advantage to those working in the region.

The principal canoe route from Senneterre is northward down Bell river to Mattagami lake and thence up Waswanipi river and across Olga lake to Goéland lake. La Trêve lake, in the eastern half of the map-area, is accessible from Goéland lake by ascending Maicasagi and La Trêve rivers. Inconnu, La Ribourde, and Daine lakes, in the central section, may be reached by way of Maicasagi and Inconnue rivers. Branssat creek, which joins La Trêve river at the northern border of the area,

provides entrance to its northwest corner. The southern section of the area is accessible from Goéland lake by ascending Waswanipi river, Chibougamau river - which flows southwestward across the southern section of the eastern half of the map-area - and Renault creek, a small tributary of the Chibougamau, to Renault lake. Rapids, necessitating portages, are numerous along most of the large streams following the routes mentioned above, especially along the upper sections of Maicasagi, Waswanipi, and Inconnue rivers, the whole length of La Trêve river, and that part of Chibougamau river leading to the southeastern section of the map-area (Plate I). Travel along these routes is therefore slow and difficult and should be undertaken only under the most favourable conditions and by persons experienced with canoes.

An easily followed portage, a mile and a third long, connects Daine lake to Rita bay, an arm of La Trêve lake. La Trêve lake can also be reached from Chibougamau river by means of two well-cut portages, one extending westward from outside the map-area to Dussault bay, the other northward to the southern tip of Rita bay. In the southern section of the western half of the map-area, there is a poorly-blazed trail (not shown on the accompanying map) joining Gilles bay, on Inconnu lake, to the northern tip of Renault lake. This trail is not recommended for travelling, except with very light loads.

One east-west and two north-south survey lines have been cut in the area. The principal north-south line is known as the 'Third Meridian' line and is about 6,000 feet west of the 75°30' meridian, i.e., the eastern boundary of the map-area. This line is in poor shape and almost impossible to follow in the section south of La Trêve lake, but is relatively well preserved from Dussault bay northward. The east-west township-line separating Branssat and Daine townships follows the north shore of Inconnu and Daine lakes and crosses Rita bay. This line is in fairly good condition, except east of Rita bay, where it could not be followed by the writer for more than a few hundred feet. The other north-south line starts from post No. 60 of the east-west township line and continues southward to south of the present area, separating Montalembert and Kreighoff townships. This line was cut in 1947 and, consequently, is very easily followed.

All the portages in existence before commencement of the field work were cleaned out by the writer's parties, new ones were cut where thought necessary, and lines were blazed and cut to facilitate access to certain parts of the area. Most of these portages, trails, and lines are shown on the accompanying map.

Travelling through the bush is, in general, relatively easy.

Field Work and Acknowledgments

The field investigation of the Branssat-Daine area was carried out during the summer months of 1948 and 1949.

All rock exposures along the navigable streams and reachable lakes were visited, and land traverses by pace-and-compass were run systematically across the intervening ground at intervals of about half a mile. Vertical air photographs supplied to the writer's party by the Quebec Department of Mines proved a great help in localizing the more elevated sections of the area and thus permitting modification of land traverses, generally planned to cross the regional structures, so as to concentrate on those sections which afford the best chances of finding rock exposures. The air photographs were also found helpful in the identification and interpretation of some of the physiological and structural features of the area. The data collected in the field were compiled on base-maps supplied by the Topographic Survey, Ottawa, and modified by the writer during the field work.

M.M. Ritchie, R.K. Finer, W.G. Gillespie, and R.W. Phendler, all of McGill University, René Lavertu of Laval University, and Jean-Louis Lambert of l'Ecole Polytechnique, Montreal, proved most helpful field assistants. Joseph Lépine, cook, and Rosaire Bordeleau, Urbain Therrien, and Boromé Lampron, canoeemen, also performed their duties in a very satisfactory manner.

Previous Geological Work

The first geological observations in the area discussed in the present report are recorded in Robert Bell's report of 1896 (1898)^A and on his map of 1900 (1902). He shows most of the western half of the area as underlain by 'Laurentian gneisses' intruded by granite, whereas 'green schists' or 'coarsely crystalline greenstone (gabbro?)' are indicated as the dominant rocks of a five-mile wide stretch in the easternmost section. The maps of Norman (1936) and Retty and Norman (1938) are the only ones hitherto published presenting a reasonably broad aspect of the geology of the area. Two preliminary reports accompanied by maps at the scale of one mile to the inch and giving the main results of the present investigation were published by the Quebec Department of Mines in 1948 and 1949 (Gilbert 1948, 1949).

The broad features of the geology of the surrounding region are shown on maps presenting the results of reconnaissance surveys by Sproule (1940), and Shaw (1942). More detailed work has been done in some adjoining areas by Shaw (1940), Beach (1941), Longley (1951), and the present writer (Gilbert, 1951).

^ADates within brackets refer to Bibliography at end of report.

DESCRIPTION OF THE AREA

Topography

The topographical features of the area are similar to those characteristic of the Temiscamian sub-province, to which it belongs, and consist of relatively low, rolling hills, few in number, surrounded by flat lowlands containing abundant detrital accumulations of Pleistocene or post-Pleistocene age. The lowest elevation is of the order of 965 feet above sea-level, where Inconnue river crosses the eastern limit of the map-area. The level of La Trêve lake, in the eastern half of the area, is close to 1,035 feet above sea-level, and that of Inconnu and Renault lakes is at about 990 feet.

Broadly speaking, the area can be divided into three physiographic units, each with a distinctive relief pattern and each underlain by a distinctive suite of rocks. The sections underlain by sedimentary rocks have the lowest relief, with a maximum of 50 feet, except where small masses of intrusive rocks of acidic or basic composition outcrop as prominent knolls or elongated ridges. The lakes lying in these regions of low relief are shallow and their shores are generally low and flat (Plates III-A and III-B). A somewhat more considerable relief characterizes those sections of the area, in which the surficial rocks are volcanics or acidic intrusives. In these, the maximum relief is of the order of 300 feet. A prominent knoll rises to a height of about 350 feet above the surrounding, generally flat, ground at a point about a mile south and a mile and a quarter east of the northwestern corner of the map-area. Another prominent elevation in this district is a 'plateau', about six square miles in extent and underlain by highly-folded volcanic rocks, about a mile and a half west of the junction of Caupichigau and La Trêve rivers. The sections underlain by intrusive rocks of basic composition, i.e., diabases, gabbros, and anorthositic or dioritic gabbros, have the highest relief, about 500 feet. In these sections sharp knolls and ridges (Plate II) are relatively abundant, notably west of Renault lake, south of Inconnue river, on La Trêve lake, between Branssat and Inconnu lakes, and west of Branssat lake.

Drainage

Swamps and muskegs are relatively abundant in the low sections in the central part of the map-area from Inconnu lake eastward, and also north and northeast of Branssat lake. The structural features of the underlying bed-rock have controlled elongation of the largest lakes and, to a lesser extent, the direction of the principal streams. The smaller streams are largely insequent on the surface of the glacial or post-glacial deposits. Inconnue river, the present outlet of Inconnu lake, is believed to be of post-Pleistocene origin. In pre-glacial

times, the lake was probably drained through the westerly-flowing tributary that joins Inconnue river at a point slightly over two miles south of the present outlet of the lake. Inconnu, Daine, La Ribourde, Colette, Branssat, Huguette, and Veto lakes, and the main body of La Trêve lake, are shallow and their shores are generally flat and low (Plates III-A and III-B). Renault lake, on the other hand, has a considerable depth (over 200 feet) in relation to its size, and its shores are generally high and rocky. This lake is believed to lie in a zone of faulting.

Natural Resources

No mining or diamond drilling had been done in the map-area at the time of the writer's visits, although considerable development work had been carried out on mining properties in the Opémisca-Chibougamau district to the east and in the Bachelor-Opawica Lake region to the southwest. A few parties of prospectors worked from Inconnu and La Trêve lakes during the field season of 1948 and 1949. The section of the area west of Renault lake, especially, was being prospected systematically in 1949, following interesting gold discoveries south of Capisisit lake, which lies about three miles west of the western limit of the present map-area. The possibilities for the occurrence of economic mineral deposits within the limits of the area here under review are dealt with later in this report.

The best stand of black spruce in the area is in the eastern half of Kreighoff township. The growth there is fairly dense, but the majority of the trees have butt diameters not exceeding eight inches and would be best suitable for pulp. The southern half of Daine township and the section near the northeastern corner of La Ribourde are also fairly well wooded. In the remainder of the area, the ground is covered mainly by shrub and small trees, with occasional patches of black or white spruce and banksian pine. A few hillocks are covered with birch.

Pike and pickerel are abundant in Renault and La Trêve lakes, as well as in Chibougamau and La Trêve rivers. There appear to be few fish in Inconnu lake. Brook trout can be caught in most of the small streams and in Inconnue river.

Muskrat and mink are relatively abundant, together with some otter. Three moose were seen in the vicinity of La Trêve lake and numerous traces of bear were noticed. Small game such as rabbit and partridge are plentiful. Evidence of the presence of beaver was seen in one place.

The summer of 1948 was cool and rains were very frequent, especially from the second half of July to the middle of September. Rain fell about one day in four during the summer months of 1949 and the average monthly humidity was: June, 73.5 per cent; July, 71 per cent; August, 81 per cent; the first half of September, 88 per cent. The highest temperature recorded was 94°F. on the 30th of June, and the first frosts occurred during the nights of the 14th, 15th, and 16th of August, when the temperature dropped to 25°F.

Owing to the abundance of coarse detrital material and to the extent of muskegs, the major part of the area appears little suitable for farming. The eastern half of Kreighoff township and the region around La Ribourde and Daine lakes are the only sections where farming might stand a chance of success.

Sands and gravels are abundant in a broad zone extending from the east across most of La Ribourde township, between Chibougamau river and La Trêve lake. Sand is also abundant along the northwest shore of Rita bay, and on the small pear-shaped island in Inconnu lake, near the entrance to Gilles bay. Small sand and gravel ridges also occur between Branssat and Veto lakes.

GENERAL GEOLOGY

General Statement

Exposures of bed-rock are relatively abundant in those sections of the area occupied by rocks of the basic intrusive series (Plate II) and also where, in the northern half of Branssat and Daine townships, the surficial rocks are highly-folded volcanics. Good exposures also occur near the northwest and southeast corners of the map-area. Elsewhere, bed-rock crops out only at scattered points and the exposures are ordinarily low and small.

All the consolidated rocks of the area are of Precambrian age. Volcanic and sedimentary formations together occupy about 70 per cent of the area, and altered gabbroic and associated intermediate or ultrabasic intrusive rocks close to 10 per cent. The remainder of the area is underlain by granitic rocks of various types intruding the volcanic, sedimentary, and gabbroic series. Diabase dykes of probable Keweenawan age cut across all the other rocks, more abundantly in the eastern half of the map-area.

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Table of Formations

CENOZOIC	Unconsolidated Deposits	Sand, gravel, till, clay, peat
<u>Great Unconformity</u>		
PRECAMBRIAN	Unaltered Basic Intrusives (Keweenaw?)	Olivine diabase, diabasic gabbro, quartz diabase
	<u>Intrusive Contact</u>	
	Acidic Intrusives	Pegmatite, aplite, syenite, porphyry, diorite porphyry, granodiorite, and granite dykes; small granitic bosses Coarse-grained syenite Southern Granite: albite granite, oligoclase granite, syenite, quartz diorite, diorite Capisisit Lake Granite: biotite-chlorite granite Northern Gneiss: gneissic oligoclase granite, gneissic quartz diorite, diorite, fine-grained albite or oligoclase granite
	<u>Intrusive Contact</u>	
	Altered Basic Intrusives	Gabbro, dioritic gabbro, pyroxenite, a little serpentine and anorthosite
	<u>Intrusive Contact</u>	
	Sedimentary Series	Conglomerate Feldspathic greywacke, slate, argillite, a little arkose and ferruginous chert Some interbeds of volcanics
	Volcanic Series	Massive, ellipsoidal, amygdaloidal, and fragmental basaltic to andesitic flows, a little dacite Interbeds of tuffs and basic to intermediate sedimentary rocks

Volcanic Series

Distribution

Keewatin-type volcanic rocks underlie about one-third of the map-area and can be described as forming two east-west trending belts separated by a wide belt of sedimentary formations that extends across the central part of the area. Both volcanic belts are deeply indented by masses of intrusive rocks of various ages and compositions. These have especially affected the southern belt of volcanics, which has been separated into four distinct sectors, once very probably connected.

The northern belt of volcanic rocks, much larger and better exposed than its counterpart to the south, is slightly less than half a mile wide at the western boundary of the map-area, which it crosses at a point some four miles south of the northwest corner. About four miles to the east it broadens abruptly and, midway across the map-area, it is six miles wide. It decreases slightly in width farther toward the east and, north of Gisèle lake, in Daine township, its outcrop width is only slightly over three and a half miles. The belt continues northeastward across the 50th parallel (Shaw, 1942) into the Mechamego Lake area (Beach, 1941), immediately east of the present area.

Along the whole of its length across the area, the northern belt of volcanics is bounded on the south by the broad belt of sedimentary formations mentioned above, except south and northwest of Branssat lake, where concordant masses of basic intrusive rocks and a small dioritic body outcrop at the contact between the two series. The volcanics are invaded by large masses of a gneissic acidic intrusive rock in the northwestern part of the map-area and in the northern part of Daine township, and by a smaller, crescent-shaped body of similar rock in the northeastern portion of Branssat township.

A few exposures of much altered and, in places, considerably injected, amphibolite schist occur between this crescent-shaped body and the larger mass of gneissic acidic intrusive of the northwestern corner of the map-area, but the contacts between the two types of rock are difficult to draw with a reasonable degree of accuracy. Physiographical features well visible on air photographs were used in conjunction with the distribution of exposures of the two types of rock in order to obtain better results, and it is believed that the boundaries of the gneissic intrusive masses are generally concordant with the direction of the flows and with the strike of the schistosity of the intruded volcanics, as shown on the accompanying map.

The volcanic flows and associated tuffs and sedimentary rocks of the southern half of the map-area outcrop in four different

zones that probably are parts of a once continuous belt across the whole of the southern half of the area and which has been split and interrupted by later intrusions of basic or acidic igneous rocks.

Difficulty was encountered in drawing the boundaries between the basic intrusive rocks and the adjacent basaltic to andesitic flows, especially in the western half of Kreighoff township. However, the fact that the intrusive rocks are more massive and form the hills and ridges, whereas the volcanics are more schistose and underlie the lowlands, aided in differentiating these rocks. As a consequence of these features, exposures of volcanics are very few in the relatively rugged section of the map-area west and northwest of Renault lake, whereas those of gabbro and associated intrusive rocks are very abundant. It is believed, however, that most of the valleys are underlain by lavas and tuffs now covered by a generally thick layer of unconsolidated deposits, and, while the boundaries between the two types of rock are approximately as indicated on the accompanying map, the area occupied by the volcanics may be larger than shown.

The largest of the southern zones of volcanics enters the map-area slightly south and west of Renault lake where it has a width of about three and a half miles, including the gabbroic masses that lie within it and which total about one mile in width. West of the northern extremity of Renault lake, this zone of volcanics turns eastward and continues in this general direction, with a width of about half a mile, to slightly east of the centre of the southern half of La Ribourde township, where it is cut by a large body of granite that extends from the south into the present area. However, a small wedge-shaped zone of similar volcanic rocks, lying between granite (to the south) and sedimentary formations (to the north), crops out about a mile and a half west of the eastern boundary of the map-area.

The narrow band of volcanics which is indicated on the map as extending southeastward from the Capisisit Lake area to the northwestern section of Kreighoff township is about three-fifths of a mile wide at the western boundary of the area. Good exposures of fine-grained, slightly schistose volcanics occur in that section of the band included between the western limit of the map-area and Inconnue river. Farther to the southeast, exposures are few, low, highly schistose, and altered, and the rock is extremely difficult to distinguish from the sedimentary formations to the north and northeast.

A few exposures of fine-grained and, in places, pillowed lavas are present near the western boundary of the map-area, just south of Inconnue river, between gabbroic rocks to the east and southeast and the Capisisit Lake granite to the south and west. It is possible that this zone follows closely the eastern margin of the Capisisit Lake

granite mass and joins the small wedge-shaped zone of volcanics which enters the present map-area from the west at a point about one mile north of its southwest corner; but as outcrops of granite and gabbro occur less than half a mile apart in the intervening ground, with, so far as could be ascertained, no exposures of volcanics between them, the two zones are mapped separately.

Structure and Lithology

The volcanic rocks of the area occur mainly as a series of flows, of various thicknesses, which include ellipsoidal, massive, ropy, fragmental, amygdaloidal, and vesicular types, with some thin interbedded tuffaceous and basic or feldspathic sedimentary beds.

The ellipsoidal types are the most abundant, especially in the volcanics of the northern belt. The best exposures are found in the area included between Huguette lake and the eastern boundary of the map-area, where they form, in places, conspicuous ridges. Pillow structures can be seen in the rock on a hill about one mile northeast of the north end of Renault lake and on the large 'plateau' of volcanic rocks near the northeast corner of Branssat township. The pillows, which generally have the shape of flattened cushions, are surrounded by a black 'ribbon', 5 to 15 millimeters thick, of a very fine-grained to glassy material, which changes gradually in character to the coarser-grained, lighter-coloured, crystalline lava of the interior of the pillow. These black border facies of the pillows generally weather rusty, with formation of depressions a few millimeters deep. Pillows up to three feet long were seen, but most of them do not exceed eighteen inches. Massive or structureless types of lavas, i.e., flows in which no primary structures are recognizable, are abundantly associated with the pillowed lavas.

Lavas with well-preserved ropy structure are to be seen in many places on the volcanic 'plateau' mentioned above. Fragmental lavas are rather scarce and usually consist of thin flows in which angular, light-coloured fragments are set in a fine-grained, dark-coloured matrix. The fragments are generally much more acidic in composition than the enclosing matrix, and, in the thickest flows, they tend to be sub-angular to rounded, as if they have been re-worked by the molten material in which they were caught. Vesicular and amygdaloidal types of lavas were seen at a few places. The vesicles and amygdules seldom exceed one-eighth of an inch in diameter. Most of them are filled with quartz and carbonate.

The characteristic volcanic rock of the area is a dark green, slightly to highly schistose type in which the main constituent minerals are amphibole and plagioclase feldspar. The relative proportions of these two minerals vary somewhat, but the great bulk of the

lava appears originally to have been basalt, with andesitic flows occurring in lesser abundance. Dacite outcrops in small amount at a few localities, as at the entrance to Gilbert bay on La Trève lake, and at a point about one mile southwest of the southern tip of Gilles bay, Inconnu lake. Rhyolite was seen at only a very few places and only in very thin flows.

In thin sections, the basaltic to andesitic facies of the volcanics appears as a felty or granular aggregate of amphibole, 40 to 80 per cent; altered or recrystallized plagioclase, 20 to 60 per cent; with iron oxides, leucoxene, titanite, chlorite, epidote, zoisite, paragonite, and incidental secondary quartz and carbonate. Even in the least altered and metamorphosed rock, the feldspar is generally much saussuritized. This, and the great abundance of very fine inclusions, make a determination of the calcicity of the primary plagioclase of the rock impossible. The amphibole associated with the saussuritized plagioclase is a green, acicular actinolite, probably secondary after minerals of the pyroxene group. With increasing intensity of metamorphism, the small granules of secondary albite that are present in the rock become more abundant, and the actinolite changes to a granular, dark bluish-green, clear hornblende, which persists into the highest grade of metamorphism. The maximum grade of regional metamorphism reached in the basalts and andesites is the 'andesine-hornblende' grade; generally, however, the grade is within the limits of the 'oligoclase-hornblende' zone.

In a thin section of the dacite studied microscopically, the rock appears as a fine-grained, slightly schistose, light-green rock composed mainly of epidote and zoisite, secondary after the original plagioclase grains; pale-green tremolite; 5 to 8 per cent primary quartz; iron oxides; and kaolin. From the abundance of zoisite and epidote, it is presumed that the original feldspars of the rock were of a fairly calcic type, possibly andesine. The section contains patches of carbonates and secondary quartz, and a few small cubes of pyrite.

Fine-grained, banded tuffs are, in places, interbedded with the lava flows. These tuffs are generally highly feldspathic and greenish-grey in colour, with narrow, dark-green bands composed of more basic constituents. They have yielded more easily to dynamic metamorphism than the adjacent lava flows, and they are generally somewhat more schistose and sheared than the flows. Beds of buff to dark-coloured, fine-grained, sedimentary rock of intermediate to basic composition are also found associated with the lavas, especially along the north and south boundaries of the main belt of sedimentary rocks in the western half of the map-area. On small exposures, the basic beds are difficult to distinguish from the schistose lavas with which

they are associated, and their identification as of sedimentary origin was usually based on their remarkable uniformity in width, and for any one bed, in composition. The more basic beds generally contain about 45 per cent granular hornblende, with altered feldspar and varying amounts of quartz as the other dominant constituents.

Sedimentary Series

Distribution

Sedimentary rocks of various types underlie about 40 per cent of the area. They are restricted almost entirely to a broad, southeasterly-to-easterly trending belt extending completely across the map-area and continuing westward in the Capisisit Lake (Gilbert, 1951) and Maicasagi (Imbault, 1949) areas and eastward in the Mechamego Lake (Beach, 1941), Michwacho Lake (Beach, 1941), and Opémisca (Norman, 1941) areas.

At the western boundary of the map-area, rocks of this main belt of sedimentaries crop out over a width, across the regional strike, of about four and a half miles. The width of the belt decreases eastward to about two and a half miles at the outlet of Inconnu lake, but east of that point it increases continuously until, at the eastern boundary of the area, the belt is approximately nine and a half miles wide. At a point about two and a half miles south of Gilles bay, a lobe, about one mile wide, projects from the southern side of the belt and extends toward the west.

The sedimentary belt is generally bounded on both the north and the south by volcanic rocks. In a few localities, however, it is in contact with masses of rocks belonging to the basic intrusive series, as is the case, for example, between two and two and a half miles north of Colette lake, one mile north of the outlet of Inconnu lake, and in the westward projection of the belt north of Renault lake. In places, also, this sedimentary belt comes in contact with bodies of acidic intrusive rocks, as in the southeastern section of La Ribourde township, where the outer edge of a large mass of granite interrupts the southern zone of volcanics and projects into the sedimentary belt; and in Bransat township, two and a half miles north of the outlet of Colette lake, where a small, lenticular body of diorite, probably related to the large, foliated intrusive mass of this rock to the north, is present at the contact between the volcanics and sedimentaries.

Four exposures of rock, with composition and structure similar to some of the sedimentaries of the main belt, occur in a narrow southeasterly trending zone, about two and a half miles long,

between three and four miles north of the eastern extremity of Inconnu lake. These exposures suggest the presence of a small subsidiary lenticular zone of sedimentary rocks lying completely within the northern belt of volcanics.

The sedimentary rocks of the area include coarse- to very-fine-grained feldspathic greywacke, conglomerate, slate, argillite, and minor arkose and ferruginous chert. Some of the very-fine-grained feldspathic beds may be tuffaceous, but they all appear to be water-lain.

Feldspathic Greywacke

The dominant type of sedimentary rock in the area is coarse- to very-fine-grained, feldspar-rich greywacke, creamy-white to grey in colour, and well bedded, except in the coarser-grained facies, which is usually more massive. The beds vary in thickness from a small fraction of an inch to tens of feet. The thickness appears to be related to the size of the grains, the coarse-grained beds being the thickest and those of very fine grain thinly laminated (Plate IV-A).

Outcrops of the coarse- to medium-grained types are most numerous along the north and south edges of the main belt of clastic rocks. The coarser-grained types are found on the small islands at the entrance to Dussault bay, La Trêve lake; south of Inconnu lake, where they form very thick beds; south and north of the outlet of Inconnu lake; on the north shore of Colette lake, at the western boundary of the map-area; and north of La Ribourde lake. Fine- to very-fine-grained facies of sedimentaries are not altogether absent in the zones of these coarser-grained types, but they are definitely subordinate to them.

The coarse- to medium-grained feldspathic greywacke generally weathers chalky-white or reddish to brownish on account of its high content of feldspar and varying amount of iron oxide. One band of the iron-rich rock can be followed from the small islands at the entrance to Dussault bay southwestward to Inconnu lake. Another band of similar rock appears to extend southeastward and northwestward from some very good exposures two miles almost due south of the southern extremity of Gilles bay.

Usually, this coarse- to medium-grained type appears under the microscope as a slightly schistose and recrystallized rock in which the large primary plagioclase grains are easily recognizable. They are much saussuritized or partly to completely recrystallized, but their primary outlines are, in many cases, well preserved. They are, as a rule, subangular to rounded and vary in size from a fraction

of a millimeter to over five millimeters, the majority having a diameter of about two millimeters. These grains are set in a fine- to very-fine-grained matrix, essentially feldspathic but containing a little biotite, chlorite, epidote, clinozoisite, white mica, iron oxides, and very minor quartz. A few large to very large rounded quartz grains may be present in the rock, but silica is seldom in excess of five per cent. Some of the quartz is undoubtedly secondary. The large plagioclase grains are usually too highly saussuritized to permit a definite determination of their composition, but where, in a few cases, this was possible, they were found to be, most probably, oligoclase-andesite. The recrystallized grains are generally oligoclase ($An_{11}-An_{22}$).

The fine- to very-fine-grained types of feldspathic grey-wacke, somewhat less abundant than the coarser-grained facies, outcrop mainly close to the central part of La Trêve lake and southwestward; on the shore and south of La Ribourde lake; and on the east shore of Gilles bay and northwestward along a narrow zone between the two belts of the coarser-grained facies. They are generally thinly bedded, finely laminated in places, and their composition is more variable than that of the coarser-grained types. They are whitish to very-dark-grey in colour, and the alternation of dark- and light-coloured beds is very conspicuous on weathered surfaces. Their grains vary in size from 0.2 millimeter to particles of silt grade. Recrystallized plagioclase (An_6-An_{36}) is by far the dominant constituent and in some of the specimens studied in thin section, it makes up as much as 95 per cent of the rock. In most of the sections examined, quartz is entirely lacking and, where present, it never exceeds 15 per cent of the rock. Biotite is the main ferromagnesian mineral, but actinolite or hornblende may also be fairly abundant. Occasional small metacrysts of almandite were noted in some of the sections, which contain, also, as secondary and accessory minerals, abundant epidote and clinozoisite, and white mica, leucoxene, kaolin, apatite, iron oxides, and titanite.

Conglomerate

A conglomeratic band about 2,500 feet thick is well exposed in the general vicinity of La Trêve lake. This band, referred to below as the northern conglomeratic belt, extends southwestward to westward as far as Inconnu lake. Two exposures of somewhat similar conglomerate near the southern edge of the main belt of sedimentary rocks may indicate the presence of a southern conglomeratic belt.

In the northern belt of conglomerate, the best exposures are on the south shore of the entrance to Dussault bay, on each side of the diabase dyke outcropping along the eastern shore of the bay on La Trêve lake extending between Geneviève bay and Gisèle lake (Plates IV-B and V-A); and on the south side of the entrance to Geneviève bay.

These last exposures are on the faces of cliffs that rise from the lake to a height of at least 30 feet. There are exposures also on the north edge of the diabase dyke about two-thirds of a mile north of the outlet of La Ribourde lake, and on the north shore of the eastern extension of Inconnu lake.

Of the two exposures of conglomerate near the southern edge of the main belt of sedimentary rocks, one is along and slightly north of the north shore of Chibougamau river, about half a mile upstream from the end of the portage from the extreme southern tip of Rita bay, the other is more than three miles southeast of the southern tip of Gilles Bay.

Many large boulders of conglomeratic material are seen on the shores of the main section of La Trêve lake, on Daine and La Ribourde lakes, and on the small island close to the west shore of the bay on Inconnu lake at the sixty-sixth mile post of the east-west survey line between Branssat and Kreighoff townships. All these boulders are undoubtedly fragments of the conglomerate bed exposed immediately to the north.

The northern and better-exposed conglomeratic belt consists of a poorly-bedded rock composed of well-rounded boulders, cobbles, and pebbles set in a coarse- to medium-grained, highly-feldspathic matrix strikingly similar to the majority of the coarse- to medium-grained facies of the sedimentaries already described. The rounded stones vary in size from a fraction of an inch to over two feet and they are generally poorly sorted. On the large cliff that forms the south shore of the entrance to Dussault bay, the pebbles average 20 per cent of the rock. They range in diameter from a fraction of an inch to one foot, and about 80 per cent of them are acidic intrusive rocks, 15 per cent medium-grained metagabbro or metavolcanics, and 5 per cent acidic lavas or tuffaceous sedimentaries. On some of the exposures along the shore of La Trêve lake, farther to the southwest, and in some loose boulders on the shores of La Trêve and Daine lakes, the pebbles comprise more than 80 per cent of the rock, whereas, elsewhere, they may be widely scattered through the matrix. Almost without exception, however, rocks of the acidic intrusive suite make up 80 per cent or more of the pebbles with the remainder consisting of amphibolite, fine-grained trachyte, feldspathic greywacke (in places somewhat similar to the rock of the matrix itself), very-fine-grained feldspathic sedimentaries, tuffs, and rhyolite.

In the two exposures of conglomerate in the southern part of the belt of sedimentaries, the pebbles seem to be smaller and less abundant than in the northern conglomerate beds. They also tend to be subangular instead of well rounded, with granitic pebbles less abundant.

Two thin sections of the matrix of the conglomerate were studied under the microscope and the rock was found to be strikingly similar in texture and composition to the coarse- to medium-grained facies of the feldspathic greywacke. Oligoclase is by far the dominant mineral. In one section, the quartz content is below 5 per cent whereas in the other it is about 10 per cent. In a few exposures on La Trêve lake, the coarse-grained greywacke was observed to grade into a conglomeratic rock in which rounded pebbles become more and more abundant away from the normal greywacke.

The stratigraphical and structural significance of these occurrences of conglomeratic rocks will be discussed later in this report, in the chapter on the structural geology of the area.

Argillite, Slates, Ferruginous Chert, and Arkose

Thin interbeds of argillite, slate, and ferruginous chert are fairly common within the belt of sedimentaries, about midway between the north and south boundaries, and on the shores of La Trêve lake. Slates deserve special mention since it is possible to follow a narrow zone of these rocks across the entire area, and even farther west. Exposures of slate may be seen on the northern flank of the diabasic ridge on the eastern boundary of the map-area, 2,000 feet south of the south shore of the entrance to Dussault bay; on the easternmost of the three islands in the central part of La Trêve lake; on the south shore of La Ribourde lake; on the east shore of Gilles bay; north of Colette lake; and westward into the Capisisit Lake area (Gilbert, 1951).

A few interbeds of arkose lie within the sedimentaries, generally near the outer boundaries of the belt, as along the portage on the north shore of Chibougamau river, about one mile southwest of the mouth of Alouettes river; and close to the contact with the northern belt of volcanics, about two and a half miles north of Colette lake. The arkose contains up to 60 per cent quartz, 10 to 20 per cent feldspar, 20 to 30 per cent biotite or amphibole, with chlorite, epidote, sericite, iron ores, and, occasionally, garnet.

Basic Intrusive Rocks

Distribution

Intrusive rocks of generally basic composition underlie about 10 per cent of the area and are especially well represented in the southwestern section. There, a series of ridges and relatively elevated areas show abundant exposures of rocks (Plate II) belonging

to an altered gabbroic suite which extends southwestward into the Capisist Lake (Gilbert, 1951), Opawica Lake (Shaw, 1940), and Bachelor Lake (Longley, 1951) map-areas. Other relatively large outcrops belonging to this suite are: a five-mile-long and 2,000-foot-wide zone of coarse-grained, generally dioritic rock outcropping on, east, and west of the extreme southern tip of La Trêve lake; a series of northwesterly-trending, lenticular bodies, south and west of Branssat lake; and a long and narrow northeasterly-trending zone along the southeast shore of Rita bay and extending southwestward to Daine lake. Numerous other smaller lenticular bodies of generally basic intrusive rocks were observed throughout those sections of the area which are underlain mainly by rocks of the volcanic or sedimentary series. Some of these small masses are shown on the accompanying map but many that were seen are too restricted in extent to be separated, in the process of regional mapping, from the volcanics and sedimentaries they intrude.

Since the rocks of the gabbroic suite are more resistant to erosion than those of the surrounding volcanic and sedimentary series, they are generally well exposed on ridges and hills (Plate II). The intervening lowlands are usually covered with a thick mantle of glacial or post-glacial deposits and thus are devoid of rock exposures. Such is the case in the southwestern section of the map-area, where volcanic rocks possibly underlie a larger section of the area than is indicated on the accompanying map.

The smaller masses of gabbro and associated facies are all concordant with the volcanic flows or the sedimentary beds and were undoubtedly introduced as sheets or lenses. The physiographical expressions of some of the larger masses also suggest that they were introduced as concordant bodies. The large gabbro masses of the southwestern section of the map-area may seem to constitute an exception to this rule, but the writer believes that their apparent local discordance with the intruded volcanic rocks is due to the lack of critical exposures which would allow a better and more exact delineation of the intrusive masses. It may be, however, that local complexity of the folding, and disturbances created by the emplacement of granitic intrusive bodies to the east and west, caused this apparent discordance. Faulting, also, may have played an important role in this respect.

Lithology

A notable feature of the 'old' basic intrusive rocks of the area is their differentiation. Although they are described here as basic intrusive or gabbroic rocks, they really constitute an intrusive complex ranging in composition from pyroxenite, in which feldspar is totally absent, to anorthosite, in which there is not more than two per cent of dark-coloured minerals. In all occurrences, however, the

great bulk of the rock is close to gabbro in composition, and ultrabasic or anorthositic facies are generally found only near the boundaries of the larger masses. A distinct layering of alternating plagioclase- and mafic-rich bands features some of the largest masses. This type of banding is especially conspicuous in the rock exposed about two miles northwest of the northern extremity of Renault lake.

The typical 'old' basic intrusive rock of the area is a generally massive rock, medium- to coarse-grained, which, in the field, has a mottled appearance, caused by the differential weathering of the light-coloured plagioclase and the dark-green ferromagnesian constituents. A diabasic texture is in places recognizable without the aid of a lens. A porphyritic facies occurs at intervals in the long and narrow zone outcropping along the shore of Rita bay. This porphyritic facies was tentatively mapped by the writer (Gilbert, 1949) as belonging to the volcanic facies of the Opémisca series of Beach (1941) and Norman (1941), but further study of the textural, structural, and mineralogical features has provided good evidence that the rock forms concordant dykes and lenses of intrusive rock belonging to the same series as the other 'gabbro' of this area.

Microscopic studies show that the gabbro is composed essentially of a uraltized pyroxene, generally diopside, and saussuritized labradorite (An_{60}), in very variable proportions. The ultrabasic facies may contain partly or completely serpentinized olivine and, in some exposures, such as the one about half a mile southwest of the western branch of the extreme southern extension of Rita bay, and at other places west of Renault lake, the rock is a medium- to coarse-grained serpentinite which originally contained about 90 per cent olivine. Altered pyroxenite is relatively abundant in the porphyritic facies of the narrow zone along the main section of Rita bay and may also be seen at a few places in the large masses west of Renault lake. In the dioritic and anorthositic facies, the amount of ferromagnesian minerals - altered pyroxene, uraltite, biotite, and chlorite - may be very low, and the plagioclase is in general saussuritized and partly replaced by a more sodic member of the albite-anorthite solid solution series. Accessory constituents of all facies of these basic intrusive rocks are iron oxides, leucoxene, titanite, and apatite.

In general, the large bodies of rocks of the series are quite massive and almost devoid of joints, away from their contacts with the rocks they have intruded, whereas they are schistose at their peripheries. The small masses display a well-developed schistosity concordant with that of the adjacent lava flows or sedimentary beds.

The gabbroic magma is believed to have been injected in numerous thin to relatively thick sills or sheets between the flat-

lying or nearly horizontal volcanic flows and sedimentary beds. A certain amount of magmatic differentiation took place in situ in the larger masses before the final consolidation of the magma. In the larger bodies found in the area, the ultrabasic and anorthositic facies are generally found on opposite sides of the masses.

Acidic Intrusive Rocks

Intrusive rocks of acidic or intermediate composition underlie about 20 per cent of the map-area and belong to five principal types. Three of these are marginal facies of more extensive masses lying outside of the present area, another is represented by a small boss of peculiar coarse-grained syenite, and the fifth includes a series of granitic bosses and porphyritic syenite, diorite, granite, pegmatite, and aplité dykes.

Northern Gneiss

About 25 square miles of the northern half of the map-area is underlain by a fine- to medium-grained border facies of a very extensive granitic mass lying north of the present area (Shaw, 1942). This border facies occupies a twelve-square-mile segment in the north-western corner of the area; another ten-mile-long zone between Mildred lake and the point in Branssat township east of where La Trêve river crosses the northern boundary of the map-area; and, between these, a crescent-shaped area about 4 miles long with a maximum width of one and a half miles. This lenticular body appears to be connected, farther north, to the main mass of the intrusive (Shaw, 1942) and is interpreted as a long and narrow concordant offshoot of that mass.

Within the limits of the map-area, this intrusive is a medium- to fine-grained rock whose structural, compositional, and, to a lesser degree, textural features are somewhat variable. It commonly shows a well-developed foliation caused by a pronounced aggregation of dark-coloured minerals into lenticles, streaks, and discontinuous bands separated one from the other by zones rich in light-coloured minerals. These lenticles and streaks may in places merge gradually into well-defined continuous zones, producing a banded gneiss in which the individual ribbons vary in width from a few millimeters to a few inches. In the smaller masses of the intrusive, the foliated character of the rock is much less apparent, and, four and three-quarter miles south and one and a half miles east of the northwest corner of the map-area, the rock is a massive, medium-grained diorite.

The relative proportions of the dark- and light-coloured constituents of the gneissic intrusive do not as a rule vary much from

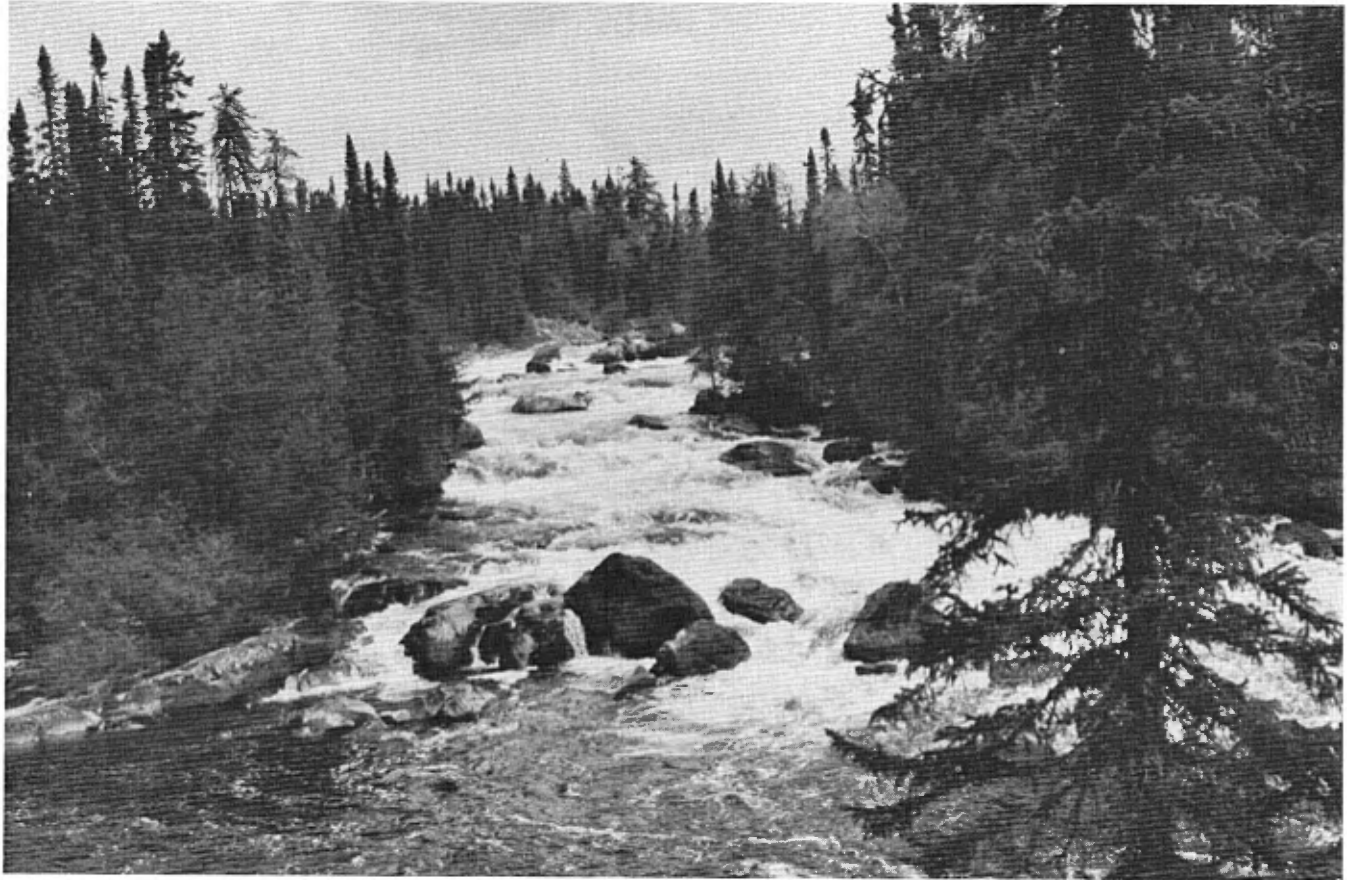
one exposure to another. The great bulk of the rock is made up of an aggregate of plagioclase feldspar, about 60 per cent; dark-coloured, strongly-pleochroic biotite, 15 per cent; quartz, close to 20 per cent; microcline, between 2 and 5 per cent; with apatite, muscovite, iron oxides, leucoxene, titanite, epidote, sericite, and chlorite as accessory and secondary minerals. The plagioclase ranges in composition from An_{32} and An_{11} . Study of thin sections indicates that, in the rock in the northwestern corner of the map-area, the dominant feldspar is andesine, whereas, in the zone of gneiss between La Trêve river and Mildred lake, it is chiefly oligoclase. The andesine and the calcic oligoclase of the western bodies are much saussuritized and the grains are generally surrounded by a corona of sodic oligoclase. The grains of sodic plagioclase in the rock of the eastern (La Trêve River-Mildred Lake) zone have highly altered, small cores of presumably more calcic material. It is probable that the original andesine and calcic-oligoclase, which crystallized first during the cooling of the magma, was later altered and more or less replaced by sodium-rich rest liquid and that this replacement was more complete in the eastern half of the map-area.

The texture of the rock is generally protoclastic, and the plagioclase grains and biotite flakes have been stressed, bent, or granulated. Most of the quartz, also, has been fractured, but some quartz occurs in large, unstressed grains in association with microcline. The microcline is a late constituent which has frequently corroded and surrounded the earlier-formed plagioclase.

Greenstone inclusions are fairly abundant throughout the masses of this intrusive exposed within the limits of the present area, especially in the western half and close to the contact between the gneiss and the intruded volcanics. The degree of alteration and assimilation of the xenoliths by the intrusive material, although somewhat variable, is generally low. All the inclusions have their long dimension parallel to the foliation of the adjacent intrusive rock and the latter appears everywhere concordant with the schistosity and, probably, the bedding of the neighbouring volcanic rocks.

An outstanding feature of this gneissic intrusive is the diversity and abundance of dykes and small bosses cutting it. The oldest type of these later intrusives is represented by a few fine-grained, faintly gneissic or massive dykes or bosses of oligoclase granite. These are cut in turn by massive albite-granite dykes, and by still later leucocratic granite, aplite, and very numerous pegmatite dykes and lenses, grading, in places, into white quartz veins.

The gneissic character of this border facies of the extensive intrusive mass that lies to the north is believed to be due mainly to movements that occurred in the partly-crystallized magma and ceased

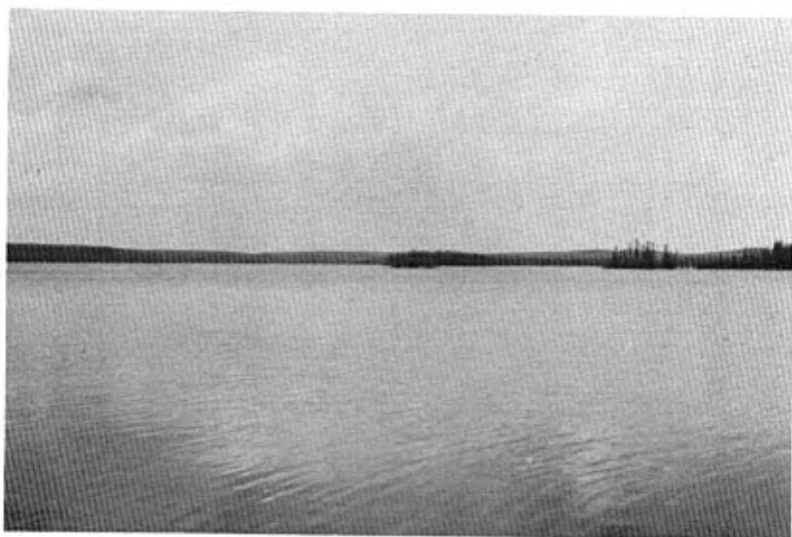


Part of a fall on Chibougamau river, near the southeastern corner of Kreighoff township.

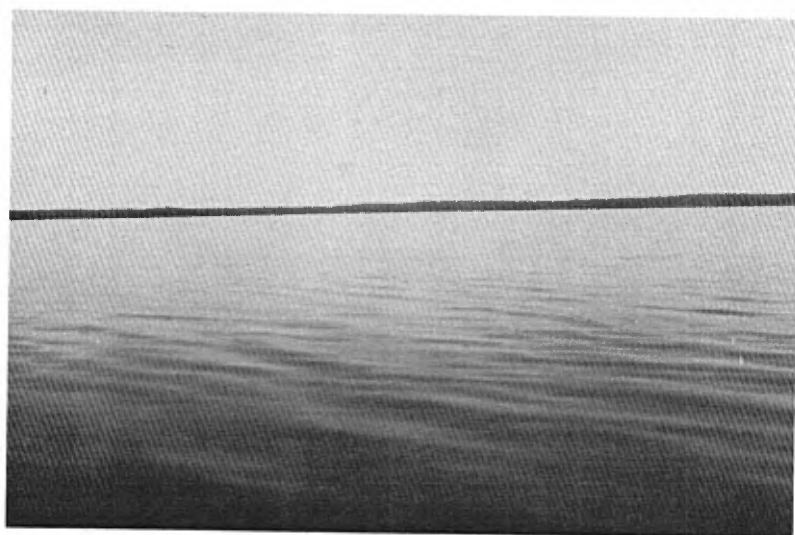


Summit of a typical gabbro hill, west and northwest of Renault lake, Kreighoff township.

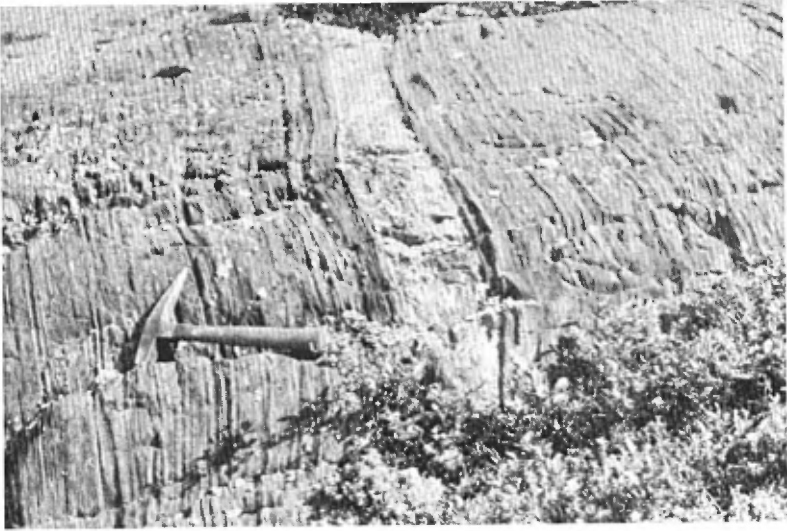
Plate III



A - The northeastern section of Rita bay, La Trêve lake.



B - Gilles bay, Inconnu lake. Note the low shores of the lake and the general flatness of the area.



A - Well-bedded, fine-grained, basic sedimentary rocks intruded by a concordant porphyritic body, two miles north of the eastern part of Colette lake, near the western boundary of Branssat township.

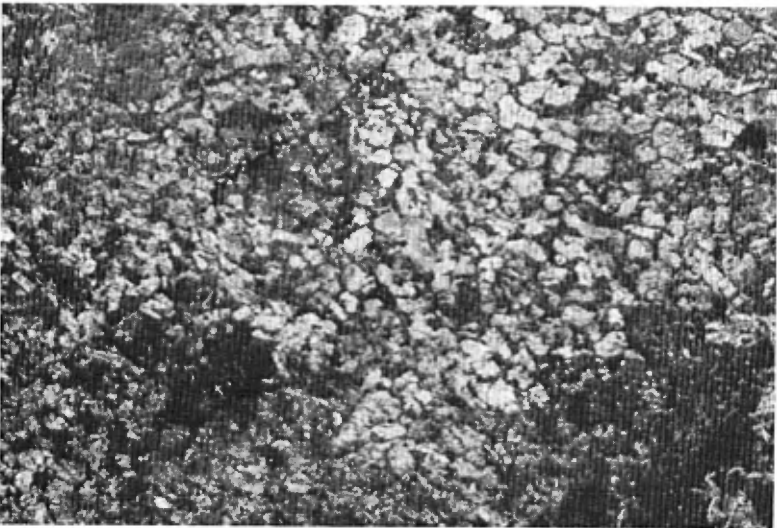


B - Conglomerate on La Trêve lake. Note the rounded nature of the granitic pebbles.

Plate V



A - Conglomerate on La Trêve Lake. Note the rounded nature of the granitic pebbles.



B - Coarse-grained syenite, two miles northeast of Branssat lake, Branssat township.

Plate VI



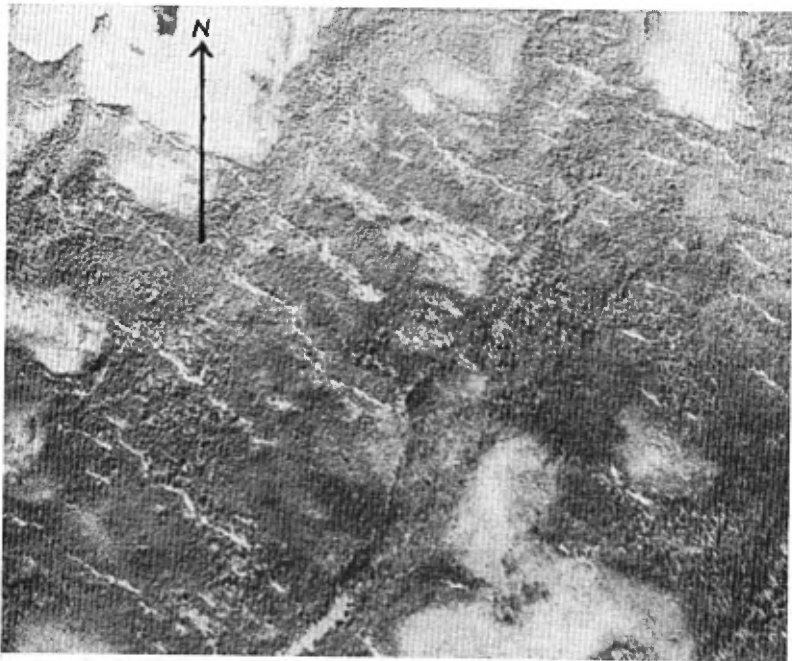
A - Ridge underlain by a dyke of diabase, at the mouth and along the south shore of Geneviève bay, La Trêve lake.



B - Boulder train, near the southeastern corner of Daine township.



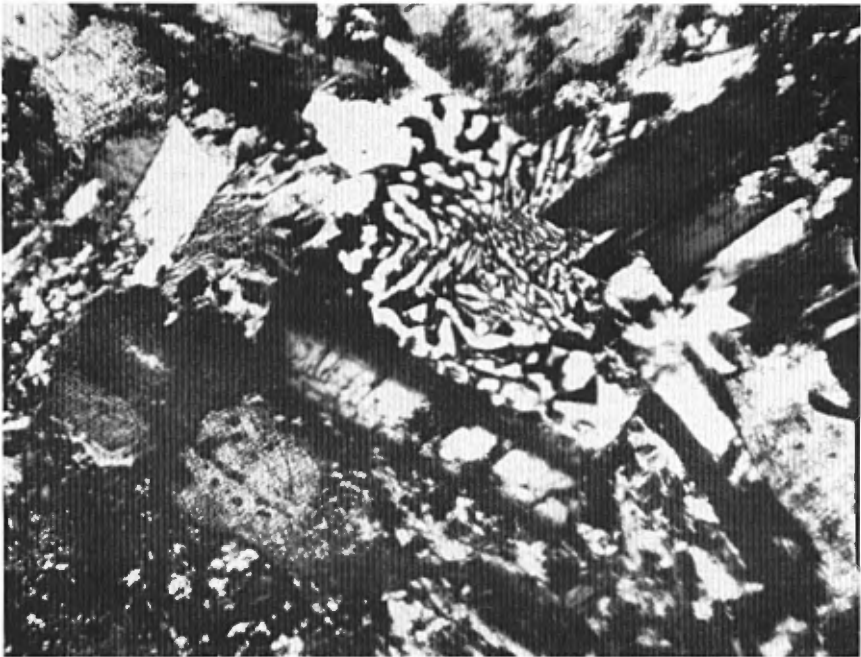
A - Wash-board moraines, west of Huguette lake, Branssat township. (Photo by Photographic Survey (Quebec), Ltd. for Dominion Gulf Co., Ltd.)



B - Wash-board moraines, northeast of Branssat lake, Branssat township. (Photo by Photographic Survey (Quebec), Ltd. for Dominion Gulf Co., Ltd.)



A - Photomicrograph of a section of the Capisit Lake intrusive showing altered albite and colourless quartz included in a very large microcline grain (x45). Polarized light.



B - Photomicrograph of graphic intergrowth of quartz and sodic plagioclase in quartz diabase (x45). Polarized light.

during the acidic oligoclase-albite stage of differentiation. The presence and the partial digestion of inclusions of greenstone serves to emphasize the foliated and banded structure of the rock.

Capisisit Lake Granite

A group of rock exposures belonging to the Capisisit Lake granite mass, more fully exposed in the Capisisit Lake area to the west (Gilbert, 1951), occurs near the western boundary of the present map-area, between Inconnue river and the southern boundary. Within the limits of the area, the Capisisit Lake granite is a medium- to fine-grained, altered, greyish-pink, leucocratic rock in which the quartz and feldspar grains generally appear to be highly fractured. Pegmatite and, in lesser abundance, aplite dykes are fairly numerous cutting the granite in two large outcrops: one close to mile post No.6, on the north-south survey line between Kreighoff and Montalembert townships, the other on a hill slightly less than half a mile to the west of post No.7 on the same survey line.

Under the microscope, the rock is seen to consist of a granular aggregate of quartz, 15 to 30 per cent; albite (An₈) about 60 per cent; microcline, generally about 20 per cent; and a small amount of biotite or chlorite, with apatite, iron oxides, leucoxene, titanite, zircon, paragonite, allanite, epidote, and zoisite. The texture of the rock is generally protoclástico, with stressed and granulated albite, quartz, and, to a much lesser extent, microcline. The albite grains are usually clouded with very fine iron oxide inclusions, which account for their pink colour. The microcline is generally clear and well twinned, and large grains of this mineral commonly enclose smaller grains of the primary plagioclase, biotite and incidental quartz (Plate VIII-A). The biotite is partly or completely altered to chlorite.

Southern Intrusive

About 35 square miles of the southernmost section of the map-area is underlain by the northern border facies of a large intrusive mass farther south and east which has been studied by many workers, including Shaw (1940), Beach (1941), Retty and Norman (1938), and Norman (1936). Shaw describes the main mass of the intrusive as a tonalite, whereas, according to Beach, its border facies in the Mechamego and Michwacho Lake map-areas is a hornblende granodiorite.

Within the limits of the present area, the intrusive is a medium-grained, generally massive rock in which the relative proportions of light- and dark-coloured minerals vary widely from one locality to another. This seems to be partly due to contamination of the intrusive

by the mafic-rich volcanic or intruded gabbroic rocks, and partly to the composition of the magma from which the rock crystallized.

The rock actually varies in composition between an albite granite and a diorite. The acidic facies, which appears to be predominant in the western half of the map-area, has approximately the following composition: quartz, 15 to 20 per cent; albite-oligoclase (An_6-An_{14}), 50 to 60 per cent; microcline, 10 per cent; biotite and chlorite, 10 to 15 per cent. Near the eastern limit of the map-area, the prevailing facies is a medium-grained diorite or mafic-rich syenite in which the dominant ferromagnesian mineral is amphibole that appears to be secondary after pyroxene, as shown in one of the thin sections studied. This medium-grained, massive diorite or syenite is cut by fine-grained, massive or slightly gneissic albite-oligoclase granite bosses and dykes.

The intrusive, as a whole, is somewhat altered. The constituent minerals are generally partly changed to secondary products, except the microcline, which is very fresh. The plagioclase grains are clouded with saussurite, paragonite, and very fine iron oxides. Some of the plagioclase grains of the granitic facies have retained a faint zoning, with the cores slightly more calcic than the peripheries. The amphibole is commonly partly or wholly altered to a pale-green chlorite. Many dykes of aplitic leucocratic granite are found cutting the southern intrusive mass within the limits of the map-area, and medium- to coarse-grained pegmatites are abundant, especially in the eastern half.

Coarse-grained Syenite

A very coarse-grained, mafic-rich syenite or shonkinite is exposed in two outcrops, about 800 feet apart, on a low elliptical hill, about 2,500 feet long and 1,500 feet wide, close to one and a half miles nearly due west of Huguette lake, in the western half of the map-area. The more southerly of the two exposures is very small, but the other is about 125 feet in diameter, and is a coarse-grained, hornblende- and feldspar-rich rock (Plate V-B). The feldspar crystals are euhedral and some are as much as three inches long. This mineral is pinkish-grey, weathering pink, and is generally stained on the weathered surface by abundant iron oxide derived from the neighbouring amphibole. The amphibole grains are anhedral and interstitial to the feldspar crystals. Epidote, chlorite, and some cubes of pyrite are also visible without the aid of a lens. The rock weathers rapidly because of the coarseness of its constituent minerals.

Fragments of the feldspar were examined microscopically. The refractive indices of the mineral were checked by oil immersion and were found to be close to 1.527. The characteristic cross-hatched

twinning of the microcline was plainly visible in most of the slides studied. In some of them, the feldspar was seen to be a microperthite with very acidic albite as the sodic constituent.

The amphibole is dark green-blue, highly pleochroic, and apparently belongs to the alkaline group. Determinations of its optical properties were unsatisfactory because of the alteration, the deep colouring, and the presence of thickly disseminated iron oxides. Indications are that the amphibole is of the arfvedsonite variety.

The paucity of the exposures and the deep weathering of this syenitic body, together with the absence of observed contacts and field relationships, make a more detailed study of the rock a difficult task. It possibly represents a late and much contaminated facies of the large granitic intrusive mass to the north.

Granitic Bosses and Acidic Dyke Rocks

Five small, rounded bodies of granitic rock were observed in the eastern half of the map-area, the largest of which is between half a mile and two miles east of the entrance to Rita bay. The distribution of the exposures suggests that this is an ellipsoidal, north-west-southeast trending mass, about one and a half miles long and 3,500 feet wide, which intrudes a fine- to medium-grained feldspathic grey-wacke. The great irregularity of its boundaries, the profound alteration and granitization of the adjacent sedimentaries, and the occurrence of numerous dykes, veins, and irregular small bodies of granitic material around the mass and in its vicinity suggest that it represents a cupola from a larger granitic mass at depth.

The rock of this boss is a medium-grained, pink granite containing up to 20 per cent glassy quartz and poor in ferromagnesian minerals. Slightly altered and clouded albite is the main constituent mineral, comprising about 60 per cent of the rock. Partly chloritized biotite accounts for about 5 per cent, and both it and the albite grains are commonly cemented by large grains of fresh microcline, which varies in amount between 5 and 15 per cent of the rock. Chlorite, epidote, titanite, iron oxides, and apatite constitute the accessory minerals. In many places, very fine pyrite is disseminated throughout the rock.

Another fairly large boss of granitic rock is well exposed in the eastern half of Daine township, between the main part of La Trêve lake and Gisèle lake to the north. Here again, the granite cuts across the structure of the main belt of sediments, and it is in turn cut by a large northeasterly-trending diabase dyke. The rock of this boss is a medium-grained, reddish-pink, albite-oligoclase granite or

syenite. It is much altered and, in places, plagioclase and biotite, its early constituents, have been strongly fractured. Microcline and quartz are the latest of the primary minerals, and chlorite, epidote, allanite, apatite, leucoxene, titanite, and iron oxides are the secondary and accessory minerals. Occasional small crystals of zircon were observed in the syenitic facies, and of purplish fluorite in the granitic facies. Pyrite is very widely disseminated throughout this boss.

A fine- to medium-grained, grey syenite is exposed along the north shore of the northernmost of the two large islands in the central section of Rita bay. The primary sodic plagioclase (An_{6-9}) of this syenite, which makes up nearly 90 per cent of the rock, has been partly replaced by a potassic feldspar, probably microcline, and the remaining plagioclase is generally slightly clouded. Chlorite, secondary after biotite, constitutes about 5 per cent of the rock; quartz, 3 per cent; and the accessory minerals include apatite, leucoxene, and iron oxides. Pyrite and carbonate are disseminated throughout the rock.

A single exposure of fine-grained, slightly foliated, albite granite was seen in La Ribourde township, about a mile and three-quarters almost due south of the main part of Rita bay. Pyrite is widely scattered throughout the rock.

A fine-grained, grey granite forms a small hill two and a half miles slightly west of south of La Ribourde lake, in La Ribourde township.

As stated above, pegmatite and, to a lesser extent, aplite dykes occur abundantly in association with most of the major intrusive masses of the area. In the volcanic, sedimentary, and gabbroic rocks, their presence is generally restricted to the contacts between the intruded and intrusive rocks.

Widely scattered granite dykes occur throughout most of the sections underlain by pre-granitic rocks, but not many of them exceed a few inches in width. A 15-foot dyke of fine-grained pink granite cuts gabbroic rocks about one-eighth of a mile north of post No. 5 on the north-south surveyed line between Montalembert and Kreighoff townships. A similar but slightly narrower dyke, possibly its extension, is exposed along the blazed line about a mile and a half to the northeast. Numerous dykes of fine-grained grey to pink granite can be seen close to the entrance of Rita bay.

Fine-grained, grey, quartz diorite dykes outcrop in two places along the north shore of Inconnu lake. One is half a mile southeast of post No. 64 on the east-west surveyed line between Branssat

and Kreighoff townships; the other is a quarter of a mile east of post No. 65, on the same surveyed line.

Buff- to dark-coloured porphyritic dykes occur in all parts of the map-area, but most abundantly in sections underlain by pre-granitic rocks. The largest are along Inconnue river, slightly west of the outlet of Inconnu lake; at the southern tip of Gilles bay; and intruding sedimentary rocks about two miles slightly east of south of Gilles bay. These dykes range in width from a few inches to over ten feet, but most of them are one to two feet wide. The great majority have been introduced as concordant bodies prior to the main period of folding of the pre-granitic rocks and they have been rendered schistose to a degree comparable to that of the rocks they intrude. Others are massive, unsheared, and presumably post-tectonic in age.

In most of the porphyritic dykes, the phenocrysts are euhedral to subhedral plagioclase feldspar enclosed in a darker coloured, fine-grained, generally feldspathic matrix. The plagioclase phenocrysts range in calcicity from An_8 in some dykes to An_{25} in others. The dykes containing albite or sodic oligoclase are usually lighter coloured than those in which the phenocrysts are more calcic.

A few narrow quartz porphyry dykes and very dark, iron-rich trap dykes were seen in the area. There are several of the latter on each side of the large olivine diabase dyke in the eastern part of the map-area.

Post-granitic Basic Intrusives

Relatively unaltered intrusive rocks of basic composition which outcrop at a few localities within the limits of the map-area include olivine diabase, diabasic gabbro, and quartz diabase. They intrude the pre-granitic and some of the granitic rocks and appear to be the youngest consolidated rocks in the area, probably of Keweenawan age.

The best exposure of these rocks is a fresh, fine- to medium-grained olivine diabase dyke extending, possibly with short interruptions, from the eastern limit of the map-area half a mile south of the southern shore of Dussault bay, southwestward to beyond the western end of Geneviève bay. From 200 to 300 feet wide, this dyke has fine-grained, chilled borders and is generally well jointed. It has resisted disintegration and erosion much better than the adjacent conglomerate and feldspathic greywacke and forms a conspicuous landmark across the northeastern section of the map-area (Plate VI-A).

Half a mile north of the outlet of La Ribourde lake is an exposure, 200 feet wide and 300 feet long, of fine- to medium-grained

serpentine diabase. This dyke is southwest of, and along the strike of, the olivine diabase dyke, but it probably represents a separate dyke since, like the large dyke, it forms a conspicuous hill whereas the ground between the two is very low and swampy. The two may, however, be sections of one continuous dyke extending right across the eastern half of the map-area.

A medium- to coarse-grained olivine diabase dyke exposed along the north shore of Inconnu lake lies only slightly south of the projected strike of the dyke last described. This dyke, however, is coarser-grained and has a much higher content of plagioclase and biotite.

Two exposures of medium-grained quartz diabase are visible at low water on the east shore of Gilles bay, about a mile and a half south-southwest of the olivine diabase dyke on the north shore of the lake.

Four relatively large exposures of medium-grained diabase and quartz diabase occur about one mile east of Veto lake, in the northwestern section of the map-area. They are elongated masses, about 50 feet wide and 100 to 200 feet long, and rise about 20 feet above the surrounding gneissic granite. The four exposures fall into two groups, one of which trends N.25°E. and the other N.35°E. The bed-rock is thickly covered between the two members of each group, but it is probable that the four outcrops are parts of two dykes, which converge to the south and possibly join to form a single dyke.

Other, smaller occurrences of diabasic rock of probable Keweenawan age include: one exposure of very fresh, olivine-bearing, rusty-weathering, diabasic gabbro, in the section of the area underlain by rocks belonging to the 'old' gabbroic suite, about three and a half miles northwest of Renault lake; a fine- to medium-grained fresh diabasic gabbro outcropping about three-quarters of a mile north of the outlet of Colette lake, near the southwest corner of Branssat township; a very small dyke of unaltered diabasic gabbro intruding schistose volcanic rocks about half a mile west of the shore of Gilbert bay; a ten-foot-wide dyke of fine-grained quartz diabase exposed along with volcanic rocks on a small ridge about one mile slightly north of west of the mouth of Mildred river, in the northeastern section of Daine township; and a deeply-weathered, coarse-grained, magnetite-rich, olivine diabase dyke outcropping about midway between Gilbert and Geneviève bays on La Trêve lake.

The post-granitic basic intrusives of the area are light- to dark-grey, and their ophitic texture is commonly recognizable with the naked eye. The rock weathers rusty-brown, and grains of iron oxide

are generally visible with the help of a pocket lens. The plagioclase (An_{60-63}) occurs in well formed laths and generally makes up close to 55 per cent of the rock. The main pyroxene is diopside, with augite and hypersthene in lesser abundance. Uralite and, less commonly, black mica are present as alteration products of the pyroxene. Biotite and iron oxides are the other main constituents. Slightly or completely serpentinized olivine occurs in the olivine-bearing types, and quartz and well-developed micrographic intergrowths of quartz and sodic plagioclase in the quartz diabase (Plate VIII-B). Apatite is relatively abundant in some of the specimens studied.

Cenozoic Deposits

The whole of the Branssat-Daine map-area lies within the known limits of glacial lake Barlow-Ojibway. The characteristics of the unconsolidated deposits of the area are, consequently, somewhat similar to those of adjacent regions. Raised beaches are present along the slopes of the higher rocky hills and ridges, such as those in the elevated sections west of Renault lake. Varved clays are not very abundant; the best developed are found along Renault creek, close to the southern boundary of the map-area. Marine clays were not identified during the investigation on which this report is based but sand, gravel, and boulder clays are abundant. A few boulder trains (Plate VI-B) and small eskers were seen in some localities.

Numerous glacial striae and a few glacial chatter-marks on the rocky hills and shores of the largest lakes in the area indicate that the main direction of movement of the last Pleistocene ice-sheet was 25° to 30° west of south. Small, elongated, glacial ridges composed of unsorted material and trending parallel to the known movement of the last ice-sheet are distributed throughout the area.

Transverse, elongated glacial deposits, termed 'wash-board moraines' by Mawdsley (1936) and described by Mawdsley and Norman (1938) in the area farther southeast and east, are to be seen, especially in the northwestern section of the map-area, in the low ground south, southeast, and east of Veto lake, in Branssat township (Plates VII-A and VII-B). These ridges trend at nearly right angles to the longitudinal ridges mentioned above, vary in length from a few hundred feet to over two miles, and are usually about 15 feet high. They are generally 600 to 700 feet apart, although there may be intervals of only 200 feet or of over 1,000 feet between two successive ridges. The inter-ridge areas are generally muskeg, although longitudinal ridges are not infrequently found in them. The transverse moraines were seen in at least two instances to ride over the longitudinal ridges, with their bottoms at a higher level than their summits in the intervening valleys. These transverse ridges are interpreted as representing successive annual fronts of the last ice-sheet during its final retreat.

STRUCTURAL GEOLOGY

Folding

The volcanic and sedimentary rocks of the area, together with the sill-like masses of the 'old' gabbroic suite, have been tightly folded and highly deformed in probably more than one period of orogenic activity. The two largest structural units of the area, i.e., the main belt of sedimentary rocks and the northern zone of volcanics, strike in a general east-west direction, and this may be considered as broadly representing the general trend of the structure of the area. The dips are generally steep or vertical. The bedding and schistosity of the deformed volcanic and sedimentary rocks are parallel, except at a few places where there is a small angle difference.

At the western boundary of the map-area, the strike of the flows in the northern zone of volcanics and of the structure in the adjacent gneissic intrusive to the north is close to east-west, and the dips are generally vertical. Eastward from there, the strike of the flows and their schistosity, the direction of the gneissic structures of the adjacent intrusive, and the trend of the contact between the two types of rock, swing around more than 90° , changing from near east-west to north-south, and, close to the northern boundary of the map-area, they become almost northwest-southeast. The dips there are generally southward or eastward and vary from 50° to 85° except in a few places, where they are vertical. Toward the centre of the large 'plateau' of volcanic rocks immediately east of the crescent-shaped body of foliated intrusive rock in the northeastern part of Branssat township, the strikes and dips of the flows change very abruptly through a wide range because of the intense drag-folding and crumpling to which the rock has been subjected.

In the eastern half of the map-area, the strike of the flows and their schistosity varies from close to east-west to about $N.60^{\circ}E.$, near the northeastern corner of the area.

The strike of the beds of the main central belt of sedimentaries is about $N.70^{\circ}W.$ at the western boundary of the map-area. Farther toward the east it becomes east-west and it averages $N.70^{\circ}E.$ at the eastern limit of the map-area. The dips of the sedimentaries are steep to the north or vertical.

The direction of the lava flows of the southern zone of volcanics and of the concordant gabbroic sills is about $N.45^{\circ}E.$ west of Renault lake, near the southwest corner of the map-area. From the northern end of Renault lake, the strike swings around to slightly south of east and, in the eastern half of the area, it is a few degrees north of east. The dips are nearly everywhere vertical.

Structural determinations by means of drag folds were made at a number of places, but most of them are not too reliable because of the small dimensions of the folds and of the inconstancy of plunge and strike of their axes within the limits of a single rock exposure.

The best observations of drag folds were made on the volcanic 'plateau' in the northeastern part of Branssat township, about two miles west of the junction of Caupichigau and La Trêve rivers. The 'plateau' itself has the shape of a fold, possibly a large drag fold, and a great number of small drag folds are seen on the surface throughout the schistose lava flows. Some of the smaller folds are much deformed, with their axes parallel to the schistosity of the lava, but there is a marked tendency in the great majority of them to maintain approximately parallel axial planes, which strike about S.65°E. and generally dip 80° to the southwest. With few exceptions, their axes plunge toward the southeast at angles varying between 55° and 75°, suggesting that the fold exposed on the volcanic 'plateau' is an anticline with axial plane striking about S.65°E. and dipping about 80°S.W., and the axis plunging about 65° to the southeast. The beds on the northern limb of the fold, according to this interpretation, would be overturned.

Good attitude determinations by means of pillows were obtained in the ellipsoidal lavas of the northern zone of volcanics, especially north and south of Huguette lake in Branssat township; on the southern limb of the volcanic 'plateau' described above; in the flows exposed on the shores of Gilbert bay, and southwestward; and in the area included between Gilbert bay and Mildred lake, in the northeast corner of the map-area. All these determinations indicate that the tops of the flows are toward the south and that the beds are vertical, right-side-up, or overturned. No reliable determinations of tops and bottoms were obtained from the lava flows of the southern zone of volcanics because of the paucity of pillows in the ellipsoidal flows and the intense deformation of those that are present.

Well-developed fracture cleavage in dark-coloured, slaty sedimentary beds outcropping on the north side of the point on the east shore of Gilles bay, a mile and a quarter north of the southern tip of the bay, suggests that the tops of the beds there are toward the north.

From these determinations, a synclinal axis is presumed to lie somewhere near the centre of the sedimentary belt or slightly farther north. This synclinal fold is believed to have a general easterly plunge in the western half of the map-area, as suggested by observations made by the writer in the Capisisit Lake area (Gilbert, 1951) and in the western half of the present area. There seems to be a change in the plunge of the fold in the region between La Ribourde

lake and the main section of La Trêve lake. This suggestion is based on a few structural determinations made on small drag folds near the eastern boundary of the map-area, determinations which indicate a very steep plunge of the axis to the west or southwest. Similar conclusions were reached by Beach (1941) in the adjacent area to the east.

A special effort was made in the field and in the course of subsequent laboratory work to collect all the possible information concerning the structural relationships between the volcanic and sedimentary rocks of the area and to indicate the possible presence, in the large central belt of sedimentary rocks, of two different series, corresponding to the Opémisca and Pre-Opémisca rocks (Beach, 1941; Norman, 1941) described in the areas to the east and separated one from the other by an angular unconformity.

The basal member of the so-called Opémisca series is, at most points observed by Beach, a thin porphyritic lava. Within the limits of the present area, no exposures of this type of rock were observed below the conglomeratic beds. The basal member of the northern series in the present area is a medium-grained, highly feldspathic greywacke, somewhat ferruginous in certain localities. It is well exposed on the small islands off the north shore of the entrance to Dussault bay, on the south shore of Geneviève bay, 1,000 feet north of the northern extension of La Ribourde lake, and just north of the exposures of conglomerate on the north shore of Inconnu lake. This feldspathic greywacke grades southward and upward into a conglomeratic facies which is well exposed to the south and whose matrix is strikingly similar in texture and composition to the basal greywacke.

This basal greywacke is also exposed along the southern border of the main belt of sedimentaries on both shores of Chibougamau river, some four miles south of the southern tip of Rita bay. The best outcrops are to be seen south and southwest of Gilles bay, where the rock is very similar in structure, texture, and composition to that exposed in the vicinity of La Trêve lake. South of Gilles bay it has an outcrop width of about three and a half miles but this decreases to the northwest and, along Inconnue river, immediately below the outlet of Inconnu lake, the width is only about one mile.

Overlying this basal, medium-grained, commonly reddish, feldspathic greywacke is the conglomerate described earlier in this report. Both the greywacke and the conglomerate are well exposed on the northern limb of the main synclinal fold. This is mainly because of the presence nearby of a concordant dyke of late-Precambrien diabase which has effectively resisted erosion and thus forms hills on the flanks of which the conglomerate and greywacke beds have been protected. It is quite possible that there is much more conglomerate along the

southern limb of the main synclinal fold than is suggested by the two small exposures described on an earlier page, but, because of less favourable circumstances, it is not as well exposed there as along the northern limb.

South of the main conglomeratic bed on La Trêve lake, and toward the axis of the syncline, fine- to very-fine-grained feldspathic greywacke and slate are the predominant rocks. Some of these beds can be followed across the entire area and well into the Capisisit Lake area to the west. This is especially true for the dark-coloured and ferruginous slates which can be seen outcropping here and there as far west as McDonald creek in the Capisisit Lake area (Gilbert, 1951).

In the latter map-area and in the section of the present area included between the western boundary and Gilles bay, interbedding between sedimentary beds and volcanic flows or tuffs was frequently observed near the northern and southern borders of the sedimentary belt. Similar observations were made northeast of Renault lake near the contact between schistose basalts to the south and medium-grained feldspathic beds similar to the basal sedimentary beds exposed north of the main conglomeratic bed on the shores and in the vicinity of La Trêve and Inconnu lakes.

The medium-grained feldspathic greywacke exposed on the north and south sides of the main sedimentary belt usually grades into a more basic facies going westward from Inconnu lake. An increase in the amount of biotite or hornblende is the only change noticeable in the rock. Moreover, some of the rocks retain their feldspathic character right to the western half of the Capisisit Lake area, where they are found interbedded with more basic sedimentaries or thin volcanic flows.

Nowhere within the present area or in the Capisisit Lake area has the writer observed any indication of an angular unconformity between members of the sedimentary series or between them and the volcanic rocks to the north and south. He considers that the evidence cited above strongly suggests that the sedimentary rocks of the Branssat-Daine and Capisisit Lake areas represent one and the same series, structurally conformable with the underlying volcanics and folded along with them into a broad synclinorium, on both limbs of which minor synclinal and anticlinal folds were developed. Such minor folds may explain the apparently more considerable thickness of the medium-grained greywacke on the southern limb of the synclinorium between Renault lake and Gilles bay, in the western half of the present area.

The poor sorting of the components of the lower members of the sedimentary series between the outlet of Inconnu lake and the

eastern boundary of the map-area indicates unstable conditions of deposition, possibly from streams descending from mountain ranges and depositing their load when reaching a plain, a lake, or a sea. The majority of the conglomerate pebbles are well rounded as if rolled for long distances, but some are sub-angular, and small angular fragments are very abundant in the medium-grained feldspathic greywacke underlying the conglomerate and in the matrix of the conglomerate itself, indicating that the constituents of the rocks did not all come from the same source.

In the central section of the belt of sedimentary rocks from Inconnu lake eastward, and throughout the belt westward from the lake, the structural, textural, and compositional features of the beds suggest that they were deposited in a body of quiet water, possibly an interior sea or a large lake. It appears that the frequently reddish basal feldspathic greywacke and the overlying conglomerate were deposited partly under subaerial conditions and partly in a shallow body of water. It is quite possible that, under the weight of deposited material, the floor of the valley began to sink, permitting the sea to flow in and providing more stable conditions of deposition for the overlying fine-grained and well-bedded greywackes and slates.

The origin of the pebbles of acidic intrusive rocks contained in the conglomerate is unknown. Exposures of bed-rock similar to the great majority of the granitic and syenitic pebbles were not found anywhere in the area.

Besides being subjected to all the pre-granitic regional stresses, the volcanic formations of the southwestern section of the map-area were further affected by disturbances caused by the intrusion of large masses of basic and acidic rocks. As a result, the structure of the volcanics there is more complex than in the remainder of the map-area. There is a suggestion, from the pattern of strikes and dips and from the compositional diversity of the rocks of the gabbroic series, that the Capisisit Lake granitic mass occupies a position along the axis of an elongated, southeasterly-trending dome extending from the west into the present area (Gilbert, 1951), and that the nose of an anticlinal fold is present just west and northwest of Renault lake, in the southwestern section of Kreighoff township. Such a hypothesis would predicate a tight synclinal fold between the two masses of granite exposed in that section of the area, strong evidence for which is afforded by the shapes of the structurally-controlled hills and valleys. It is, however, fully realized that the evidence for such an interpretation of the structure of this section of the area is very weak.

Faulting and Shearing

There are probably many faults in the area, since it is unlikely that rock formations could have been so tightly folded without development of major zones of fracture. However, owing to many factors, direct evidence of faulting is very scarce.

Renault lake, in the southern half of Kreighoff township, probably lies within a zone of faulting trending about N.40°E. The volcanics on the east shore of this lake, just north of the southern limit of the map-area, are highly sheared in a direction parallel, or nearly so, to the elongation of the lake. Also, the east shores of the northern half of the lake are high and rocky, and faint slickensiding suggests a near vertical movement along the fault plane.

There are many shear zones in the area, especially in the volcanic and sedimentary rocks, but most of them are exposed for only relatively short distances. The most important are the zone, 55 feet wide, on the east shore of Renault lake, and the one extending from the west through Colette lake and southeastward from there across Inconnue river, some 4,000 feet downstream from the outlet of Inconnue lake. In the latter zone, highly sheared and crushed porphyritic dykes and sedimentary beds are exposed on both the west and the east banks of the Inconnue. The possible continuation of the shearing southeastward from the river was not traced because of the lack of bedrock exposures. Another shear zone, at least seven feet wide, was seen along the eastern flank of the large gabbro hill west of Renault lake, about three-quarters of a mile west of the kidney-shaped bay on the western shore of the lake.

The strongest zones of shearing in the area, and also those in which there is a certain amount of quartz, carbonate, and sulphides, are indicated on the accompanying map. Most of the shear zones strike parallel to the local bedding or schistosity.

ECONOMIC GEOLOGY

Mineral Occurrences

Most of the larger shear zones of the area carry a certain amount of quartz, carbonate, and disseminated pyrite. In some of them, the pyrite is concentrated in streaks or pockets, and massive sulphides were observed at a few places. Some occurrences of chalcopyrite were also noted.

Lenses of quartz and carbonate are fairly frequent in the folded rocks of the area and smoky-blue quartz 'eyes' and stringers are well distributed throughout the sedimentary and gabbroic rocks outcropping southwest of Gilles bay.

A fine to coarse dissemination of pyrite is visible in some of the granitic exposures of the area, especially in the small bosses and dykes outcropping in the vicinity of La Trêve lake. Along the northern shore of the northernmost of the two large islands in the middle of Rita bay, there are concentrations of pyrite with very minor chalcopyrite and galena in quartz veins cutting the granitic intrusive.

Much pyrite and pyrrhotite replacement occurs in the sedimentary beds near their contact with the volcanics and the small mass of diorite one and a half miles east and five miles south of the north-western corner of the map-area. In that locality, stripping and trenching have exposed a heavily-mineralized band, up to three feet wide, strongly magnetic, and containing much massive pyrite, pyrrhotite, and some chalcopyrite. Massive sulphides were also seen close to the main diabase dyke but slightly east of the present area, and in a large boulder half a mile south of the middle of the portage from the outlet of Inconnu lake. Assays, however, failed to indicate any economic concentration of precious or base metals in these occurrences.

A strong magnetic 'anomaly' was noted at a point south of Inconnue river and two and a half miles east of the western boundary of the map-area. A line was blazed from the river to this place, and a dip-needle survey was made of the vicinity in which the anomaly was noted. This section of the area is mapped as underlain by rocks of the gabbroic suite, exposures of which occur on the high ground around the lowlands in which the magnetic anomaly is at its maximum. The area in which the highest readings were obtained has a thick cover of overburden and no exposures of the underlying bed-rock were located.

A large number of quartz-carbonate-pyrite rich stringers and lenses are disseminated in the northern belt of volcanics, especially in the western half of Daine township.

The best mineralized shear zones and quartz-carbonate veins that were seen during the field work are indicated in the accompanying map by circled numbers which correspond, respectively, to the individual occurrences described below.

- No. 1 - Disseminated pyrite in sheared and injected basic lavas,
4,000 feet slightly north of east of the north end of Renault
lake.

- No. 2 - Small shear zone containing disseminated sulphides and blue quartz in feldspathic sedimentary rocks, slightly less than two miles north of east of the north end of Renault lake.
- No. 3 - Carbonatized and sheared basic intrusive rock containing pyrite and a low tenor of chalcopyrite, 450 feet west of the northern section of Renault lake.
- No. 4 - Sulphide-bearing, quartz-carbonate vein in a small shear zone in fine-grained greywacke, four and a half miles east of the north end of Renault lake.
- No. 5 - Carbonatized, quartz- and pyrite-rich sheared lava, on the eastern shore of Renault lake.
- No. 6 - Small shear zone in gabbro, containing abundant quartz and carbonate with heavy pyrite and low chalcopyrite mineralization, slightly over two miles west of Renault lake and a quarter of a mile north of the southern boundary of the map-area.
- No. 7 - Quartz-carbonate vein in altered and sheared gabbro, containing disseminated pyrite, 2,000 feet east of post No. 8 of the north-south surveyed line between Montalembert and Kreighoff townships.
- No. 8 - Seven-foot wide, silicified, carbonatized, and pyritized shear zone in gabbroic rocks, 4,000 feet west of the kidney-shaped bay along the west shore of Renault lake.
- No. 9 - Altered and carbonatized zone in highly mineralized sedimentary rocks, with, in places, massive pyrite, pyrrhotite, and some chalcopyrite, two and a half miles north of the eastern extension of Colette lake, in the western half of Branssat township.
- No. 10 - Narrow shear zone in volcanics, containing quartz and carbonate, with some sulphides, two miles south and one mile east of the northwestern corner of Kreighoff township.
- No. 11 - Heavy pyrite mineralization in sheared, fine-grained, basic igneous rocks, just south of Inconnue river and on the north-south surveyed line between Montalembert and Kreighoff townships.
- No. 12 - Sheared and altered lava and fine-grained gabbro containing carbonate, quartz, and pyrite, on the southeastern shore of the small lake one and a half miles north of the east end of Inconnu lake.

- No.13 - Small quartz-pyrite vein in a narrow mineralized shear zone in altered and schistose volcanic rocks, about two and three-quarter miles north of Branssat lake.
- Nos. 14 and 15 - Mineralized quartz lenses in drag-folded volcanic rocks, south of La Trêve river and about one mile west of the boundary between Branssat and Daine townships.
- No.16 - Quartz lens containing disseminated pyrite, in sheared sedimentary rocks, one and a half miles northeast of Huguette lake, in Branssat township.
- No.17 - Heavily-mineralized quartz-carbonate vein in contorted and drag-folded volcanic rocks, two and a quarter miles northeast of Huguette lake, in Branssat township.
- No.18 - Disseminated pyrite in quartz and carbonate stringers in drag-folded volcanics about two and a half miles almost due south of the junction of La Trêve and Caupichigau rivers, in Daine township.
- No.19 - Disseminated pyrite with copper stains in a highly carbonatized rock, probably sedimentary, two and a half to three miles east of Huguette lake.
- No.20 - Scattered pyrite in a highly carbonatized and silicified shear zone in volcanic rock, about 3,500 feet west of the southwest extension of Gilbert bay.
- No.21 - Sheared lava traversed by quartz veins containing pyrite and stained by iron and copper, just south of the entrance to Gilbert bay.
- No.22 - Disseminated pyrite in blue quartz veins in silicified sediments, about 1,000 feet north of the north shore of Chibougamau river and one and three-quarter miles west of post No. 52 of the north-south survey line between La Ribourde and Saussure townships.
- No.23 - Pockets of pyrite with a little chalcopyrite and galena, in quartz veins cutting a small granitic mass containing disseminated pyrite, on the northern shore of the northernmost of the two large islands in the middle of Rita bay, La Trêve lake.
- No.24 - Disseminated pyrite in carbonatized and drag-folded feldspathic greywacke, on the south shore of the entrance to Rita bay.

- No.25 - Disseminated pyrite in small quartz veins cutting conglomeratic sedimentary beds, along the eastern side of the long point on the north shore of the entrance to Geneviève bay.
- No.26 - Disseminated pyrite in sedimentary rock, on the south shore of the entrance to Rita bay, about three-quarters of a mile north-east of post No.58 on the north-south survey line between Daine and Guettard townships.
- No.27 - Disseminated pyrite in small quartz veins and in medium-grained feldspathic greywacke, on the south shore of Geneviève bay.

Recommendations

Gold discoveries made in the fall of 1948 and during 1949 in the southeastern corner of the Capisisit Lake area, immediately to the west, have attracted prospectors to the southwestern section of the present area which resembles, geologically, the region in which the finds were made. Numerous small and a few relatively large zones of shearing, some with pyrite and a little chalcopryrite, were observed in this section of the area during the investigation upon which this report is based. The abundance of quartz veins in tension fractures and the presence of quartz in veinlets and 'eyes' in the general region between Inconnu lake and the southwestern corner of the map-area is an indication of the activity of hydrothermal solutions in this district. Much of the prospecting there will have to be done by stripping, especially west and northwest of Renault lake, since the valleys in which the rock is more altered and more easily disintegrated are covered with a layer of unconsolidated deposits that hide the underlying bed-rock. Zones of tension cracks and of shearing exposed on the sides of the ridges should be followed, by stripping, downward into the valleys, where it is probable they increase in size and become richer in interesting minerals. Systematic prospecting of the area southwest of Gilles bay and Inconnu lake is recommended.

The northern belt of volcanic rocks and especially the section east of Huguette lake and of the crescent-shaped body of gneissic intrusive rocks near the northern boundary of the map-area also deserves careful examination. West of the localities mentioned, the ground is low, with thick overburden, and the consequent paucity of exposures is a serious hindrance to prospecting, but it is probable that the structural and lithological characteristics of the underlying bed-rock are as favourable for the presence of metallic mineral deposits as in the higher ground to the east. In this higher ground, outcrops of highly-folded and crumpled volcanic rocks are more plentiful, and the occurrence in them of a large number of quartz-carbonate-pyrite-rich lenses, stringers, and veins suggests good possibilities for the presence there of mineral deposits of economic interest. The vicinity of a well-

differentiated acidic intrusive mass to the north, and the occurrence of intensely carbonatized exposures of sedimentary and volcanic rocks near the eastern boundary of the map-area, are considered as other features favouring good potentialities for this section of the map-area, extending from the crescent-shaped intrusive body in Branssat township to the eastern boundary of the area.

The common occurrence of disseminated pyrite in the small granitic bosses in the vicinity of La Trêve lake and in the adjacent intruded rocks, as well as the concentration of sulphides in quartz veins cutting the intrusive and the wall-rocks, suggest that a careful investigation of these should also be made.

The mineralized exposures of silicified and sheared sedimentary rocks just north of Chibougamau river suggest some possibilities for mineral deposits in the volcanics and sedimentaries close to the large acidic intrusive mass that extends eastward from Renault lake, near the southern boundary of the map-area.

The occurrence, slightly east of the present area, of massive pyrrhotite and pyrite that is possibly related to the main diabase dyke also makes worthwhile a thorough investigation of the formations in the vicinity of the dyke in the Branssat-Daine area.

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