ROCKS AND MINERALS
FOR THE COLLECTOR

Geological Survey of Canada
Miscellaneous Report 32

**Kingston, Ontario to
Lac St-Jean, Quebec**

Ann P. Sabina

1983

Natural Resources Canada Ressources naturelles Canada

Canada

COVER

Left:
Weloganite crystals from Francon Quarry, Montreal. Specimen measures 3 cm from tip to base. National Mineral Collection specimen (No. 36384). National Museum of Canada photo.

Right:
Serandite with analcime and mangan-neptunite crystals from Mont St-Hilaire quarry. Specimen 22 is cm long. National Mineral Collection specimen (No. 37124). National Museum of Canada photo.

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Plate I

Mont St-Hillaire quarry. (GSC 138741)

CONTENTS

Abstract

Occurrences of minerals, rocks and fossils are described from about one hundred and forty easily accessible localities between Kingston, Ontario and the Lac St-Jean area in Quebec. All localities are on the north side of the St. Lawrence River except for a few in the Montreal area. The occurrences furnish a wide variety of specimen material but very little material suitable for lapidary purposes.

In the Kingston-Perth area there are numerous formerly-worked apatite, mica and feldspar mines as well as some lead-zinc, iron and graphite mines. Good specimens including crystal-specimens and uncommon minerals are available from many of these localities. Minerals suitable for lapidary purposes include: wilsonite, perthite and peristerite, but good quality material is not abundant. Fossils are common in quarries and road-cuts in the Kingston area.

Many uncommon and/or rare minerals are reported from deposits at Oka, Montreal Island, Mont St-Hilaire and Mont St-Bruno. Between Montreal and Lac St-Jean, there are numerous fossil-bearing limestone quarries and other quarries where rocks suitable for ornamental purposes may be obtained. The ornamental-type rocks include marble from Ste-Thècle, granite from Rivière-à-Pierre and Alma, and anorthosite from the Lac St-Jean area. The lead-zinc mines at Montauban, the titanium mines at St-Urbain, and the mica feldspar mines at Lac du Pied-des-Monts and Lac Charlotte provide additional localities for specimen material.

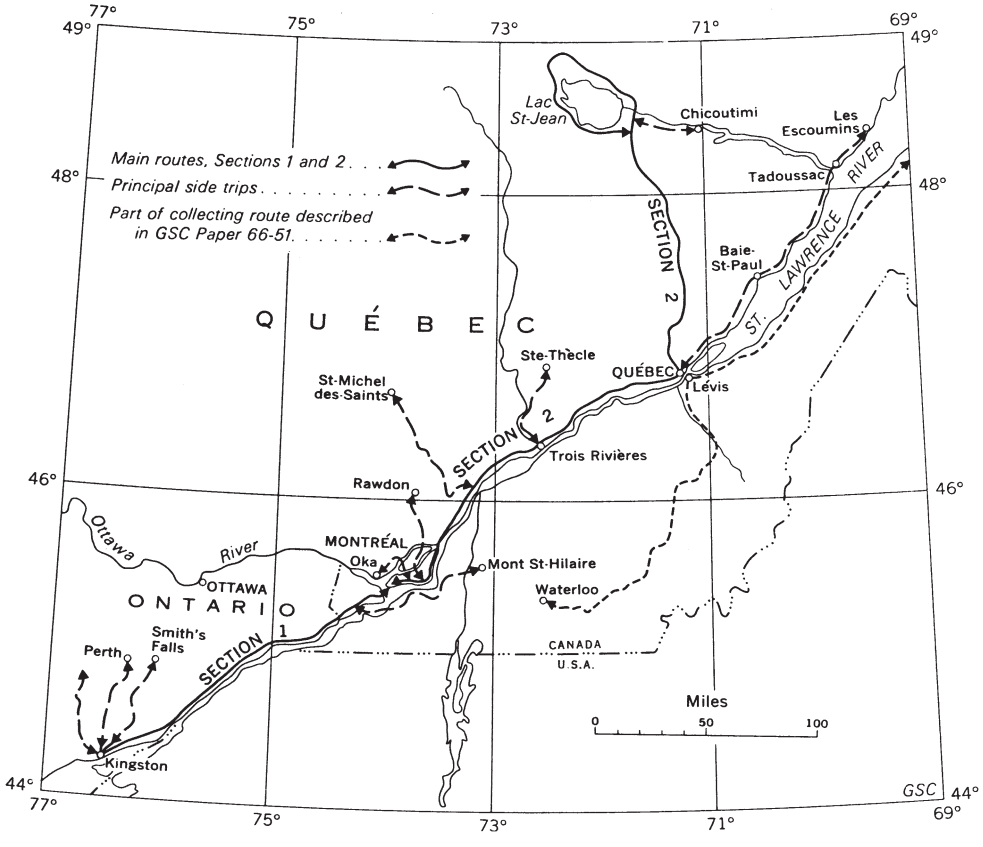


Figure 1. Index map showing collecting routes.

ROCKS AND MINERALS FOR THE COLLECTOR: KINGSTON, ONTARIO TO LAC ST-JEAN, QUEBEC

INTRODUCTION

This booklet describes mineral, rock and fossil localities between Kingston, Ontario and Lac St-Jean, Quebec. Except for a few localities on the south side of Montreal, all collecting sites are along the north shore of the St. Lawrence River. This publication supplements Geological Survey of Canada Paper 66-51 which describes occurrences south of the St. Lawrence River.

Most localities are easily accessible from main highways and side roads, but to reach some a hike of about a mile may be required. A boat is needed to visit a few of the localities. Directions to reach each of the occurrences are given in the text and are designed for use with official provincial road maps. Throughout the text the spellings of place names are those used on these maps. Locality maps are included where deposits may be difficult to find. Additional detailed information can be obtained from the appropriate topographic and geological maps listed for each locality. These maps are available from the agencies listed on page 97.

Many of the old mines have not been worked for many years so that entering shafts, tunnels and other workings is dangerous. Some of the localities are on private property and the fact that they are listed in this booklet does not imply permission to visit them. Please respect the rights of property owners at all times.

The localities were visited during the summer of 1966 by the author ably assisted by Miss Donna Daniels. The field investigation was facilitated by information received from Dr. Gaston Pouliot, École Polytechnique, Montreal and Dr. Mousseau Tremblay, Soquem, Quebec. The laboratory identification of minerals by X-ray diffraction was performed by R.N. DeLabio, Geological Survey of Canada. Their assistance is gratefully acknowledged.

A Brief Geological History

The collecting area comprises two geological regions – the Canadian Shield and the St. Lawrence Lowlands. The former is an immense body of Precambrian rocks occupying over half of Canada and part of the northern United States. The St. Lawrence Lowlands is a flat region of unfolded Palaeozoic rocks extending from the Thousand Islands of Ontario to Quebec City.

During Precambrian time there were repeated cycles of inundation, sedimentation, mountain building, intrusion and erosion producing a variety of igneous, metamorphic and volcanic rocks. The rock formations of this area contain deposits of mica, feldspar, apatite, lead, zinc, marble, granite and anorthosite.

At the close of the Precambrian era, a long period of erosion reduced the Shield to a nearly featureless plain and set the stage for uplift, inundation and deposition that took place during the long Palaeozoic era that followed. Great thicknesses of sediments were deposited by Palaeozoic seas over much of the Shield particularly along its margins including the St. Lawrence Lowlands where the accumulated sediments still remain. These sedimentary rocks furnish building and structural material and provide numerous fossil localities.

TABLE 1

Geological history

AGE (Millions of years)	ERA	PERIOD	ROCKS FORMED	WHERE TO SEE THEM
	Cenozoic	Quaternary	Gravel, sand, clay	Stream beds, lakes, gravel pits throughout area.
			Peat	Les Escoumins; Bagotville bogs.
			Ochre	Red Mill iron bog.
			Bog iron	Shawinigan area.
		Tertiary	Nepheline syenite	Mont St-Hilaire.
			Igneous dykes, sills	Mont St-Bruno; Francon, Miron quarries.
60				
	Mesozoic		Not represented	
230				
	Palaeozoic	Permian Pennsylvanian Mississippian Devonian Silurian	Not represented	
		Ordovician	Limestone	Quarries at Kingston, Montreal area, St-Marc, St-Barthélemy, Joliette, Neuville, Quebec City area, Roberval.
			Shale	Val-Jalbert, Cap-Santé graptolite localities.
			Dolomite	Brockville area quarries.
		Cambrian	Sandstone	Kingston area; Melochville.
600				
	Precambrian		Crystalline limestone	Road-cuts at Morton, on Westport Road; Long Lake zinc mine; Globe graphite mine; Ste-Thècle quarry.
			Pegmatite	Kingston area feldspar mines; Maisonneuve, McGie mines, Lac du Pied-des-Monts mine; Superior silica mine.
			Granite	Quarries at Rivière-à-Pierre, Ile d'Alma, Roberval.
			Pyroxenite	Mica-apatite mines in Kingston, Perth areas.
			Anorthosite	Matthews mine; St-Gédéon, Péribonka quarries; road-cuts along Highway 55, Hébertville to Péribonka.
			Quartz-biotite gneiss	Quarries in Shawinigan, Grand'Mère area.
			Garnet-sillimanite gneiss	Rawdon area.
			Quartzite	Rawdon area.

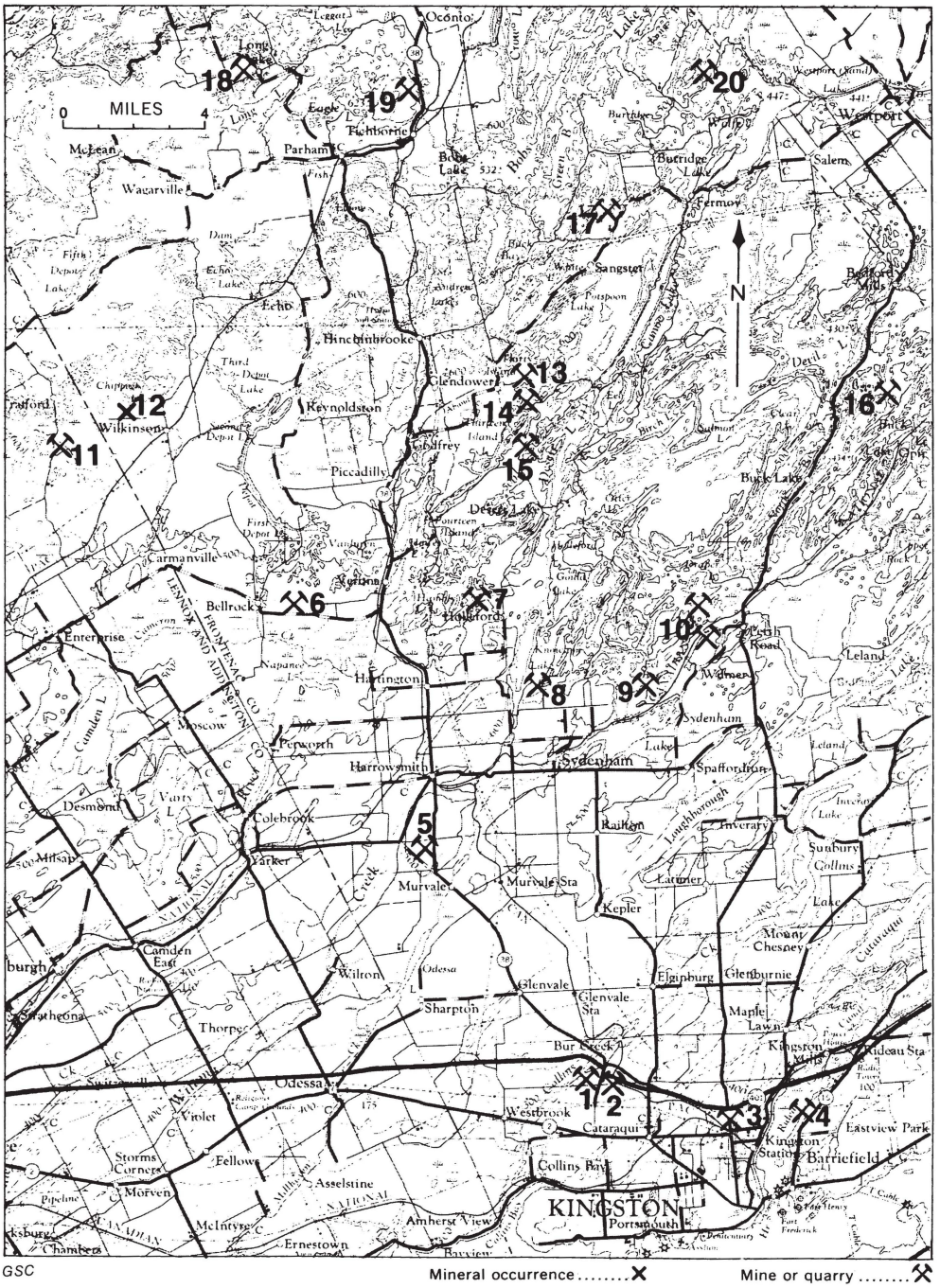
In more recent times – during the Pleistocene Period – great ice sheets spread southwards across the Shield and the lowlands scouring out the landscape as we know it today and leaving behind accumulations of sand, gravel and till. As the ice withdrew from the St. Lawrence Lowlands, marine waters flooded the region forming the Champlain Sea which, when it retreated, left unconsolidated deposits of clay and sand over the Palaeozoic strata. Other deposits of recent times include beach sands, stream detritus and peat bogs.

The geological history, with examples of rocks formed, is summarized in Table 1.

How to use this Guide

The route, as shown on Figure 1, is indicated in the text by heavy type; it is divided into three sections: (1) Kingston to Montreal via Highway 2; (2) Montreal-Quebec via Highway 138; and (3) Quebec-Lac St-Jean via Highways 175 and 169. There are several side trips leading from these main routes.

Information on each locality is systematically listed as follows: kilometre distance along the highways starting at the beginning of each section; name of the locality or deposit; minerals or rocks of interest to the collector shown in capital letters; mode of occurrence; brief notes on the locality with specific features of interest to the collector; location and access; references to other publications indicated by a number and listed at the end of the booklet; references to maps of the National Topographic System (T), and to geological maps (G) of the Geological Survey of Canada, the Ontario Geological Survey, and the Quebec Department of Natural Resources (scale 1 inch to 1 mile unless noted otherwise).



Map 1

Kingston Area (Highway 38)

1. McFarland quarry;
2. Kingston township quarry;
3. Frontenac quarry;
4. McGinnis & O'Connor quarry;
5. Limestone quarry;
6. Sand road quarry;
7. Mobey mine;
8. Freebern mine;
9. Lacey mine;
10. Frontenac lead mine;
11. Enterprise mine;
12. Dwyer brucite occurrence;
13. Glendower mine;
14. Kingston mica mine;
15. Richardson mine;
16. Stoness mine;
17. Hickey-Murphy mine;
18. Long Lake zinc mine;
19. Eagle Lake mine;
20. McLaren phosphate mine

SECTION 1

KINGSTON-MONTREAL

km 0.0 **Kingston, at traffic circle (junction Highways 2 and 3).** The main road log proceeds east along Highway 2 (Princess Street), from which there will be numerous side trips.

Kingston-Sharbot Lake Occurrences

Road log for side trip along Highway 38 from Kingston to Sharbot Lake (Occurrences described in text following the log are underlined; descriptions begin on page 6):

km		
	0.0	Traffic circle; proceed west along Highway 2.
	3.2	Junction (on right) Sydenham Road; continue along Highway 2.
	5.6	Junction Highway 38; turn right onto Highway 38.
	8.2	Junction 4th Concession road to Kingston township quarry and McFarland quarry.
	8.2 to 8.4	Road-cuts on both sides of highway.
	8.4	Turn-off (right) to Highway 401.
	9.3	Road-cuts on both sides of highway.
	10.0	Junction Cordukes Road.
	20.7	Junction (on left) road to Limestone quarry.
	21.1	Junction (on left) Yarker Road.
	25.6	Harrowsmith; junction (on right) Sydenham Road to Freebern mica mine.
	29.6	Hartington; junction (on right) Holleford Road to Mobey mine.
	34.4	Junction (on left) Bellrock Road to Enterprise mine.
	34.6	Verona; junction (on left) Sand Road to Sand Road quarry.
	39.9	Piccadilly, at junction Oak Flats Road to Dwyer brucite occurrence.
	42.1	Godfrey; junction (on right) Westport Road to localities between Godfrey and Westport (see page 11).
	56.5	Parham; junction (on left) Long Lake Road to Long Lake blue calcite occurrence, Long Lake zinc mine and Gabbro quarry.
	57.6	Road-cut on right.
	60.0	Tichborne, at railway crossing.
	62.9	Turn-off (left) to G.H. Somerville farm and Eagle Lake mine.
	63.9	Junction Camp Oconto Road on left.
	72.6 to 72.7	Sharbot Lake; road-cuts on both sides of highway.
	74.3	Road-cut on left.
	76.3	Junction Highway 7.

Kingston Township Quarry

CALCITE, CELESTITE, PYRITE, HYDROCARBON, FOSSILS.

In limestone.

Colourless to greyish white transparent crystal aggregates of calcite are common. Colourless to white radiating fibres of celestite occur on colourless calcite crystals (dogtooth spar) that line cavities about an inch across. Pyrite forms irregular veinlets and patches in the limestone, and a black lustrous hydrocarbon fills tiny cavities in limestone and calcite. The limestone is dense, dark grey and fine grained; it weathers to a light grey colour. Fossils are abundant in some of the beds; brachiopods measuring 20 mm across, colonial corals (up to 13 cm long), and worm burrows were found.

The limestone is known geologically as the Black River Limestone and is of Ordovician age; it is exposed by many road-cuts and quarries in the Kingston area. Among the fossils identified from this limestone are: corals, crinoids, bryozoans, brachiopods, pelecypods, gastropods, cephalopods, trilobites and ostracods. It is durable and attractive as a building stone and was so widely used for this purpose that Kingston has been referred to as the 'Limestone City'. Examples of its use as a building stone in Kingston are: the Post Office, City Hall, several Queen's University buildings, the Penitentiary buildings (some dating back to 1831) and numerous other public buildings and private residences. It is no longer used as a building stone but is quarried for road metal.

Road log from Highway 38, at km 8.2 (see page 5):

km		
	0.0	Turn right (east) onto 4th Concession road.
	0.08	Junction; turn left.
	0.25	Entrance to quarry.

Refs.: 29 pp. 87-89; 35 pp. 25-26; 91 pp. 45-46.

Maps: (T): 31 C/7 Sydenham.
(G): 25E south part of Frontenac County, eastern Ontario (Ont. Geol. Surv.).

McFarland Quarry

CALCITE, FOSSILS.

In limestone.

Massive white and pinkish white calcite occurs in veins about 20 mm wide in the limestone. Fossils, including colonial corals, horn corals, and worm burrows, are abundant. The limestone belongs to the Black River Group and is quarried by H.S. McFarland Construction Company Limited.

Road log from Highway 38 at km 8.2 (see page 5):

km		
	0.0	Turn left (west) onto 4th Concession road.
	0.3	Quarry on right.

Maps (T): 31 C/7 Sydenham.
(G): 25E south part of Frontenac County, eastern Ontario (Ont. Geol. Surv.).

Road-cuts, km 8.2 to 8.4, Highway 38

CALCITE, CHERT, FOSSILS.

In limestone.

The exposures on both sides of the highway are similar to the McFarland quarry. Colonial and horn corals are particularly abundant in the exposure on the west side of the highway. Chert occurs in the limestone as dull black irregular masses (2 cm to 8 cm across) with conchoidal fracture.

Other exposures of fossil-bearing Black River Limestone can be observed along Highway 401 between the Highway 38 and Highway 15 overpasses.

Maps (T): 31 C/7 Sydenham.
(G): 25E south part of Frontenac County, eastern Ontario (Ont. Geol. Surv.).

Plate II

Cavity lined with calcite crystals in Black River Limestone, Highway 38 road-cut at km 9.3. (GSC 138745)

Road-cuts, km 9.3, Highway 38

GYPSUM, ANHYDRITE, CALCITE, FOSSILS.

In limestone.

Snow-white, finely granular gypsum and colourless to white platy aggregates of anhydrite occur in cavities in limestone or, more commonly, in association with coarsely crystalline pink to white calcite in cavities measuring about 20 cm across. Tiny pyrite crystals are studded on colourless calcite crystals (dogtooth spar). The limestone, which belongs to the Black River Group, is moderately fossiliferous.

Maps (T): 31 C/7 Sydenham.
(G): 25E south part of Frontenac County, eastern Ontario (Ont. Geol. Surv.).

Limestone Quarry, West of Highway 38

CELESTITE, CALCITE, PYRITE, FOSSILS.

In Black River Limestone.

Celestite occurs commonly as colourless to snow-white, transparent, parallel or radiating tabular aggregates in limestone forming masses that measure up to 15 cm across, and as acicular to platy patches on pink to white calcite which occupies veins about 2 cm wide. Tiny pyrite crystals are found sparingly on colourless crystals. Fossils (Black River species) are present but are not common.

Access to the quarry is by a side road (0.15 km long) which leads west from Highway 38 at km 20.7 (see page 5).

Maps (T): 31 C/7 Sydenham.
(G): 2053 Madoc area (Ont. Geol. Surv., 1 inch to 2 miles).

Freebern Mica Mine

MICA, APATITE, PYRITE, CALCITE, PYROXENE.

In veins cutting pyroxenite.

Specimens of light-amber mica from this deposit were awarded a gold medal at the Chicago World's Fair in 1893. Green and, less commonly, red apatite, pyrite, pink calcite and dark green pyroxene crystals are associated with the mica.

The deposit was worked from 1897 to 1907 from four pits, the largest measuring 9 m by 6 m and 20 m deep. Twenty-five thousand dollars worth of mica was recovered.

Road log from Highway 38 at km 25.6 (see page 5):

km		
	0.0	Harrowsmith; turn right (east) onto Sydenham Road.
	3.7	Junction gravel road; turn left.
	5.1	Crossroad; continue straight ahead.
	6.3	Junction; turn right.
	8.0	Junction; turn left.
	9.0	Gate on left. From this point, a trail leads west along the base of the hill to the mine (just north of an old shack).

Ref.: 74 p. 144.

Maps (T): 31 C/7E Sydenham.
(G): 2054 Gananoque area, Ontario (Ont. Geol. Surv., 1 inch to 2 miles).

Mobey (Burnham) Mine

PERISTERITE.

In feldspar dyke cutting crystalline limestone.

The peristerite is white with a blue play of colour and is suitable for lapidary purposes. It is associated with pink feldspar, calcite and quartz. The dyke cuts Precambrian crystalline limestone. It was worked by a small pit from 1922 to 1925. Specimens of peristerite can be found in small quantities in the scattered piles of rock near the pit.

The deposit is on Mr. Syd Mobey's farm, about 450 m north of the farmhouse.

Road log from Highway 38 at Hartington (km 29.6, see page 5):

km		
	0.0	Turn right (east) onto the Holleford road.
	1.7	Junction, turn left.
	3.0	Junction, turn right.
	5.0	Junction, turn left.
	6.4	Holleford at junction; turn left.
	7.7	S. Mobey farmhouse (end of road).

Ref.: 83 p. 39.

Maps (T): 31 C/7 Sydenham.
(G): 2053 Madoc area (Ont. Geol. Surv., 1 inch to 2 miles).

Enterprise Mine

PYRITE, PYRRHOTITE, MOLYBDENITE, MICA, PYROXENE, CALCITE, APATITE, TALC, HORNBLENDE, SERPENTINE, SCAPOLITE, GYPSUM, HEXAHYDRITE, JAROSITE, COPIAPITE, ROZENITE, FIBROFERRITE.

In crystalline limestone.

Massive pyrite and pyrrhotite are the most common minerals at this locality. They are associated with salmon pink to white massive calcite containing: molybdenite; amber mica; massive, green pyroxene; transparent, greenish yellow, granular apatite; light green, massive talc; hornblende, as crystals and in massive form; translucent green serpentine; and light green to brownish green scapolite crystals about 2 cm across. White powdery and colourless crystalline gypsum occurs as encrustations on pyrite and pyrrhotite. Hexahydrite forms snow-white globular aggregates and is associated sparingly with gypsum on the sulphides. Rust-coloured, powdery, and dull green, massive jarosite forms irregular coatings on the pyrite-pyrrhotite assemblages. Secondary iron sulphates formed by the oxidation of pyrite are: copiapite, as sulphur-yellow to orange-yellow very fine granular to cauliflower-like encrustations on pyrite; rozenite, as white, yellowish white or, less commonly, colourless loose granular to globular masses also on pyrite; fibroferrite, as silky white, fine-fibrous and radiating fibrous aggregates on rozenite and copiapite. Copiapite and rozenite are very common on the exposure on the north wall of the pit; fibroferrite is less common.

The deposit was opened about 60 years ago as a source for sulphur. It was then known as the Foley prospect. A pit, 24 m by 12 m, and a small dump can be seen on the property.

Road log from Highway 38 at km 34.4 (see page 5):

km		
	0.0	Turn left (west) onto the Bellrock Road.
	0.1	Road-cut on right exposes crystalline limestone containing small amounts of mica, pyrite, serpentine, graphite, and tremolite.

km 15.1 Turn right at signpost "County Road 14".

17.4 Junction; turn right.

17.8 Junction; turn left onto road to Sixth Lake.

19.9 Fork; bear left.

23.6 Turn-off (right) to mine. The pit is in the woods about 18 m from the road.

Ref.: 92 p. 71.

Maps (T): 31 C/10 Tichborne.
(G): 2053 Madoc area (Ont. Geol. Surv., 1 inch to 2 miles).

Sand Road (Card) Quarry

TOURMALINE, HORNBLENDE, QUARTZ (CRYSTALS), MICA, PYRITE, FERGUSONITE, FELDSPAR.

In pegmatite dyke cutting gneiss.

Tourmaline occurs as coal-black masses, and as large crystal aggregates. Hornblende, as black crystals and in massive form is common. Transparent to translucent quartz crystals (up to 12 mm across) are associated with massive quartz and feldspar. Tiny books of light amber and black mica, crystalline patches of pyrite, and brownish black massive fergusonite with resinous lustre occur in the feldspar which varies from light pink to salmon pink and greenish white.

The deposit was worked for feldspar from 1915 to 1919. The quarry is water-filled but specimens are available from a small dump at the side of Sand Road.

Road log from Highway 38 at km 34.6 (see page 5):

km 0.0 Turn left (west) onto Sand Road.

3.4 Junction; continue straight ahead.

3.6 Dump on right. The quarry is in the meadow about 45 m north of the dump.

Ref.: 75 p. 17-18; 82 p. 40.

Maps (T): 31 C/7 Sydenham.
(G): 2053 Madoc area (Ont. Geol. Surv., 1 inch to 2 miles).

Dwyer Brucite Occurrence

BRUCITE, SERPENTINE, GRAPHITE.

In crystalline limestone.

Brucite occurs as colourless to greenish grey, irregular granules up to 5 mm across; when weathered it becomes chalk white and, because it is more resistant than the enclosing limestone, it stands in relief and can readily be recognized. Tiny flakes of graphite and very small orange-yellow grains of serpentine are sparingly disseminated in the limestone.

The deposit was exposed by a few pits and trenches by the Consolidated Mining and Smelting Company, Limited (now Cominco) in 1940. This was the first discovery of brucite in this part of Ontario. The deposit proved to be too small and too low a grade for further exploitation. The openings are now partly overgrown and specimens are not plentiful.

Road log from Highway 38 at Piccadilly (km 39.9, see page 5):

km		
	0.0	Turn left (west) onto the Oak Flats Road.
	4.8	Junction; continue straight ahead.
	7.1	Junction; turn left.
	11.1	Junction; continue straight ahead.
	12.9	Junction; turn right.
	15.1	Junction; turn left.
	16.2	Junction; continue straight ahead.
	16.7	End of road at Dwyer farmhouse. The occurrence is about 275 m north-northwest of the barn.

Ref.: 34 p. 42-45.

Maps (T): 31 C/10 Tichborne.
(G): 1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Godfrey-Westport Occurrences

Road log from Highway 38, at Godfrey (km 42.1, see page 5), for localities between Godfrey and Westport (descriptions for underlined localities are in text following road log):

km		
	0.0	Godfrey; turn right (east) onto the Westport Road.
	4.5	Road-cuts both sides of road.
	5.1	Junction (on right) road to Thirty Island Lake, Kingston mica mine and Richardson mine.
	5.5	Junction (on right) road to Thirty Island Lake and Glendower iron mine.
	10.9	Road-cut on left.
	14.1	Junction (on left) White Lake Camp Road.
	15.3	Turn-off (left) to Hickey farm and Hickey-Murphy mine.
	16.7	Road-cuts on left.
	17.8	Junction (on left) road to Burridge and McLaren phosphate mine.
	30.4	Junction; turn right to Westport.
	30.7	Westport, at junction Highway 42.

Road-cuts at km 4.5, Westport Road

TOURMALINE, APATITE, AMPHIBOLE, SERPENTINE, CALCITE, MICA, MAGNETITE, GRAPHITE, PYRITE.

In crystalline limestone.

Tourmaline occurs as yellowish orange, amber-coloured or dark reddish brown scattered grains, individual crystals (about 15 mm across) and crystalline aggregates up to 12 cm across; the yellowish orange and amber varieties fluoresce bright yellow under the 'short' ultraviolet rays. Apatite is found as light yellow to green crystals generally less than 1 cm across. Serpentine is common as bluish green translucent grains, streaks and granular blotches. Less common in occurrence are: amphibole, as light green vitreous, sugary patches; white coarsely crystalline calcite; mica, as amber-yellow flaky aggregates and as smoky brown tiny books; magnetite, as tiny grains or crystals; graphite flakes; and pyrite, as crystalline masses or as individual crystals.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Kingston (Bedford) Mica Mine

TOURMALINE, TREMOLITE, APATITE, MICA, CALCITE, PYROXENE, QUARTZ, PYRITE, PYRRHOTITE, MOLYBDENITE, VESUVIANITE.

In quartz-feldspar veins cutting crystalline limestone.

Silvery-amber books of mica up to 15 cm across are common in the dumps. Associated minerals are: tourmaline, as dark brown crystalline masses measuring 2 to 7 cm across, and as reddish brown grains; tremolite, as greenish grey columnar or bladed aggregates associated with dark amber mica; sea-green, granular apatite; pyroxene, as dark green crystals (2.5 cm across) and in massive form; massive and crystals of quartz (up to 1 cm across); pink and white crystalline calcite; and crystalline aggregates of pyrite. Pyrrhotite, molybdenite and dark brown vesuvianite have also been reported from the deposit.

The deposit was last worked by the Kingston Mica Mining Company from 1942 to 1945. It had previously been worked in 1896 and from 1908 to 1910. On the property at present, there is a dump and a fenced-off shaft.

Road log from Westport Road at km 5.1 (see page 11):

km		
	0.0	Proceed east along road to Thirty Island Lake (the Westport Road turns left at this point).
	0.3	Junction; turn right.
	0.8	Junction single lane mine road; turn left onto it.
	1.3	Fork; bear right.
	1.45	Mine dump.

Refs.: 34 p. 80-83; 74 p. 156-157.

Maps (T): 31 C/10 Tichborne
(G): 33-1964 Tichborne Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Richardson Feldspar Mine

FELDSPAR, HORNBLENDE, PYROXENE, TITANITE, TOURMALINE, QUARTZ, GARNET, CALCITE, APATITE, MICA, PYRITE, MAGNETITE, GRAPHIC GRANITE.

In pegmatite dyke.

Most of the feldspar is flesh-red to brownish red, but pink, greenish grey and white varieties are also present. Minerals associated with the feldspar include: black hornblende crystals, light green pyroxene, black tourmaline and minor amounts of titanite, garnet, quartz (smoky and some crystals), calcite, apatite, dark mica (biotite), brown tremolite, pyrite and magnetite. An attractive graphic granite can be found in the dumps. It has been reported that the tremolite, when cut en cabochon, produces attractive cats eyes.

This mine is reputed to have been the largest feldspar mine in Canada. It was opened in 1901 by H. Richardson of Kingston and was operated until 1916 by the Kingston Feldspar and Mining Company. Various operators worked the quarry intermittently until the early 1950s. From 1901 to 1920, it was the major producer of feldspar in the Verona district which accounted for most of Canada's production at the time. A total of 207 463 t of feldspar (represents 35 per cent of the entire production from Ontario) was produced from the Richardson mine from 1901 to 1950. Quartz was mined from the deposit prior to 1909. The pit, now water-filled, measures about 115 by 38 m and is between 30 and 45 m deep. Specimens can be obtained from large dumps adjacent to the pit.

Road log from the Westport Road at km 5.1 (see page 11):

km		
	0.0	Proceed east along road to Thirty Island Lake (see log for Kingston mica mine).
	0.3	Junction; turn right.
	0.8	Turn-off (on left) to Kingston mica mine; continue straight ahead.
	3.0	Fork, bear right.
	5.6	Turn-off, left, to Richardson mine. The pit is about 45 m from this point.

Refs.: 34 p. 50-51; 37 p. 6-7; 78 p. 465; 83 p. 38.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC).
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Glendower Iron Mine

MAGNETITE, APATITE, SCAPOLITE, GARNET, DIOPSIDE, AMPHIBOLE, SERPENTINE, CHALCOPYRITE, PYRITE, GRAPHITE, MICA.

At contact of crystalline limestone and metamorphic pyroxenite.

Massive and coarsely crystalline magnetite occurs as disseminations, streaks and bands in the sheared and brecciated zones of the contact rocks. Intimately associated with it are: calcite, diopside, scapolite, apatite, amphibole and dark reddish brown garnet. Narrow veinlets of serpentine, chalcopyrite and pyrite cut the magnetite. Crystals of sea-green apatite and grey scapolite occur with flakes of mica (phlogopite) and graphite in the limestone.

The deposit was operated by open pits and shafts intermittently from the 1860s to 1899 at which time it was the most important mine in the area. Approximately 45 359 t of iron ore (averaging over 50 per cent iron) and a small amount of apatite were removed from the deposit. Prior to the building of the Kingston and Pembroke Railway (about 1885) the ore was hauled by wagon to Kingston. The smelting of the ore was begun in Kingston in 1895. On the property at present there is a small dump and two water-filled pits.

Road log from the Westport Road at km 5.5 (see page 11):

km		
	0.0	Turn right (east) onto road to Thirty Island Lake (this is 0.3 km beyond the first turn-off to Thirty Island Lake).
	0.8	Fork; bear left onto single lane road. The right fork leads to the Kingston mica mine.
	1.9	Mine dump on left side of road and pits on right.

Refs.: 34 p. 5, 64-65; 67 p. 38-39.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Road-cut at km 10.9, Westport Road

DIOPSIDE, TITANITE, TOURMALINE, APATITE, SCAPOLITE, CHONDRODITE, ZIRCON, CALCITE, QUARTZ, FELDSPAR, MICA, GRAPHITE, PYRITE.

In crystalline limestone.

The most common minerals are: diopside, as light green to dark green crystals (averaging 1 cm by 2 cm) and in massive form; titanite, as dark brown, flat, wedge-shaped crystals (up to 2 cm long); tourmaline, as jet black grains and crystal aggregates; apatite, as sea-green transparent to translucent crystals (measuring up to 18 cm by 4 cm) and as crystalline masses; and scapolite, as light yellowish green transparent crystalline aggregates (about 2 cm across) with vitreous to greasy lustre. The scapolite has a reddish pink fluorescence under the 'short' ultraviolet rays. These minerals occur in a coarse matrix of white to pink calcite, white feldspar and colourless to grey quartz. Less common in occurrence is chondrodite which forms transparent, orange, granular masses up to 1 cm across in white calcite. Brownish pink, turbid grains and tiny crystals of zircon occur sparingly in calcite and feldspar. Tiny books of light to dark smoky-brown mica, graphite flakes and pyrite crystals are disseminated in calcite.

This road-cut is on the west side of the Westport Road; similar rocks are exposed at intervals for about 0.4 km north and south of the cut.

Maps (T): 31 C/10 Tichborne
(G): 33-1964 Tichborne, Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Hickey-Murphy Lead Mine

GALENA, BARITE, APATITE, DIOPSIDE, SERPENTINE, TOURMALINE, GRAPHITE, PYRITE, SPHALERITE.

In a calcite vein cutting crystalline limestone and granite.

Galena occurs as flakes, granular patches and as cubes (up to 1 cm across) in pink to white coarsely crystalline calcite. Massive and coarsely crystalline white barite is closely associated with white to pale mauve, coarse calcite that fluoresces a very bright pink under the 'short' ultraviolet rays. Apatite crystals and granular masses are yellow-green to blue-green; the yellowish variety fluoresces a bright reddish pink under 'short' ultraviolet rays. Brownish black tourmaline crystals averaging 1 cm across are conspicuous in pinkish white calcite. Diopside (small prisms), serpentine, pyrite, graphite and sphalerite are present in minor amounts.

The deposit was opened prior to 1915 by several pits and by two shafts, one on the Hickey farm and the other on the Murphy farm. Specimens are found in small dumps near the shafts and in the pits.

Road log from the Westport Road at km 15.3 (see page 11):

km		
	0.0	Turn left (west) onto a farm lane leading to the Hickey farm.
	0.25	Hickey farmhouse. The Hickey shaft is about 460 m from the house; pits extend 96 to 140 m northwest of the shaft. The Murphy shaft is 168 m southeast of the Hickey.

Refs.: 1 p. 151-153; 34, p. 67-70.

Maps (T): 31 C/10 Tichborne
(G): 33-1964 Tichborne, Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Road-cuts at km 16.7, Westport Road

GRAPHITE, SERPENTINE, PYRITE, TITANITE.

In crystalline limestone.

Graphite (tabular grains and foliated patches) and serpentine (disseminated grains) are the most common minerals. Crystals and patches of pyrite and tiny grains of amber-brown, transparent titanite are found in smaller amounts.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

McLaren Phosphate Mine

APATITE, HORNBLENDE, DIOPSIDE, ACTINOLITE, GARNET, CALCITE, MICA, PYRITE.

In veins cutting Precambrian gneiss.

Most of the apatite is the blue-green granular variety; crystals, measuring up to 2 cm across, occur sparingly. Associated minerals include: black hornblende crystals; diopside crystals and crystalline masses; actinolite, as green radiating aggregates; garnet, as tiny red crystals; coarsely crystalline salmon pink to white calcite; amber mica; and crystalline aggregates of pyrite.

The deposit was worked from 1888 to 1890 and at intervals between 1942 and 1945 by several pits and a shaft. About 1039 t of apatite were produced and sold to the Electric Reduction Company, Limited at Buckingham, Quebec. The deposit is on the farm of Mr. N. Leafloor.

Road log from the Westport Road, at km 17.8 (see page 11):

km		
	0.0	Turn left (north) onto gravel road to Burridge. (At this junction the Westport Road turns sharply to the right.) Crystalline limestone, similar to the road-cut at km 16.7, is exposed at the side of the road (see road log, page 11).
	1.8	Burridge, at crossroad; continue straight ahead.
	2.2	Fork; bear right.
	4.5	N. Leafloor farmhouse on right. A rough road, about 1.9 km long, leads northeast to the workings that extend over a distance of about 183 m.

Refs.: 34 p. 37-40; 80 p. 43.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC).
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

This is the last locality described along the Westport Road; localities off Highway 38 are described below (see road log on page 5).

Long Lake Blue Calcite Occurrence

CALCITE, MICA, DIOPSIDE, SERPENTINE, PYRITE.

In crystalline limestone.

Coarsely crystalline white to sky blue, greenish blue and salmon pink calcite is exposed along a cliff opposite Long Lake. Associated with it, in small amounts, are grains and crystal aggregates of diopside, mica, serpentine and pyrite.

Road log from Highway 38 at km 56.5 (see page 5):

km		
	0.0	Parham; turn left (west) onto Long Lake Road.
	0.4	Junction; turn right.
	1.0	Junction; turn left.
	5.0	Calcite exposure on right.

Maps (T): 31 C/10 Tichborne
(G): 33-1964 Tichborne, Ontario (GSC)
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Long Lake Zinc Mine

SPHALERITE, GALENA, PYRITE, MOLYBDENITE, PYRRHOTITE, CHALCOPYRITE, HYDROCERUSSITE, HYDROZINCITE, DIOPSIDE, GARNET, VESUVIANITE, SERPENTINE, CALCITE.

In crystalline limestone.

Dark brown sphalerite occurs as granular masses and disseminated grains with galena, pyrite, molybdenite, pyrrhotite and chalcopyrite in colourless, white to greenish white, grey to almost black crystalline calcite. Hydrocerussite and hydrozincite form white, finely granular, irregular encrustations on the ore; hydrozincite fluoresces bluish white under the 'short' ultraviolet rays. Small crystalline masses of light green diopside, brownish yellow garnet and light yellow vesuvianite occur in calcite. Much of the diopside has been altered to serpentine. Some of the calcite, particularly the white variety, fluoresces pink under the 'short' ultraviolet rays. An attractive marble composed of a white matrix with salmon pink blotches is found in the dumps; it takes a good polish and is suitable for lapidary purposes.

The deposit was discovered in 1901 by Leslie Benn who sank the first pit and recovered 90 t of zinc ore. Since then it has been held by James Richardson and Sons. Intermittent development of the property from 1901 to 1909 by 5 shafts and several open-cuts resulted in the production of 3147 t of ore. In 1950, further exploration was done on shaft No. 2 and a concentrating unit was installed by Rochette Gold Mines, Limited but no shipments were reported. The property is also known as the Olden and the Richardson zinc mines.

Road log from Highway 38, at km 56.5 (see page 5):

km		
	0.0	Parham; turn left (west) onto Long Lake Road.
	0.4	Junction; turn right.
	1.0	Junction; turn left.
	5.1	Blue calcite occurrence on right.
	5.9	Junction; turn left.
	8.2	Crossroad at Long Lake village; turn left.
	8.8	Junction mine road on right; turn right.
	9.0	Shaft No. 2 (38 m deep) and dump. The other workings extend 90 yards to the west and 137 yards east northeast of this shaft.

Refs.: 1 p. 146-151; 34 p. 91-94; 86 p. 7.

Maps (T): 31 C/10 Tichborne.
(G): 1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Gabbro Quarry

GABBRO, FELDSPAR.

The gabbro is a black, coarse-textured rock containing a few veins (about 1 cm wide) of brick red feldspar.

The quarry was worked from 1936-1942 by Building Products Limited of Montreal; the rock was crushed at a mill in Verona and used for roofing and stucco. The quarry is about 7.5 m deep and is now water-filled. Broken blocks of the rock lie adjacent to it. The deposit is on the farm of Mrs. J. Drew.

Road log from Highway 38, at km 56.5 (see page 11):

km		
	0.0	Parham; turn left onto the Long Lake Road and proceed to Long Lake village.
	8.2	Crossroad at Long Lake village; continue straight ahead.
	12.0	Junction; turn left (west).
	15.8	Turn-off to the Drew farmhouse on left. (This turn-off is 5.0 km from Highway No. 7.) The quarry is approximately 183 m west of the farmhouse.

Ref.: 34 p. 45.

Maps (T): 31 C/10 Tichborne
(G): 1947-5 Olden-Bedford, County of Frontenac, Ontario (Ont. Geol. Surv.).

Road-cut on Highway 38 at km 57.6 *(see page 11)*

SERPENTINE, TREMOLITE, TOURMALINE, MICA, CALCITE, GRAPHITE.

In crystalline limestone.

The limestone contains patches of pea-green to yellow-green serpentine, greenish grey tremolite, amber-yellow to brown tourmaline (disseminated grains), amber and black mica, pink crystalline calcite, and graphite (flakes). The exposure is on the north side of Highway 38, 1.1 km west of its junction with the Long Lake Road.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC).
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Eagle Lake (Blessington) Mine

APATITE, MAGNETITE, SCAPOLITE, TITANITE, TOURMALINE, HORNBLENDE, PYROXENE, CALCITE, MICA.

In veins cutting gabbro.

Hornblende, calcite, pyroxene and light green apatite are the most common minerals in the dumps. Scapolite, as greenish yellow, transparent crystals (about 1 cm long) and as greenish yellow transparent to greenish grey turbid crystalline aggregates, is commonly associated with pink to white calcite; it fluoresces a bright reddish pink under the 'short' ultraviolet rays (turbid variety does not fluoresce as brightly as the transparent variety does). Massive jet-black tourmaline, black mica, and tiny crystals of reddish brown titanite occur with calcite. Titaniferous magnetite veins cut the apatite-pyroxene rocks.

The deposit was worked from 1887 to 1891 by several open pits extending for 122 m along the west side of a hill. Approximately 3629 t of phosphate and 635 t of iron ore were recovered. Operations in this and other Ontario phosphate mines were terminated when the low-cost Florida deposits came into production in about 1900. The openings are now water-filled but specimens can be obtained from numerous dumps. The deposit is on the farm of Mr. G.H. Somerville on the west side of Highway 38 at km 62.9 (see page 11). The largest pits are approximately 183 m southwest of the farmhouse.

Refs.: 34 p. 5, 35; 67 p. 11; 80 p. 44-45.

Maps (T): 31 C/10 Tichborne.
(G): 33-1964 Tichborne, Ontario (GSC).
1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Sharbot Lake Road-cuts on Highway 38, km 72.6 to km 72.7 *(see page 11)*

TOURMALINE, MICA, PYROXENE, CHLORITE, TALC, SERPENTINE, MAGNETITE, PYRITE.

In crystalline limestone.

Crystals (measuring up to 8 cm long) and crystalline masses of dark brown tourmaline are common. Other minerals present are: dark brown mica; greyish white massive and finely foliated talc; pyrite and magnetite grains. Pyroxene, as small crystals (about 2 cm long) and crystalline masses, is commonly altered to chlorite and serpentine.

The road-cuts are on both sides of the highway, just north of the causeway on the narrows of Sharbot Lake.

Maps (T): 31 C/15 Sharbot Lake.
(G): 1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

Road-cut on Highway 38 at km 74.3 *(see page 11)*

TOURMALINE, AMPHIBOLE, SCAPOLITE, MICA, PYRITE, CALCITE.

In crystalline limestone.

Tourmaline is dark brown and similar to the occurrence at km 72.6-72.7. Crystals and crystalline masses of light green amphibole and greyish green scapolite are rather abundant in white coarsely-crystalline calcite. The scapolite fluoresces orange-yellow when exposed to the 'long' ultraviolet rays. Dark brown mica and pyrite are disseminated in the calcite.

The exposure is on the west side of the highway.

Maps (T): 31 C/15 Sharbot Lake.
(G): 1947-5 Olden-Bedford area, County of Frontenac, Ontario (Ont. Geol. Surv.).

This is the last locality described along Highway 38; the main road log along Highway 2 east from Kingston is resumed.

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km 0.0 **Kingston, at traffic circle (junction highways 2 and 33);** proceed east on Highway 2.

km 1.8 **Kingston, at junction Highway 2 (Princess Street) and Division Street.**

Kingston-Westport-Perth Occurrences

Road log for the Kingston-Westport-Perth area via Perth Road (underlined localities are described in text following road log):

km		
	0.0	Proceed north along Division Street.
	3.5	Turn-off to Frontenac quarry on right.
	3.9	Turn-off to Highway 401, east.
	5.8 to 8.4	Road-cuts. See Frontenac quarry for rock description.
	10.0	Crossroad; continue straight ahead.
	20.4	Quarry (abandoned) on left. See Frontenac quarry for rock description.
	27.5	Perth Road, at post office and junction (left) to Frontenac lead mine and Lacey mine.
	37.3	Bridge over narrows of Buck Lake.
	40.8	Junction (on right) Buck Lake Road to Stoness mine.
	54.9	Junction Highway 42. Road on right leads to Newboro and Matthews mine; turn left to continue log to Perth.
	56.1	Westport, at junction road to Godfrey; turn right toward centre of town.
	56.9	Westport; turn left onto road to Perth.
	57.9	Junction; turn right.
	59.4	Fork; bear left.
	61.8	Junction; turn right.

km		
	65.8	Feldspar quarry on left.
	66.6	Junction; turn left onto road to Black Lake.
	67.2	Fork; bear right.
	68.4	Gate to Timmins mine on right. The foundation of an old farmhouse is just south of the gate.
	70.8	Junction; turn left onto road to Black Lake, Stanleyville.
	71.9	Junction; continue straight ahead.
	73.0	Junction (on right) road to Silver Queen, Baby, and Rogers mines; to continue log, proceed straight ahead.
	76.6	Junction single lane road on right to Byrnes mine. Log continues straight ahead on main road.
	78.2	Crossroad; continue on main road.
	79.8	Crossroad; turn left to Stanleyville for Olympus and Pike Lake mines. Log continues straight ahead.
	81.7	Junction; turn right onto Westport-Perth Road.
	82.4	Crossroad; continue straight ahead.
	84.5	Junction; turn right.
	89.1	Junction (on right) Otty Lake North Shore Road to Kent and McLaren mines.
	91.4	Perth, at junction road to Rideau Ferry, to Perthite occurrence and Globe graphite mine. To continue log, turn left onto Gore Street.
	92.0	Perth, at junction Highway 43, continue straight ahead.
	93.5	Perth, at junction (on left) road to Christie Lake and to Fournier mine.
	94.1	Junction Highway 7.

Frontenac Quarries Limited

BARITE, CALCITE, PYRITE, FOSSILS.

In limestone.

Barite occurs as white tabular aggregates associated with colourless to white crystalline calcite. Large cavities (about 20 cm across) in limestone are commonly filled with pink to white coarsely crystalline calcite. Veinlets and tiny cubes of pyrite occur in calcite. The limestone is dense, dark grey (weathering to greyish white) and contains corals and other fossils common to the Black River Group (see description of Kingston Township quarry). The crushed rock is being used for road construction.

The quarry is located approximately 140 m east of Division Street at km 3.5. Similar limestone beds are exposed along the road to Perth Road at km 5.8 to 8.4 and at the abandoned quarry at km 20.4 (see page 19).

Ref.: 38 p. 67-69.

Maps (T): 31 C/8 Gananoque.
(G): 27-1962 Gananoque, Ontario (GSC).

Frontenac (Frontenac Draper Lake) Lead Mine

GALENA, SPHALERITE, PYRITE, CHALCOPYRITE, BARITE, CERUSSITE, HYDRO-CERUSSITE, CELESTITE, MARCASITE, TOURMALINE.

In veins cutting crystalline limestone and gneiss.

Crystalline galena is associated with dark brown sphalerite, pyrite and small amounts of chalcopyrite in coarsely crystalline white, pink or lilac coloured calcite. Tiny clusters of cream-white platy barite occur on the calcite. Cerussite and hydrocerussite form greyish white coatings on the ore. Sky-blue celestite crystals (up to 10 cm long) and marcasite have been reported to line cavities in calcite. Jet black crystalline tourmaline occurs with calcite in gneiss. The calcite fluoresces bright pink when exposed to ultraviolet rays ('short' rays are more effective than the 'long') and hydrocerussite fluoresces pale yellow under the 'long' rays.

The deposit was worked by three shafts. The first shaft, a mill and a furnace was in operation prior to 1869 and one to two thousand t of ore were mined. Two other shafts were subsequently sunk and the mine was in production from 1916 to 1917. Exploration work was done by New Calumet Mines Limited (in 1948) and by Draper Lake Frontenac Lead Zinc Mines Limited (in 1951-52). Specimens are plentiful in large dumps adjacent to shafts No. 1 (95 m deep) and No. 3 (57 m deep). The most recent work was done on shaft No. 3. Specimens of galena in calcite were exhibited at the Philadelphia International Exhibition (1876), the Paris Exposition (1878) and the London Colonial and Indian Exhibition (1886).

Road log from Perth Road at post office (km 27.5 on Kingston-Westport-Perth road, see page 19):

km		
	0.0	Turn left (west) onto gravel road.
	0.8	Junction single lane road on right; turn right.
	0.9	Fork. The right fork leads 0.6 km to shaft No. 1 located on the left (south) side of the road just east of the railway crossing. This property belongs to L.B. Harris of Kingston. To reach shaft No. 3 proceed as follows from km 0.8.
	0.8	Continue straight ahead.
	2.6	Junction; continue straight ahead.
	3.4	Junction; turn right.
	5.3	Junction; turn left.
	5.4	Junction farm lane on right. Obtain permission to enter at farmhouse. Follow the farm lane 0.8 km to the mine.

Refs.: 1 p. 142-145; 35 p. 25; 86 p. 5-6; 89 p. 164-165; 97 p. 34; 98 p. 48.

Maps (T): 31 C/7 Sydenham.
(G): 25E south part of Frontenac County, eastern Ontario (Ont. Geol. Surv.).

Lacey Mica Mine

MICA, APATITE, CALCITE, PYROXENE, TITANITE, ZIRCON, ACTINOLITE, TALC, DATOLITE, SCAPOLITE, PYRITE, GRAPHITE, MOLYBDENITE, CHALCOPYRITE.

In veins cutting pyroxenite.

Very large crystals of amber mica (275 cm in diameter), blue to greenish blue apatite (25 cm across), light to dark green pyroxene (15 cm across and 45 cm long), titanite (10 cm across) and zircon (1 cm across and 4 cm long) have been found at this deposit.

Other minerals reported include: white to pink calcite; fibrous aggregates of dark green actinolite; grey to green talc; transparent, yellowish green datolite crystals (measuring up to 3 x 3.5 x 2 cm); greenish grey scapolite; and small grains and/or patches of metallic minerals. Except for mica, apatite and pyroxene, most of the minerals are now difficult to find.

The deposit was discovered in 1882 and was worked originally for phosphate, and later mica was produced as a by-product. After about 1890 only mica was mined because of competition from foreign phosphate producers. At this time mica was in demand to meet the requirements of the newly developing electrical industry and from 1886 to about 1920, Canada was the world's chief supplier of amber mica. The Lacey mine was the largest mica mine in Canada and was in continuous operation until 1927 and again from 1944 to 1947. The total production amounted to 5443 t of mica and 181 t of apatite. The deposit was originally worked from a shaft (56.4 m deep). Open pit operations commenced in 1906. The mine was operated for about 25 years by the General Electric Company and it is sometimes referred to by that name.

Road log from Perth Road at post office (see log for Frontenac lead mine, page 21):

km		
	0.0	Turn left (west) onto gravel road.
	0.8	Turn-off to Frontenac lead mine (Shaft No. 1); continue straight ahead on main road.
	2.6	Junction; continue straight ahead.
	3.4	Junction road to Frontenac Shaft No. 3; turn left.
	4.7	Junction; turn right onto improved dirt road.
	6.4	Junction single lane road on right. Turn right and proceed to mine.
	7.4	Main pit on left.

Refs.: 2 p. 30; 40 p. 14-15; 42 p. 116; 54 p. 197; 74 p. 141-143, 286; 80 p. 45-46; 82 p. 69-70.

Maps (T): 31 C/7 Sydenham.
(G): 2054 Gananoque area, Ontario (Ont. Geol. Surv., 1 inch to 2 miles).

Stoness Mine

APATITE, MICA, CALCITE.

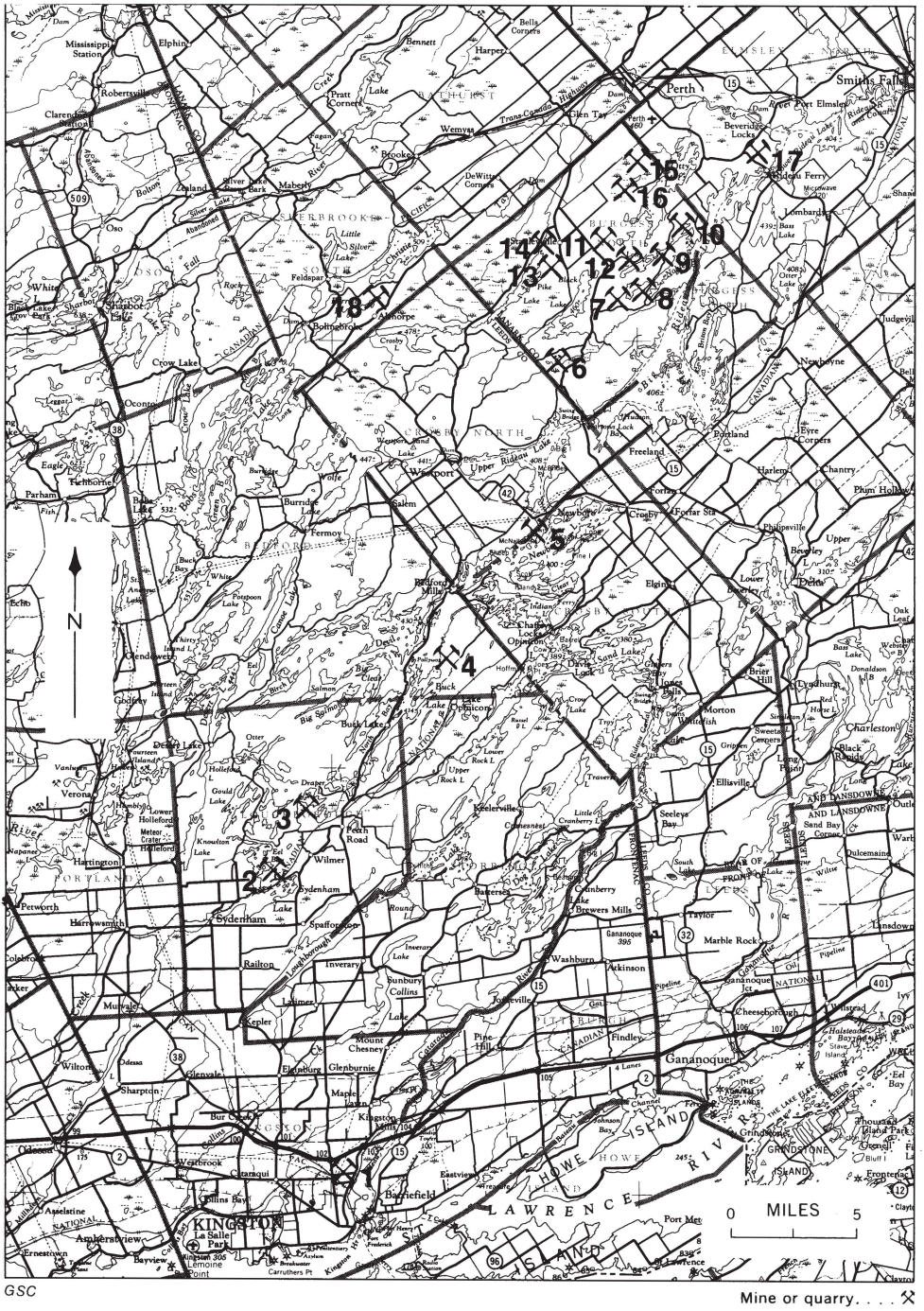
In veins cutting pyroxenite.

The deposit consists of blue-green apatite crystals and granular masses, light amber mica and pink coarsely crystalline calcite. It was worked for mica by a series of pits in 1901 and 1902. The largest pit, about 8 m deep is located near the shore of Buck Lake.

Access from km 40.8 of Kingston-Westport-Perth road (see page 19) is by a single-lane road, 2.6 km long, leading to the shore of Buck Lake. There are several small pits along the road beginning about 1.6 km from the turn-off. Near the end of the road, a trail leads left for approximately 185 m to some large dumps. The openings are overgrown and dangerous to enter.

Ref.: 74, p. 155.

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).



Map 2

Kingston-Westport-Perth area

1. Frontenac Quarry;
2. Lacey Mine;
3. Frontenac lead mine;
4. Stoness Mine;
5. Matthews Mine;
6. Timmins Mine;
7. Silver Queen Mine;
8. Baby Mine;
9. Rogers Mine;
10. Perthite occurrences;
11. Byrnes Mine;
12. Hanlon Mine;
13. Olympus Mine;
14. Pike Lake Mine;
15. Kent Mine;
16. McLaren Mine;
17. Globe Mine;
18. Fournier Mine

Matthews Mine

MAGNETITE, ILMENITE, PYRITE.

In gabbroic anorthosite.

The ore consists of titaniferous magnetite with minor ilmenite and pyrite. It occurs as disseminations and as granular masses in anorthosite.

The deposit was worked from 1860 to 1871 for magnetite from an open pit that measured 91 m by 30 m and 12 m deep. It is now held by New Mylamaque Mining and Smelting Limited who conducted a program of diamond drilling between 1958 and 1960. Specimens are available from two dumps near the pit.

Road log from Kingston-Westport-Perth road at km 54.9 (see page 19):

km		
	0.0	Turn right (south) onto Highway 42.
	3.2	Junction Rideau Road (on left); continue straight ahead.
	6.4	Junction (on right) Mon Okel Road; turn right and leave Highway 42. (This junction is 6.7 km west of the junction of Highways 42 and 15.)
	6.6	Junction single-lane road on right; turn right.
	7.2	Matthews mine. The pit is approximately 69 m south of the buildings.

Refs.: 67 p. 12-14; 96 p. 124-125.

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Feldspar Quarry at km 65.8 on Kingston-Westport-Perth Road

FELDSPAR, BIOTITE, QUARTZ, TOURMALINE.

In pegmatite.

The small quarry exposes reddish pink feldspar, biotite, quartz and black tourmaline crystals (up to 12 cm). The opening is in the woods on the north side of the road (see road log page 20).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Timmins Mine

GRAPHITE, TOURMALINE, TITANITE, PYROXENE, CALCITE, MICA, PYRITE.

In silicated crystalline limestone.

Graphite occurs as disseminated flakes in association with grains or small crystals of orange-brown tourmaline, brownish yellow titanite, green pyroxene, pink to white calcite, mica and pyrite. The tourmaline fluoresces deep yellow when exposed to 'short' ultraviolet rays.

The deposit was worked (1918, 1919) for graphite by open pits, and in 1951 was diamond-drilled by Frobisher Limited. The western workings consisted of a mill and 3 pits, the largest measuring 52 m by 3.6 m and 1.5 m deep. This pit is about 45 m east of two smaller ones. Another pit (52 m by 12 m and 6.7 m deep) and a large dump are located 730 m farther east.

To reach the mine proceed through the gate at km 68.4 of Kingston-Westport-Perth road (see page 20) and beyond the farm buildings for about 275 m to the western pits on the south side of the hill, approximately 183 m east of the pond.

Refs.: 41 p. 31-35; 81 p. 28-29; 96 p. 128.

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Silver Queen Mines

APATITE, MICA, TREMOLITE-ASBESTOS, ACTINOLITE, SCAPOLITE, TOURMALINE, DIOPSIDE, WOLLASTONITE, GARNET, TREMOLITE, SERPENTINE, ZIRCON, BARITE, CALCITE, QUARTZ, PYRITE, MARCASITE, PYRRHOTITE, GRAPHITE, MICROCLINE, TITANITE.

In crystalline limestone and pegmatite.

The deposit consists of two mines – a mica-apatite mine and a feldspar mine. Minerals reported from the mica-apatite deposit include: apatite, as blue to light green fine- to coarse-grainular masses and as crystals measuring up to 20 cm long; silvery-amber mica crystals exhibiting asterism; tremolite-asbestos ('mountain leather') as white, fibrous sheets in sugary apatite; actinolite, as dark green prismatic crystals in pink calcite; greyish green scapolite; brownish green, transparent, massive tourmaline; graphite flakes and tiny pyrite crystals in bluish, coarse-grained crystalline limestone that releases hydrogen sulphide (H_2S) when crushed. The limestone also contains small amounts of phlogopite, diopside, wollastonite, zircon, serpentine, hematite, barite, tourmaline, quartz (crystals), marcasite and pyrrhotite; these minerals are found in a small pit near the main mica-apatite openings.

The deposit was opened in 1903 as a mica mine; mica and apatite were recovered between 1905 and 1947. It was developed by a shaft and a few pits. There is a large dump near the shaft and smaller ones nearby.

A feldspar deposit was worked from a pit located 152 m southeast of the mica-apatite shaft. The feldspar is cloudy, bluish white and occurs as crystal aggregates; individual crystals measuring up to 10 cm long have been found. Associated minerals reported from the deposit include: smoky quartz; small, dark brown crystals of titanite; bright blue slender apatite crystals; diopside crystals measuring up to 13 cm long and 5 cm across; green tourmaline; muscovite; and calcite, in shades of yellow and blue. The feldspar releases hydrogen sulphide (H_2S) when crushed. The deposit was worked from 1911 to 1914 and 2712 t of spar were produced.

The mines are in Murphys Point Provincial Park.

Another apatite occurrence is exposed by a pit along the road to the Silver Queen mine. The apatite is bluish green, transparent granular and occurs in white to grey feldspar. Associated minerals include: dark brown crystals of titanite commonly 5 cm long and 2 cm across; light green granular patches (about 2 cm across) of diopside; greenish brown granular patches of tourmaline; dark brown mica and quartz. The pit is at a point 2 km from the turn-off (Km 73.0) from the Kingston-Westport-Perth road.

Road log from km 73.0 of Kingston-Westport-Perth road (see page 20; for alternative route see road log to perthite occurrence, page 30):

km		
	0.0	Turn right (west) at school.
	2.1	Apatite pit on left, just inside the fence.
	3.0	Lally homestead on right. On the left side of the road, a trail leads 500 m to the Silver Queen Mines.
	5.2	Entrance to Murphys Point Provincial Park.

Refs.: 23 p. 118-122; 40 p. 23; 74 p. 167-168, 253-254; 75 p. 21-23; 80 p. 51-53.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Baby Mine

APATITE, MICA, SCAPOLITE.

In pyroxenite.

Red and green granular apatite occurs with amber to dark brown mica and altered scapolite crystals.

The deposit was worked for apatite and mica between 1893 and 1912. The mine consists of several pits and dumps located approximately 365 m west of the Silver Queen mine.

Refs.: 40 p. 23; 74 p. 168-169, 281.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Rogers Mine

APATITE, MICA, CALCITE, CENOSITE, QUARTZ, SPHALERITE, CHALCOPYRITE, CELESTITE, PYROXENE, TOURMALINE, TITANITE.

At contact of gneiss and pyroxenite.

The deposit consists of green, massive and crystalline apatite and phlogopite. The rare mineral cenosite has been found at this locality but is difficult to find now. It occurred as tiny prisms on colourless quartz crystals and on white to pink calcite crystals lining small cavities in coarse limestone. It varied from a transparent pink to almost opaque rose colour. Other minerals found in the cavities are: chalcopyrite, as tiny striated crystals; celestite, as platy aggregates; pyroxene, as rosettes of silvery acicular crystals. Grains of apatite, sphalerite and phlogopite occur in the limestone. Transparent, doubly-terminated quartz crystals up to 5 cm long have been found at this locality. Patches of black granular tourmaline and crystals of dark green pyroxene and of brown titanite (averaging 2 cm long) occur in a coarse quartz-calcite matrix.

The deposit was worked by a series of pits for apatite and mica between 1903 and 1917. The deepest pit is 21.3 m by 1.5 m and is 15.2 m deep. The property belongs to Mr. Ross Tully.

Road log from Kingston-Westport-Perth road at km 73.0 (see page 20; for alternate route see road log to perthite occurrence, page 30):

km		
	0.0	Turn right at school and follow log to Silver Queen mine.
	3.0	Turn-off to Silver Queen mine.
	5.2	Entrance to Murphys Point Provincial Park.
	6.4	Rogers mine in pasture on left (opposite the gate to the T.B. Thompson cottage); walk parallel to the low ridge 180 m to the mine.

Refs.: 31 p. 205-211; 41 p. 23; 74 p. 165.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Byrnes Mine

APATITE, MICA, CALCITE, TITANITE, FELDSPAR, BARITE, CHLORITE, PYRITE.

At contact of gneiss and pyroxenite.

Granular bluish and greyish green apatite occurs with dark brown mica in coarse, salmon to reddish pink calcite. Apatite also occurs in greyish white feldspar where it is associated with dark brown titanite crystals measuring up to 1 cm across. Pyrite is common in the mica-apatite-calcite assemblages. Barite occurs sparingly as cream-white platy aggregates (some radiating) on finely granular white calcite that fluoresces bright pink under 'short' ultraviolet rays. Yellowish brown chlorite is found sparingly with apatite and calcite. In the northernmost pits, originally opened for phosphate, massive red apatite occurs with dark brown mica and a little calcite.

Road log from Kingston-Westport-Perth road at km 76.6 (see page 20):

km		
	0.0	Turn right (east) onto gravel road.
	0.5	Byrnes Mine; on left (north) side of road is the southernmost pit on a ridge about 45 m from the road. The oldest (northernmost) pits are located down the hill, approximately 320 m from the road.

Refs.: 74 p. 176; 80 p. 55.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark, and Leeds Counties, Ontario (GSC).

Hanlon Mine

APATITE, MICA, CALCITE, PYRITE.

In pyroxenite.

Two varieties of apatite occur: the light green sugary variety and clear bluish green crystals. The mica is silvery- to smoky-brown. These minerals are associated with coarsely crystalline white, pink or salmon pink calcite containing tiny pyrite crystals. Blue calcite has also been reported from the deposit.

The deposit was worked for mica by a series of pits and shafts from the late 1890's to 1909. It was one of the district's principal producers. The pits are now water-filled but specimens may be found in numerous dumps. The mine is on the property of Mr. M. Nagle and is located in the woods about 90 m north of the farmhouse.

Road log from Kingston-Westport-Perth road at km 76.6 (see page 20):

km		
	0.0	Turn right (east) onto gravel road.
	0.5	Byrnes mine on left; continue straight ahead.
	0.9	Turn-off (right) to the M. Nagle farmhouse.

Ref.: 74 p. 171-172.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Olympus Mine

VERMICULITE, TALC, CHLORITE, DIOPSIDE, SERPENTINE, PHLOGOPITE, CALCITE.

In serpentinized metamorphic pyroxenite.

The vermiculite ranges in colour from silvery amber to smoky brown. It is an alteration product of phlogopite and is associated with conglomerations of greyish and bluish green talc, light green chlorite, green diopside, serpentine, calcite and phlogopite.

The vermiculite deposit was discovered in 1950 by C.G. Bruce of the Mines Branch, Ottawa. The first exploration work was done by Siscoe Gold Mines Limited soon after the discovery, and in 1960 Olympus Mines Limited commenced development by an open pit. A pilot mill was in operation during part of 1965 and 1966. In July 1966, the pit was water-filled and there was a large stock-pile adjacent to it.

Road log from Kingston-Westport-Perth road at km 79.8 (see page 20):

km		
	0.0	Turn left (west) onto road to Stanleyville.
	1.3	Stanleyville, at crossroad; turn left.
	1.9	Junction road to Olympus mine; turn right.
	2.6	Mine.

Refs.: 33 p. 7-11; 99 p. 245.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Pike Lake Mine

MICA, TOURMALINE, ZIRCON, SERPENTINE, QUARTZ, HEMATITE, PYRITE.

In pyroxenite.

Mica occurs as large sheets and as large aggregates (about 30 cm across) of cleavage plates. In colour, it varies from silvery-amber to dark brown. Large sheets of the mica were shipped to Paris in 1860 for use as port-holes in French battleships. Associated with the mica are brown tourmaline, light yellow zircon, serpentine, quartz, hematite and pyrite. Small cavities in limestone have been found to contain zircon and serpentine with hematite and quartz. Mica specimens were exhibited at the Philadelphia International Exhibition, 1876.

This was one of the first mica deposits to be worked in the province, being worked as far back as 1860 for use in the stove industry. It was last worked in 1902 by numerous pits (some over 30 m deep) along a ridge overlooking Pike Lake. The dumps, in wooded areas near the pits, are now partly overgrown and covered with moss. The mine is on the property of J. Anderson.

Road log from Kingston-Westport-Perth road at km 79.8 (see page 20):

km		
	0.0	Turn left (west) onto road to Stanleyville.
	1.3	Stanleyville at crossroad; continue straight ahead (road on left leads to Olympus mine).
	1.9	Fork; right fork leads 0.3 km to J. Anderson farmhouse (obtain permission here). To continue log, follow left fork.
	2.2	Fork; bear right.
	2.3	Pits are on right side of road in the woods.

Refs.: 23 p. 2-3, 35-36; 74 p. 181; 97 p. 124.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Kent Mine

APATITE, MICA, GRAPHITE, MAGNETITE, PYROXENE, SCAPOLITE, WILSONITE.

In pyroxenite.

Small amounts of green apatite occur with pale mica, graphite, magnetite and colourless pyroxene grains (which fluoresce greenish white under 'short' ultraviolet rays) in white, coarsely crystalline calcite. Scapolite and pinkish mauve to rose red wilsonite have been reported to be plentiful at this locality but specimens are now difficult to find. Wilsonite was discovered by Dr. James Wilson, a Perth medical doctor, who submitted a specimen of the rose red mineral resembling wollastonite to Queen's University for identification. It was associated with crystalline white diopside, mica, apatite crystals, calcite and chalcopyrite. In 1853, T.S. Hunt of the Geological Survey of Canada named the mineral for Dr. Wilson as a tribute to a knowledgeable and "zealous student of the mineralogy of his district" (ref. 44).

The deposit was first worked for apatite in 1855 and is believed to have been the first phosphate mine in Canada. It was worked in 1870 by the Hon. R. Matheson of Perth and in 1907 by Kent Bros. of Kingston who operated it for mica. One large pit (19 m by 75 m and 75 m deep) and several small openings near the shore of Andrew Lake expose the deposit. Most of the dumps are now overgrown. The deposit is on the farm of Mrs. W. Baron.

Road log from Kingston-Westport-Perth road at km 89.1 (see page 20):

km		
	0.0	Turn right (south) onto Otty Lake, North Shore Road.
	3.4	Turn right onto single lane road.
	4.7	Baron farmhouse at end of road. The pits are in the woods near the eastern end of the lake, approximately 410 m south of the barn.

Refs.: 44 p. 168-171; 74 p. 177-178, 300; 80 p. 55-56.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

McLaren Mine

APATITE, MICA, PYROXENE, TITANITE, TOURMALINE, GYPSUM, ANHYDRITE, ZIRCON, QUARTZ, FELDSPAR, PYRITE.

In pyroxenite.

Blue-green granular and crystalline apatite is associated with dark brown mica, green pyroxene and minor amounts of pink to orange calcite and pyrite in a quartz-feldspar matrix. Jet black massive tourmaline and reddish brown transparent titanite crystals (very small) and crystalline masses occur sparingly in quartz. Transparent, pink grains of zircon were noted in mica. During mining operations, anhydrite and gypsum were found. Anhydrite occurred as lilac-coloured cleavable masses with snow white, finely granular gypsum; in some specimens the two minerals formed alternating layers resulting in a banded structure. Another mineral collected during mining operations was zircon which occurred as reddish brown crystals (measuring up to 3 cm long) characterized by a very brilliant lustre. The last three minerals described are difficult to find in the dumps now. Mica books measuring 60 cm across were mined. Apatite specimens from this deposit were exhibited at the 1878 International Exhibition in Paris.

The deposit was operated by numerous trench-like pits between 1870 and 1912. The deepest pits are over 30 m deep. Both apatite (6532 t) and mica were produced. The deposit is on the property of Mrs. W.L. McLaren. The dumps are moss-covered and now partly overgrown.

Road log from Kingston-Westport-Perth road at km 89.1 (see page 20):

km		
	0.0	Turn right (south) onto Otty Lake North Shore Road.
	3.2	Mrs. W.L. McLaren's farmhouse on right. Obtain permission to enter mine.
	3.4	Turn-off to Kent mine; continue straight ahead.
	5.8	Fork; bear right.
	6.6	Gate to McLaren property. The pits are on both sides of road leading to the farmhouse (located 230 m from the gate) and in the woods to the north and south of the house.

Refs.: 25 p. 475-476; 35 p. 67; 58 p. 384-391; 74 p. 178-179; 80 p. 56-57.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Perthite Occurrence

PERTHITE, QUARTZ, PYROXENE, CHLORITE, MAGNETITE.

In pegmatite dyke.

Perthite and quartz are the main constituents of the dyke. Accessory minerals include: greenish black pyroxene, chlorite and magnetite. The presence of these dark minerals precludes the use of much of the perthite as a gem stone. The perthite, an intergrowth of colourless plagioclase and pink microcline, exhibits the characteristic laminated structure. The plagioclase has a silvery satin lustre which is most noticeable in the polished cabochon.

Dr. James Wilson, of Perth, discovered perthite on the Dobey farm near the west side of Adam Lake. He sent a specimen for identification to Professor Thomas Thomson of the University of Glasgow who named it for Perth in 1843. A polished specimen of perthite was exhibited at the Philadelphia International Exhibition in 1876. The dyke is exposed at two localities between Otty and Adam Lakes. One is on the farm of Mr. Glenn Poole.

The log for this occurrence may also be followed to reach the Rogers (see page 26) and Silver Queen (see page 25) mines.

Road log from Kingston-Westport-Perth road at km 91.4 (see page 20):

km		
	0.0	Perth at junction Gore Street E and Lanark County Road No. 4; proceed onto road to Rideau Ferry.
	5.9	Junction; turn right onto Elmgrove Road (Lanark County Road No. 21).
	7.2	Junction; Otty Lake Road 1; continue along paved road.
	8.3	Junction; Rideau Lake Road 1; continue along paved road.
	11.2	Turn-off to Glenn Poole farmhouse on left. Arrangements to visit the perthite occurrence on the Poole property may be made here.
	12.0	Clearing on farm on left. The dyke containing perthite is exposed on the farm about 90 m north of this point.
	12.15	Junction; on left, Cherie Hill Road; continue along paved road for main perthite occurrence.
	12.25	Perthite exposure in woods on right side of road. The dyke has been dynamited and specimens can be obtained from broken blocks near it.
		For alternate route to reach Rogers and Silver Queen mines (see pages 25, 26), continue straight ahead.

km 15.3 Rogers mine in pasture on right, opposite T.B. Thomson gate.

16.45 Entrance to Murphys Point Provincial Park.

25.5 Turn-off (right) to Silver Queen and Baby mines.

Refs.: 23 p. 78; 87 p. 189; 97 p. 133.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Globe Graphite Mine

GRAPHITE, PYROXENE, SERPENTINE, CHLORITE, TITANITE, TOURMALINE, MICA, FELDSPAR, CALCITE, SCAPOLITE, PYRITE.

In silicated crystalline limestone.

The minerals occur as disseminations in white crystalline limestone. Graphite is most abundant in limestone containing a high percentage of dull green pyroxene which is commonly altered to serpentine and chlorite. Dark brown, wedge-shaped crystals (averaging 2 cm long) of titanite are common in quartz-feldspar matrix. Tourmaline occurs as brownish orange grains in limestone.

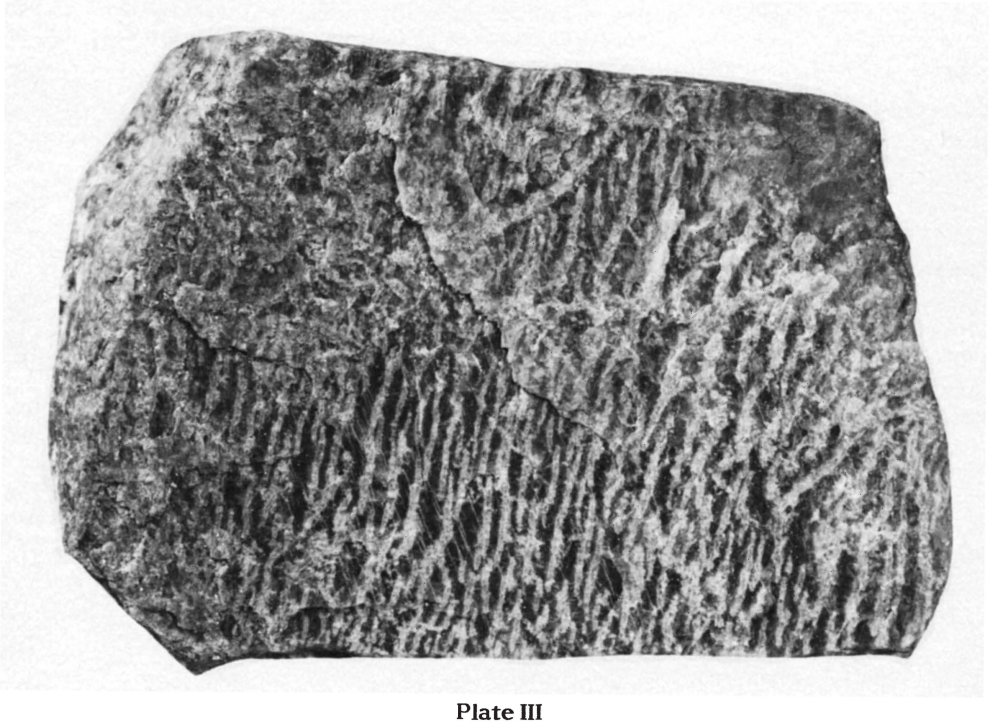


Plate III

Perthite showing microcline (dark) and plagioclase (light) intergrowths, Perth area. Specimen courtesy National Mineral Collection (actual size). (GSC 200383-E)

The deposit was worked intermittently between 1870 and 1919 and was the first graphite mine in Ontario. The main workings consisted of an open pit (122 m by 3 to 9 m) and two shafts (16 m and 32 m deep). Originally the ore was treated at a mill at Rideau Ferry (formerly Oliver's Ferry). In 1902, an old woolen mill on the Tay River in Port Elmsley was converted into a plant for the treatment of graphite ore. Specimens may be obtained from small dumps adjacent to the pit. The deposit is on the property of Mr. James Coutts.

Road log from Kingston-Westport-Perth road at km 91.4 (see page 20):

km		
	0.0	Turn right onto road to Rideau Ferry (see log for perthite occurrences, page 30).
	1.8	Junction; continue straight ahead.
	6.1	Junction road to Otty Lake; continue straight ahead.
	8.4	James Coutts house on left. Obtain permission to enter Globe mine.
	8.5	Junction; road turns right to Rideau Ferry. Continue straight ahead along Port Elmsley Road.
	9.0	Globe mine on right opposite the John McLean farmhouse. To reach the pit walk south along the fence (separating a garden and field) for 182 m. The pit is in a wooded area and extends in an east-west direction on both sides of the fence. Most of the mining operations were conducted from the eastern end of the pit and from the shaft directly south of this end. The other shaft is located 60 m from the road on the east side of the fence.

Refs.: 23 p. 3; 41 p. 35-38; 93 p. 29-42; 98 p. 29-35.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

Fournier Mine

MAGNETITE, APATITE, MICA, HORNBLENDE, SCAPOLITE, PYROXENE, PYRITE, CHALCOPYRITE.

In gneiss.

Massive magnetite is associated with minor amounts of apatite, mica, etc. The scapolite is granular massive, greenish to yellowish grey and fluoresces a rose red colour when exposed to 'short' ultraviolet rays.

The deposit was worked by numerous pits and a shaft in the 1870s. About 544 t of ore were produced. Most of the pits have since been filled in. Specimens of magnetite may be obtained from several small dumps. The deposit is on the farm of Mr. W. Fournier.

Road log from Perth at km 93.5 of Kingston-Westport-Perth road (see page 20):

km		
	0.0	Turn left onto road to Christie Lake.
	14.1	Junction; turn left.
	15.2	Junction; turn right.
	20.3	Junction road to Christie Lake Boy's Camp; continue straight ahead.
	24.0	W. Fournier farmhouse on right. The dumps are in the pasture just north of the house.

Ref.: 67 p. 38.

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

This is the last locality described along the Kingston-Westport-Perth road; the main road log along Highway 2 east from Kingston is resumed from page 19.

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km 4.8 Kingston, at junction Highway 15.

Kingston-Smiths Falls Occurrences

Road log for side trip along Highway 15 from Kingston to Smiths Falls (underlined localities are described in text following road log):

km		
	0.0	Leave Highway 2 and proceed north along Highway 15.
	3.0	McGinnis & O'Connor quarry on left.
	6.6	Turn-off to Highway 401 east.
	6.7	Turn-off to Highway 401 west.
	7.1	Road-cut on right. See McGinnis & O'Connor quarry description for description of rock.
	16.6	Junction road to Joyceville Penitentiary.
	17.5	Junction, on right, road to Griffin Brothers Quarry.
	18.0	Junction Joyceville Road.
	37.3	Junction Highway 32.
	37.8	Road-cuts, both sides of highway.
	38.4	Junction Leeds County Road 2. A side trip to Black Rapids and Higley Lake quartz crystal occurrences begins at this junction (see page 36).
	43.4	Road-cut, on left.
	43.5	Morton, at bridge.
	43.6	Road-cut, on left.
	43.7	Junction, road to Jones Falls.
	43.8 to 44.9	Road-cuts.
	45.0	Turn-off (left) to Morton Park picnic site.
	45.2 to 45.5	Road-cuts on both sides of highway.
	51.2	Turn-off (right) to Elgin.
	51.9	Road-cuts, both sides of highway.
	58.1	Junction Highway 42.
	64.7	Junction Harlem-Cedar Cove Road.
	67.7	Road-cut on left.
	67.8	Junction Burgess Road.
	68.9	Road-cuts, both sides of highway.

km	71.1	Junction Portland Graphite Road.
	76.9	Road-cuts both sides of road.
	79.8	Junction Otter Lake Road.
	81.4	Junction road to Rideau Ferry, Perth via Lombardy.
	92.0	Smiths Falls, at junction Highway 29 (i.e. Lombard and Brockville Streets).
	92.9	Smiths Falls, at junction Highway 43 (i.e. intersection Beckwith and Elmsley Streets).

McGinnis & O'Connor Quarry

CELESTITE, CALCITE, MARCASITE, FOSSILS.

In Black River Limestone.

This limestone is similar to that found in the Kingston Township and McFarland quarries except that fossils are much less abundant. Colourless calcite crystals (dogtooth spar) commonly fill cavities in the limestone and, occurring on the calcite are colourless to white, elongated tabular aggregates of celestite. Marcasite occurs sparingly in the limestone and in calcite. The road-cut at km 7.1 exposes similar rock to that found in the quarry.

The quarry and crushing plant are operated by McGinnis & O'Connor Limited. The stone is used for road construction and concrete aggregate. The entrance to the quarry is 0.15 km west of Highway 15 at km 3.0 (see page 33).

Ref.: 38 p. 69-71.

Maps (T): 31 C/8 Gananoque.
(G): 27-1962 Gananoque, Ontario (GSC).

Griffin Brothers Quarry

GYPSUM, CALCITE, FOSSILS.

In Black River Limestone.

Colourless to grey calcite crystals (dogtooth spar) occur in limestone cavities measuring up to 20 cm across. Gypsum (selenite), as transparent tabular plates (about 2 cm long), is associated with calcite in some cavities. Fossils characteristic of the Black River limestones are found sparingly in the rock.

The quarry belongs to Griffin Brothers contractors of Gananoque. Access is by a road, 0.15 km long, leading east from Highway 15 at km 17.5 (see page 33).

Maps (T): 31 C/8 Gananoque.
(G): 27-1962 Gananoque, Ontario (GSC).

Road-cuts at km 37.8, Highway 15

TOURMALINE, TITANITE, SERPENTINE, PYRITE, GRAPHITE, MICA.

In white pegmatite and crystalline limestone.

The road-cuts expose white pegmatite composed of white feldspar and tan-coloured quartz, and crystalline limestone. The pegmatite contains columnar aggregates (up to 8 cm long) of dark brown tourmaline, tiny brown crystals of titanite and small patches of pyrite, graphite and dark mica. Grains of serpentine, pyrite, titanite and graphite occur in crystalline limestone.

Maps (T): 31 C/8 Gananoque.
(G): 27-1962 Gananoque, Ontario (GSC).

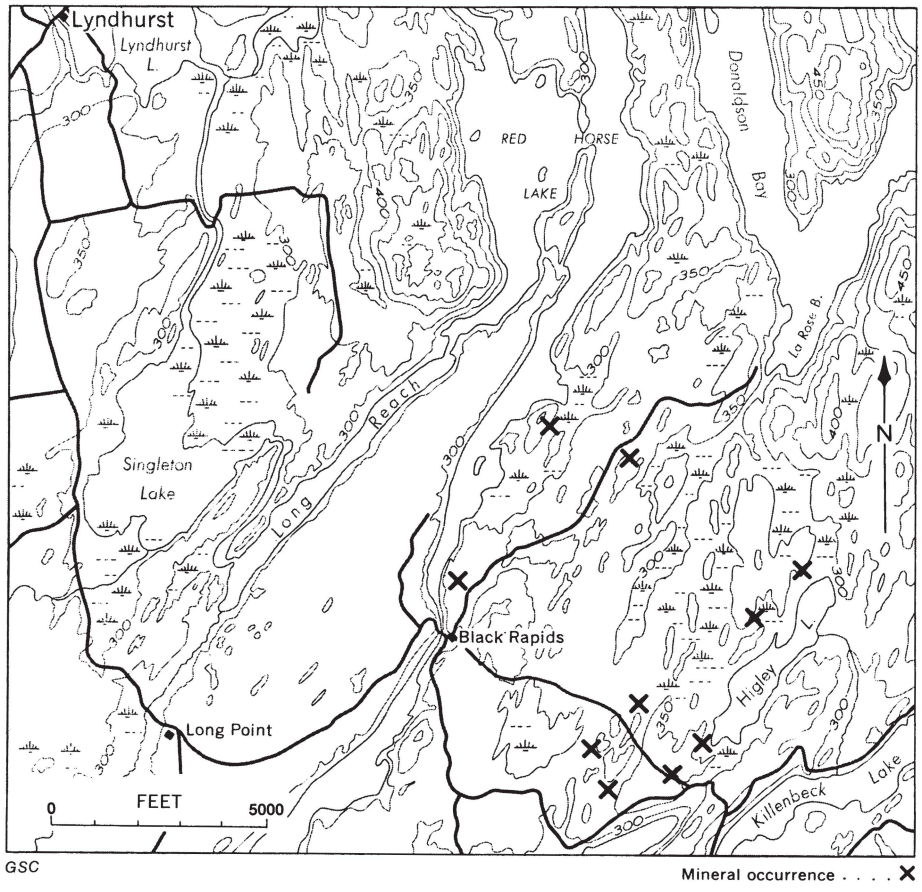
Black Rapids, Higley Lake Quartz Crystal Deposits

QUARTZ-CRYSTALS, BARITE, CHLORITE, HEMATITE.

In quartz veins cutting brecciated quartzite, gneiss, crystalline limestone, granite.

The quartz crystals occur as aggregates and as individual doubly-terminated crystals up to 12 cm long and about 2 cm across. They occupy vugs in milky quartz. The smaller crystals are clear but the larger ones are generally milky. Reddish brown hematite coats

Part of 31 C/9 and 31 C/8



Map 3

Black Rapids – Higley Lake quartz crystal occurrences

some of the crystals and, in some cases, fine, micaceous specularite occupies spaces between crystals. Phantom crystals having a thin film of red hematite or of green chlorite between the original and regenerated crystal, are common. Cream-white to slightly pinkish barite occurs sparingly as small platy aggregates on the quartz crystals.

The Black Rapids quartz crystal deposit was operated during World War II when quartz crystals were in demand for use in radio and radar equipment. The mine is no longer in operation.

Road log from Highway 15 at km 38.4 (see road log on page 33):

km		
	0.0	Turn right (east) onto Leeds County Road 2 (to Lyndhurst).
	3.2	Road-cut. The exposure consists of crystalline limestone containing greyish green massive scapolite (fluoresces orange under the 'long' ultraviolet rays), and grains of serpentine, brown tourmaline, graphite, pyrite and mica.
	7.7	Junction road to Lansdowne; turn right (this junction is 0.4 km south of the bridge at Lyndhurst).
	13.3	Road-cut, on right. The road-cut exposes black tourmaline with minor amounts of dark brown mica, pyrrhotite, titanite (very small grains) and serpentine in a matrix of white feldspar and quartz.
	15.0	Road-cut on left. The exposure is similar to the one at km 13.3.
	15.3	Road-cuts, both sides of the road. Black tourmaline and dark green pyroxene are associated with small amounts of salmon-pink calcite, serpentine, titanite and pyrite in a quartz-feldspar rock.
	15.4	Black Rapids bridge.
	15.6	Crossroad: to reach the Black Rapids Mine, follow road on left for 0.6 km to the turn-off (left) to the property. The mine is about 1 km from this point. Continue straight ahead to reach Higley Lake occurrences.
	15.8	Road-cuts, both sides of road. The exposed rock is a pyroxene-calcite rock containing patches of pyrrhotite.
	18.0	Trail on left for access to Higley Lake quartz crystal occurrences. The pits are scattered in a wooded area and are not easy to locate. Access to the area is by a tractor road that leaves the Lyndhurst-Lansdowne Road at km 18.0 (just before crossing a bridge over a swampy area). The nearest pit is at the southern end of Higley Lake approximately 180 m from the road. Other pits may be reached by following the ridge along the west side of Higley Lake (see map).

Refs.: 36 p. 1, 4-6; 96 p. 128-129.

Maps (T): 31 C/9 Westport.
(G): 44-8A Higley Lake, Rear of Leeds and Lansdowne Township, Leeds County, Ontario (GSC 1 inch to 800 feet). 1182A Westport, Ontario (GSC).

Road-cuts on Highway 15, km 43.4 and km 43.6

TITANITE, TREMOLITE, PYROXENE, APATITE, SERPENTINE, MICA, GRAPHITE, PYRITE.

In siliceous crystalline limestone.

Graphite, as disseminated flakes and massive patches, light green pyroxene and serpentine are the most common minerals at these exposures. Titanite occurs as dark brown crystals

measuring up to 1 cm across and 2 cm long. Bluish green apatite crystals (generally very small), transparent, grey columnar aggregates of tremolite, and massive pyrite were also noted.

The road-cuts are on the west side of the highway (see road log page 33).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cuts on Highway 15, km 43.8 and km 44.9

(a) CORDIERITE, SILLIMANITE, MAGNETITE, PYRITE, DUMORTIERITE;
(b) TALC.

(a) In gneiss; (b) in crystalline limestone.

The road-cuts expose dark quartz-biotite-feldspar gneiss containing cordierite, sillimanite and small grains of magnetite and pyrite. The cordierite commonly occurs as dark blue pods (about 2 cm long) generally altered to a green mica or chlorite along the edges. Sillimanite is found as white sheaf-like aggregates about 2 cm long, and as bluish fibrous aggregates. Small grains of transparent purplish blue dumortierite were found in quartz; these grains were visible with the aid of a magnifying lens.

Hard, greenish, massive talc has been found as patches in white serpentine-bearing limestone which is interbedded with gneiss at the road-cut at km 44.9.

Refs.: 95 p. 21, 30-31, 40, 44, 67, 92, 228; 96 p. 20, 25.

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cuts on Highway 15, km 45.2 to km 45.5

PYROXENE, APATITE, CALCITE, TITANITE, ZIRCON, SCAPOLITE, SERPENTINE, FELDSPAR, PYRITE.

In crystalline limestone.

The limestone exposed by these road-cuts contains much dark green massive pyroxene resulting in a rock that is much darker in colour than other crystalline limestones in the area. Minerals occurring in the rock are: apatite, as light greenish blue crystals (measuring up to 2 cm across) and as granular masses; salmon pink coarsely crystalline calcite; titanite, as small transparent brown grains; zircon, as transparent, mauvish pink grains (not readily visible without magnification); scapolite as bluish grey, small crystals and in massive form; dark brown serpentine; greyish white feldspar; and tiny crystals of pyrite. Dark green to almost black pyroxene crystals are common in a calcite-apatite matrix.

The road-cuts are on both sides of the highway between the north and south turn-offs to Morton Park picnic site (see page 33).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cut on Highway 15, at km 51.9

The cut exposes an unconformity between Palaeozoic sandstone and Precambrian gneiss (see road log page 33).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cut on Highway 15, at km 67.7

GRAPHITE, PYROXENE, PYRITE, APATITE, TITANITE, FELDSPAR.

In crystalline limestone.

Graphite is common as small masses and flakes in crystalline limestone of which feldspar is an abundant constituent. Dark green pyroxene forms large blotches (about 30 cm across) in the rock. Associated minerals present in small amounts are apatite, pyrite and titanite, the latter as transparent brown crystals averaging 3 mm long (see road log page 33).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cuts on Highway 15, at km 68.9

TOURMALINE, SERPENTINE, FELDSPAR, TREMOLITE, TITANITE, APATITE, PYROXENE, GRAPHITE, PYRITE, MICA.

In crystalline limestone.

Tourmaline occurs as orange to brown transparent striated crystals (up to 4 cm long and 1 cm across) and crystalline aggregates; it fluoresces deep yellow under the 'short' ultraviolet rays. Massive grey to bluish grey feldspar is common. Pyroxene forms dark green crystalline aggregates some of which have altered to olive-green or greyish green serpentine. Graphite flakes and flaky masses are disseminated throughout the limestone. Minerals present in relatively small amounts are: tremolite, as transparent grey radiating columnar aggregates; titanite, as amber to light brown grains; apatite, as light blue grains; pyrite as tiny crystals and grains; and light amber mica.

The road-cuts are on both sides of the highway just north of the junction of the Burgess Road (see page 33).

Maps (T): 31 C/9 Westport.
(G): 1182A Westport, Ontario (GSC).

Road-cuts on Highway 15, at km 76.9

TREMOLITE, TALC, QUARTZ, MICA, PYRITE.

In crystalline limestone.

The road-cuts expose crystalline limestone in contact with dark gneiss. Colourless, grey and greenish tremolite and quartz are abundant constituents of the limestone. Massive light green talc occurs as an alteration product of tremolite. Silvery-amber mica books averaging 5 cm across and tiny pyrite grains are also present in the limestone (see road log page 34).

Maps (T): 31 C/16 Perth.
(G): 1089A Perth, Lanark and Leeds Counties, Ontario (GSC).

This is the last locality described along the Kingston-Smiths Falls side trip; the main road log along Highway 2 is resumed.

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km 32.0 Gananoque, at junction Highway 32. The occurrences along Highway 15 may be reached by proceeding 20.1 km north on Highway 32 to its junction with Highway 15 (see page 33).

Marble Rock Quartz Mine

QUARTZ CRYSTALS.

In quartz veins cutting brecciated quartzite.

This deposit is similar to the quartz crystal deposit at Black Rapids. It was worked during World War II by a pit at the side of a ridge. Specimens are available from a dump adjacent to the opening.

Road log from Highway 2 at km 32.0 (for alternate route see km 35.7 below):

km		
	0.0	Gananoque; proceed north along Highway 32.
	6.3	Junction Marble Rock Road; turn right (this junction is 13.8 km south of the junction of Highways 32 and 15).
	9.8	Junction; turn right.
	11.7	Bridge at Marble Rock. Turn right after crossing bridge.
	12.4	Junction single lane road on left, turn left.
	12.5	End of road. Walk along the base (east side) of the ridge for about 180 m to the mine.

Ref.: 36 p. 4-6.

Maps (T): 31 C/8 Gananoque.
(G): 27-1962 Gananoque, Ontario (GSC).

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km 35.7 Junction road to Marble Rock

Alternate Route to Marble Rock Quartz Crystal Mine

km		
	0.0	Proceed north along road to Marble Rock.
	2.4	Junction; continue straight ahead.
	3.7	Junction; turn left.
	4.3	Junction; turn left.
	5.6	Junction single lane road; turn right.
	5.8	End of road. Walk along the base (east side) of the ridge for about 180 m to the mine.

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km 65.9 Junction; road to Lyn.

km 67.1 Road-cuts, both sides of Highway 2.

Road-cuts, both sides of Highway 2

TOURMALINE, TITANITE, PYRRHOTITE.

In coarse arkosic sandstone.

The tourmaline is jet black and forms crystalline aggregates 2 to 3 cm across. Reddish brown titanite (up to 5 mm long) and grains of pyrrhotite are scattered throughout the rock. The sandstone has a greenish tint and contains grains of feldspar exhibiting a blue opalescence.

Maps (T): 31 B/12 Brockville.
(G): 7-1963 Brockville-Mallorytown area, Ontario (GSC).

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km 81.4 Brockville, at junction Highway 29/42 (King Street West and Court House Avenue).

Quarry off Highway 29

CALCITE, MARCASITE, MICA.

In sandy dolomite.

White to brownish pink coarsely crystalline calcite occupies cavities about 2 cm across in the dolomite. The calcite fluoresces pink under 'short' ultraviolet rays. Dark brown-stained marcasite nodules averaging 2 cm across are common. Dull greenish blue mica occurs as very fine flakes in parts of the dolomite giving the rock a bluish cast.

The quarry is no longer in operation and the lower level is water-filled. Specimens are available from the upper level.

Road log from Highway 2 at Brockville:

km		
	0.0	Turn left (north) onto Highways 29/42 (Court House Avenue).
	2.2	Intersection Parkdale Avenue; continue straight ahead.
	9.8	Junction New Dublin Road; continue straight ahead.
	9.9	Turn right onto road to quarry.
	10.0	Quarry.

Maps (T): 31 B/12 Brockville.
(G): 7-1963 Brockville-Mallorytown area, Ontario (GSC).

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km 84.5 Turn-off (left) to Permanent Concrete Quarry.

Permanent Concrete Quarry

Sandy dolomite, similar to that found in the quarry on Highway 29, is currently being quarried here. The quarry is located 0.3 km north of Highway 2.

Maps (T): 31 B/12 Brockville.
(G): 7-1963 Brockville-Mallorytown area, Ontario (GSC).

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km	106.5	**Junction Highway 16 and turn-off to bridge to the United States.**
km	115.4	**Cardinal, at junction Dundas Street.**
km	120.8	**Junction single lane road (on left) to Fetterly's quarry.**

Fetterly's Quarry

CALCITE, PYRITE, QUARTZ CRYSTALS.

In limestone.

White to pink crystalline calcite is associated with pyrite in cavities and veins. The calcite fluoresces pink under 'short' ultraviolet rays. Small quartz crystals line cavities measuring up to 15 cm across. The quarry, not in operation in 1966, is water-filled at the lower level.

Plate IV

Calcite-filled coral colonies, McFarland's quarry, Williamsburg. (GSC 138742)

Access is by the road (0.8 km long) leading north from Highway 2 at km 120.8.

Maps (T): 31 B/14 Morrisburg.
(G): 710A Prescott, Ontario (GSC, 1 inch to 2 miles).

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km 122.1 Turn-off (left) to McFarland's Iroquois quarry.

McFarland's Iroquois Quarry

The limestone at this quarry is similar to that at Fetterly's quarry. The deposit is being worked by McFarland Construction Company to supply road metal for the construction of Highway 401.

Access is by the road (0.3 km long) leading north from Highway 2 at km 122.1.

Maps (T): 31 B/14 Morrisburg.
(G): 710A Prescott, Ontario (GSC, 1 inch to 2 miles).

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km 124.2 Iroquois, at junction Carman Road.

km 136.8 Morrisburg, at junction Highway 31.

McFarland's Williamsburg Quarry

CELESTITE, STRONTIANITE, CALCITE, FOSSILS.

In limestone.

Celestite as bluish white radiating fibrous aggregates (up to 5 cm across) is commonly associated with colourless to grey transparent crystalline calcite. Occurring less commonly is grey fibrous strontianite which is found as small masses on crystalline calcite that lines cavities in the limestone. Calcite-filled coral colonies measuring up to 60 cm across are common. Worm burrows were observed in the rock. The limestone is of Ordovician age and is being quarried by the McFarland Construction Company for use in the building of Highway 401.

Road log from Highway 2 at km 136.8:

km		
	0.0	Proceed north on Highway 31.
	9.5	Williamsburg, at flashing light; turn right onto Road No. 18 to Osnabruck.
	13.0	Junction road to quarry; turn left.
	13.2	Quarry.

Maps (T): 31 B/14 Morrisburg.
(G): 710A Prescott, Ontario (GSC, 1 inch to 2 miles).

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km 147.4 Turn-off (on right) to Upper Canada Village.

km 170.5 Junction Richmond Drive.

Silvertone Marble Quarry

LIMESTONE.

The limestone is fine-textured, very dark grey and takes a high polish. It is used as ornamental stone for interior decoration. The quarry is operated by Silvertone Black Marble Quarries Limited of Crysler.

Road log from Highway 2 at km 120.5:

km 0.0 Turn left (north) onto Richmond Drive.

2.2 Junction; turn right and continue straight ahead where main road turns left.

2.7 Junction quarry road; turn right.

3.1 Quarry.

Ref.: 85 p. 42.

Maps (T): 31 G/2 Cornwall.
(G): 661A Maxville, Ontario and Quebec (GSC, 1 inch to 2 miles).

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km 176.8 Cornwall, at turn-off to bridge to United States.

km 206.4 Lancaster, at junction Highway 34.

km 215.5 Quebec border. This is now Highway 338.

km 234.6 Junction road to Meloche quarry.

Meloche Quarry (Coteau Landing)

DOLOMITE, CALCITE, PYRITE.

In limestone.

Crystals of pinkish white dolomite occur with massive calcite in cavities about 10 cm long. Crystal aggregates of pyrite are also found in the limestone which is of Ordovician age. The quarry and crushing plant are operated by Meloche Inc.

Access is via a road, 0.3 km long, leading north from Highway 2 at km 234.6.

Maps (T): 31 G/8 Vaudreuil.
(G): 660A Valleyfield, Quebec and Ontario (GSC, 1 inch to 2 miles).

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km 234.7 Junction; road to Salaberry-de-Valleyfield.

St. Lawrence South Shore Occurrences

Road log for side trip along south shore of the St. Lawrence River (underlined localities are described in text following road log):

km 0.0 Junction Highways 338 and road to Salaberry-de-Valleyfield; proceed toward Salaberry-de-Valleyfield.

3.8 Salaberry-de-Valleyfield; turn-off on left to Paul Viau quarry. The road log continues eastward along Highway 132.

km		
	23.2	Melocheville sandstone quarry (active) on right.
	24.0	Melocheville sandstone quarry (inactive) on right.
	42.8	Junction Highway 138; proceed along Highway 132 (Boulevard Taschereau) to Montreal.
	46.2	Turn-off (left) to Rivermont quarry.
	47.8	Junction road to Caughnawaga; continue along Highway 132.
	49.7	Turn-off to Montreal via Mercier bridge. The road log continues along Highway 132 (Boulevard Taschereau).
	62.1	Highway 132 ends; proceed along Highway 15.
	65.0	Junction; proceed onto Highway 134.
	73.0	Turn-off to Montreal via Champlain bridge; continue along Highway 134.
	74.2	Turn-off to Montreal via Victoria bridge; continue straight ahead along Highway 134.
	78.3	Junction Highway 116 (Highway 134 continues 3.4 km straight ahead to the Jacques Cartier bridge). Turn right onto Highway 116.
	83.3	Junction Highway 112; proceed along Highway 116.
	89.9	Junction road to St-Bruno, Goyer and Dulude quarries.
	103.4	St-Hilaire, at junction Highway 133.
	108.6	Junction road to St-Jean-Baptiste and Mont St-Hilaire quarry.

Paul Viau Quarry

CALCITE, PYRITE.

In limestone and dolomite.

White to orange crystalline calcite is common in cavities about 10 cm long. Tiny pyrite crystals occur sparingly with the calcite. The rocks are of Ordovician age. The quarry is operated by Paul Viau Construction Company for use in road building. The crushing plant is across the road from the quarry at km 3.8 (see road log page 43).

Maps (T): 31 G/8 Vaudreuil.
(G): 660A Valleyfield Quebec and Ontario (GSC, 1 inch to 2 miles).

Melochville Quarries

SANDSTONE.

The sandstone is cream coloured with buff, yellowish or pinkish tones; some of it is banded in these shades. It is known as Potsdam sandstone and is of Cambrian age. Mica forms greyish to greenish blue patches on the rock. The sandstone has been used for the construction of the Beauharnois canal and of local buildings, for glass-making and for use in the manufacture of ferro-silicon. Exposures of the rock can be seen along the highway between Melocheville and Beauharnois.

The quarries are on the south side of Highway 132 at km 23.2 and km 24.0 (see page 43).

Ref.: 18 p. 17-19, 131-132.

Maps (T): 31 H/5 Lachine.
(G): 810 Lachine, Quebec (Que. Dept. Natural Resources).

Rivermont Quarry

CALCITE, KAOLINITE, PYRITE, SIDERITE, FOSSILS.

In limestone.

The limestone contains numerous shell fossils of Ordovician age. On the weathered surface the shells are partially coated with dull rusty-brown siderite. Aggregates of colourless calcite crystals occupy cavities (up to 2 cm across) in the limestone and in white massive calcite veins measuring about 5 cm wide. White powdery kaolinite occurs as irregular patches on calcite and limestone. The quarry is operated by Rivermont Construction Company Limited.

Access is by a road (0.3 km long) leading west from Highway 132 at km 46.2 (see page 44).

Ref.: 18 p. 34-36.

Maps (T): 31 H/5 Lachine.
(G): 801 Lachine, Quebec (Que. Dept. Natural Resources).

Goyer Quarry

CALCITE, STRONTIANITE, QUARTZ, PLAGIOCLASE, PYRITE, FOSSILS, ANALCIME, DOLOMITE, CHLORITE, OLIVINE, TALC, JAROSITE.

In limestone, shale, igneous dykes.

Cavities in grey limestone are commonly lined with white calcite rhombs (about 2 cm across) and colourless dogtooth spar. Tiny crystals of colourless transparent quartz, white platy plagioclase, colourless to white radiating fibrous strontianite (about 1 cm across) and tiny pyrite crystals are associated with the calcite. Ordovician shell fossils are abundant in charcoal grey shale. They are commonly replaced by finely granular pyrite and by silvery-white to chalk white calcite. Earthy yellowish to reddish brown jarosite forms coatings on the rock. Igneous sills and dykes cutting the sedimentary rocks contain phenocrysts (measuring up to 2 cm long) of colourless to white analcime, greenish yellow olivine, dolomite, chlorite and talc.

The quarry is operated by Carrière Goyer (Division of Dominion Lime Limited).

Road log from Highway 132 at km 89.9 (see page 44):

km		
	0.0	Turn left (north) onto road to St-Bruno.
	1.6	St-Bruno, at intersection Montarville and Rabastalière Streets; turn left onto Montarville Street.
	3.5	Junction; bear right and follow road toward St-Amable.
	4.3	Turn right onto road to quarry.
	5.5	Goyer quarry.

Ref.: 18 p. 21, 43.

Maps (T): 31 H/11 Beloeil.
(G): 848 Beloeil, Quebec (Que. Dept. Natural Resources).

Dulude Quarry

CALCITE, PYRITE, DOLOMITE, ACTINOLITE, PYRRHOTITE, FOSSILS, PYROXENE, AMPHIBOLE, OLIVINE, DAWSONITE, QUARTZ, ANALCIME.

In hornfels, igneous rock and limestone.

White massive calcite containing cavities lined with dogtooth spar occurs with crystalline pyrite in veins up to 5 cm wide. Colourless crystalline dolomite occurs along fractures in the hornfels. Green radiating actinolite is associated with patches of massive pyrrhotite on hornfels. Ordovician shell fossils replaced by finely granular pyrite occur abundantly in layers in hornfels; attractive specimens can be obtained from freshly broken surfaces. Fossils reported from the quarry include graptolites, worms, brachiopods, cephalopods, pelecypods and trilobites. Igneous rocks cutting the hornfels contain phenocrysts of pyroxene, amphibole, olivine and calcite. Colourless to white radiating dawsonite associated with quartz, analcite and pyrite has been reported to occur (Ref. No. 38) in fractures in black limestone.

The quarry is operated by Carrière Dulude Limitée (Dominion Lime Limited) whose office is in St-Bruno.

Road log from Highway 116 at km 89.9 (see page 44):

km		
	0.0	Proceed north along road to St-Bruno.
	1.6	St-Bruno; turn left onto Montarville Street.
	3.5	Junction; bear right along road to St-Amable.
	4.3	Junction road to Goyer quarry; continue straight ahead.
	6.1	Turn right onto road to quarry.
	6.8	Dulude quarry.

Refs.: 18 p. 21, 26, 43; 51 p. 378-379.

Maps (T): 31 H/11 Beloeil.
(G): 848 Beloeil, Quebec (Que. Dept. Natural Resources).

Mont St-Hilaire Quarry

ACMITE, ALBITE, MICROCLINE, ANALCIME, CALCITE, CATAPLEIITE, FLUORITE, NATROLITE, SIDERITE, ACTINOLITE, ANCYLITE, ASTROPHYLLITE, AUGITE, CANCRINITE, DIOPSIDE, EUDIALYTE, GENTHELVITE, GOTZENITE, NEPHELINE, PYROCHLORE, RHODOCHROSITE, SERANDITE, ELPIDITE, EPIDIDYMITE, ZIRCON, APOPHYLLITE, NEPTUNITE, HACKMANITE, LEUCOPHANITE, POLYLITHIONITE, PYROPHANITE, RAMSAYITE, RINKITE, SANIDINE, SODALITE, TITANITE, WILLEMITE, WOHLERITE, ANKERITE, BASTNAESITE, SYNCHISITE, BRITHOLITE, LEUCOSPHENITE, NARSARSUKITE, PECTOLITE, THOMSONITE, VESUVIANITE, DAWSONITE, APATITE, AMPHIBOLE, DOLOMITE, CHLORITE, DATOLITE, GARNET, MUSCOVITE, BIOTITE, PHLOGOPITE, QUARTZ, SPHALERITE, PYRITE, RUTILE, GALENA, GOETHITE, LIMONITE, MARCASITE, HEMATITE, ILMENITE, MAGNETITE, MOLYBDENITE, CHALCOPYRITE, ARSENOPYRITE, PYRRHOTITE, BIRNESSITE, KARPINSKYITE, BURBANKITE, WURTZITE, BROOKITE, CROCIDOLITE, ANATASE, ANTIGORITE, ARAGONITE, ARFVEDSONITE, ASHCROFTINE, BARYLITE, BEHOITE, CHABAZITE, CORDYLITE, EKANITE, EWALDITE, GIBBSITE, GMELINITE, HARMOTOME, HEDENBERGITE, HIORTDAHLITE, HYDROTALCITE, JOAQUINITE, KAERSUTITE, KAINOSITE, KAOLINITE, LABUNTSOVITE, LAVENITE, LOELLINGITE, MCKELVEYITE, NENADKEVICHITE, NORDSTRANDITE, PARISITE, PHILLIPSITE, RAITE, RHABDOPHANE, RICHTERITE, SCHEELITE, SEPIOLITE, STEENSTRUPINE, STILLWELLITE, STRONTIANITE, THAUMASITE, THORITE, TUNDRITE, VILLAUMITE, VINOGRADOVITE, WOLLASTONITE, WULFENITE, CARLETONITE, DONNAYITE, GAIDONNAYITE, HILAIRITE, LEMOYNITE, MONTEREGIANITE, TETRANATROLITE, PETARASITE, YOFORTIERITE.

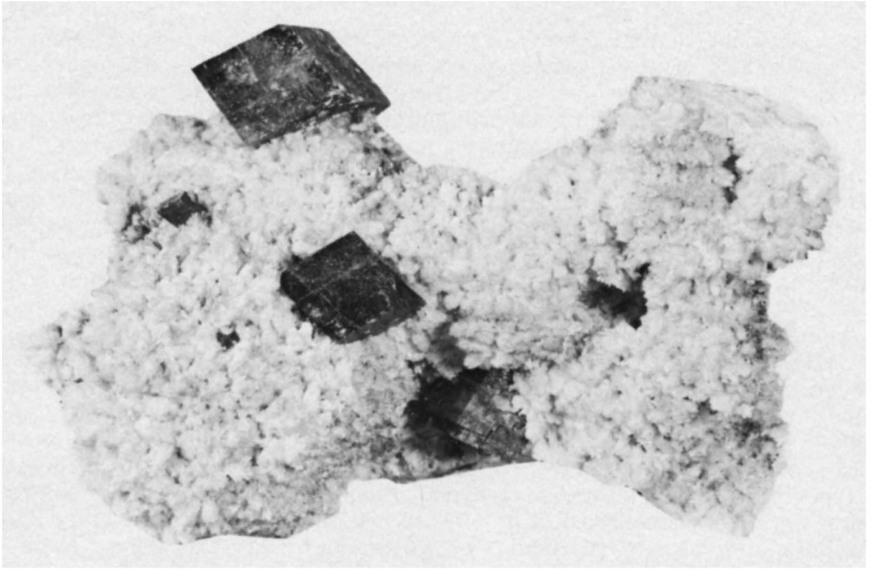

Plate V

Siderite crystals on albite, Mont St-Hilaire quarry. Specimen courtesy National Mineral Collection. (Actual size). (200383H)

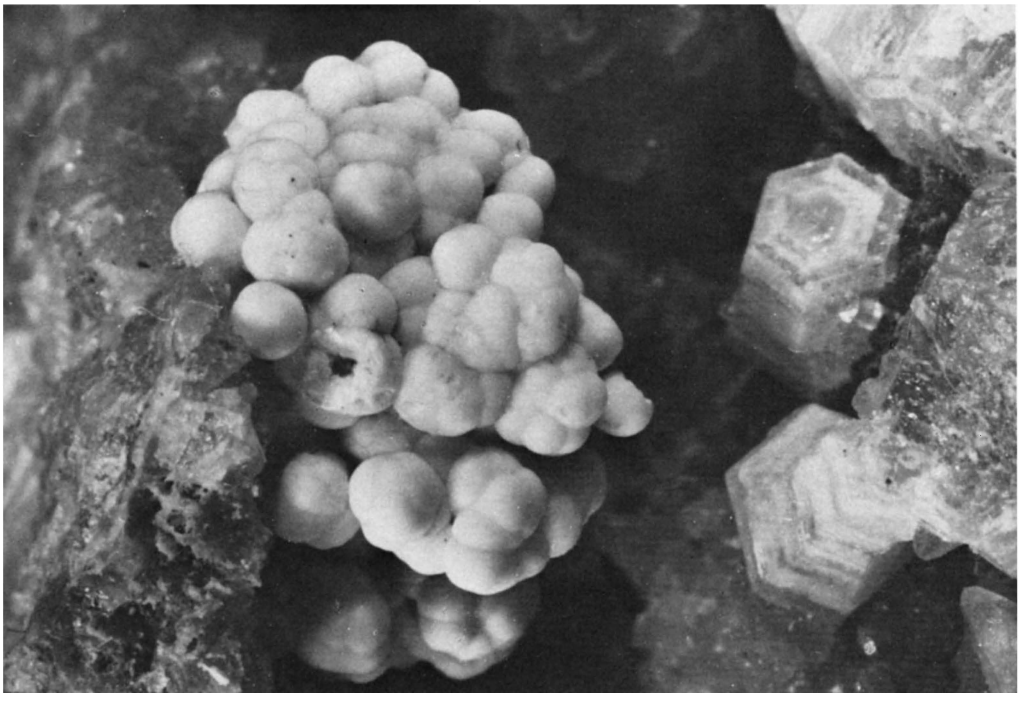

Plate VI

Dresserite and weloganite, Francon Quarry. Specimen courtesy National Mineral Collection. (202820-H)

In nepheline syenite.

The most abundant minerals are: acmite, as dark green, brown or black acicular or elongated prismatic crystals; albite, as colourless to white platy aggregates; microcline, as white or grey tabular crystals, or massive; analcime, as colourless crystals (up to 15 cm across) and as white crystalline patches; calcite, as colourless, light yellow, green, blue or white crystalline aggregates; catapleiite, as colourless, yellowish white or tan coloured hexagonal plates (up to 10 cm across); fluorite, as colourless, green or purple transparent crystals and in massive form; natrolite, as colourless, white or yellowish fibrous, prismatic or platy crystals, or in massive form; siderite, as dull brown crystals (up to 20 cm across) and as tan coloured transparent crystalline aggregates. Other less common minerals are: actinolite, as light to dark green, colourless to light brown, acicular and elongated prismatic crystals and in massive form; ancylite, as pink transparent prismatic crystals (up to 3 cm long) and in massive form; astrophyllite, as brown micaceous or radiating clusters with splendent to pearly lustre; augite, deep purple to black, vitreous in massive form; cancrinite, as yellow, white or grey fibrous aggregates, prismatic crystals (up to 3 mm long) and in massive form; diopside, as green prismatic crystals and massive; eudialyte, as pink, deep red, brown or deep yellow granular patches; genthelvite, as pistachio-green transparent tetrahedral crystals; gotzenite, as tan coloured radiating acicular aggregates; nepheline, as greyish green to pink masses; pyrochlore, as brown octahedral crystals; rhodochrosite, as pink to red or orange rhombs, platy aggregates or massive; serandite, as pink to reddish brown prismatic crystals (up to 10 cm long), also massive or fibrous; elpidite, as pale green to white or grey prismatic crystals (up to 5 cm long) and fibrous aggregates with silky lustre; epididymite, as white, silky prismatic crystals (up to 5 mm long) and massive; zircon, as brown crystals and massive; neptunite, as deep red to black prisms; hackmanite, as purple masses that fade on exposure and fluoresce yellow when exposed to ultraviolet rays; leucophanite, as green tabular crystals (up to 3 cm across) that fluoresce pink under ultraviolet light; polylithionite, as pearly white micaceous aggregates that fluoresce dull yellow when exposed to 'short' ultraviolet rays; pyrophanite, as reddish brown to black tabular crystals and thin flakes with adamantine lustre; ramsayite, as colourless to tan coloured, fine needles; rinkite, as yellowish green to brownish yellow tabular crystals and massive; sanidine, as colourless crystalline aggregates; sodalite, as blue to mauve masses; titanite, as tiny brown to yellow crystals; willemite, as colourless, white or grey tiny prisms; wohlerite, as orange tabular crystals (up to 1 cm across); ankerite, as grey vitreous rhombs; bastnaesite, as brownish green earthy masses; synchisite, as waxy brown, tiny plates; britholite, as light tan coloured platy aggregates; leucosphenite, as light blue vitreous prisms (up to 1 cm long); narsarsukite, as bright yellow tabular or prismatic crystals; pectolite, as white silky fibrous aggregates, wedged-shaped crystals and massive; thomsonite, as grey prisms; vesuvianite, as green, yellow or brown prismatic crystals (up to 1 cm long) and massive; dawsonite, as dull white earthy patches; apatite, as colourless prismatic and acicular crystals; amphibole, as green to bluish green, long prisms; dolomite, as light green rhombohedral aggregates; chlorite, as dark green to black spherical aggregates on other minerals; yellow massive datolite; dark green and reddish brown garnet; muscovite, biotite, and phlogopite; smoky to colourless and pink quartz. Metallic minerals include: black, yellow or green sphalerite, pyrite, black rutile, galena, black goethite (pseudomorphs after siderite), yellow to brown limonite (pseudomorphs after siderite), marcasite, earthy red hematite, black ilmenite, magnetite crystals, molybdenite flakes, chalcopyrite, arsenopyrite (crystals), and pyrrhotite. Among the minerals occurring only rarely are: dull black birnessite, associated with microcline, analcime, and serandite; karpinskyite, as white silky, fine needles associated with catapleiite, eudialyte, acmite and microcline; burbankite, as light green tiny prisms with analcime, zircon, acmite and eudialyte; wurtzite, as dull mauve spherulites intergrown with sphalerite, or with analcime or acmite; brookite, as black, pyramidal crystals with adamantine lustre associated with feldspars and acmite.

Other minerals reported from the deposit include: anatase, antigorite, aragonite, arfvedsonite, ashcroftine, barylite, behoite, chabazite, cordylite, ekanite, ewaldite, gibbsite, gmelinite, harmotome, hedenbergite, hiortdahlite, hydrotalcite, joaquinite,

kaersutite, kainosite, kaolinite, labuntsovite, lavenite, loellingite, mckelveyite, nenadkevichite, nordstandite, parisite, phillipsite, raite, rhabdophane, richterite, scheelite, sepiolite, steenstrupine, stillwellite, strontianite, thaumasite, thorite, tundrite, villiaumite, vinogradovite, wollastonite, and wulfenite.

In addition, several new species have been established from this deposit. The new minerals are: carletonite, donnayite, gaidonnayite, hilairite, lemoynite, monteregianite, tetranatrolite, petarasite and yofortierite. These minerals are described in the glossary which begins on page 108.

These minerals occur in veins and in cavities in nepheline syenite which forms the eastern half of Mont St. Hilaire, essexite forming the western half. Along the margins of the syenite, there is a brecciated hornfels traversed by veins of greyish blue, silky, fibrous crocidolite.

The quarry, also known as the Desourdy quarry, is on the north side of Mont St-Hilaire and is operated by De-Mix. It is not accessible to individual collectors; organized groups may arrange a visit by writing about 2 weeks in advance to the company at Longueuil, Quebec.

Road log from Highway 116 at km 108.6 (see page 44):

km	0.0	Turn right (south) onto road to St-Jean-Baptiste.
	1.0	Junction; continue straight ahead.
	2.2	Quarry.

Refs.: 9, p. 1855-1866; 10 p. 561-565; 11 p. 109-123; 12 p. 316-319; 13 p. 237-240; 14 p. 335-340; 15 p. 99-101; 16 p. 497-509; 17 p. 77-84; 18 p. 41-42; 61 p. 585-596; 62 p. 68-74.

Maps (T): 31 H/11 Beloeil.
(G): 848 Beloeil, Quebec (Que. Dept. Natural Resources).

This is the last occurrence described for the St. Lawrence South Shore side trip; the main log along Highway 338 is resumed.

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km **234.7** **Junction, road to Salaberry-de-Valleyfield;** proceed straight ahead, on Highway 338.

km **260.8** **Dorion, at junction Highway 20;** proceed along Highway 17/2 toward Montreal.

km **266.3** **Ste-Anne-de-Bellevue, at junction Ste-Anne Road.**

SECTION 2

MONTREAL – QUEBEC

km **0.0** **Ste-Anne-de-Bellevue, at junction Highway 20 and Ste-Anne Road.** Proceed east along Highway 20.

km **9.5** **Beaconsfield, at intersection St. Charles Road.**

Meloche (Kirkland) Quarry

FOSSILS, PYRITE, CALCITE.

In limestone.

The limestone belongs to the Black River Group and is of Ordovician age. It contains shell fossils, thin veins of massive white calcite and small amounts of pyrite. The quarry and crushing plant are operated by Meloche Inc. for road metal.

Road log from Highway 20 at km 9.5 (intersection Trans-Island Boulevard and St. Charles Road):

km 0.0 Turn left (north) onto St. Charles Road.

1.9 Turn right onto quarry road.

2.1 Meloche quarry.

Ref.: 19 p. 69-78.

Maps (T): 31 H/5 Lachine.
(G): 801 Lachine, Quebec (Que. Dept. Natural Resources).

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km **18.3** **Dorval, at junction Highway 520 (Côte de Liesse);** continue along Highway 20.

km **26.1** **Junction Highway 138 to Mercier bridge;** continue along Highway 20.

km **31.7** **Junction Autoroute Decairie** (Highway 15).

Oka - St-Eustache Occurrences

Road log for side trip to Oka localities and St-Eustache quarry (underlined localities are described in text following log):

km 0.0 Proceed north along Décairie Autoroute (Highway 15).

5.9 Junction; proceed onto Laurentian Boulevard.

11.6 Intersection Gouin Boulevard; continue straight ahead along Highway 117 (Boulevard Laurentien).

15.0 Turn left onto Highway 148.

27.7 Junction Highway 344. Follow No. 344 to reach Oka Rare Metals mine, St. Lawrence Columbium & Metals mine, Quebec Columbium property, and Dufresne property. To continue log proceed straight ahead along Highway 148.

28.8 Turn-off (right) to Auto-route to Ste-Thérèse (Highway 640) and to St-Eustache quarry.

Oka Rare Metals Mine

AKERMANITE, HIBSCHITE, OLIVINE, PYROXENE, TITANITE, PYRITE, TOURMALINE, ANALCIME, THOMSONITE, PEROVSKITE, CALCITE, MAGNETITE.

In calcite rock.

The minerals occur as grains and patches forming constituents of the calcite rock. Among the more common minerals are: tan coloured akermanite, greenish yellow olivine, greyish white hibschite, olive-green pyroxene, dark brown tourmaline, greenish grey feldspar, dark brown massive perovskite, pyrite and magnetite. Analcime, thomsonite, titanite and anatase are less common. The specimens are found in small dumps in the vicinity of the shaft.

A shaft was sunk 91.4 m deep on the property in 1956 by Oka Rare Metals Mining Company but no work has been done on it. It was investigated as a columbium-thorium deposit. There are three small dumps near the shaft.

Road log from Highway 148 at km 27.7 (see road log page 50):

km	0.0	Junction Highways 148 and 344; turn left (west) onto Highway 344 to Oka.
	10.1	Junction; turn right onto road to St-Joseph-du-Lac.
	16.1	Turn right onto road to Delta Explosives and obtain permission at office to pass through gate.
	16.4	Shaft and dumps.

Ref.: 52 p. 10.

Maps (T): 31 G/9 Lachute.
(G): 1179 Oka area, Deux Montagnes Electoral District (Que. Dept. Natural Resources, 1 inch to 2000 feet).

St. Lawrence Columbium & Metals Corporation Mine

PYROCHLORE, APATITE, CHLORITE, PYROXENE (AEGIRINE), MONTICELLITE, MAGNETITE, PYRITE, CALCITE.

In calcite rock.

Pyrochlore is the ore mineral of niobium (columbium). It occurs as dark reddish brown grains and crystals (up to about 2 cm across) in greenish white, crystalline calcite that fluoresces very bright pink under the 'short' ultraviolet rays and reddish pink under the 'long' rays. The most abundant associated minerals are: pyroxene, as dark green long prisms; chlorite, as greenish black books generally less than 2 cm across; and apatite, as light yellow to colourless sugary patches and tiny prisms. Magnetite and pyrite are less common. Monticellite nodules have been reported from the deposit.

Niobium-bearing rocks were discovered in the Oka region in 1953 by Mr. Stephen Bond. Since then, numerous mining companies have conducted exploration work in the area, but only the St. Lawrence Columbium & Metals Corporation is active at present. Its mine has been in production since 1961. Open pit methods have been used and operations from a shaft commenced in 1967. Prospective visitors to the mine should make prior arrangements by writing to the company mine office in Oka.

Road log from Highway 148 at km 27.7 (see road log page 50):

km	0.0	Junction Highways 148 and 344; turn left (west) onto Highway 344 to Oka.
	10.1	Junction road to St-Joseph-du-Lac.

Plate VII

Aegirine (long crystals), pyrochlore (indicated by arrows) and chlorite in calcite rock, St. Lawrence Columbium & Metals mine, Oka. (Actual size) (200383-D)

km 15.0 Oka; turn right (north) onto road to St-Benoit.

15.4 Turn-off to St. Lawrence Columbium & Metals mine on right.

Refs.: 28 p. 14; 52 p. 9-10; 70 p. 1, 4-11; 71 p. 88.

Maps (T): 31 G/9 Lachute.
(G): 1179 Oka, Deux Montagnes Electoral District (Que. Dept. Natural Resources, 1 inch to 2000 feet).
54-22 Oka (GSC, 1 inch to 3500 feet).

Quebec Columbium Property

NIOCALITE, MONTICELLITE, AKERMANITE, GARNET, PYROXENE (AEGIRINE), PYROCHLORE, PEROVSKITE, APATITE, FORSTERITE, MELILITE, MAGNETITE, PYRITE.

In banded calcite rock.

Niocalite, a new niobium silicate mineral, was first described from this locality in 1956 by Dr. E.H. Nickel, Department of Energy, Mines and Resources. The mineral is light to smoky or amber yellow, transparent to turbid (in larger crystals), and occurs as slender prisms (up to 3 cm long and 6 mm across) in crystalline greenish white calcite that fluoresces pink when exposed to 'short' ultraviolet rays. Associated minerals occurring as grains or patches are: amber yellow monticellite; light yellow apatite; brownish yellow garnet; light brownish grey akermanite; dark green pyroxene; magnetite and pyrite. Forsterite, melilite and niobium minerals (pyrochlore and perovskite) also occur in the rock.

The deposit was exposed by trenches at the side of a hill and is known as the Bond zone. Permission to visit it should be obtained from Mr. S. Bond, Quebec Columbium Limited, Oka.

Road log from turn-off to St. Lawrence Columbium & Metals Mine (see page 50):

km 0.0 Turn-off to St. Lawrence Columbium & Metals mine; continue straight ahead (north) along road to St-Benoit.

1.4 Turn left onto farm lane leading to red-brick house. The trenches are 180 m west and 450 m southwest of the house.

Refs.: 28 p. 13; 56 p. 785-786.

Maps (T): 31 G/9 Lachute.
(G): 1179 Oka, Deux Montagnes Electoral District (Que. Dept. Natural Resources, 1 inch to 2000 feet).
54-22 Oka (GSC, 1 inch to 3500 feet).

Dufresne Property (Quebec Columbium Manny Zone)

BRITHOLITE, APATITE, PYROCHLORE, NIOCALITE, BIOTITE, MAGNETITE, FELDSPAR, QUARTZ.

In calcite rock.

Britholite is finely granular, massive and reddish brown with a slightly resinous lustre. The rock that it occurs in is a mixture of calcite, magnetite, biotite, apatite, feldspar and quartz. Grains of dark brown pyrochlore and prisms of lemon yellow niocalite also occur in the rock.

The deposit was exposed by trenches during exploration conducted by Quebec Columbium Limited between 1954 and 1961.

Road log from turn-off to St. Lawrence Columbium & Metals Mine (see page 50):

km 0.0 At turn-off to mine, continue straight ahead (north) along road to St-Benoit.

1.4 Turn-off to Quebec Columbium property (Bond Zone); continue straight ahead.

2.6 Dufresne farmhouse on right (opposite junction road to Oka). Obtain permission from farmhouse to enter property. The trenches are located approximately 180 m and 730 m northeast of the house.

Refs.: 28 p. 14; 43 p. 937-951; 52 p. 9.

Maps (T): 31 G/9 Lachute.
(G): 1179 Oka, Deux Montagnes Electoral District (Que. Dept. Natural Resources, 1 inch to 2000 feet).
54-22 Oka (GSC, 1 inch to 3500 feet).

St-Eustache Quarry

DOLOMITE, QUARTZ CRYSTALS, PYRITE, PYROXENE.

In dolomite and limestone.

Dolomite occurs as transparent, colourless to pink, saddle-shaped crystal aggregates lining cavities measuring up to 20 cm across. Individual dolomite crystals measure up to 2 cm across. Tiny pyrite crystals and black, fine acicular aggregates of pyroxene occur sparingly on dolomite crystals. Clear, terminated crystals of quartz (up to 5 cm long) are associated with the dolomite in some cavities. The rocks belong to the Beekmantown Group and are of Ordovician age.

The quarry is operated by J.G. Mathers Inc. of St-Eustache. It is located on the right (east) side of the Auto-route leading from St-Eustache to Ste-Thérèse, at a point 3.2 km east of the junction of Highway 148 (km 28.8 of log to Oka and St-Eustache localities; see page 50).

Ref.: 19 p. 45-48.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

This is the last locality described for the Oka-St-Eustache side trip; the main road log along Highway 138 is resumed.

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km 31.7 Intersection Décairie Boulevard.

km 37.2 Intersection St. Laurent Boulevard.

km 39.1 Intersection Papineau Avenue. Localities along the South Shore can be reached from here via the Jacques Cartier bridge (see pages 43 and 49, Section 1).

km 42.2 Intersection Pie IX Boulevard.

Montreal-Rawdon Occurrences

Road log for side trip to Rawdon area (underlined localities are described in text following log):

km 0.0 Intersection Pie IX Boulevard and Sherbrooke Street; proceed north along Pie IX Boulevard.

km		
	4.4	Intersection Jarry Street to Francon quarry (see below) and Miron quarry (see page 57).
	9.1	Intersection Gouin Boulevard; continue straight ahead.
	9.6	Intersection Lévesque Boulevard to St-Vincent-de-Paul and Cap-St-Martin quarries. To continue road log, turn right onto Highway 125.
	13.8	Inactive quarry in woods on left (for description see Terrebonne quarry).
	15.1	Terrebonne quarry on right.
	17.4	St-Francois, at junction Highway 125 and Boulevard des Milles-Iles; continue on Highway 125.
	18.2	Terrebonne, at junction Highway 344; continue on Highway 125.
	43.1	Junction Highway 158. To reach St-Lin and St-Calixte localities, turn left; to continue log follow Highway 125.
	44.9	St-Esprit, at junction; bear left onto Highway 125.
	52.9	Ste-Julienne; proceed right onto Highway 125 by-pass.
	60.0	Junction; Highway 125 goes left. Proceed straight ahead to Rawdon.
	60.8	Rawdon, at turn-off (right) to Dorwin Falls picnic site.
	61.8	Rawdon, at junction Highway 341. For Garnet occurrence turn left; to continue log turn right onto Highway 341.
	61.9	Highway 341 turns left; road straight ahead leads to Manchester Falls. To continue log, continue on Highway 341.
	62.9	Junction; turn left onto Highway 348.
	74.2	Junction; turn left onto Highway 343.
	79.5 to 79.6	Road-cuts.
	80.8	Lac-des-Français road-cuts.
	81.9 to 82.4	Road-cuts.
	87.0 to 89.8	Road-cuts.
	89.8	St-Alphonse; continue on Highway 343.
	95.4 to 101.7	Road-cuts.
	107.5	St-Côme, at bridge.

Francon Quarry

WELOGANITE, DRESSERITE, HYDRODRESSERITE, STRONTIODRESSERITE, SABINAITE, DAWSONITE, CALCITE, QUARTZ, ALBITE, STRONTIANITE, BARITE ANALCIME, ACMITE, CRYOLITE, FLUORITE, CELESTINE, ANKERITE, DOLOMITE, SIDERITE, CYRTOLITE, SYNCHISITE, THORBASTNAESITE, BADDELEYITE, CRISTOBALITE, CHALCEDONY, MORDENITE, ELPIDITE, ILMENORUTILE, HEMATITE, SMYTHITE, BROOKITE, MARCASITE, PYRITE, GALENA, MOLYBDENITE,

SPHALERITE, PSEUDORUTILE, PYRRHOTITE, SULPHUR, NATROJAROSITE, ROZENITE, GOETHITE, KAOLINITE, MONTMORILLONITE, HALITE, NAHCOLITE, PYROCHLORE, ANATASE, CROCOITE, HARMOTOME, HYDROCERUSSITE, WURTZITE, GARNET, GYPSUM, MAGNETITE, DACHIARDITE, THENARDITE, HYDROCARBON.

In igneous sills cutting Ordovician limestone.

The new species – weloganite, dresserite, hydrodresserite, strontiodresserite and sabinaite – were originally described from this quarry. They occur in cavities lined with crystals of quartz, calcite, albite and/or dawsonite, the cavities in the sills measuring from a few millimeters to several centimeters in length. These minerals occur as follows: weloganite, as colourless, white and yellow transparent to nearly opaque prisms measuring up to about 6 cm long; dresserite, as colourless to white hemispheres composed of radiating blades; hydrodresserite, as hemispheres like dresserite, strontiodresserite, as white spheres formed of radiating blades (about 1 mm in diameter) and as aggregates of white flakes on quartz; sabinaite, as white finely flaky aggregates with silky lustre. Strontianite is one of the most common minerals associated with these new species; it occurs as colourless, pink, yellow, white or greenish spherical, tabular, prismatic, fibrous, platy aggregates and in massive form.

Other minerals occupying cavities are: barite (colourless, white, pink, yellow crystals), analcime (colourless, yellow to orange to brown crystals), acmite (green blade-like crystals generally associated with analcime), cryolite (colourless crystals, rarely yellow crystal aggregates), fluorite (colourless, white, light to dark violet, grey, yellow, light green crystals and as black inclusions in calcite and in the sill rock), celestine (colourless, white, yellow, pink, grey, blue crystals and crystal aggregates), ankerite (yellow to white and greenish yellow fine crystal aggregates), dolomite (white, colourless, pink crystals), siderite (yellow, amber, brown crystal aggregates), cyrtolite (yellow, tan-coloured, grey granular aggregates), synchisite (white to grey silky fibrous or platy aggregates and spheres measuring about 1 mm in diameter), thorbastnaesite (white fibres forming coatings and spheres measuring less than 1 mm in diameter), baddeleyite (tan to light yellow scaly or granular aggregates, cristobalite (white fibrous and botryoidal masses associated with white chalcedony and dolomite and celestine), mordenite (white matted fibres associated with ankerite, cristaobalite, celestine), elpidite (white fibrous, acicular aggregates associated with yellow cryolite and with synchisite), ilmenorutile (black velvety plates and rosettes), hematite (reddish brown to black pulverulent and botryoidal encrustations on celestine, dawsonite, calcite, etc.), smythite (dark brown metallic flakes, plates associated with pyrrhotite), brookite (black plates forming rosettes on albite), marcasite (blades, prisms, plates, fibres), pyrite (crystals, spheres, granular aggregates), galena (crystals generally associated with weloganite), molybdenite (flakes, rare), sphalerite (tan to orange red crystals, granular aggregates), pseudorutile (black finely granular associated with K-feldspar), pyrrhotite (bronze flakes on cryolite, calcite, quartz), sulphur (black sooty admixed with pyrite), natrojarosite (yellow to rusty powdery masses with marcasite, pyrite), rozenite (white coating on pyrite, marcasite), goethite (yellow to brown flakes, fibres forming micro-rosettes), kaolinite (white flaky or granular aggregates), montmorillonite (white to greenish, waxy fibrous, flaky masses), halite (white string-like patches on sill rock, admixed with nahcolite), pyrochlore (orange granular associated with yellow crocoite, tan crystals in sill rock), anatase (grey flaky, tan aggregates, coatings), harmotome (grey clay-like), hydrocerussite (grey to white powder on galena), wurtzite (reddish brown crystals), garnet (pink associated with dawsonite in sill rock), gypsum (selenite variety, large sheets), magnetite (associated with smythite, pyrite; rare), sodium-rich dachiardite (white silky fibrous, acicular aggregates), thenardite (white coating on sill rock and on limestone), and hydrocarbon (dark brown coating on crystals lining vugs). Fossils (trilobites, brachiopods, bryozoans) occur in the limestone.

The quarry and crushing plant are operated by Francon, Division de Canfarge Limitée for use in road building and for cement. Prospective visitors to the quarry, should make written arrangements prior to the visit.

Road log from Pie IX Boulevard at intersection Jarry Street (km 4.4, road log on page 55):

km		
	0.0	Proceed west onto Jarry Street.
	0.6	Entrance to quarry on right.

Refs.: 19 p. 89, 118; 45 p. 84-89; 46 p. 399-407; 47 p. 405-407; 48 p. 25-29; 72 p. 115-120; 73 p. 468-477.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

Miron Quarry

NATROLITE, CALCITE, ANALCIME, BURBANKITE, PLAGIOCLASE, ORTHOCLASE, AEGIRINE, DAWSONITE, DOLOMITE, QUARTZ, AMPHIBOLE, KAOLINITE, ANATASE, ILMENITE, SPHALERITE, GRAPHITE, PYRITE, FOSSILS.

In igneous rocks cutting limestone.

Minerals identified from small cavities in a sill cutting the limestone include: natrolite, as colourless, white and orange-red crystal aggregates, and as pinkish red, hair-like, matted aggregates; calcite, as colourless to transparent yellow crystals; burbankite, as colourless and reddish pink fine, hair-like aggregates on calcite, orthoclase, and/or quartz crystals; plagioclase, as white platy aggregates; orthoclase, as colourless tiny crystals; and aegirine, as dark green and straw yellow acicular crystals. Graphite, pyrite and amber-yellow sphalerite occur in the rock. Small cavities in igneous dykes contain: colourless analcime crystals; colourless striated crystals of dawsonite generally associated with calcite crystals; white and pale yellow dolomite crystals; and colourless quartz crystals. Embedded in the rock are brownish black, slender prisms of amphibole partly altered to cream-white kaolinite. Tiny pockets of massive blue anatase and platy black ilmenite occur in the rock. Patches of massive yellow sphalerite and of graphite, and fine pyrite disseminations are found sparingly.

The limestone is of Ordovician age and contains fossils including trilobites, brachiopods and bryozoans. The quarry, crushing and cement plants are operated by Miron Inc. Prospective visitors should make written arrangements prior to the visit.

Road log from Pie IX Boulevard, at km 4.4 (intersection Jarry Street; see road log page 55):

km		
	0.0	Turn left (west) onto Jarry Street.
	0.6	Francon quarry on right; continue along Jarry Street.
	2.4	Entrance to Miron quarry on right (at intersection Papineau Street).

Ref.: 19 p. 89.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

St-Vincent-de-Paul Quarry

FOSSILS, CALCITE.

In limestone.

The limestone is rich in bryozoans and ostracods. Other Ordovician fossils found in the limestone are: cephalopods, gastropods, trilobites, sponges, brachiopods and crinoids. Thin white calcite veins cut the limestone.

The quarry is no longer in operation and is now a municipal park. The walls of the quarry expose fossil-bearing limestone.

Road log from Pie IX Boulevard at km 9.6 (intersection Levesque Boulevard; see road log page 55):

km		
	0.0	Turn left (west) onto Levesque Boulevard.
	0.15	St-Vincent-de-Paul Municipal Park on right (between Rose de Lima and Parc Avenues). Turn right to park entrance.
	0.3	Quarry.

Ref.: 19 p. 72.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

Cap-St-Martin Quarries

FOSSILS, CALCITE.

In limestone.

The limestone, of Ordovician age, contains numerous fossils including: brachiopods, bryozoans, crinoids, corals, cystoids, algae, pelecypods, gastropods, cephalopods, trilobites and ostracods. White crystalline calcite and small amounts of pyrite occur in the limestone. The quarries in the Cap-St-Martin area produce building stone and crushed stone. Operators include A. Billet Limitée, Canada Cement Company, Back River Quarries Limited, and De Laval Ready Mix Limitée.

Road log from Pie IX Boulevard at km 9.6 (intersection Levesque Boulevard; see road log page 55):

km		
	0.0	Turn left (west) onto Levesque Boulevard.
	0.15	Turn-off (right) to St-Vincent-de-Paul quarry.
	5.5	Turn right (north) onto Autoroute des Laurentides.
	8.2	Quarry on right operated by A. Billet Limitée.
	8.4	Junction Blvd. St. Martin. To reach the Canada Cement quarry proceed along Blvd. St. Martin for 3.7 km then turn left and proceed .15 km to quarry. To continue log, proceed straight ahead along Autoroute des Laurentides.
	9.3	Junction Blvd. St. François. To reach the Back River quarry turn right onto Blvd. St. François and proceed 0.5 km to the quarry on the right side of the road. (Quarry on the left side of road is no longer in operation.) To continue log, proceed straight ahead along Autoroute des Laurentides.
	9.8	Turn left onto Rue de la Station and proceed 0.15 km; turn left again and proceed 0.15 km to the De Laval quarry.

Ref.: 19 p. 63-64, 70.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

Terrebonne Quarry

FOSSILS, CALCITE.

In limestone.

Quarries on both sides of Highway 125 at km 15.1 (see road log page 55) are operated by Terrebonne Quarries Limited. This deposit is similar to the Cap-St-Martin limestone. The inactive quarry at km 13.8 also exposes limestone.

Ref.: 19 p. 63.

Maps (T): 31 H/12 Laval.
(G): 800 Laval, Quebec (Que. Dept. Natural Resources).

St-Lin Fossil Locality

FOSSILS.

In limestone.

Ordovician limestone containing fossil corals is exposed along the bed of the Achigan River at St-Lin on the east side of the Highway 337 bridge. Fossils reported include Tetradium (up to 20 cm across), Stromatocerium (up to 45 cm across) and Columnaria. Ostracods are found sparingly in the limestone that forms cliffs below the bridge. About 455 m downstream from the bridge, limestone containing silicified brachiopods is exposed for 1220 m along both banks of the river.

Road log from Highway 125 at km 43.1 (junction Highway 158; see road log page 55):

km		
	0.0	Turn left (west) onto Highway 158.
	7.4	Highway 337 joins Highway 158; turn left (south) onto Highway 158/337.
	9.0	St-Lin, at intersection Highways 158 and 337; proceed straight ahead on Highway 337.
	9.1	Bridge over Achigan River. The fossil locality is on the left. A descent to the river can be made from the left (east) side of the highway just before crossing the bridge.

Ref.: 57 p. 28-29.

Maps (T): 31 H/13 Laurentides.
(G): 1270 New Glasgow – St-Lin Area, Electoral Districts of Montcalm, Terrebonne and L'Assomption (Que. Dept. Natural Resources).

Road-cut on Highway 337

CALCITE, APATITE, DIOPSIDE, SERPENTINE, TALC, TITANITE, GRAPHITE, PYRRHOTITE, PYRITE.

In crystalline limestone.

Light blue, coarsely crystalline calcite containing crystals of pyrite, pink titanite (very small), greenish yellow diopside, light blue apatite (small), and grains of serpentine, graphite and pyrrhotite, are exposed by the road-cut. White flaky aggregates of talc occur on the calcite. An attractive rock composed of a white calcite matrix containing light green serpentine grains occurs in the limestone; it can be polished and could be used for small ornamental objects. Serpentine also occurs as olive green, fine-grained porcelain-like masses, small patches of which may be suitable for cutting into cabochons.

Road log from Highway 125 at km 43.1 (junction Highway 158; see road log page 55):

km		
	0.0	Turn left (west) onto Highway 158.
	7.4	Junction Highway 337; turn right and proceed north along Highway 337.
	22.0	St-Calixte, at junction road to church; continue along Highway 337.
	24.9	Road-cut on left just in front of a crossroad.

Ref.: 57 p. 11.

Maps (T): 31 H/13 Laurentides.
(G): 1270 New Glasgow – St-Lin Area, Electoral Districts of Montcalm, Terrebonne and L'Assomption (Que. Dept. Natural Resources).

Dorwin Falls Occurrence

GARNET, PYRITE.

In gneiss.

Pink garnets measuring up to 5 mm across and tiny pyrite grains occur in gneiss exposed along the bed and cliffs at Dorwin (Darwin) Falls on the Ouareau River at Rawdon. The gneiss weathers to a rusty brown, and the garnets are apparent only on the freshly broken surfaces. The occurrence is below the Dorwin Falls picnic site at km 60.8 (see road log on page 55).

Maps (T): 31 I/4 Rawdon.
(G): 1264 Rawdon area, Electoral Districts of Joliette and Montaclm (Que. Dept. Natural Resources).

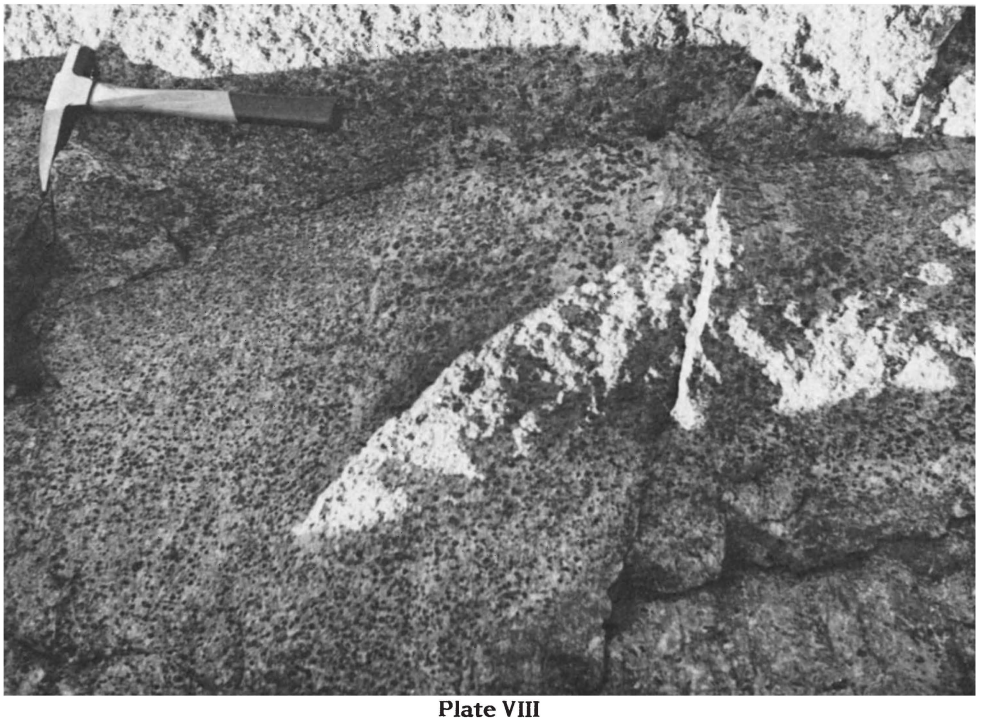

Plate VIII

Garnets in quartzite, in road-cut near Rawdon. (GSC 138739)

Garnet Occurrence

GARNET, MONAZITE, GRAPHITE.

In quartzite.

Pink to deep red garnets averaging 5 mm across are abundant in grey quartzite. The garnets are generally highly fractured. Monazite occurs sparingly as small, amber-coloured transparent grains. Fine flakes and streaks of graphite give the rock a banded appearance.

Road log from Rawdon at km 61.8 (see road log page 55):

km	0.0	Turn left onto Metcalf Street.
	0.5	Junction; turn right.
	1.0	Bridge over Rouge Nord-Ouest River; continue straight ahead on paved road.
	2.1	Junction; turn left.
	3.5 to 3.7	Road-cuts on left side of road.
Maps	(T):	31 I/4 Rawdon.
	(G):	1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

Manchester Falls Occurrence

GARNET, GRAPHITE, PYRITE.

In gneiss.

Pink garnets (about 5 mm across) occur with fine flakes of graphite and small grains of pyrite in rusty-weathering gneiss near the oil railway bridge at Manchester Falls on the Ouareau River.

Road log from Rawdon at km 61.9 (see road log page 55):

km	0.0	Highway 341 curves to the left; proceed straight ahead at sign "Manchester Falls Hotel".
	0.6	End of paved road; follow single lane road 0.15 km to abandoned railway bridge. Walk down to exposures along river bed.

Ref.: 4 p. 13.

Maps	(T):	31 I/4 Rawdon.
	(G):	1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

Road-cuts, km 79.5 to km 79.6 on Highway 343

GARNET, MONAZITE, MAGNETITE.

In gneiss.

Brownish red garnet crystals (averaging 5 mm across) and granular aggregates are common in the rock and are generally fractured. Monazite, as small, amber-coloured, transparent grains, is present sparingly. Magnetite occurs as streaks and small patches (see road log page 55).

Maps (T): 31 I/4 Rawdon.
(G): 1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

Road-cuts, km 80.8 on Highway 343

SILLIMANITE, GARNET, FELDSPAR, MONAZITE, GRAPHITE, PYRITE, MAGNETITE, GOETHITE.

In paragneiss.

Sillimanite, as sheaf-like aggregates measuring up to 10 cm long, has been found at this locality. It also occurs as small colourless blades with a pearly lustre. Pink to deep red and brownish yellow garnet crystals (about 5 mm across) and granular patches are common in the paragneiss and in greyish white columnar plagioclase feldspar. Monazite, as amber transparent grains, occurs sparingly. Flakes of graphite, grains of magnetite, and irregular patches of pyrite are scattered throughout the rock. Goethite forms yellow to brownish yellow powdery coatings on the rock.

The road-cuts are on both sides of Highway 343 opposite Lac-des-Français (see road log page 55).

Ref.: 4 p. 10-11.

Maps (T): 31 I/4 Rawdon.
(G): 1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

Road-cuts, km 81.9 to 82.4 and km 87.0 to 89.8 on Highway 343

GARNET, MAGNETITE.

In gneiss.

Garnet occurs as brownish red crystals (small) and as crystalline patches with tiny grains of magnetite. (See road log page 55).

Maps (T): 31 I/4 Rawdon.
(G): 1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

Road-cuts, km 95.4 to 101.7 on Highway 343

GARNET.

In quartzite and gneiss.

The garnets are deep red and average about 3 mm across. The garnetiferous rocks are exposed by numerous road-cuts between St-Alphonse and St-Côme, i.e. between km 95.4 and 101.7 (see road log page 55).

Maps (T): 31 I/4 Rawdon.
(G): 1264 Rawdon area, Electoral Districts of Joliette and Montcalm (Que. Dept. Natural Resources).

This is the last locality described for the side trip to the Rawdon area. The main road log along Highway 138 is resumed.

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km **42.1** **Intersection Pie IX Boulevard and Sherbrooke Street** in Montreal.

km **49.6** **Canada Cement quarry on left.** Ordovician limestone is quarried here. The rock is similar to that found in other limestone quarries on Montreal Island.

km **51.8** **Intersection Broadway Avenue.**

Montreal-East Quarry

FOSSILS, CALCITE.

In limestone.

The limestone is dense, charcoal-grey and contains brachiopods, trilobites, gastropods, cephalopods, bryozoans and worms. The fossils are difficult to remove from the limestone because of the rock's dense character. The limestone is of Ordovician age. Thin white calcite veinlets cut the rock. The quarry is operated by Montreal-East Quarries (1965) Limited.

Road log from Highway 138 (Sherbrooke Street) at km 51.8:

km 0.0 Turn left (north) onto Broadway Avenue.

1.85 Intersection Metropolitan Boulevard; turn left.

2.1 Montreal-East quarry on right.

Ref.: 19 p. 96-99.

Maps (T): 31 H/12 Laval.
(G): 800 Laval Quebec (Que. Dept. Natural Resources).

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km **76.1** **Junction Highway 343.**

Domtar Joliette Quarry

FOSSILS, CHERT.

In limestone.

Nodules of black chert and shell fossils (not very common) occur in the limestone which is of Ordovician age.

Road log from Highway 138 at km 76.1:

km 0.0 Turn left onto Highway 343 and proceed to Joliette.

28.8 Junction; turn left.

30.1 Domtar office on right. Obtain permission to enter quarry.

Ref.: 30 p. 72-75.

Maps (T): 31 K/3 Sorel.
(G): 590 Geological map of parts of Joliette, Argenteuil, Terrebonne and Montcalm Counties, Quebec (GSC, 1 inch to 4 miles). Out of print.

Joliette Quarry

FOSSILS, CHERT, CALCITE, PYRITE.

In limestone.

Ordovician shell fossils are abundant in brownish grey to dark grey limestone. Black chert nodules occur in the brownish grey limestone and veins of white crystalline calcite containing tiny crystals of pyrite cut the dark grey limestone. The quarry and crushing plant are operated by Carrière Joliette Limitée.

Road log from Highway 138 at km 76.1 (see page 63):

km		
	0.0	Turn left onto Highway 343 and proceed to Joliette.
	30.6	Joliette, at junction Highway 158; turn right and proceed along Highway 158.
	33.0	Entrance to Joliette quarry on left.

Ref.: 30 p. 72-76.

Maps (T): 31 I/3 Sorel.
(G): 590 Geological map of parts of Joliette, Argenteuil, Terrebonne and Montcalm Counties, Quebec (GSC, 1 inch to 4 miles). Out of print.

Road-cuts on Highway 131, km 95.7 to 96.2

GARNET, GRAPHITE.

In gneiss.

Pink to deep red garnets (up to 5 mm across) occur abundantly with small amounts of graphite in biotite gneiss. The exposures are on Highway 131 between St-Zénon and St-Michel-des-Saints (see road log for Superior silica mine, below).

Maps (T): 31 I/12 St-Michel-des-Saints.
(G): 1611 St-Michel-des-Saints area (west), Maskinongé, Berthier and Joliette Counties (Que. Dept. Natural Resources).

Superior Silica Mine

QUARTZ, HORNBLENDE, GARNET, FELDSPAR.

In pegmatite.

A zone of pale rose quartz occurs in white massive quartz. Some smoky quartz is also present. The rose quartz is fractured and generally not suitable for ornamental purposes. Small grains of pink garnet occur with hornblende in pink feldspar.

The deposit is worked for silica by Les Mines de Silice Supérieure Limitée.

Road log from Highway 138 at km 76.1 (see page 63):

km		
	0.0	Turn left onto Highway 343 and proceed to Joliette.
	30.6	Joliette, at junction Highway 131; proceed along Highway 131.
	95.7 to 96.2	Road-cuts (see preceding description).
	109.9	St-Zénon, at church.
	125.7	St-Michel-des-Saints, at junction road to St-Guillaume; continue straight ahead.

km 126.0 St-Michel-des-Saints, at intersection Brassard Street and des Aulnaies Street; turn left onto des Aulnaies Street.

131.1 Turn right onto single lane road at sign "Les Mines de Silice Supérieure Ltée".

135.8 Fork; bear right. This part of the road is rough but passable.

136.8 Superior silica mine.

Ref.: 76 p. 11-12.

Maps (T): 31 I/12 St-Michel-des-Saints.
(G): 1611 St-Michel-des-Saints area (west) Maskinongé, Berthier and Joliette Counties (Que. Dept. Natural Resources).

Maisonneuve Mine

MICA, GARNET, TOURMALINE, PERISTERITE, BERYL, SMOKY QUARTZ, PYRITE, PYROCHLORE, EUXENITE, FERGUSONITE, SAMARSKITE.

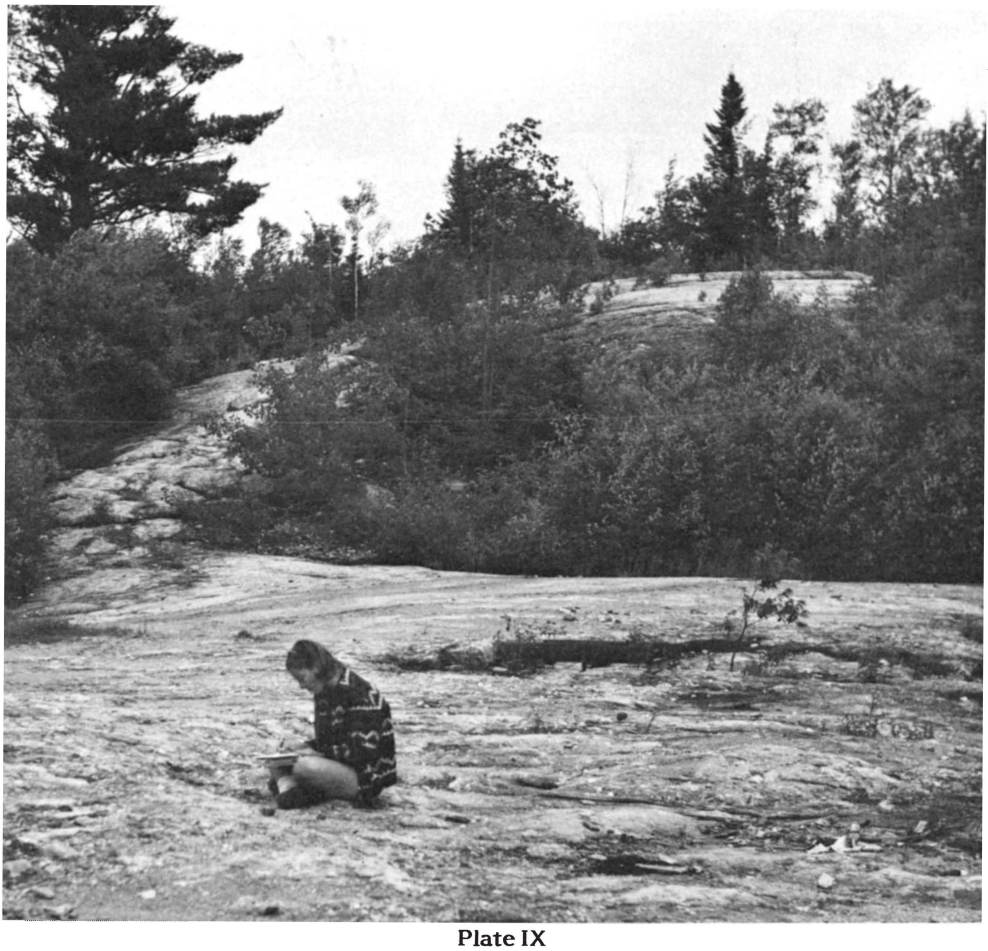

Plate IX

Pegmatite outcrop along road and hill-side, Maisonneuve Mine, St-Michel-des-Saints. (GSC 138738)

In pegmatite.

Muscovite was formerly mined from this deposit; sheets of mica measuring up to 45 cm square were obtained during mining operations. The mica occurs with salmon-coloured feldspar and colourless to smoky quartz. Other minerals present are: garnet, as deep red crystals (generally less than 5 mm across) and crystalline aggregates; black tourmaline; white peristerite exhibiting the characteristic blue iridescence; small, bluish green beryl crystals; smoky quartz; pyrite; yellowish brown grains of pyrochlore (not common); nodules (about 3 mm across) or grains of samarskite, fergusonite and/or euxenite; and books of biotite. Small specimens of peristerite, free of fractures and suitable for producing cabochons, can easily be found. The beryl is of a poor quality and is not abundant.

The deposit was worked by a shaft, an open pit and by stripping. It was opened for mica and was worked briefly (1904-1906) for rare-element minerals. It was investigated for uranium by South State Uranium Mines Limited in 1954. A travel permit from the Quebec Department of Lands and Forests Protection Service is necessary to enter the property; it can be obtained at St-Michel-des-Saints.

Road log from St-Michel-des-Saints:

km		
	0.0	Intersection Brassard Street and des Aulnaies Street; proceed west on des Aulnaies Street.
	5.1	Turn-off to Superior Silica mine; continue straight ahead.
	10.0	Fork; bear left.
	12.9	Gate; travel permits are collected here. After passing through gate, take the left fork.
	15.0	Road passes over exposure of pegmatite before reaching a fishing camp. The mine is to the left (west) of the exposure and a large stripped area is to the right. The old shaft is near the west end of the rock exposure just east of the creek (about 45 m from the road). The old pits and dumps are in the woods approximately 110 m southwest of the shaft.

Refs.: 24 p. 248-249; 68 p. 32-33; 74 p. 200-201; 77 p. 29.

Maps (T): 31 J/16 Lac Charland.
(G): Three Rivers (GSC, 1 inch to 4 miles). Out of print.

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km 125.0 Junction road to St-Barthélemy.

St-Barthélemy Quarry

FOSSILS, CALCITE.

In limestone.

Crinoids and shell fossils are found in dark grey, dense limestone of Ordovician age. Finely crystalline, colourless to light grey calcite occurs along fractures in the rock.

The quarry and crushing plant are operated by Carrière St. Barthélemy Limitée.

Road log from Highway 138 at km 125.0:

km		
	0.0	Turn left (north) onto road to St-Barthélemy.
	2.4	St-Barthélemy at crossroad; turn right.
	2.7	Junction quarry road; turn left.
	2.9	Quarry.

Ref.: 30 p. 47-49.

Maps (T): 31 I/3 Sorel.
(G): 665 Three Rivers (GSC, 1 inch to 4 miles). Out of print.

---

km 161.7 Trois-Rivières, at Highway 138 (Royale Street) and des Forges Street.

Les Forges de St-Maurice

The St-Maurice forges, formerly located about 145 km upstream from Trois-Rivières, were erected in 1733 and were operated almost continuously until 1883. The works consisted of charcoal furnaces and two forges. The iron produced was of a high quality and was used to make cast iron stoves, pots, kettles, and for bar iron. During the French regime, artisans from France were sent to instruct local workmen. In 1752, approximately 180 men were employed, and in 1775, there were "400 to 800 persons employed in the woods, mines, quarries, workshops and offices of the Company" (Ref. 94, p. 85).

The ore was obtained from swampy areas or bogs in the vicinity of Trois-Rivières where it was discovered in about 1667. Initially, the forges treated ore from bogs close to the works, but when this deposit became depleted, ore was obtained from 12 or 13 km away and was transported only during the winter by sledges as there were no all-weather roads. Operations ceased when the ore and wood supply became exhausted.

At present, in the village of Les Vieilles Forges, a historic monument indicates the place formerly occupied by the St-Maurice forges. There are no remnants of the installations.

Road log from Highway 138 at Trois-Rivières (km 161.7):

km		
	0.0	Proceed north along des Forges Street.
	0.3	Junction; bear right and follow des Forges Boulevard.
	10.9	Les Vieilles Forges; historic monument on right.

Ref.: 94 p. 77-89.

Map (T): 31 I/7 Trois-Rivières.

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km 184.1 Cap-de-la-Madeleine, at junction Highway 157.

Shawinigan - Ste-Thècle Occurrences

Road log for side trip to localities along Highway 157 and 153 (occurrences described in text following log are underlined):

km		
	0.0	Proceed north along Highway 157.
	11.1	Junction Ste-Marguerite Boulevard to St-Maurice quarry.
	28.0	Almaville, at turn-off to 31st Avenue and Shawinigan-Sud quarry.
	29.6	Shawinigan; bear right to Grand'Mère.
	30.7	Shawinigan, at junction road to Ste-Flore and to Shawinigan and St-Maurice quarries.
	37.8	Grand'Mère, at junction road to Ste-Flore.
	39.9	Grand'Mère, at junction road to St-Jean-des-Piles and Grand'Mère quarry.

km 45.4 Junction Highway 155 and 153; proceed straight ahead on Highway 153. (Highway 155 leads to the Lac à Baude allanite occurrence; see page 70).

49.1 Junction road (on left) to Black Creek bog.

57.1 St-Tite, at junction Highway 159. Continue straight ahead through St-Tite, then to Ste-Thècle marble quarry.

St-Maurice Quarry

FOSSILS, CALCITE.

In limestone.

This deposit is similar to that at the St-Barthélemy quarry (see page 66). The crushing plant and quarry are operated by Carrière St-Maurice Inc.

Road log from Highway 157 at km 11.1 (see road log above):

km 0.0 Turn right (east) onto Ste-Marguerite Boulevard.

0.15 Turn left onto road to quarry.

0.3 Quarry.

Ref.: 30 p. 49-52.

Maps (T): 31 I/7 Trois-Rivières.
(G): 54-1959 Trois-Rivières, Quebec (GSC).

Shawinigan-Sud Quarry

GARNET, GRAPHITE.

In pyroxene gneiss.

Tiny crystals and granular aggregates (about 5 mm across) of red garnet occur with patches of flaky graphite in greenish grey gneiss. The quarry is no longer active.

Road log from Highway 157 at km 28.0 (see road log page 67):

km 0.0 Turn right from Highway 157 just before crossing bridge.

0.15 Intersection 31st Avenue and 104th Street; turn right onto 104th Street.

0.4 Quarry on left, opposite Notre-Dame School playground.

Maps (T): 31 I/10 Shawinigan.
(G): 1327 Shawinigan area, Electoral Districts of Champlain, Laviolette and St-Maurice (Que. Dept. Natural Resources).

Shawinigan and St-Maurice Quarries

QUARTZ, BIOTITE, FELDSPAR GNEISS.

The gneiss contains pink garnet grains, fibrous sillimanite, magnetite, pyrite and pyrrhotite. These minerals are present in very small amounts and are not readily visible without magnification. The rock is crushed and used as aggregate in concrete.

Road log from Shawinigan at km 30.7 (see road log page 67):

km		
	0.0	Turn left onto road to Ste-Flore.
	1.2	Bridge over Shawinigan River.
	1.3	Shawinigan quarry on left, operated by Carrière Shawinigan Limitée.
	3.1	Junction; turn right.
	3.7	Turn-off (left) to St-Maurice quarry. (This turn-off is 7.9 km from km 37.8 on Highway 157 at Grand'Mère; see road log page 67).
	4.0	St-Maurice quarry.

Ref.: 3 p. 15-16.

Maps (T): 31 I/10 Shawinigan.
(G): 1327 Shawinigan area, Electoral Districts of Champlain, Laviolette and St-Maurice (Que. Dept. Natural Resources).

Grand'Mère Quarry

CALCITE.

In quartz-biotite-feldspar gneiss.

White calcite veins measuring about 2 cm wide cut the gneiss which is similar to the rock quarried at the St-Maurice and Shawinigan quarries. The calcite fluoresces bright pink when exposed to ultraviolet rays (both 'long' and 'short' rays). The quarry is no longer in operation.

Road log from Highway 157 at Grand'Mère (km 39.9; see road log page 67):

km		
	0.0	Turn left onto road to St-Jean-des-Piles (4ème rue).
	1.3	Quarry on right behind road-cut.

Ref.: 3 p. 15-16.

Maps (T): 31 I/10 Shawinigan.
(G): 1327 Shawinigan area, Electoral Districts of Champlain, Laviolette and St-Maurice (Que. Dept. Natural Resources).

Black Creek Bog

BOG IRON.

The ore occurs as spongy, rusty masses but is black and lustrous on fresh surfaces. It is found in rusty sand near the surface of a swampy area. Formerly it was removed with picks, then washed and shovelled into horse-drawn carts for transportation to the forges.

Bog iron ore was recovered from the Shawinigan area as early as 1733, when François Poulin, Sieur de Francheville, propietor of the Seigneurie de St-Maurice first exploited the deposits. Iron ore has been removed from the Black Creek, Tortue Lake, and Radnor fields and the ore was treated at the Radnor and "Les Petites Forges" (the latter, on the Mékinac-du-Sud River). The forges were operated from 1860 to 1910.

The Black Creek Bog is located about 1.6 km northwest of Highway 153. Access is by a road, 1.1 km long, leaving the highway at km 49.1 (see road log page 68).

Ref.: 3 p. 41-43.

Maps (T): 31 I/10 Shawinigan.
(G): 1327 Shawinigan area, Electoral Districts of Champlain, Laviolette and St-Maurice (Que. Dept. Natural Resources).

Ste-Thècle Marble Quarry

CALCITE, SERPENTINE, SCAPOLITE, PYROXENE, TREMOLITE, TITANITE, MICA, FELDSPAR, QUARTZ, GARNET.

In crystalline limestone.

An attractive marble composed of bright salmon-pink calcite with blotches, bands, and/or streaks of yellow-green to dark green serpentine is found in this quarry. Another variety is composed of white calcite with patches of pink calcite. The marbles take a good polish and are suitable for ornamental purposes not requiring large blocks of rock as there are numerous inclusions of dark igneous rocks in the crystalline limestones (marble). Minerals found in the marble include: grey translucent massive scapolite; dark green pyroxene; light tan-coloured tremolite; dark brown titanite grains; amber mica; greyish white feldspar; and massive and crystalline quartz. Granular patches of pink garnet occur in biotite gneiss that forms the country rock enclosing the crystalline limestone.

The quarry was opened in 1911 by La Compagnie de Marbre du Canada to furnish marble for interior decoration but was closed soon after. In 1949 it was worked again and the stone was used to face local private homes; examples of this use can be seen in numerous houses in Ste-Thècle.

Road log from St-Tite at km 57.1 on Highway 153 (see road log page 68):

km		
	0.0	St-Tite, at junction Highways 153 and 159; proceed to the centre of town.
	0.6	St-Tite; turn left onto road to Ste-Thècle.
	12.5	Ste-Thècle, at junction St-Jacques Street; turn right onto St-Jacques Street.
	12.9	Ste-Thècle, at church; turn left onto Masson Street.
	13.7	Junction; turn right.
	14.1	Junction; turn left.
	15.9	Junction; turn left.
	16.1	Junction; turn right.
	18.3	Fork at cabin on right; bear left.
	18.6	Junction, on left, single lane quarry road; turn left.
	19.1	Quarry.

Refs.: 6 p. 66; 30 p. 52-53; 60 p. 199-200.

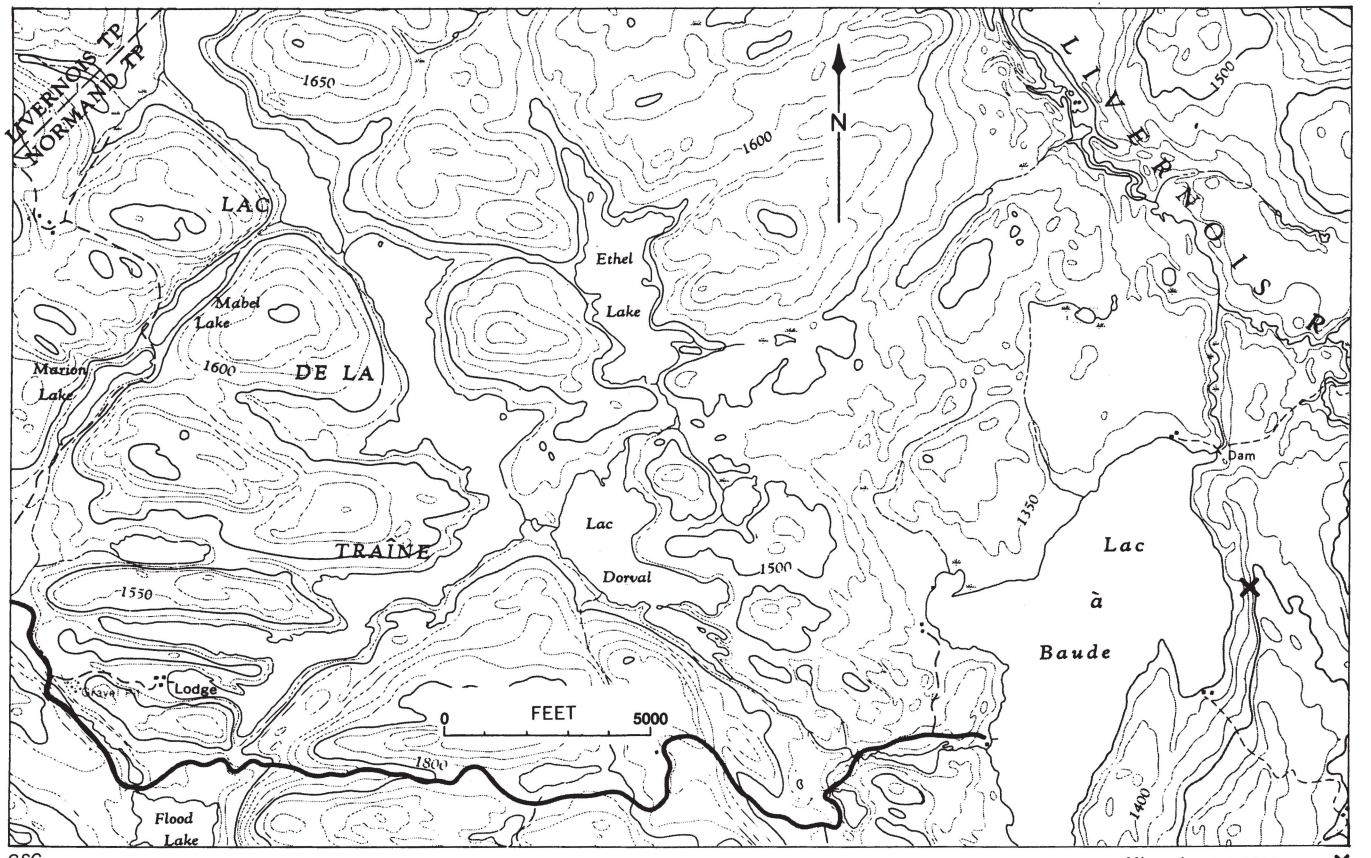
Maps (T): 31 I/15 Mattawin.
(G): 665 Three Rivers (GSC, 1 inch to 4 miles). Out of print.

Lac à Baude Allanite Occurrence

ALLANITE, HORNBLENDE, MAGNETITE, MICROCLINE.

In pegmatite dyke cutting gneiss.

Allanite occurs as black tabular crystals measuring up to 8 cm long by 5 mm wide, and as clots up to 30 cm across. A sunburst of reddish altered material surrounds many of the allanite crystals. Microcline crystals up to 8 cm across and hornblende crystals measuring 5 mm across have been reported. These minerals and magnetite occur in pegmatite composed mainly of microcline, quartz and minor plagioclase and biotite. The deposit has been exposed by blasting at the face of a cliff on the east side of Lac à Baude. The cliff is visible from the centre of the lake and from the landing on the west side of the lake;



Map 4

Lac à Baude allanite occurrence

the bearing is N 65°E. The deposit can be recognized from the south-central part of the lake by a buff-weathered, slightly rusty spot on the crest of the northern extension of the main escarpment. The lake is about 1.5 km wide.

Road log from km 45.4 on Highway 157 (see log for side trip to localities along Highway 157 and 153, p. 68):

km		
	0.0	Junction Highways 157 and 153 northeast of Grand'Mère; proceed along Highway 157.
	24.0	St-Roch-de-Mékinac, at junction Highway 153; continue along Highway 157.
	45.8	Mattawin; turn left onto ferry landing.
	46.3	Ferry landing. Obtain permission from Consolidated Paper Corporation Limited to use their ferry and company road. From ferry proceed along Chienne Depot Road.
	107.8	Junction; turn right (north) onto Straw-hat Depot Road.
	113.1	Fork. The fork on right is a private road leading about 9.6 km to the west side of Lac à Baude. For permission to use this road and to use a boat to cross the lake, follow left fork for 0.8 km to the owner at the Sleigh Lake private lodge. The road to Lac à Baude is very rough and may not be negotiable by automobile.

Refs.: 24 p. 251-252; 68 p. 31-32.

Maps (T): 31 P/3 Steamboat Rock Lake.
(G): 665 Three Rivers (GSC, 1 inch to 4 miles). Out of print.

This is the last locality described along Highways 157 and 153; the main road log along Highway 138 is resumed.

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km **184.1** **Cap-de-la-Madeleine, at junction Highway 157.**

km **187.4** **Junction, road to Red Mill.**

Red Mill Ochre Deposit

OCHRE

In bogs.

Red and yellow ochre occur in the bogs near Red Mill. The ochre consists of hematite and/or limonite mixed with clay material and forms pulverulent to earthy masses. Small flaky aggregates of black metallic hematite are disseminated in the ochre. The iron oxides (ochre) are contained in organic matter (peat, muck) which is removed by furnaces at the mill. The resulting produce – red iron-oxide – is then pulverized, sized and used as a paint pigment.

The bog deposits in this area have been worked since 1888. At present, the Red Mill deposits furnish the total Canadian output of natural iron-oxide pigments. They are operated by the Sherwin Williams Company of Canada Limited.

Road log from Highway 138 at km 187.4:

km		
	0.0	Turn left (north) onto road to Red Mill.
	2.2	Red Mill, at junction; turn right.
	2.4	Junction; turn left.
	3.1	Red Mill station.
	4.5	Ochre deposits.

Refs.: 27 p. 30-31; 88 p. 44.

Maps (T): 31 I/8 Bécancour.
(G): 42-1959 Bécancour, Quebec (GSC).

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km 217.4 Ste-Anne-de-la-Pérade, at junction Highway 159.

km 238.3 Junction road to St-Marc.

St-Marc-des-Carrières Quarries

BARITE, CALCITE, FOSSILS.

In limestone.

White barite, in massive form and as bladed aggregates, is associated with colourless to white or grey coarsely crystalline calcite that fluoresces pale yellow when exposed to ultraviolet rays. Fossils, including brachiopods, crinoids and bryozoans, are abundant in some layers. The limestone is mostly light brownish grey, but dark grey beds are also present. Small cavities filled with petroleum occur sparingly in the limestone. The rock is of Ordovician age. Formerly, it was widely used as a building stone and was known commercially as Deschambault stone, St-Marc stone, and Portneuf stone. The cut stone has a silvery-grey surface, is durable, retains sharp edges and carving details. Examples of its use as a building stone are: Parliament Buildings, Post Office and City Hall in Quebec City; City Hall in Montreal; Post Office in Rigaud; Canadian Pacific station in Trois Rivières; Sun Life Building (in corridors) in Montreal. At present, its main use is for agricultural lime and as crushed limestone for paper mills but some of it is still quarried as a building stone. The deposits in St-Marc have been worked for over 150 years.

Road log from Highway 138 at km 238.3:

km		
	0.0	Turn left onto road to St-Marc (St-Marc-des-Carrières).
	7.1	Monument at centre of St-Marc; continue straight ahead.
	7.3	Entrance, on left, to quarry operated by Les Carrières Martineau et Deschambault Inc.
	7.7	Entrance, on left, to quarry operated by Les Carrières Langlois Limitée.
	8.0	Junction; turn left leaving main road.
	8.5	Quarry operated by Jos. O. Gauthier Limitée.

Ref. 29 p. 38-54.

Maps (T): 31 I/9 Grondines.
(G): 837 Grondines area, Counties of Champlain, Portneuf, Lotbinière (Que. Dept. Natural Resources, 1 inch to 3 miles).

Tetreault Mine

SPHALERITE, GALENA, PYRRHOTITE, CHALCOPYRITE, MOLYBDENITE, ARSENOPYRITE, PYRITE, MARCASITE, TETRAHEDRITE, GOLD, SILVER, GRAPHITE, TREMOLITE, WILSONITE, DIOPSIDE, TOURMALINE, CHALCEDONY, TALC, CHLORITE, TITANITE, SCAPOLITE, EPIDOTE, GARNET, APATITE, PHLOGOPITE, ANTHOPHYLLITE, QUARTZ, CALCITE, DOLOMITE, BREUNNERITE, HISINGERITE, JAROSITE, ROZENITE, GYPSUM, BROCHANTITE.

In limestone-tremolite rock.

The principal ore minerals are sphalerite (dark brown variety) and galena. Closely associated with them are pyrrhotite and chalcopyrite and minor amounts of pyrite, molybdenite, graphite, arsenopyrite, marcasite, tetrahedrite, and native gold and silver. The most abundant gangue mineral is tremolite which fluoresces pink ('short' ultraviolet rays) and pinkish orange ('long' rays). Lilac-coloured wilsonite is also common; it takes a fair polish and may be suitable for cabochons, etc. Large crystals of diopside (measuring up to 30 cm in length) were found during mining operations. Tourmaline occurs as dark amber masses in tremolite. A dark greyish blue nodule (about 4 cm across) of chalcedony was found in the dumps. Other minerals reported from the deposit include: talc, chlorite, titanite, scapolite, epidote, garnet, apatite, phlogopite, anthophyllite, quartz, calcite, dolomite, breunnerite and hisingerite. Coatings and encrustations of yellow jarosite, white rozenite, white fibrous gypsum, and emerald green brochantite were noted on the surfaces of the tremolite rock.

Zinc ore was discovered on this property in 1910 by Mr. Elzéar Gauthier. Mining operations began in 1911 by Mr. Pierre Tetreault who aquired the mineral rights. The mine was worked by various operators until 1921. It was then worked intermittently until 1948 when Anacon Lead Mines Limited took over continuous operations until 1955. The property is currently held by Ghislau Mining Corporation Limited and is inactive. The mine is located at Montauban (Montauban-les-Mines).

Road log from Highway 138 at km 238.3 (see page 73):

km		
	0.0	Turn left onto road to Ste-Marc (St-Marc-des-Carrières).
	7.1	St-Marc, at monument; continue straight ahead.
	16.6	St-Casimir; turn right onto road to St-Ubald.
	34.1	St-ubald; turn right onto road to Notre-Dame-des-Anges.
	43.9	Fork; bear right.
	45.4	Tetreault mine. The mill and some of the underground workings are on the right.
	45.5	Turn left onto road leading (0.3 km) to another shaft and dumps.

Refs.: 1 p. 79-85; 63 p. 10-11; 79 p. 22-31.

Maps (T): 31 I/16 Montauban.
(G): 1095 Montauban-les-Mines area, Portneuf County (Que. Dept. Natural Resources, 1 inch to 1000 feet).

Montauban Mine

SPHALERITE, GALENA, CHALCOPYRITE, PYRRHOTITE, PYRITE, MOLYBDENITE, ARSENOPYRITE, ANTHOPHYLLITE, PHLOGOPITE, CORDIERITE, GARNET, QUARTZ, WILSONITE, ACTINOLITE, RUTILE, SPINEL, FELDSPAR, ANGLESITE, ROZENITE, HEXAHYDRITE.

In garnetiferous gneiss.

The ore minerals – sphalerite and galena – are closely associated with pyrrhotite, pyrite, chalcopyrite and quartz. Molybdenite and arsenopyrite are present in small amounts. Anthophyllite, as greyish to silvery brown radiating fibrous or platy aggregates, occurs abundantly and is commonly associated with sky blue translucent to greenish blue turbid, massive cordierite and with phlogopite. In general, the cordierite is fractured, contains inclusions of other minerals, and is not suitable for lapidary purposes. Pink garnet grains and small crystals occur in quartz and in gneiss. The wilsonite is mauve to purple, massive, and contains patches of green actinolite and specks of metallic minerals; these

inclusions would render the mineral unsuitable for most lapidary purposes with the exception of producing small cabochons. Rutile, spinel and feldspar have also been reported from this deposit. Anglesite forms dull bluish white coatings on galena, and the secondary sulphates – rozenite and hexahydrite – occur as snow white coatings or encrustations on the ore-bearing gneiss.

The deposit was opened by two shafts in the period 1914-1917 by Montauban Mining Syndicate. In 1951, a shaft was sunk 275 m north of the original mine by Montauban Mines Limited and United Lead and Zinc Mines Limited and a surface plant was installed but work was suspended in 1954. Specimens are available from large dumps near the shafts.

Road log from Highway 138 at km 238.3 (see page 73):

km		
	0.0	Turn left onto road to St-Marc and follow log given for Tetreault mine.
	45.4	Turn-off to Tetreault mine dumps; continue straight ahead to the centre of Montauban village.
	46.2	Montauban, at corner store; turn left (north).
	47.1	Junction mine road; turn left.
	47.5	Gate to mine.

Refs.: 1 p. 86-87; 63 p. 10-11; 79 p. 22-31.

Maps (T): 31 I/16 Montauban.
(G): 1095 Montauban-les-Mines area, Portneuf County (Que. Dept. Natural Resources, 1 inch to 1000 feet).

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km 247.5 Junction road to Portneuf molybdenite occurrence.

Portneuf Molybdenite Occurrence

MOLYBDENITE, QUARTZ, FELDSPAR, APATITE, BIOTITE, URANINITE, URANOTHORITE.

In pegmatized biotite gneiss.

Molybdenite occurs as flaky aggregates in colourless to smoky quartz and greenish white feldspar. Apatite, as light bluish green grains and as small granular masses is present in small amounts. Uraninite and uranothorite have also been reported from the deposit. The deposit has been exposed by three pits and shallow trenches. Specimens are available from these openings.

Road log from Highway 138 at km 247.5:

km		
	0.0	Turn left onto gravel road at sign "Chateau de Roche". (This turn-off is 1.7 km west of the Highway 138 bridge over the Portneuf River in Portneuf.)
	2.4	Crossroad; continue straight ahead.
	2.7	Junction single lane road; turn left.
	3.9	End of road. The openings are in the woods at end of road.

Ref.: 90 p. 212.

Maps (T): 21 L/12 Portneuf.
(G): 694 Portneuf, Counties of Portneuf, Lotbinière (Que. Dept. Natural Resources, 1 inch to 3 miles).

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km 249.2 Portneuf, at bridge over Portneuf River.

km 254.1 Fossil-bearing rock exposure on left.

Cap-Santé Fossil Occurrence

FOSSILS.

In shale.

Graptolites, about 7 cm long, are common in dark grey shale exposed by a cliff on the north side of Highway 138 at km 254.1, just east of the De Chatillon Motel's camping ground.

Maps (T): 21 L/12 Portneuf.
(G): 694 Portneuf, Counties of Portneuf, Lotbinière (Que. Dept. Natural Resources, 1 inch to 3 miles).

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km 257.9 Cap-Santé at junction road to St-Basile.

km 271.3 Junction road to St-Raymond.

Rivière-à-Pierre Quarries

GRANITE.

Two types of granite are quarried in this district: a medium-grained blue-grey to dark grey granite composed chiefly of plagioclase, quartz and hornblende, and a coarse-grained rose to brownish pink granite composed principally of microcline, albite, quartz and biotite. Accessory minerals occurring as small grains include epidote in the grey granite, and titanite in the pink variety. The granite takes a good polish, can be obtained in large blocks and has been used as a building stone since 1894. It has also been used for paving blocks and for curbstone. Examples of its use as a building stone include: The National War Memorial and French Embassy in Ottawa, and the Bank of Canada Building in Montreal (rose granite); International Aviation Building and Phillips Square Building in Montreal (grey granite); the Palais de Justice in Quebec City (grey granite); the piers and abutments for the Quebec bridge (rose granite); the monolithic rose-granite cross erected in Gaspé as a memorial to Jacques Cartier's first landing in Canada. The cross weighs over 38 t and measures 9.7 m high and 27 m across at the arms.

Road log from Highway 138 at km 271.3:

km		
	0.0	Turn left onto road to St-Raymond.
	8.5	Pont-Rouge, at junction; turn left.
	9.0	Junction; turn left.
	27.8	St-Raymond, at church; turn left onto road to Rivière-à-Pierre.
	33.6	Crossroad, turn right.
	62.1	Inactive grey granite quarry on right.
	65.8	Junction; turn right. (Road on left leads 28.8 km to Montauban-les-Mines and to Montauban mine; see page 74).
	68.1	Rivière-à-Pierre, at turn-off to bridge. To reach Perron et Fils quarry (grey granite), turn left toward bridge, and proceed 0.15 km; turn left and proceed 0.6 km to the quarry entrance on the right. To continue log, proceed straight ahead.

km 68.7 Dumas et Voyer dressing plant on left.

69.3 Junction; turn right onto quarry road.

70.3 Dumas et Voyer quarry (rose granite).

Ref.: 8 p. 86-90.

Maps (T): 31 I/16 Montauban.
31 P/1 Talbot.
(G): 1595 Montauban-Colbert area, Champlain, Joliette and Portneuf Counties (Que. Dept. Natural Resources).

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km 275.3 Neuville, at turn-off (right) to wharf.

km 277.7 Neuville, at junction road to quarry.

Neuville Quarry and Shoreline Exposures

FOSSILS, CALCITE.

In limestone.

The limestone is light brownish grey and contains small trilobites and shell fossils of Ordovician age. Thin veinlets of white calcite (fluoresces pale yellow when exposed to 'long' ultraviolet rays) occur in the limestone. The rock is exposed at the St. Lawrence shoreline at the Neuville wharf, and at the quarry operated by Les Calcaires Neuville Inc.

The quarry is located 0.15 km north of Highway 138 at km 277.7.

Ref.: 30 p. 148-149.

Maps (T): 21 L/12 Portneuf.
(G): 694 Portneuf, Counties of Portneuf, Lotbinière (Que. Dept. Natural Resources, 1 inch to 3 miles).

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km 306.3 Quebec, at junction Highway 73 (Laurentian Boulevard).

Escoumins Occurrences

Log along Highway 138 for side trip to Escoumins (underlined localities are described in text following log):

km 0.0 Quebec, at junction Highways 138 and 73; proceed along Highway 138.

2.1 Intersection Canardière Street, to Verreault quarry. Road log continues along Highway 138.

92.7 Junction Highway 362 to Baie-St-Paul lead occurrence.

103.5 Junction Highway 381 to St-Urbain titanium mines.

131.6 Junction road to St-Aimé-des-Lacs and Lac du Pied-des-Monts mine.

177.5 Junction Highway 170.

214.8 Tadoussac, at ferry landing.

250.7 Escoumins peat bog and cutting on left.

253.9 Escoumins, at bridge and junction to McGie and Simard mines.

Verreault Quarry

FOSSILS, CALCITE.

In limestone.

Ordovician shell fossils occur in light brownish grey to grey limestone. Veins of greyish white to colourless calcite (fluoresces pale yellow under 'long' ultraviolet rays) cut the limestone.

The quarry and crushing plant is operated by Elzéar Verreault Limitée.

Road log from Highway 138 at km 2.1 (see road log page 77):

km		
	0.0	At intersection Canardière Street, bear left onto Highway 360 (Avenue Royale).
	2.2	Highway turns sharply to right; proceed straight ahead along secondary road.
	2.5	Quarry.

Ref.: 30 p. 154-155.

Map (T): 21 L/14 Quebec.

Baie-St-Paul Lead Occurrence

GALENA, SPHALERITE, PYRITE, FLUORITE, CALCITE.

In veins cutting garnetiferous gneiss.

Small amounts of galena, amber-coloured sphalerite and pyrite occur in white coarsely crystalline calcite that fluoresces yellow when exposed to 'long' ultraviolet rays. Apple-green, massive fluorite is the most common mineral present in the calcite.

The galena-bearing vein is about 1 m wide and is exposed along the walls and floor above the lower falls of du Moulin River at Baie-St-Paul.

Road log from Highway 138 at km 92.7 (see road log page 77):

km		
	0.0	Leave Highway 138 and proceed onto Highway 362 to Baie-St-Paul.
	2.2	Fork; bear right.
	3.1	Bridge over du Moulin River; the falls are on the right. Cross bridge and walk along left (east) side of river to the base of the upper falls. The deposit is exposed between the lower and upper falls.

Ref.: 1 p. 91.

Maps (T): 21 M/7 Maillard.
(G): 2106 St-Urbain area, Charlevoix County, Quebec (GSC).

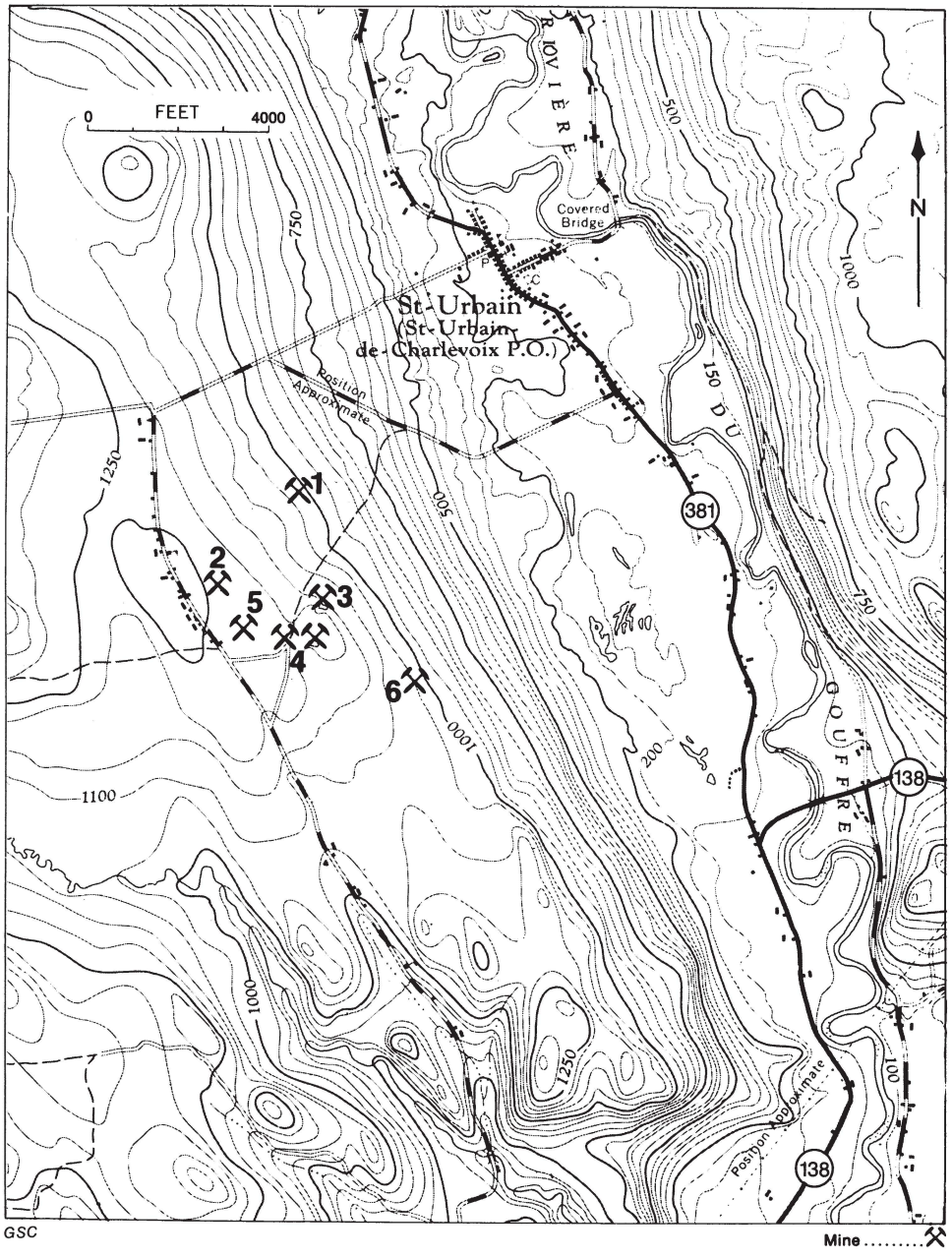
St-Urbain Titanium Mines

ILMENITE, HEMATITE, RUTILE, PYRITE, PYRRHOTITE, CHALCOPYRITE, LIMONITE, CALCITE, LAUMONTITE, MESOLITE, PYROXENE, CHLORITE, SERPENTINE, ORTHOCLASE, SAPPHIRINE, TITANITE.

In veins cutting anorthosite.

Ilmenite and hematite occur as massive intergrowths containing minor amounts of pyrite, pyrrhotite, chalcopyrite, and reddish brown rutile. Vugs in the ore are partly filled with pyrite, limonite, and hematite, and with pale green chlorite, pinkish white zeolites and

Part of 21 M/10



Map 5

St-Urbain area

1. Furnace mine;
2. Bignell mine;
3. General Electric mine;
4. Coulombe East and West mines;
5. Bouchard mine;
6. Joseph Bouchard mine.

calcite crystals. The zeolites – pale pink, radiating, platy mesolite and greenish white, massive leumontite – are associated with calcite and dark mica and occur on the host rock and on the ore. White crystalline calcite fluoresces bright pink when exposed to 'short' or 'long' ultraviolet rays. Two types of pyrite occur, massive and cellular. The latter is a loose network of tiny pyrite crystals with which are associated small amounts of calcite and pyroxene (altered to serpentine and chlorite). Salmon-pink orthoclase occurs in the deposit. Sapphirine is intimately associated with ilmenite, feldspar, chlorite and rutile and is generally visible only under magnification. Titanite occurs as white "micro" crystals associated with the ore minerals.

Historical records indicate that the deposit was discovered in 1666 by Sieur de la Tesserie who investigated the area by order of Colbert, the prime minister of Louis XIV. It was first worked between 1872 and 1874 for iron which was produced using wood-charcoal furnaces. The venture proved to be too costly and subsequent operations were intermittent, the longest periods of operations being 1928-1932 (by the Dupont Chemical Company) and 1940-1946. In 1956, Continental Iron and Titanium Mining Limited took over operations and, later, installed a titanium oxide plant at Baie-St-Paul. The ore was utilized for heavy aggregate in concrete used in laying the natural gas pipe-line from Alberta and for use in concrete shields for nuclear reactors. No work was being done on the deposit in the summer of 1966. Six mines had been worked in an area extending about 1.6 km just west of St-Urbain village. They are known as the Furnace, Bignell, General Electric, Coulombe, Bouchard and Joseph Bouchard mines. They were worked by open pits, now water-filled. Specimens are available from large dumps near the openings.

Plate X

Pit at Bignell mine, St-Urbain. (GSC 138733)

Road log from Highway 138 at km 103.5 (see road log page 77):

km		
	0.0	Proceed north on road to St-Urbain.
	4.7	St-Urbain; turn left onto gravel road just beyond church.
	7.4	Junction; turn left.
	9.3	Junction mine road on left. Proceed east on this road for 175 m to the Bignell mine, then continue along road in northeasterly direction for 900 m to the Furnace mine.
	9.8	Junction on left, mine road to Bouchard, Coulombe (East and West), General Electric and Joseph Bouchard mines.

Refs.: 53 p. 44-53; 66 p. 46-52; 69 p. 15-20; 94 p. 77.

Maps (T): 21 M/10 St-Urbain.
(G): 2106 St-Urbain area, Charlevoix County, Quebec (GSC).
Figure 1 (Paper 61-7). Geology, aeromagnetic contours, and the known iron and titanium occurrences in the St-Urbain anorthosite massif, Charlevoix County, Quebec.

Lac du Pied-des-Monts Mine

GARNET, ZIRCON, MONAZITE, URANINITE, BERYL, ANTHRAXOLITE, MICA.

In pegmatite dyke cutting hornblende gneiss.

The minerals occur in pegmatite composed of pink microcline, white albite, smoky and white quartz, and mica. Aggregates of red garnets are abundant and are generally associated with biotite; some of the garnets are clear but they are too small for gem purposes. The zircon crystals are dark brown and about 3 mm long. Small amber-coloured monazite crystals occur sparingly. A large dodecahedral crystal of uraninite weighing 365 gm had been found in the deposit but this mineral is not readily found in the dumps now. A few small crystals of beryl have also been reported. Anthraxolite forms rounded, coal-like fragments in feldspar and quartz. Both muscovite and biotite micas are present and are commonly intergrown. Muscovite crystals measuring almost 30 cm across were and are commonly intergrown. Muscovite crystals measuring almost 30 cm across were obtained during mining operations; one crystal (63 cm by 81 cm) weighed 315 kg and yielded perfect sheets measuring 25 cm by 35 cm.

The mine was operated for mica from 1893 to 1894 and in 1908. The main workings consist of adits and an open cut into the steep hill overlooking the northeast side of Lac du Pied-des-Monts and 180 m above the lake. Two pits (3 by 2.5 m and 12 m deep, and 3 by 3 and 7.5 m deep) are located on the north side of the creek flowing from the east end of the lake, approximately 1.2 km from the main openings and 175 m from the lake. As the mine is difficult to reach a local guide would be helpful.

Road log from Highway 138 at km 131.6 (see road log page 77):

km		
	0.0	Proceed west on road to St-Aimé-des-Lacs.
	0.3	Junction; turn left.
	3.4	St-Aimé-des-Lacs at junction road to Notre-Dame-des-Monts; continue straight ahead.
	10.3	Junction; proceed left.
	10.4	Junction; turn right.

km 14.5 Junction single lane road on right (at Boily farmhouse). Main gravel road continues straight ahead to a fishing camp at the lake. The mine at the northeast side of the lake is visible from this point and is accessible by boat which may be rented from local residents. To reach the mine by road, turn right at the Boily farm and follow single lane road.

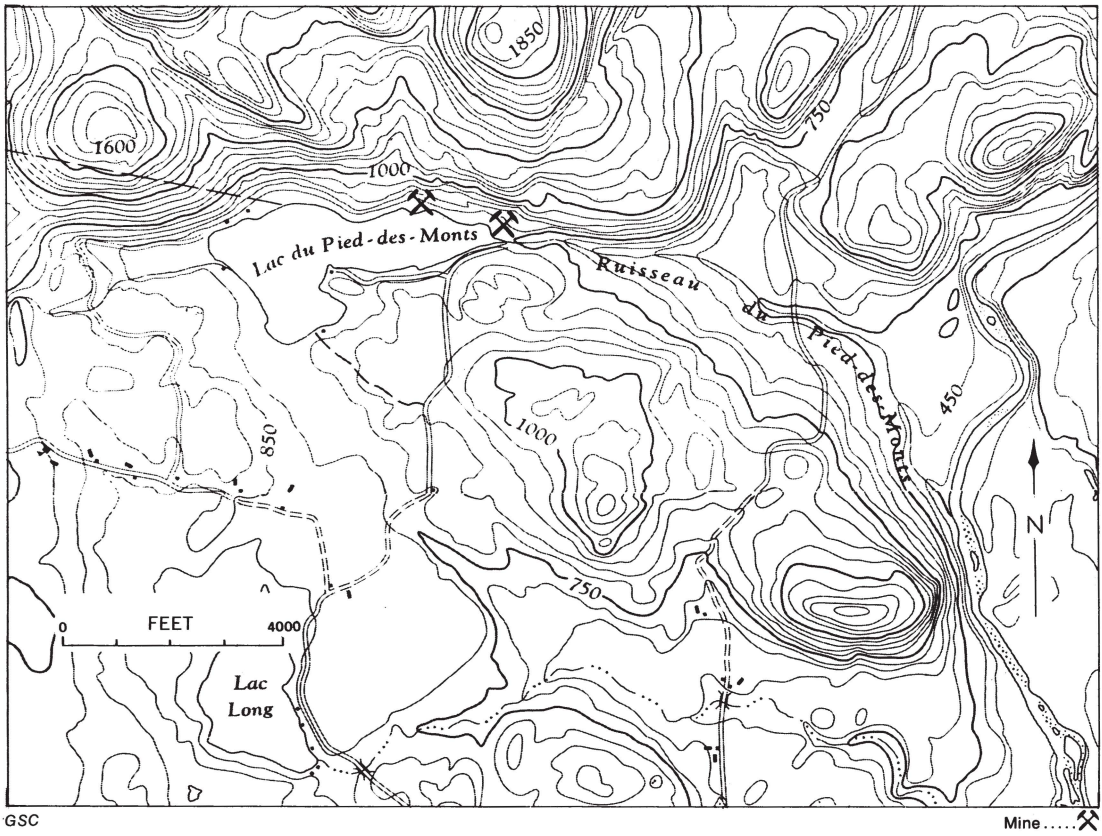
16.6 Fork; bear right. (Left fork leads to south shore of lake.)

17.0 Bridge over creek at east end of lake (may not be passable). The eastern pits are to the right of the outlet and the main openings are on a slope facing the lake about 0.8 km from here.

Refs.: 24 p. 250-251; 55 p. 34; 74 p. 201; 75 p. 48-49.

Maps (T): 21 M/16 Lac au Plongeon.
(G): 2106 St-Urbain area, Charlevoix County, Quebec (GSC).

Parts of 21 M/9 and 21 M/16



Map 6

Lac du Pied-des-Monts mine

Escoumins Peat Bog

PEAT.

This peat bog has an area of 5 to 8 square km and is one of the largest peat deposits known to occur in Quebec. It is 3 to 5 m deep and consists mainly of sphagnum moss with rosemary, labrador tea, abundant blueberry bushes, and spruce trees. The bog and peat cutting are adjacent to Highway 138 at km 250.7 (see road log page 77).

Ref.: 50 p. 55-57.

Maps (T): 22 C/6 Les Escoumins.
(G): 101 Part of the North Shore, County of Saguenay, Tadoussac Sheet (Que. Dept. Natural Resources).

McGie Mine

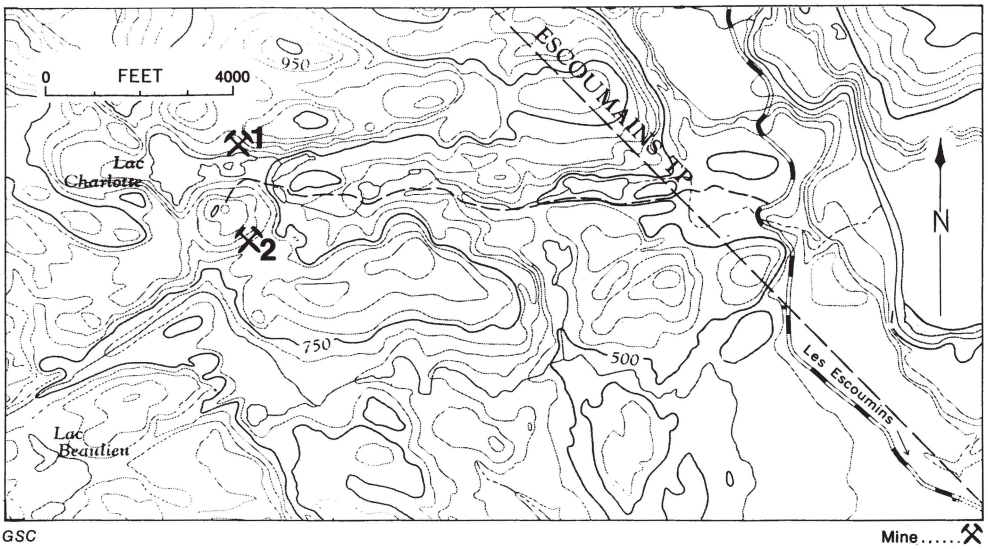
MUSCOVITE, GARNET, BERYL, TOURMALINE, APATITE, ANTHRAXOLITE.

In pegmatite dyke cutting biotite paragneiss and quartzite.

Muscovite sheets (ruby and green varieties) about 20 cm in diameter have been found during mining operations; sheets measuring 7 to 10 cm across are common. Other constituents of the pegmatite are feldspar, quartz and biotite. Good crystals of tourmaline, garnet and beryl, and small amounts of apatite have been reported from the deposit. The beryl crystals measured 7 cm in diameter. Attractive specimens consisting of sheets of clear mica enclosing crystals of deep red garnet and of sea green apatite are also found. Anthraxolite is present in small amounts.

The deposit was worked for mica between 1891 and 1894, and in 1941 by a shaft and open cuts. The mine is located on the north side of Charlotte Lake at its eastern end. Access is easiest by boat from the end of the road as there is no trail through the woods. There are no boat-renting facilities at Charlotte Lake; such arrangements could be made at Escoumins.

Part of 22 C/5



Map 7

1. McGie mine; 2. Simard mine

Road log from Highway 138 at km 253.9 (see road log page 77):

km		
	0.0	Escoumins, at bridge over Escoumins River. Proceed to junction on north side of bridge then turn left.
	0.15	Consolidated Paper Company office on right; obtain forest permit here.
	9.5	Gate. The forest permit is collected here.
	11.9	Main road turn right; bear left at sign "Chemin Club Michel" and follow single lane, rough, dry-weather road.
	14.6	From this point to the lake, the road becomes very rough and may not be passable for automobiles.
	15.0	Junction wagon road (on left) to Simard mine (description follows). To reach McGie mine continue straight ahead.
	15.3	East end of Charlotte Lake. The main working of the McGie mine is on the shore, opposite the small island (about 175 m from the end of the lake). Other workings are about 175 m to the northwest.

Refs.: 32 p. 12-14; 74 p. 194.

Maps (T): 22 C/5 Lac de Pons.
(G): 629 Pontgrave-Bergeronnes area Saguenay County (Que. Dept. Natural Resources, 1 inch to 1/2 mile).

Simard Mine

MUSCOVITE, TOURMALINE, APATITE, BERYL.

In pegmatite dyke cutting quartzite.

This deposit is similar to the McGie deposit. Ruby mica occurs as books measuring up to 60 cm across, and sheets up to 15 cm in diameter are common. Other constituents of the pegmatite are plagioclase (as crystals 60-90 cm long), quartz and biotite; accessory minerals are tourmaline, apatite and beryl.

The deposit was worked for mica by open pits in the 1940s. It is owned by Mr. Eugene Simard of Grandes-Bergeronnes. Access is by a partly overgrown wagon road that leaves the road to Charlotte Lake at km 15.0 (see road log above). The road goes south then swings to the southwest. Follow this road for approximately 460 m from its junction with the Charlotte Lake road to the pits in the woods on the southeast side of a hill.

Ref.: 38 p. 11-12.

Maps (T): 22 C/5 Lac de Pons.
(G): 629 Pontgrave-Bergeronnes area, Saguenay County (Que. Dept. Natural Resources, 1 inch to 1/2 mile).

This is the last locality described along the Highway 138 side trip; the main road log to Lac St-Jean is resumed.

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km **306.3** **Quebec, at junction Highways 73 and 138.** Proceed north on Highway 73 (Laurentian Boulevard).

km **310.7** **Junction road to Charlesbourg.**

Charlesbourg West Limestone Quarries

FOSSILS, CALCITE.

In limestone.

Brachiopods and other Ordovician fossils occur in dense grey, fine-grained limestone cut by greyish white calcite veins measuring about 1 cm wide. The calcite fluoresces pale yellow when exposed to ultraviolet rays ('long' rays are more effective than 'short' rays). The quarries are operated by Quebec Ready-Mix and by Union des Carrières et Pavages Limitée for the production of crushed limestone.

Road log from Charlesbourg:

km 0.0 Intersection 1st Avenue and 80th Street at church; proceed west along 80th Street.

1.4 Turn-off from Laurentian Boulevard; continue straight ahead toward Loretteville.

2.1 Quebec Ready-Mix quarry on right.

2.4 Main road continues straight ahead; bear right.

2.7 Union des Carrières et Pavages Limitée quarry.

Ref.: 30 p. 151-152.

Map (T): 21 L/14 Quebec.

SECTION 3

QUEBEC – LAC ST-JEAN

km	**0.0**	**Quebec, at junction Highway 73 (Boulevard Laurentien) and Highway 40 (Autoroute de la Capitale);** proceed north along Highway 73. Note: this highway later joins Highway 175.
km	**122.3**	**Junction Highway 175 and Highway 169;** proceed onto Highway 169.
km	**188.6**	**Road-cut on right.** Pink granite containing epidote in fractures is exposed here.
km	**194.7**	**Abandoned anorthosite quarry** on right (see National Granite quarry for description, p. 90).
km	**200.6**	**Hébertville (Notre-Dame-de-Hébertville),** at junction; proceed north along Highway 169 toward Alma.
km	**204.2**	**Abandoned anorthosite quarry on right.**
km	**209.4**	**St-Bruno, at junction Highway 170.**

Chicoutimi Occurrences

Log for side trip to Chicoutimi area via Highway 170 (descriptions are given in text for underlined localities):

km	0.0	St-Bruno; turn right onto Highway 170.
	10.6	Larouche.
	32.0	Jonquière; continue along Highway 170.
	37.2	Junction Chemin (road) du Pont Arvida on left, to road-cuts.
	38.4	Arvida, at junction road to commercial section.
	47.8	Chicoutimi, at junction Ste-Anne Street to Chicoutimi-Nord (SteAnne) and to Chicoutimi North quarry, Plourde et Plourde quarry, and Carrière Pic.
	48.9	Chicoutimi, at junction Highway 175.
	60.5	Turn-off (right) to Bagotville peat bog.

Chemin du Pont Arvida Road-cut

LABRADORITE, HYPERSTHENE, SCAPOLITE.

In anorthosite.

Labradorite, exhibiting characteristic blue play of colour, occurs as a constituent of coarse-grained anorthosite; fragments sufficiently large for gem purposes are uncommon. Crystals and cleavable masses of bronze-brown hypersthene are common. Scapolite occurs as light green patches in the rock.

The anorthosite is exposed on both sides of the Pont Arvida Road at a point 1.1 km north of Highway 170.

Road-cuts on Highway 170 between Larouche and Chicoutimi expose similar anorthosite containing labradorite which shows a blue schiller.

Map (T): 22 D/6 Arvida.

Aluminum Company of Canada

This company operates a plant for the production of aluminium metal from the mineral bauxite which is mined in Guyana, Surinam, and Jamaica. The large source of hydro-electric power available on the Saguenay River and favourable deep water transport facilities have made Arvida a suitable centre for the establishment of the industry.

Chicoutimi North Quarry

SYENITE.

Coarse, pinkish to purplish brown syenite is composed chiefly of microcline, plagioclase and minor amounts of pyroxene, biotite and magnetite. The rock was formerly used as a monument stone. The quarry is no longer in operation.

Road log from Highway 170 at Chicoutimi (km 47.8, road log page 86):

km		
	0.0	Turn left (north) onto Ste-Anne Street.
	0.9	Chicoutimi-Nord; turn left onto Highway 172.
	4.2	Junction; road on right leads to St-Honoré. To reach syenite quarry continue straight ahead.
	6.4	Turn-off, on left, to quarry.
	6.6	Quarry.

Ref.: 8 p. 98-99.

Maps (T): 22 D/6 Arvida.
(G): 297 Chicoutimi area, County of Chicoutimi (Que. Dept. Natural Resources).

Plourde et Plourde Ste-Anne Quarry

CALCITE, CHALCEDONY, QUARTZ CRYSTALS, FLUORITE, BARITE, PYRITE, HYDROCARBON, MARCASITE, SPHALERITE, GOETHITE, FOSSILS.

In limestone.

Calcite occurs as white crystal aggregates in cavities measuring several cm across, and in veins about 2 cm wide; it fluoresces bright pink when exposed to ultraviolet rays (especially bright under the 'short' rays). Calcite also forms unusual spherulitic growths (spherulites) with radial concentric interiors and measuring about 5 cm in diameter. The spherulites are composed of a light brown calcite (massive) interior rimmed by blackish brown calcite crystals forming the exterior. Some spherulites have a nucleus of colourless quartz as well as crystals of quartz on the exterior. The spherulites form aggregates several cm across. The brown calcite fluoresces pale yellow under ultraviolet rays. Chalcedony, in veins up to 2 cm wide, is generally light to dark grey, bluish or pinkish grey and commonly banded; some would be suitable for lapidary purposes although much of it is almost opaque. Chalcedony also occurs in cavities (about 5 cm across) and is commonly chalk white grading to translucent grey; colourless quartz crystals line the vugs. Small amounts of apple-green, massive fluorite associated with colourless to white, platy barite and tiny pyrite crystals were found. A black hydrocarbon with splendent lustre occurs as small masses with marcasite in greyish white crystalline calcite. Reddish amber patches of sphalerite are associated with colourless tiny crystals of calcite and the hydrocarbon in massive brownish grey calcite. Pulverulent yellow and brown goethite forms patches on limestone. Fossil corals and crinoids, replaced by calcite, are common. The limestone is brownish grey and of Ordovician age. Thin beds of dark grey shale are present.

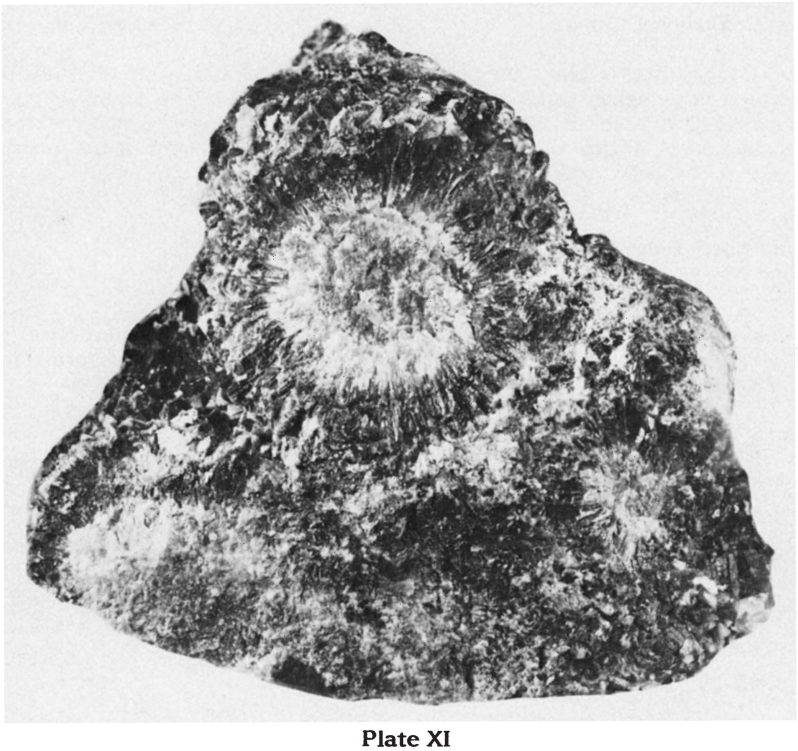

Plate XI

Spherulitic calcite growths, Plourde et Plourde quarry, Chicoutimi-Nord. (Actual size) (200383-C)

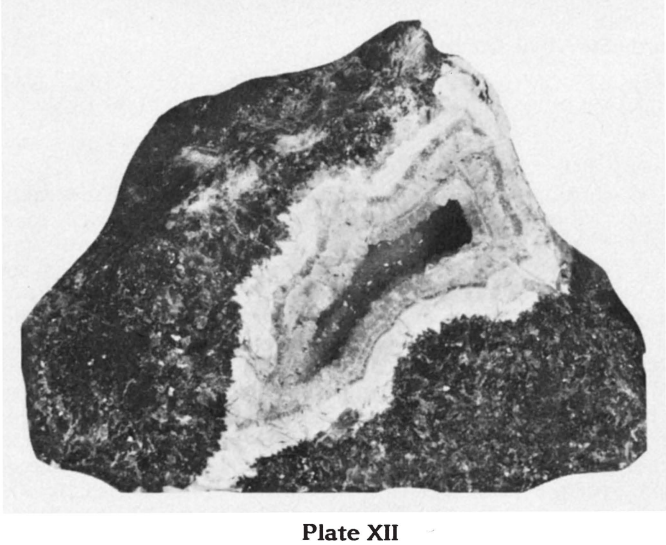

Plate XII

Cavity in limestone lined with chalcedony and quartz crystals, Plourde et Plourde quarry, Chicoutimi-Nord. (Actual size) (200383-A)

The operator of this quarry is Plourde et Plourde Limitée. Limestone from this area was formerly used as a building stone and examples of this use can be seen in the churches at Chicoutimi-Nord and at St-Honoré. At present, crushed limestone is produced.

Road log from Highway 170 at Chicoutimi (km 47.8, road log page 86):

km		
	0.0	Proceed north along Ste-Anne Street.
	1.0	Chicoutimi-Nord; turn left, onto Highway 172.
	4.2	Junction; turn right.
	6.4	Junction; turn right onto quarry road.
	6.6	Road-cut (on left) exposes limestone similar to that found in quarry.
	7.2	Plourde et Plourde quarry.

Refs.: 20 p. 63-68; 30 p. 166-167.

Maps (T): 22 D/6 Arvida.
(G): 297 Chicoutimi area, County of Chicoutimi (Que. Dept. Natural Resources).

Pic Quarry

CALCITE, CHERT, QUARTZ CRYSTALS, HYDROCARBONS, FOSSILS.

In limestone.

Calcite occurs as colourless to white crystalline masses and as smoky brown crystal aggregates. Under ultraviolet light, the white variety fluoresces bright pink ('short' rays more effective than 'long') and the brown variety fluoresces pale yellow. Milky-white and grey chert forms irregular masses (up to 7 cm across) in limestone. It contains small vugs lined with colourless quartz crystals. A small amount of black hydrocarbon with bright lustre is associated with calcite. Ordovician fossils including corals and crinoids are found here. The limestone is light brownish grey, fine grained and compact.

The quarry and crushing plant are operated by Carrière Pic.

Road log from Highway 170 at Chicoutimi (km 47.8, road log page 86):

km		
	0.0	Proceed north along Ste-Anne Street.
	1.0	Chicoutimi-Nord, turn left onto Highway 172.
	4.2	Junction; turn right.
	6.4	Turn-off to Plourde et Plourde quarry; continue straight ahead.
	7.6	Entrance, on left, to Pic quarry.

Refs.: 20 p. 63-68; 30 p. 166-167.

Maps (T): 22 D/6 Arvida.
(G): 297 Chicoutimi area, County of Chicoutimi (Que. Dept. Natural Resources).

Bagotville Peat Bog

PEAT.

The peat bog is about 1 m deep and occupies an area of about 1130 hectares. It was operated from 1944 to 1946 by the Saguenay Peat-Moss Company for use in the manufacture of peat fuel and for horticultural purposes.

The bog is on the south side of Highway 170, about 11 km east of Chicoutimi. A road, 1.6 km long, leads south from the highway at km 60.6 to the peat cutting.

Ref.: 50 p. 20, 57.

Map (T): 22 D/7 Bagotville.

This is the last locality described for the side trip to the Chicoutimi area; the main road log along Highway 169 is resumed.

---

km 209.4 St-Bruno, at junction Highway 170; proceed north along Highway 169.

km 222.5 Junction road to St-Gédéon.

National Granite St-Gédéon Quarry

ANORTHOSITE.

The anorthosite is brownish to purplish black and coarse-grained. It is composed chiefly of plagioclase crystals with small amounts of ilmenite, magnetite and pyroxene. The stone was used for monuments and as a building stone. The rock exposed at the abandoned quarry on Highway 169 at km 194.7 is similar to that found in this deposit. This quarry was originally opened in 1930 but is no longer in operation. The National Granite Company operates a dressing plant here to process the rock from its Péribonka anorthosite quarry.

The St-Gédéon quarry is situated on the west side of the St-Gédéon Road at a point 6.3 km west of Highway 169 at km 222.5.

Ref.: 8 p. 93-94.

Maps (T): 22 D/12 Isle-Maligne.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).

---

km 226.7 Alma, at intersection Melancon Street.

National Granite Ile d'Alma Quarry

GRANITE.

The granite is pink, medium-grained and is composed of pink feldspar, quartz, hornblende, and biotite. Tiny red grains of garnet occur sparingly. The rock takes a high polish and is used for monuments and as a building stone. Commercially, it is known as 'Saguenay Red' granite. The quarry was not in operation in the summer of 1966.

Road log from Alma, km 226.7 on Highway 169:

km	0.0	Intersection Melancon Street and Highway 169 (Pius XII Blvd.); turn left (west) onto Melancon Street.
	0.6	Intersection Dequen Street; continue straight ahead.
	4.7	Junction gravel road; turn right (north).
	7.9	Junction single lane road; turn right.
	8.4	Gate to quarry.

Ref.: 8 p. 95-96.

Map (T): 22 D/12 Isle-Maligne.

---

km 233.0 Junction road to St-Nazaire (Highway 172).

St-Charles Titanium Deposit

MAGNETITE, ILMENITE, OLIVINE, APATITE, PYROXENE, SPINEL, HORNBLENDE, SERPENTINE, GRAPHITE, GOETHITE, BIOTITE, PYRRHOTITE.

In anorthosite.

The ore consists of a medium-grained aggregate of titaniferous magnetite and ilmenite with brownish green olivine crystals (about 1 cm across) and variable amounts of light green to colourless apatite. Other minerals associated with the deposit are dark green pyroxene, brown hornblende, feldspar, biotite, dark green spinel, serpentine (replaces olivine), graphite, goethite and pyrrhotite.

This deposit on the north shore of the Saguenay River, has been known since the 1880s but was never mined. It has been explored by trenches, stripping and diamond drilling.

Road log from Highway 169 at km 233.0:

km		
	0.0	Turn right (east) onto Highway 172.
	5.5	St-Nazaire, at church; turn right.
	7.1	Junction; turn left onto road to St-Charles.
	18.9	Junction, on right, single lane road.
	19.5	Gate, at base of hill. A partly overgrown wagon road leads up the hill to the ore-bearing anorthosite outcrops and strippings which begin about 275 m from the gate and extend for about 0.8 km to the cliffs forming the north bank of the Saguenay River.

Refs.: 49 p. 22-35; 64 p. 1.

Maps (T): 22 D/11 St-Ambroise.
(G): 1175 Bourget area, Electoral Districts of Chicoutimi and Jonquière-Kénogami (Que. Dept. Natural Resources).

Lac à la Mère (à la Mine) Mica Mine

MICA, TOPAZ, BERYL, CLEAVELANDITE, AMAZONITE, HYDROCARBON.

In pegmatite.

Books of muscovite measuring up to 15 cm across are associated with quartz and cleavelandite (albite). Greenish coloured beryl and greenish topaz (slightly darker than beryl) occur as rough crystals and in massive form. Most of the topaz is massive and intergrown with muscovite and albite. A black hydrocarbon occupies spaces between cleavelandite plates. Green amazonite and a brown radioactive mineral (as nodules and 1 cm crystals) have also been reported.

The deposit was worked for 2 years around 1920. An opening (about 6 m by 9 m) was made on the shore at the west end of Lac à la Mère, locally known as Lac à la Mine. There is a large dump adjacent to the pit. As the mine is difficult to locate, the services of a local guide would be helpful.

Road log from Highway 169 at km 233.0 (see above):

km		
	0.0	Proceed along road to St-Nazaire.
	5.5	St-Nazaire, at church; turn left (north).

km 7.1 Junction gravel road; turn right.

9.5 Junction single lane road, on right, just beyond gravel pit. Follow single lane road (later becomes a trail) for approximately 1.9 km to the mine. Accessible only in dry weather.

Ref.: 24 p. 252-253.

Map (T): 22 D/12 Isle-Maligne.

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km 236.7 Roadcut. Anorthosite is exposed by numerous road-cuts between here and Péribonka. The rock is coarse grained, dark bluish grey to almost black.

km 240.9 St-Coeur-de-Marie, at junction road to L'Ascension.

Péribonka Black Granite Quarries

ANORTHOSITE.

The anorthosite is similar to the stone at the National Granite's St-Gédéon quarry and is known commercially as 'Péribonka black granite'. It is used as a building and manument stone. Examples of its use are: the St. Catherine Street branch of the Canadian National Bank in Montreal and the war memorials at Desbiens, Quebec, and Edmunston, New Brunswick. The quarries are operated by National Granite Limited and by Carrière Chute-du-Diable; they are located on the south side of the Péribonka River near Chute-du-Diable at points approximately 19 and 21 km respectively by road from Highway 169 at km 240.9 (via L'Ascension).

Ref.: 8 p. 96-97.

Map (T): 22 D/13 Alex River.

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km 254.1 Inactive anorthosite quarry on right.

km 305.4 Mistassini, at junction road to Ste-Elisabeth; continue on Highway 169.

km 306.7 Junction road to St-Eugène.

Les Calcites du Nord Quarry

CALCITE, FELDSPAR, QUARTZ, HORNBLENDE, TITANITE, SERPENTINE, MICA, PYRRHOTITE, THORITE, PYRITE, URANINITE.

In crystalline limestone.

The deposit consists of coarsely crystalline calcite traversed by pegmatite dykes. In places the predominant white calcite is banded in shades of pink, yellow, green or grey. An attractive pink to rose-coloured calcite is present in small amounts and this variety as well as the banded varieties could be polished and used for small ornamental objects. The calcite is generally pure except for very few tiny grains of pyrite and flakes of mica. The pegmatite is composed mainly of pink orthoclase, grey to greenish grey plagioclase (massive and crystals), and white quartz. Other minerals found in the pegmatite are: dark green to almost black hornblende crystals; massive yellow-green to dark green serpentine; massive pyrrhotite; and specks of pyrite and uraninite. The calcite near the pegmatite contains grass-green transparent amphibole crystals, titanite crystals and patches (about 5 mm across) of shiny black thorite.

The quarry and crushing plant are operated by Carrière Les Calcites du Nord Inc., for use in the paper mill at Dolbeau and for crushed stone.

Road log from Highway 169 at km 306.7:

km		
	0.0	Proceed north along road to St-Eugène.
	4.5	Junction road to St-Stanislas; continue along road to St-Eugène.
	7.4	Quarry on right; enquire at office prior to visiting quarry.

Ref.: 21 p. 83-84.

Maps (T): 32 A/16 Dolbeau.
(G): 300 Dolbeau area, northwestern part of Lac St-Jean region (Que. Dept. Natural Resources, 1 inch to 2 miles).

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km	**363.5**	**St-Félicien, at junction Highway 167 to Chibougamau.**
km	**381.3**	**Granite road-cuts** (see description for Bernier quarry).
km	**385.5**	**Junction single lane road on right.**

Bernier Quarry

GRANITE.

Pink granite composed of pink microcline, albite, quartz, biotite and hornblende was quarried here from 1908 to the 1930s. It is coarse grained and, in places, has a gneissic

Plate XIII

Les Calcites du Nord quarry, St-Eugene. (GSC 138734)

structure. The stone was used for monuments and as a building stone and examples of its use include: the churches at St-Prime, Chambord and Roberval; the Chambord courthouse; the Roberval city hall and the railway station at Jonquière.

The road-cuts at km 381.3 expose similar granite but with a more gneissic structure.

Access to the quarry is by a single lane road, 0.25 km long, leading west from Highway 169 at km 385.5 (0.3 km south of its junction with the airport road).

Refs.: 8 p. 91-92; 22 p. 50.

Maps (T): 32 A/9 Roberval.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).
300 Dolbeau area, northwestern part of Lac St-Jean region (Que. Dept. Natural Resources, 1 inch to 2 miles).

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km 387.6 Roberval-Nord, at junction rue Ménard.

Roberval Quarries

CALCITE, FOSSILS.

In limestone.

Colourless to white calcite crystals (dogtooth spar) occur in veins and small cavities in limestone; they fluoresce pale yellow when exposed to ultraviolet rays. Brachiopods and crinoids are abundant. The limestone is grey and weathers to light brownish grey. It is of Ordovician age. Fossiliferous specimens are found in two quarries, one operated by Les Carrières Roberval Limitée and the other inactive.

Road log from Highway 169 at km 387.6:

km		
	0.0	Turn left (east) onto rue Ménard.
	0.6	Junction; turn left.
	1.9	Les Carrières Roberval quarry on left.
	3.2	Junction single lane road on right. Follow this road for about 45 m to the inactive quarry.

Refs.: 21 p. 79-80; 14 p. 29-35; 30 p. 171-172.

Maps (T): 32 A/9 Roberval.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).
300 Dolbeau area, northwestern part of Lac St-Jean region (Que. Dept. Natural Resources, 1 inch to 2 miles).

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km 397.3 Road-cut on right. (For description see Val-Jalbert fossil occurrence, below).

km 398.5 Val-Jalbert, at bridge over Ouiatchouan River.

Val-Jalbert Fossil Occurrence

FOSSILS.

In shale.

Graptolites, commonly 7 cm long, are abundant in grey weathering black shale. These fossils are particularly abundant on bedding cleavage planes in the rock exposures along the bed and banks of the Ouiatchouan River at the Val-Jalbert bridge. Other fossils found in the shale include brachiopods, cephalopods and trilobites. They are of Ordovician age. Mica forms a dull green coating on the shale. Similar fossil-bearing shale is exposed on the south side of Highway 169 at km 397.3.

The exposures on the Ouiatchouan River are easily accessible from the highway at the Val-Jalbert bridge.

Ref.: 22 p. 36-40.

Maps (T): 32 A/8 Chambord.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).

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km 405.1 Chambord, at junction Highway 155.

Lac Bouchette Quartz Mine

QUARTZ, HEMATITE, GOETHITE.

In quartz vein cutting granite gneiss.

Most of the quartz is massive, milky-white but some of it has a pink tinge. Cavities, commonly less than 5 cm across, are lined with clear to milky-white quartz crystals with individual crystals measuring up to 2 cm long. Finely granular hematite and dark brown earthy goethite form patches on quartz. Neither the quartz crystals nor the massive variety are suitable for lapidary purposes.

The deposit was worked by a quarry at the side of a hill. Mining operations were conducted in 1934-35 by Silica Products of Canada Limited, in 1944-45 by Industrial Silica Corporation, and in 1953 by Dominion Silica Corporation.

Plate XIV

Graptolite-bearing shale exposures, Ouiatchouan River, Val-Jalbert. (GSC 138736)

Road log from Highway 169 at km 405.1:

km		
	0.0	Proceed south along Highway 155.
	13.8	St-François-de-Sales, at church; continue along Highway 155.
	15.8	Intersection gravel road; continue straight ahead.
	17.5	Junction single lane road; turn left.
	17.6	Fork; bear left.
	17.7	Gate. Proceed beyond gate for about 1 km to the mine on the east side of a hill.

Refs.: 7 p. 56; 21 p. 84-89.

Map (T): 32 A/8 Chambord.

---

km 407.6 Road-cuts on right.

km 408.5 Road-cuts on right.

Road-cuts at km 407.6 and km 408.5, Highway 169

FOSSILS, CALCITE.

In limestone.

The road-cuts expose Ordovician limestone containing numerous crinoids, brachiopods, corals, bryozoans, gastropods and trilobites. Colourless to white crystals and crystalline aggregates of calcite occur in veins and cavities in the limestone; the calcite fluoresces pale yellow when exposed to ultraviolet rays ('long' rays more effective than 'short').

Ref.: 22 p. 29-39.

Maps (T): 32 A/8 Chambord.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).

---

km 415.4 Desbiens, at junction to Marist Monastery.

Desbiens Quarry

FOSSILS, CALCITE.

In limestone.

Fossils, including brachiopods, crinoids, gastropods, corals, trilobites and bryozoans, are abundant in grey to brownish grey Ordovician limestone. Colourless crystalline calcite (fluoresces pale yellow under 'long' ultraviolet rays) occurs in cavities and veins.

The quarry was a small scale operation and is no longer active.

Road log from Highway 169 at km 415.4:

km		
	0.0	Desbiens; turn right (south) onto road to Marist Monastery.
	1.6	Junction; turn left.
	4.6	Quarry in pasture on right.

Ref.: 22 p. 29-39.

Maps (T): 22 D/5W Hèbertville.
(G): 184A Roberval, Lake St. John County, Quebec (GSC, 1 inch to 2 miles).

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km 439.3 Hébertville (Notre-Dame-de-Hébertville), at junction Highway 169 South.

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Rock and Mineral Collecting in Canada, by Ann P. Sabina, 1964. Miscellaneous Report No. 8		
* Vol. I Yukon, Northwest Territories, British Columbia, Alberta, Saskatchewan and Manitoba, 147 p., 23 maps.		
* Vol. II Ontario and Quebec, 252 p., 47 maps.		
Vol. III New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, 103 p., 13 maps.	$ 1.50	$ 1.80
Rocks and Minerals for the collector: Buckingham-Mont-Laurier-Grenville, Quebec; Hawkesbury-Ottawa, Ontario, by Ann P. Sabina, 1983. Miscellaneous Report 33 (originally published as Paper 68-51) (available in late 1983).		
* Rocks and Minerals for the Collector: Sudbury to Winnipeg, by Ann P. Sabina, 1963. Paper 63-18, 69 p.		
* Rocks and Minerals for the Collector: Bay of Fundy Area (part of Nova Scotia and New Brunswick), by Ann P. Sabina, 1964. Paper 64-10, 96 p.		
* Rocks and Minerals for the Collector: Northeastern Nova Scotia, Cape Breton and Prince Edward Island, by Ann P. Sabina, 1965. Paper 65-10, 76 p.		
* Rocks and Minerals for the Collector: Eastern Townships and Gaspé, Quebec; and parts of New Brunswick, by Ann P. Sabina, 1967. Paper 66-51, 170 p.		

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Roches et minéraux du collectionneur: Hull-Maniwaki, Québec; Ottawa-Peterborough, Ontario par Ann P. Sabina, 1976, Etude 69-50, 181 p.	$ 2.75	$ 3.30
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GLOSSARY

Acmite $NaFeSi_2O_6$. H=6. Green striated prismatic crystals, generally elongated with acute terminations. Transparent; vitreous. Pyroxene group.

Actinolite $Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$. H=5-6. Bright green to greyish green columnar, fibrous or radiating prismatic aggregates. Variety of amphibole.

Aegirine $NaFeSi_2O_6$. H=6. Dark green to almost black or greenish brown; prismatic, commonly elongated crystals. Monoclinic variety of pyroxene.

Akermanite $Ca_2MgSi_2O_7$. H=5. Colourless, greyish green, brown to black; generally massive. Vitreous to resinous lustre. Sub-conchoidal fracture. Member of melilite group. Not readily distinguished from other members of group in hand specimen.

Albite $NaAlSi_3O_8$. H=6. Generally white tabular crystals or cleavable masses. Vitreous lustre. Variety of plagioclase feldspar. Used in manufacture of ceramics.

Allanite $(Ca, R)_2(Al, Fe, Mg)_3Si_3O_{12}(OH)$. H=6½. Black, less commonly, dark brown tabular aggregates, or massive with conchoidal fracture. Vitreous or pitchy lustre. Generally occurs in granitic rocks or in pegmatite and is commonly surrounded by an orange-coloured halo. Distinguished by its weak radioactivity.

Amazonite $KAlSi_3O_8$. H=6. Apple green to bright green variety of microcline. Used for jewellery and ornamental purposes.

Analcime $NaAlSi_2O_6 \cdot H_2O$. H=5-5½. Colourless, white, yellowish or greenish, vitreous transparent, trapezohedral crystals or massive, granular. Distinguished from garnet by its inferior hardness. Often associated with other zeolites.

Anatase TiO_2. H=5½-6. Yellowish or reddish brown pyramidal or tabular crystals with adamantine lustre; also grey, blue massive. Also known as octahedrite.

Ancylite $(Ce, La)_4(Sr, Ca)_3(CO_3)_7(OH)_4 \cdot 3H_2O$. H=4-4½. Pale yellow, yellowish brown, grey, translucent prismatic crystals or rounded crystal aggregates. Splintery fracture. Soluble in acids. Rare mineral.

Anglesite $PbSO_4$. H=2½-3. Colourless to white, greyish, yellowish or bluish tabular or prismatic crystals, or granular. Adamantine to resinous lustre. Characterized by high specific gravity (6.36 to 6.38) and adamantine lustre. Effervesces in nitric acid. Secondary mineral generally formed from galena. Ore of lead.

Anhydrite $CaSO_4$. H=3-3½. White, bluish or greyish with vitreous lustre. Generally granular massive. Alters to gypsum by absorption of water. Distinguished from gypsum by its superior hardness. Used as a soil conditioner and for portland cement.

Ankerite $Ca(Fe,Mg)(CO_3)_2$. Variety of dolomite from which it cannot be distinguished in the hand specimen.

Anorthosite An igneous rock composed almost entirely of plagioclase.

Anthophyllite $(Mg, Fe)_7Si_8O_{22}(OH)_2$. H=6. White, light grey to brown fibrous or prismatic aggregates with vitreous or silky lustre. Orthohombic variety of amphibole. Distinguished from tremolite by its fibrous habit and silky lustre. Fibrous variety resembles asbestos but is more brittle. Used in asbestos cement, for boiler coverings and fire-proof paints because of its heat resistant property.

Anthraxolite Hydrocarbon. H=3-4. Black massive. Sub-metallic to pitchy lustre. Uneven to conchoidal fracture. Friable, combustible. Exposed surface partly altered to orange powder.

Antigorite $Mg_3Si_2O_5(OH)_4$. H=2½. Green translucent variety of serpentine having lamellar structure.

Apatite $Ca_5(PO_4)_3(F, Cl, OH)$. H=5. Green to blue, colourless, brown, red, hexagonal crystals or granular, sugary massive. Vitreous lustre. May be fluorescent. Distinguished from beryl and quartz by its inferior hardness; massive variety distinguished from calcite, dolomite, by lack of effervescence in HCl, and from diopside and olivine by its inferior hardness. Used in manufacture of fertilizers and in production of detergents.

Apophyllite $KCa_4(Si_4O_{10})_2(F, OH)\cdot 8H_2O$. H=5. Colourless, grey, white, green, yellow or, less commonly, pink square prismatic or pyramidal crystals with pearly or vitreous lustre. Perfect basal cleavage and pearly lustre on cleavage face are diagnostic features. Commonly associated with zeolites.

Aragonite $CaCO_3$. H=3½-4. Colourless to white or grey and less commonly, yellow, blue, green, violet, rose-red. As prismatic or acicular crystals; also columnar, globular, stalactitic aggregates. Vitreous lustre. Transparent to translucent. Distinguished from calcite by its cleavage and higher specific gravity (2.93). Effervesces in dilute HCl.

Arfvedsonite $Na_{2-3}(Fe, Mg, Al)_5Si_8O_{22}$. H=5-6. Greenish black to black tabular or long prismatic crystals. Vitreous lustre. Occurs in alkali igneous rocks.

Arsenopyrite FeAsS. H=5½-6. Light to dark grey metallic striated prisms with characteristic wedge-shaped cross-section; also massive. Tarnishes to bronze colour. Ore of arsenic; may contain gold or silver.

Asheroftme $KNaCaY_2Si_6O_{12}(OH)_{10}\cdot 4H_2O$. Pink fibrous, prismatic or powdery aggregates. Occurs in alkali igneous rocks.

Astrophyllite $(K, Na)_2(Fe'', Mn)_4TiSi_4O_{14}(OH)_2$. H=3. Golden yellow to bronze-brown elongated crystals or blades, often radiating; also micaceous with pearly or splendent lustre. More brittle than mica. Generally occurs in nepheline syenite.

Augite $Ca(Mg, Fe, Al)(Al, Si)_2O_6$. Dark green to black. Monoclinic variety of pyroxene. Important constituent of basic and ultrabasic rocks.

Baddeleyite ZrO_2. H=6½. Cream-white, yellowish, amber-coloured scaly, finely granular, powdery aggregates. Greasy to dull lustre. Associated with fluorite, dawsonite at the Francon Quarry.

Barite $BaSO_4$. H=3-3½. White, pink, yellowish, blue, tabular or platy crystals; granular massive. Vitreous lustre. Characterized by a high specific gravity (4.5) and perfect cleavage. Used in the glass, paint, rubber, and chemical industries, and in oil-drilling technology.

Barylite $BaBe_2Si_2O_7$. H=7. Colourless, white or bluish tabular, prismatic crystals, or massive. Transparent, vitreous.

Bastnaesite $(Ce, La)(CO_3)F$. H=4-4½. Yellow to reddish brown platy or granular masses with greasy or pearly lustre; also greenish brown, earthy. Occurs with other rare element minerals. Difficult to identify in hand specimen.

Behoite $B\text{-}Be(OH)_2$. H=4. Colourless pseudo-octahedral crystals. Vitreous.

Beryl $Be_3Al_2Si_6O_{18}$. H=8. White, yellow, green, blue, hexagonal prisms, or massive with conchoidal or uneven fracture. Vitreous; transparent to translucent. Distinguished from apatite by superior hardness, from topaz by its lack of perfect cleavage; massive variety distinguished from quartz by density test (beryl has higher density). Ore of beryllium which has numerous uses in the nuclear energy, space, aircraft, electronic and scientific-equipment industries; used as alloying agent with copper, nickel, iron, aluminum and magnesium.

Birnessite $(Na_{0.7}Ca)Mn_7O_{14}\cdot 2.8H_2O$. H=1½. Dull black grains; also earthy. Secondary mineral associated with other manganese minerals. Difficult to identify except by X-ray methods.

Bog iron ore Loose, porous iron ore formed by precipitation of water in bogs or swampy areas. Ore consists of limonite, goethite and/or hematite.

Breunnerite A variety of magnesite containing iron. White, yellowish to brownish colour.

Britholite $(Na, Ca, Ce)_5(P, Si)_3O_{12}(OH, F)$. H=5½. Tan-coloured to brown prisms, platy aggregates and massive. Resinous lustre. Difficult to distinguish in hand specimen.

Brochantite $Cu_4(SO_4)(OH)_6$. H=3½-4. Vitreous emerald green acicular crystal aggregates; massive, granular. Secondary mineral formed by oxidation of copper minerals. Distinguished from malachite by lack of effervescence in HCl.

Brookite TiO_2. H=5½-6. Dark brown to black tabular or pyramidal crystals with metallic adamantine lustre. Not readily identifiable in hand specimen.

Brucite $Mg(OH)_2$. H=2½. White, grey, light blue or green tabular or platy aggregates; also foliated massive and fibrous. Pearly, waxy lustre. Soluble in HCl. Distinguished from gypsum and talc by its superior hardness and lack of greasy feel. Resembles asbestos but lacks silky lustre. More brittle than muscovite. Used for refractories and as a minor source of magnesium metal.

Burbankite $(Na, Ca, Sr, Ba, Ce)_6(CO_3)_5$. H=3½. Yellow or greyish yellow tiny hexagonal crystals, massive; also colourless to reddish pink fine hair-like aggregates in cavities with calcite. Associated with other rare element minerals. Effervesces in HCl. Not readily identifiable in hand specimen.

Cabochon A polished gemstone having a convex surface; translucent or opaque minerals such as opal, agate, jasper and jade are generally cut in this style.

Cancrinite $Na_8(AlSiO_4)_6(HCO_3)_2$. H=6. Yellow, pink, grey, massive or prismatic crystals; vitreous to greasy lustre. Associated with nepheline and sodalite in nepheline syenite. Effervesces in warm HCl.

Carletonite $KNa_4Ca_4Si_8O_{18}(CO_3)_4(F,OH)\cdot H_2O$. H=4-4½. Colourless, pink, light blue flakes. Transparent to translucent; vitreous to pearly. Originally described from Mont St-Hilaire, Quebec where it is associated with pectolite, albite, arfvedsonite, calcite, fluorite and apophyllite. Named in honour of Carleton University where recognition of this and several other new species was made.

Catapleiite $Na_2ZrSi_3O_9\cdot 2H_2O$. H=6. Light yellow, tan-coloured, yellowish brown, colourless hexagonal plates with vitreous to greasy lustre. Occurs in nepheline syenite where it can be distinguished by its platy habit.

Celestine $SrSO_4$. H=3-3½. Transparent, colourless, white or pale blue tabular crystals; also fibrous massive. Vitreous lustre. Perfect cleavage. Resembles barite but is not as heavy. Ore of strontium.

Cenosite See Kainosite.

Cerussite $PbCO_3$. H=3-3½. Transparent white, grey or brownish tabular crystals with adamantine lustre; also massive. High specific gravity (6.5) and lustre are distinguishing features. Secondary mineral formed by oxidation of lead minerals. Fluoresces in shades of yellow in ultraviolet light. Ore of lead.

Chabazite $CaAl_2Si_4O_{12} \cdot 6H_2O$. H=4. Colourless, white, yellowish or pinkish, square crystals. Vitreous lustre. Occurs in cavities in basalt. Distinguished from other zeolites by its almost cubic crystal form; distinguished from calcite by its superior hardness and its lack of effervescence in HCl.

Chalcedony SiO_2. H=7. Translucent cryptocrystalline variety of quartz. Colourless, grey, bluish, yellow, brown, reddish. Formed from aqueous solutions. Attractively coloured chalcedony is used for ornamental objects and jewellery.

Chalcopyrite $CuFeS_2$. H=3½-4. Brass yellow, massive. Iridescent tarnish. Brass colour is distinguishing feature. Also called copper pyrite. Ore of copper.

Chert Massive, opaque variety of chalcedony; generally drab-coloured (grey, greyish white, yellowish grey or brown).

Chlorite Hydrous silicate of Al, Fe, Mg. H=2-2½. Transparent, green flaky aggregates. Distinguished from mica by its colour and by the fact that its flakes are not elastic.

Chondrodite $2Mg_2SiO_4 \cdot Mg(F, OH)_2$. H=6-6½. Orange-yellow grains and granular masses. Vitreous to slightly resinous lustre. Subconchoidal to uneven fracture. Occurs in crystalline limestone Distinguished by its colour.

Cleavelandite Platy, tabular or lamellar variety of albite. White with pearly lustre.

Copiapite $(Fe, Mg)Fe_4'''(SO_4)_6(OH)_2 \cdot 20H_2O$. H=2½-3. Pale yellow to orange-yellow and greenish yellow granular to scaly aggregates; also tabular crystals. Transparent to translucent. Vitreous to pearly lustre. Secondary mineral formed from oxidation of sulphides, especially pyrite. Yellow colour is characteristic.

Cordierite $(Mg, Fe)_2Al_4Si_5O_{18}$. H=7. Blue to purplish blue, bluish grey, colourless; massive or irregular grains. Vitreous lustre. Subconchoidal fracture. Alters readily to muscovite or chlorite. Distinguished by blue colour and by its alteration products. Colourless variety distinguished from quartz by X-ray methods.

Cordylite $(Ce, La)_2Ba(CO_3)_3F_2$. H=4½. Colourless, yellowish short hexagonal prisms. Transparent; greasy to adamantine, pearly lustre. Occurs in nepheline syenite rocks.

Cristobalite SiO_2. H=6½. White grey, bluish octahedral crystals; fibrous, massive, stalactitic, botryoidal. Translucent to opaque; vitreous to dull lustre.

Crocidolite Blue or bluish grey asbestiform variety of riebeckite (amphibole). Known as 'blue asbestos'. Used as an insulator.

Crocoite $PbCrO_4$. H=2½-3. Red-orange to yellow prismatic crystals; massive. Transparent to translucent; adamantine to vitreous. Secondary mineral formed by oxidation of minerals containing lead and chromium.

Cryolite Na_3AlF_6. H=2½. Colourless, yellow, reddish, brownish massive granular; less commonly crystals with cubo-octahedral aspect. Transparent; vitreous to greasy. Appears to disappear when immersed in water.

Cyrtolite Radioactive variety of zircon containing some calcium, rare earth elements, uranium and/or thorium; usually hydrated.

Dachiardite $(Ca, Na_2, K_2)_5Al_{10}Si_{38}O_{96}\cdot 25H_2O$. H=4-4½. Colourless, white prismatic crystals, fibres forming parallel, divergent groups. Transparent; vitreous to silky. Zeolite group.

Datolite $Ca(OH)BSiO_4$. H=6½. Transparent colourless, pale yellow or green, white, short prismatic crystals; also botryoidal, porcelain-like masses or granular. Vitreous lustre. Easily fusible. Distinguished by its colour and crystal form and ease of fusibility.

Dawsonite $NaAl(CO_3)(OH)_2$. H=3. Transparent, striated square prismatic crystals; rosettes or incrustations of bladed or acicular crystals; tufts of colourless needles; also very fine micaceous aggregates. Lustre is vitreous or pearly in crystals, and silky in micaceous variety. Effervesces in HCl. Distinguished by crystal (striated) form. Generally difficult to identify in hand specimen since crystals are very small. Originally found in Montreal near the McGill University campus. Named for John William Dawson (1820-1899), a Canadian geologist and principal of McGill University.

Diopside $CaMgSi_2O_6$. H=6. Colourless, white to green monoclinic variety of pyroxene.

Donnayite $NaCaSr_3Y(CO_3)_6\cdot 3H_2O$. H=3. Yellow, colourless, white, grey, brown, reddish brown platy, tabular, columnar, granular aggregates. Vitreous. Associated with microcline, analcime, calcite, natrolite, chlorite, aegirine, and arfvedsonite in nepheline syenite at the Mont St-Hilaire Quarry, the type locality. It was named in honour of Professors J.D.H. Donnay and G. Donnay, McGill University.

Dresserite $Ba_2Al_4(CO_3)_4(OH)_8\cdot 3H_2O$. H=2½-3. White to colourless spheres commonly 3-4 mm in diameter; blade-like crystals with oblique terminations forming tufts, spheres. Transparent to translucent, opaque; silky to vitreous lustre. Effervesces in HCl. Distinguished from dawsonite by its oblique termination. Associated with weloganite in quartz/albite lined cavities in igneous sill rock at the Francon Quarry, the type locality. Named in honour of J.A. Dresser (1866-1954) in recognition of his geological work in the Monteregian Hills.

Dumortierite $(Al, Fe)_7BSi_3O_{18}$. H=7. Blue, violet or greenish blue columnar or fibrous masses; also massive. Vitreous or dull lustre. Transparent to translucent. Difficult to distinguish from cordierite except by X-ray methods. Used in manufacture of porcelain spark plugs.

Ekanite $(Ca, Na, K, Th)_2Si_4O_{10}$. H=5. Dark brown, green tetragonal prisms or massive. Transparent.

Elpidite $H_6Na_2Zr(SiO_3)_6$. H=7. White, pale green, grey, fibrous, prismatic crystals or massive. Vitreous or silky lustre. Found in nepheline syenites. Not readily identifiable in hand specimen.

Epididymite $NaBeSi_3O_7OH$. H=5½. White prismatic crystals, massive. Silky lustre. Occurs sparingly in nepheline syenites. Not readily identifiable in hand specimen.

Epidote $HCa_2(Al, Fe)_3Si_3O_{13}$. H=6-7. Yellowish green massive fibrous aggregates. Vitreous lustre. Often associated with quartz and pink feldspar, producing attractive mottled or veined patterns. Takes good polish and can be used for jewellery and other ornamental objects.

Eudialyte $Na_4(Ca, Fe'')_2ZrSi_6O_{17}(OH, Cl)_2$. H=5-5½. Pink, deep red, deep yellow, brown, massive; as grains, tabular or rhombohedral crystals. Transparent with vitreous lustre. Occurs in nepheline syenite. Difficult to identify in hand specimen.

Euxenite $(Y, Ca, Ce, U, Th)(Nb, Ta, Ti)_2O_6$. H=5½-6½. Black massive, or prismatic crystals forming parallel or radial groups. Brilliant, sub-metallic, or greasy lustre. Conchoidal fracture. Radioactive. Distinguished from other radioactive minerals by X-ray methods.

Ewaldite $Ba(Ca, Y, Na)(CO_3)_2$. Bluish green intergrown 'micro' crystals.

Fergusonite $(Y, Er, Ce, Fe)(Nb, Ta, Ti)O_4$. H=5½-6½. Black prismatic to pyramidal crystals and massive. Bright, vitreous to submetallic lustre on fresh surfaces. Alters to grey, yellowish or brownish on exposed surfaces. Subconchoidal fracture. Radioactive. Occurs in granite pegmatites. Distinguished from other radioactive minerals by X-ray methods.

Fibroferrite $Fe(SO_4)(OH)\cdot 5H_2O$. H=2½. White, yellow or greenish fibrous masses; also radiating fibres. Silky or pearly lustre. Formed by oxidation of pyrite and is associated with other secondary iron minerals from which it is distinguished by X-ray methods.

Fluorescence Property of certain substances to glow when exposed to light from an ultraviolet lamp. It is caused by impurities in the substance or by defects in its crystal structure. Two wave lengths are commonly used to produce fluorescence: long wave (3200 to 4000 Angstrom units); short wave (2537 Angstrom units).

Fluorite CaF_2. H=4. Transparent, colourless, blue, green, purple, yellowish cubic crystals; also granular massive. Vitreous lustre. Good cleavage. Often fluorescent; this property derives its name from this mineral. Used in optics, steel making, ceramics.

Forsterite Mg_2SiO_4. H=6½. White or light green square prismatic or tabular crystals; also massive. Vitreous lustre. Conchoidal fracture. Member of olivine group; distinguished from other members of the group by X-ray methods. Used in manufacture of refractory bricks.

Gabbro A dark, coarse-grained igneous rock composed mainly of plagioclase and pyroxene. Used as building and monument stone.

Gaidonnayite $Na_2ZrSi_3O_9\cdot 2H_2O$. Colourless, white to beige striated bladed crystals. Transparent; vitreous. Occurs in nepheline syenite at Mont St-Hilaire, Quebec as crystals on analcime, in cavities in natrolite; also occurs in pegmatite dykes with catapleiite, elpidite, hilairite, albite, microcline, chlorite, aegirine, epididymite and gorthite. Named in honour of Gabrielle Donnay, professor of crystallography, McGill University.

Galena PbS. H=2½. Dark grey metallic, cubic crystals; also massive with excellent cubic cleavage. Heavy (S.G. = 7.58). Ore of lead; may contain silver.

Garnet Silicate of Al, Mg, Fe, Mn, Ca. H=6½-7½. Transparent red dodecahedral crystals or massive; also yellow, brown, green. Clear garnet is used as a gemstone. Also used as abrasive. Distinguished by its crystal form.

Genthelvite $(Zn, Fe, Mn)_8Be_6Si_6O_{24}S_2$. H=6-6½. Light yellow to brown, pistachio green, reddish brown tetrahedral crystals and massive. Vitreous lustre. Uneven to conchoidal fracture. Member of helvite group.

Gibbsite $Al(OH)_3$. H=2½-3½. White 6-sided tabular crystals; massive. Translucent, vitreous to pearly, or dull, earthy.

Gmelinite $(Na_2, Ca)Al_2Si_4O_{12}\cdot 6H_2O$. H=4½. Colourless, white, light yellow, green or pink striated tabular, pyramidal or rhombohedral crystals. Transparent, vitreous. Occurs in basalt and other igneous rocks.

Gneiss A coarse-grained foliated metamorphic rock composed mainly of feldspar, quartz and mica. Used as building and monument stone.

Goethite $HFeO_2$. H=5-5½. Dark brown to yellowish brown earthy, botryoidal, bladed or massive. Has characteristic yellowish brown streak. Weathering product of iron-rich minerals. Ore of iron.

Gold Au. H=2½-3. Yellow metallic irregular masses, plates, scales, nuggets. Rarely as crystals. Distinguished from other yellow metallic minerals, by its softness, malleability, high specific gravity (19.3). Precious metal. Placer gold refers to gold dust, flakes, scales, nuggets occurring in alluvium.

Gotzenite $(Ca, Na)_3(Ti,Al)Si_2O_7(F,OH)_2$. Tan-coloured to colourless, radiating acicular aggregates. Vitreous lustre. Rare mineral, difficult to identify in hand specimen.

Granite Grey to reddish coloured relatively coarse-grained igneous rock composed mainly of feldspar with quartz. Used as a building and monumental stone.

Graphic granite A granite in which the quartz-feldspar intergrowths resemble cuneiform or hieroglyphic characters. An attractive ornamental stone.

Graphite C. H=1-2. Dark grey to black metallic flaky or foliated masses. Flakes are flexible. Greasy to touch. Black streak and colour distinguish it from molybdenite. Usually occurs in metamorphic rocks. Used as lubricant, 'lead' pencils, refractories.

Gypsum $CaSO_4\cdot 2H_2O$. H=2. White, grey, light brown; granular massive. Also fibrous (satin spar); colourless, transparent tabular crystals (selenite). Distinguished from anhydrite by its softness. Occurs in sedimentary rocks. Alabaster (fine grained translucent massive) and satin spar are used for carving into ornamental objects; the latter is chatoyant on the polished surface.

Hackmanite $Na_8Al_6Si_6O_{24}Cl_2S$. H=6. Lilac to bluish purple massive. Fades on exposure to sunlight. Vitreous to greasy lustre. Fluorescence (yellow) when exposed to ultraviolet rays is a distinguishing characteristic.

Halite NaCl. H=2. Colourless, white, red, orange, blue, violet cubic crystals; granular massive. Transparent to translucent; vitreous. Soluble in water.

Harmotome $BaAl_2Si_6O_{16}\cdot 6H_2O$. H=4½. Colourless, white, grey, yellow, pink, brown cruciform penetration twins or radiating aggregates. Transparent to translucent, vitreous. Occurs in basalt and other igneous rocks.

Hedenbergite $CaFeSi_2O_6$. H=6. Green to black short prismatic crystals or massive. Translucent to opaque; vitreous to dull. Pyroxene group.

Hematite Fe_2O_3. H=5½-6½. Reddish brown to black massive, botryoidal, earthy; also foliated or micaceous with high metallic lustre (specularite). Characteristic red streak. Ore of iron; also used as pigment.

Hexahydrite $MgSO_4 \cdot 6H_2O$. Colourless, white, finely fibrous, columnar; also globular encrustations. Pearly to vitreous lustre. Bitter, salty taste. Occurs sparingly as an alteration product of epsomite. Originally found at a Bonaparte River locality in British Columbia. Associated with other sulphates from which it is not readily distinguished.

Hibschite $H_4CaAl_2Si_2O_{10}$. H=6. Colourless, pale yellow or greenish white, octahedral crystals (minute) or massive. Vitreous to greasy (in massive variety) lustre. Uncommon mineral, not readily identifiable in the hand specimen.

Hilairite $Na_2ZrSi_3O_9 \cdot 3H_2O$. H=+4. Light brown very small trigonal transparent crystals, and pink porcelain-like opaque crystals. Associated with analcime, natrolite, microcline, catapleiite, elpidite, aegirine and chlorite in nepheline syenite at Mont St-Hilaire, Quebec, the type locality for which the mineral was named.

Hiortdahlite $(Ca, Na)_{13}Zr_3Si_9(O, OH, F)_{33}$. H=5½. Yellow to brown tabular crystals. Translucent to transparent; vitreous. Occurs in alkali igneous rocks.

Hisingerite Hydrated iron silicate. H=3. Black to brownish black amorphous, compact, massive with conchoidal fracture. Greasy to dull lustre.

Hydrocarbon Naturally occurring compounds of carbon and hydrogen such as paraffin; and compounds of carbon, hydrogen and oxygen such as amber, petroleum, coal. Compounds are not homogeneous, therefore are not classified as minerals.

Hydrocerussite $Pb_3(CO_3)_2(OH)_2$. H=3½. Colourless to white or grey tiny hexagonal scales and plates. Transparent to translucent with adamantine or pearly lustre. Associated with cerussite from which it is not readily distinguished.

Hydrodresserite $BaAl_2(CO_3)_2(OH_4) \cdot H_2O$. H=3½-4. Colourless to white obliquely terminated blades forming tufts, spheres (commonly 2-3 mm in diameter). Silky, vitreous lustre. Unstable, dehydrating to dresserite when removed from semi-humid to humid conditions. Occurs with weloganite at the Francon Quarry, the type locality. Named in allusion to its composition and relationship to dresserite to which it alters. Effervesces in HCl.

Hydrotalcite $Mg_6Al_2(OH)_{16} \cdot CO_3 \cdot 4H_2O$. H=2. White, transparent foliated lamellar aggregates; also platy. Pearly to waxy lustre. Greasy feel. Distinguished from talc by its effervescence in dilute HCl and by its superior hardness. Associated with talc, serpentine deposits.

Hydrozincite $Zn_5(OH)_6(CO_3)_2$. H=2-2½. White to grey, yellowish, brownish, pinkish, fine grained, compact to earthy or gel-like masses; also stalactitic, reniform, pisolitic, concentrically banded or radially fibrous structures; flat blade-like crystals. Dull, silky or pearly lustre. Fluoresces pale blue or lilac in ultraviolet light. Secondary mineral found in oxidized zones in zinc deposits.

Hypersthene (Mg,Fe). H=6. Dark brown, bronze-brown, black, orthorhombic variety of pyroxene.

Ilmenite $FeTiO_3$. H=5-6. Black compact or granular massive; thick tabular crystals. Metallic to submetallic lustre. Black streak distinguishes it from hematite. Source of titanium.

Ilmenorutile $(Ti, Nb, Fe)_3O_6$. H=6. Black to greenish black plates, rosettes. Opaque; velvety to submetallic lustre. Occurs with dawsonite, calcite at the Francon Quarry.

Jarosite $KFe_3(SO_4)_2(OH)_6$. H=2½-3½. Yellow to brown pulverulent coating associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Joaquinite $Ba_2NaCe_2Fe(Ti, Nb)_2Si_8O_{26}(OH, F)_2$. H=5½. Yellow to brown tabular or stubby pyramidal crystals. Transparent to translucent; vitreous.

Kaersutite $Ca_2(Na, K)(Mg, Fe^{2+}, Fe^{4+})_4TiSi_6Al_2O_{22}(O, OH, F)_2$. H=5-6. Dark brown to black short prismatic crystals, massive. Translucent to opaque; vitreous to resinous. Amphibole group. Occurs in volcanic rocks.

Kainosite (Cenosite) $Ca_2(Y,Ce)_2Si_4O_{12}(CO_3)\cdot H_2O$. H=5-6. Yellow to brown, colourless, pink prismatic crystals. Transparent, vitreous. Occurs in igneous rocks.

Kaolinite $Al_4Si_4O_{10}(OH)_8$. H=2. Chalk-white or tinted with grey, yellow or brown, dull earthy masses. Clay mineral formed chiefly by decomposition of feldspars. Becomes plastic when wet. Used as a filler in paper and in manufacture of ceramics.

Karpinskyite $Na_2(Be, Zn, Mg)Al_2Si_6O_{16}(OH)_2$. White, fine-acicular with silky lustre. Occurs in nepheline syenite with catapleiite, eudialyte, acmite, microcline. Very rare mineral.

Labradorite $(Ca, Na)(Al, Si)AlSi_2O_8$. H=6. Variety of plagioclase feldspar. Commonly shows blue, green, yellow play of colour. Chief constituent of anorthosite and gabbro.

Labuntsovite $(K, Ba, Na)(Ti, Nb)(Si, Al)_2(O, OH)_7\cdot H_2O$. H=6. Pink to brownish yellow prismatic crystals. Occurs in nepheline syenite rocks.

Laumontite $CaAl_2Si_4O_{12}\cdot 4H_2O$. H=4. White to pink or reddish white, vitreous to pearly, prismatic crystal aggregates; also friable, chalky due to dehydration. Characteristic alteration distinguishes it from other zeolites.

Lavenite $(Na, Ca, Mn)_3(Zr, Ti, Fe)(SiO_4)_2F$. H=6. Yellow to dark brown or brownish red prismatic, fibrous, acicular aggregates or massive. Translucent; vitreous to greasy or dull. Occurs in alkali igneous rocks.

Lemoynite $(Na, Ca)_3Zr_2Si_8O_{22}\cdot 8H_2O$. H=4. White, tinted yellow, minute prismatic crystals, spheres. Occurs in nepheline syenite associated with microcline at Mont St-Hilaire, Quebec, the type locality. The name is in honour of Charles Lemoyne and his sons, 17th century explorers of New France.

Leucophanite $(Ca, Na)_2BeSi_2(O, F, OH)_7$. H=4. Green to greenish yellow tabular crystals with vitreous lustre. Occurs sparingly in nepheline syenite. Not readily distinguished in the hand specimen.

Leucosphenite $Na_4Ba(TiO)_2(Si_2O_5)_5$. H=6½. Pale blue, white prismatic crystals; also tabular. Vitreous lustre. Occurs sparingly in nepheline syenite. Not readily distinguished in hand specimen.

Limestone Soft white or grey sedimentary rock formed by the deposition of calcium carbonate. Dolomite limestone contains variable proportions of dolomite and is distinguished from the normal limestone by its weaker (or lack of) effervescence in HCl acid. Crystalline limestone (marble) is a limestone that has been metamorphosed and is used as a building and ornamental stone. Shell limestone (coquina) is a porous rock composed mainly of shell fragments.

Limonite Field term referring to natural hydrous iron oxides whose true identity is unknown. Yellow-brown to dark brown earthy, porous, ochreous masses; also stalactitic or botryoidal. Secondary product or iron minerals.

Loellingite $FeAs_2$. H=5-5½. Light to dark grey metallic prismatic crystals, pyramidal crystals or massive. Associated with nickle and cobalt minerals.

Magnetite Fe_3O_4. H=5½-6½. Black octahedral, dodacahedral, rarely cubic; massive. Opaque; metallic lustre. Strongly magnetic. Ore of iron.

Marble. See limestone.

Marcasite FeS_2. H=6-6½. Pale bronze to grey metallic radiating, stalactitic, globular, or fibrous forms. Yellowish to dark brown tarnish. Transforms to pyrite from which it is difficult to distinguish in the hand specimen.

Mckelveyite $Ba_3Na(Ca, U)Y(CO_3)_6 \cdot 3H_2O$. Green to yellowish green crystal aggregates or platy. Crystals minute.

Melilite $(Ca, Na_2)(Mg, Fe'', Fe''', Al)(Si, Al)_2O_7$. H=5. White, pale yellow, greenish; square or octagonal prisms. Vitreous to resinous lustre. Conchoidal to uneven fracture. Difficult to identify in hand specimen.

Mesolite $Na_2Ca_2Al_6Si_9O_{30} \cdot 8H_2O$. H=5. Colourless or white acicular crystals and radiating aggregates; as tufts. Vitreous lustre. Member of zeolite group and is generally associated with other zeolites in amygdaloidal basalts. Distinguished from other zeolites by X-ray methods.

Microcline $KAlSi_3O_8$. H=6. White, pink to red, or green (amazonite) crystals or cleavable masses. Member of feldspar group. Distinguished from other feldspars by X-ray or optical methods.

Molybdenite MoS_2. H=1-1½. Dark grey metallic (bluish tinged) tabular, foliated, scaly aggregates; also massive. Sectile with greasy feel. Distinguished from graphite by its bluish lead-grey colour and by its streak (greenish on porcelain, and bluish grey on paper). Ore of molybdenum.

Monazite $(Ce, La, Y, Th)PO_4$. H=5-5½. Yellow, reddish brown or brown equant or flattened crystals and grains. Resinous to vitreous lustre. Radioactive. Resembles zircon but is not as hard. Distinguished from titanite by its superior hardness and radioactivity. Occurs in granitic and pegmatitic rocks. Ore of thorium.

Monteregianite $(Na, K)_6(Y, Ca)_2Si_{16}O_{38} \cdot 10H_2O$. H=3½. Colourless, white, grey, rarely mauve or light green. Transparent; vitreous to silky lustre. Acicular radiating or tabular crystals. Occurs in cavities in nepheline syenite at Mont St-Hilaire, Quebec, the type locality, where it is associated with calcite, pectolite, microcline, albite, aegirine, arfvedsonite. The mineral is named for the Monteregian Hills, igneous monadnocks protruding from the Ordovician limestone; Mont St-Hilaire is one of the Monteregian Hills.

Monticellite $CaMgSiO_4$. H=5. Colourless, grey, small prismatic crystals or grains. Vitreous lustre. Occurs in calcite and crystalline limestone. Related to olivine group. Not readily identifiable in hand specimen.

Montmorillonite $(Na, Ca)_{0.33}(Al, Mg)_2Si_4O_{10} \cdot nH_2O$. H=1-2. White, grey, greenish, yellowish flaky, finely granular massive. Waxy to dull lustre; opaque. Expands with absorption of water becoming viscose, gelatinous.

Mordenite $(Ca, Na_2, K_2)Al_2Si_{10}O_{24}\cdot 7H_2O$. H=4-5. Colourless, white acicular, minute prisms; wooly, matted, compact fibres. Transparent to translucent; silky to dull. Zeolite group.

Nahcolite $NaHCO_3$. H=2½. Colourless, white prismatic crystals; fibrous, concretionary. Transparent to translucent; vitreous to resinous.

Narsarsukite $Na_2(Ti, Fe)Si_4(O, F)_{11}$. H=7. Yellow tabular or short prismatic crystals. Vitreous lustre. Weathers to brownish grey or brownish yellow colour. Rare mineral occurring in nepheline syenites and pegmatites.

Natrojarosite $NaFe_3(SO_4)_2(OH)_6$. H=3. Yellow to brownish yellow earthy; minute tabular crystals. Dull lustre. Secondary mineral formed from alteration of iron minerals such as pyrite, marcasite.

Natrolite $Na_2Al_2Si_3O_{10}\cdot 2H_2O$. H=5. Colourless, white or reddish needle-like crystals often forming radiating or nest-like aggregates; also nodular or slender prisms. Vitreous to pearly lustre. May be distinguished from other zeolites by its acicular habit. Occurs with other zeolites in amygdaloidal basalts, and in some igneous rocks.

Nenadkevichite (Na, Ca)(Nb, Ti)$Si_2O_7\cdot 2H_2O$. H=5. Dark brown to pink foliated masses. Opaque; dull lustre. Occurs in alkali igneous rocks.

Nepheline $NaAlSiO_4$. H=6. White to grey irregular masses, less commonly as hexagonal prisms. Greasy to vitreous lustre. Distinguished from feldspar and scapolite by its greasy lustre and by its gelatinizing in HCl. Used in manufacture of glass and ceramics.

Neptunite $(Na, K)_2(Fe, Mn)TiSi_4O_{12}$. H=5-6. Black, deep red, prismatic crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral.

Niocalite $(Ca, Nb)_4Si_2(O, OH, F)_9$. H=6. Yellow prismatic crystals with vitreous lustre; also massive granular. Occurs commonly as twinned crystals. Associated with other niobium minerals. Granular variety resembles apatite but is harder. Originally found in the niobium deposit at Oka, Quebec.

Nordstrandite $Al(OH)_3$. H=3. Colourless transparent tabular crystals or crystal aggregates. Vitreous to pearly lustre.

Ochre Pulverulent impure iron oxides composed of limonite or goethite (yellow-ochre), or of hematite (red ochre). Used as a pigment.

Olivine $(Mg, Fe)_2SiO_4$. H=6½. Olive-green, vitreous, granular masses or rounded grains; also yellowish to brownish, black. Distinguished from quartz by having a cleavage; from other silicates by its olive-green colour. Used in manufacture of refractory bricks; transparent variety (peridot) is used as a gemstone.

Orthoclase Pink to white monoclinic variety of potash feldspar.

Paragneiss A gneiss derived from a sedimentary rock.

Parisite $Ca(Ce, La)_2(CO_3)_3F_2$. H=4½. Yellow, brownish or greyish yellow hexagonal pyramids or rhombohedral crystals. Striated. Transparent to translucent; vitreous to resinous or pearly.

Peat Dark brown decomposition product of mosses and plants in marshy areas. Used as fertilizer, soil conditioner, insulating material, packing material, etc.

Pectolite $Ca_2NaHSi_3O_9$. H=5. White needle-like crystals, radiating, and forming globular masses. Silky to vitreous lustre. Decomposed by warm dilute HCl. Associated with zeolites in basalt.

Pegmatite A very coarse-grained dyke rock.

Peristerite White albite having a blue schiller. Also called moonstone. Used as a gemstone.

Perovskite $CaTiO_3$. H=5½. Reddish brown to black cubic or octahedral crystals; also granular massive. Adamantine to metallic lustre. Uneven fracture. Colourless to grey streak. Distinguished from titanite by its crystal form, from pyrochlore by its lustre and streak.

Perthite A subparallel intergrowth of pink microcline and colourless plagioclase. Exhibits satiny or golden schiller. Named for Perth, Ontario where it was originally found. Used as a gemstone.

Petarasite $Na_5Zr_2Si_6O_{18}(Cl,OH)\cdot 2H_2O$. H=5-5½. Amber-yellow, greenish yellow massive. Transparent to translucent; vitreous. Associated with biotite, microcline, catapleiite, apatite, zircon, aegirine in nepheline syenite at Mont St-Hilaire, the type locality. Named in honour of Dr. Peter Tarassoff, collector and amateur mineralogist of Dollard-des-Ormeaux, Quebec.

Phillipsite $(K, Na, Ca)_{1-2}(Si, Al)_8O_{16}\cdot 6H_2O$. H=4-4½. Colourless to white penetration twins. Transparent to translucent; vitreous. Common in basalt rocks. Zeolite group.

Phlogopite $KMg_3AlSi_3O_{10}(OH)_2$. H=2½. Amber to light brown variety of mica. Used in electrical industry.

Polylithionite $K_2Li_4Al_2Si_8O_{20}(OH, F)_4$. H=2½-4. White, micaceous. Pearly lustre. Variety of lepidolite.

Pseudorutile $Fe_2Ti_3O_9$. H=3½. Brown to black platy, granular. Opaque; submetallic lustre. Reddish brown streak.

Pyrite FeS_2. H=6-6½. Pale brass yellow (iridescent when tarnished) metallic crystals (cubes, pyritohedrons, octahedrons) or massive granular. Distinguished from other sulphides by its colour, crystal form, and superior hardness. Source of sulphur.

Pyrochlore $NaCaNb_2O_6F$. H=5-5½. Dark brown, reddish brown to black octahedral crystals or irregular masses. Vitreous or resinous lustre. Light brown to yellowish brown streak. Distinguished from perovskite by its lustre and streak, from titanite by its crystal form. Ore of niobium.

Pyrophanite $MnTiO_3$. H=5. Deep-red, reddish brown thin tabular crystals or fine flakes. Metallic to adamantine lustre. Conchoidal fracture. Member of ilmenite group.

Pyrrhotite $Fe_{1-x}S$. H=4. Brownish bronze massive granular. Black streak. Magnetic; this property distinguishes it from other bronze sulphides.

Quartzite A quartz-rich rock formed by the metamorphism of a sandstone. Used as a building and monumental stone, and, if colour is pleasing, as an ornamental stone; high purity quartzite is used in the glass industry.

Raite $Na_4Mn_3Si_8(O, OH)_{24}\cdot 9H_2O$ (?). H=3. Gold to brown acicular crystals. Occurs in alkali igneous rocks.

Ramsayite $Na_2Ti_2Si_2O_9$. H=6. Colourless, fine acicular crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral. Not readily identifiable in hand specimen.

Rhabdophane $(Ce, La)PO_4 \cdot H_2O$. H=3½. Pinkish, yellowish white or brown stalactitic or botryoidal encrustations with radial structure. Translucent; greasy lustre.

Rhodochrosite $MnCO_3$. H=4. Pink to rose, less commonly yellowish to brown, massive granular to compact; also columnar, globular, botryoidal; crystals (rhombohedral) uncommon. Vitreous, transparent. Distinguished from rhodonite (H=6) by its inferior hardness. Ore of manganese.

Richterite $(Na, K)_2(Mg, Mn, Ca)_6Si_8O_{22}(OH)_2$. H=5-6. Green, brown to brownish red, yellow, rose-red long prismatic crystals. Transparent to translucent; vitreous. Amphibole group.

Rinkite $(Na, Ca)_{12}(Ce, Ti)_5Si_8(O, F)_{36}$. H=5. Yellow, yellowish green to brown tabular or prismatic crystals and massive. Vitreous to greasy lustre. Rare mineral occurring in nepheline syenite. Not easily identified in hand specimen.

Rozenite $FeSO_4 \cdot 4H_2O$. Snow white, greenish white, finely granular, botryoidal or globular encrustations. Metallic astringent taste. Difficult to distinguish in hand specimen from other iron sulphates with which it is associated.

Rutile TiO_2. H=6-6½. Brownish red to black striated prismatic or acicular crystals; massive. Crystals are commonly twinned, forming elbow shapes. Adamantine lustre. Resembles cassiterite, but not as heavy and has light brown streak (cassiterite has white streak). Ore of titanium.

Sabinaite $Na_9Zr_4Ti_2O_9(CO_3)_8$. White powdery coating, compact finely flaky aggregates. Silky lustre. Effervesces in warm HCl. Commonly coated with white powdery gibbsite-like mineral which fluoresces strongly in ultraviolet light. Associated with weloganite, dawsonite, quartz, calcite and dresserite in igneous sills at Francon Quarry, the type locality. Named in honour of Ann P. Sabina.

Samarskite $(Y, Er, Ce, U, Ca, Fe, Pb, Th)(Nb, Ta, Ti, Sn)_2O_6$. H=5-6. Black, brownish black, prismatic or tabular crystals, massive. Vitreous resinous or spendent lustre. Radioactive. Exposed surfaces alter to brown or yellowish brown. Conchoidal fracture. Dark brown to reddish or yellowish brown streak. Occurs in granite pegmatites.

Sandstone. Sedimentary rock composed of sand-sized particles (mainly quartz).

Sanidine Colourless, glassy, monoclinic variety of potash feldspar.

Sapphirine $Mg_5Al_{12}Si_2O_{27}$. H=7½. Pale to dark blue, greenish blue grains; also tabular crystals. Vitreous lustre. Uncommon mineral. Difficult to identify except by X-ray methods.

Scapolite $(Na, Ca)_4[(Al, Si)_4O_8]_3(Cl, CO_3)$. H=6. White to grey (less commonly pink, yellow, bluish, greenish) prismatic and pyramidal crystals; also massive, granular with splintery, woody appearance. Vitreous, pearly to resinous lustre. Distinguished from feldspar by its square prismatic form, its prismatic cleavage, its splintery appearance on cleavage surfaces. May fluoresce under ultraviolet rays. Clear varieties used as gemstone.

Scheelite $CaWO_4$. H=4½-5. White, yellow, brownish; transparent to translucent massive. High specific gravity (about 6). Usually fluoresces; this property is used as a method of prospecting for this tungsten ore.

Sepiolite $Mg_2Si_3O_8 \cdot 2H_2O$. H=2-2½. White, grey, yellowish compact fibrous or granular, earthy. Waxy to dull lustre.

Serandite $Na_6(Ca, Mn)_{15}Si_{20}O_{58} \cdot 2H_2O$. Pink to reddish prismatic crystal aggregates. Vitreous lustre. Occurs with analcime, acmite in nepheline syenite. Distinguished by its colour and crystal form.

Serpentine $Mg_6(Si_4O_{10})(OH)_8$. H=2-5. Usually massive with waxy lustre. Translucent to opaque in shades of yellow-green to deep green also bluish, red, brown, black. Often mottled, banded or veined. Asbestos is the fibrous variety. Formed by alteration of olivine, pyroxene, amphibole, or other magnesium silicates. Found in metamorphic and igneous rocks. Used as ornamental building stone (verde-antique) and for cutting and/or carving into ornamental objects (ash-trays, book-ends, etc.).

Shale Fine-grained sedimentary rock composed of clay minerals.

Siderite $FeCO_3$. H=3½-4. Brown rhombohedral crystals, cleavable masses, earthy, botryoidal. Distinguished from calcite and dolomite by its colour and higher specific gravity, from sphalerite by its cleavage. Ore of iron.

Sillimanite Al_2SiO_5. H=7. White to colourless fibrous or prismatic masses. Vitreous or silky lustre. Distinguished from wollastonite and tremolite by its superior hardness. Occurs in schists and gneisses.

Smythite $(Fe,Ni)_9S_{11}$. Dark brown to black flaky, platy forming rosettes; opaque; metallic lustre. Alters from pyrrhotite.

Sodalite $Na_8(AlSiO_4)_6Cl_2$. H=6. Royal blue to purplish blue granular masses; also dodecahedral crystals. Vitreous lustre. Resembles lazurite but is harder, also distinguished from it by its association: sodalite in nepheline rocks, lazurite in crystalline limestone.

Sphalerite ZnS. H=3½-4. Yellow, brown, or black, granular to cleavable massive; also botryoidal. Resinous to submetallic. Honey brown streak. Ore of zinc.

Spinel $MgAl_2O_4$. H=7½-8. Dark green, brown, black, deep blue or green octahedral crystals, grains, or massive with conchoidal fracture. Vitreous lustre. Distinguished from magnetite and chromite by its superior hardness and lack of magnetic property.

Steenstrupine $(Ce, La, Na, Mn)_6(Si, P)_6O_{18}(OH)$. H=5. Reddish brown to black rhombohedral crystals or massive. Opaque. Occurs in nepheline syenite rocks.

Stillwellite $(Ce, La, Ca)BSiO_5$. Grey, brownish yellow, maroon rhombohedral crystals or massive. Opaque with waxy to dull lustre.

Strontianite $SrCO_3$. H=3½. Colourless, white, grey, yellowish or greenish prismatic crystals, fibrous, columnar, massive granular. Vitreous lustre. Effervesces in dilute HCl. Distinguished from celestite by its effervescence in acid, from aragonite by its higher specific gravity. Ore of strontium.

Strontiodresserite $(Sr, Ca)(Al_2CO_3)_2(OH)_4 \cdot H_2O$. White silky flakes forming coatings; white spheres (1 mm in diameter). Effervesces in HCl. Associated with weloganite, strontianite, quartz in igneous sill rock, Francon Quarry, the type locality. Named in allusion to its chemical relationship to dresserite.

Sulphur S. H=1½-2½. Yellow, reddish, greenish tabular, bipyramidal crystals; massive. Transparent; greasy to resinous lustre. Black when admixed with pyrite from which it alters.

Syenite An igneous rock composed mainly of feldspar with little or no quartz. Used as building stone.

Synchisite (Ce, La)$Ca(CO_3)_2F$. H=4½. Yellow to brown tabular or platy aggregates. Greasy, vitreous or subadamantine lustre. Translucent. Soluble in acids. Associated with other rare element minerals in pegmatite. Not easily distinguished in hand specimen.

Talc $Mg_3(Si_4O_{10})(OH)_2$. H=1. Grey, white, various shades of green. Fine-grained massive, foliated. Translucent with greasy feel. Massive varieties are known as steatite and soapstone, and because of their suitability for carving, are used for ornamental purposes. Formed by alteration of magnesium silicates (olivine, pyroxene, amphibole, etc.) in igneous and metamorphic rocks. Used in cosmetics.

Tetrahedrite (tetrahedrite-tennantite series) $Cu_{12}Sb_4S_{13}$-$Cu_{12}As_4S_{13}$. H=3-4½. (Tennantite harder.) Flint grey to iron black, metallic, tetrahedral crystals; also massive granular to compact. Brown, black or deep red streak. Tennantite is less common than tetrahedrite. Ore of copper; also contains values in silver, antimony.

Tetranatrolite $Na_2Al_2Si_3O_{10}\cdot 2H_2O$. White prismatic crystals and fibrous aggregates; earthy. Translucent to opaque; vitreous to dull lustre. Transparent in specimens freshly broken from the rock, becoming white, opaque, friable on exposure to air. Associated with natrolite, analcime, microcline in nepheline syenites at Mont St-Hilaire, Quebec. The name is for its structure, tetragonal natrolite.

Thaumasite $Ca_3Si(OH)_6(CO_3)(SO_4)\cdot 12H_2O$. H=3½. Colourless to white acicular or massive. Transparent to translucent; vitreous to silky lustre.

Thenardite Na_2SO_4. H=2½-3. Colourless, white, greyish, reddish, yellowish, brownish powdery; tabular, dipyramidal crystals. Dull to vitreous lustre.

Thomsonite $NaCa_2Al_5Si_5O_{20}\cdot 6H_2O$. H=5-5½. Snow white, pinkish white to reddish, pale green, radiating columnar or fibrous masses; also compact. Vitreous to pearly lustre. Transparent to translucent. Associated with other zeolites. Massive variety used as gemstone.

Thorbastnaesite $Th(Ca, Ce)(CO_3)_2F_2\cdot 3H_2O$. White silky fibres forming spheres, less than 1 mm in diameter; coatings. Associated with baddeleyite, zircon (cyrtolite) at the Francon Quarry.

Thorite $ThSiO_4$. H=5. Black to reddish brown tetragonal prisms with pyramidal terminations; also massive. Resinous to submetallic lustre. Conchoidal fracture. Radioactive. Distinguished by crystal form, radioactivity. Source of thorium.

Titanite (sphene) $CaTiSiO_5$. H=6. Brown, wedge-shaped crystals; also massive granular. May form cruciform twins. Adamantine lustre. White streak. Distinguished from other dark silicates by its crystal form, lustre and colour.

Topaz $Al_2SiO_4(OH, F)_2$. H=8. Colourless, white, pale blue, yellow, brown, grey, green, prismatic crystals with perfect basal cleavage; also massive granular. Vitreous, transparent. Distinguished by its crystal habit, cleavage and hardness. Used as gemstone.

Tourmaline $Na(Mg, Fe)_3Al_6(BO_3)_3(Si_6O_{18})(OH)_4$. H=7½. Black, deep green or blue, pink, brown, amber-coloured, prismatic crystals; also columnar, granular. Prism faces vertically striated. Vitreous lustre. Conchoidal fracture. Distinguished by triangular cross-section in prisms; by striations, fracture. Used in manufacture of pressure gauges; transparent varieties used as gemstone.

Tremolite $Ca_2Mg_5Si_8O_{22}(OH)_2$. H=5-6. White, grey, striated prismatic crystals, bladed crystal aggregates, fibrous, perfect cleavage. Usually occurs in metamorphic rocks. Fibrous variety is used for asbestos; clear crystals are sometimes cut and polished as a gem curiosity.

Tundrite $Na_2Ce_2(Ti, Nb)SiO_8 \cdot 4H_2O$. H=3. Brownish or greenish yellow acicular crystals occurring individually or forming spheres. Occurs in nepheline syenite rocks.

Type locality Locality from which mineral species was originally described.

Uraninite UO_2. H=5-6. Black, brownish black, cubic or octahedral crystals; also massive, botryoidal. Submetallic, pitchy to dull lustre. Uneven to conchoidal fracture. Radioactive. Distinguished by high specific gravity (10.3 to 10.9), crystal form, radioactivity.

Uranothorite Hydrous silicate of Th, U. H=4½-5. Black prismatic crystals, grains. Pitchy lustre. May have orange-coloured sun-burst effect on enclosing rock. Radioactive. Occurs in granitic and pegmatitic rocks. Granular variety distinguished from thorite and uraninite by X-ray methods.

Vermiculite $Mg_3Si_4O_{10}(OH_2 \cdot xH_2O$. H=1½. Silvery-amber or light brown flaky, sheet-like aggregates. Pearly lustre. Expands or exfoliates on heating and this distinguishes it from mica. Formed by the alterations of phlogopite and biotite. Used as an insulator in construction industry, for concrete and plaster, as lubricant, etc.

Vesuvianite (Idocrase) $Ca_{10}Mg_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$. H=7. Yellow to brown or green, apple green, lilac, transparent prismatic or pyramidal crystals with vitreous lustre; also massive, granular, compact or pulverulent. Distinguished from other silicates by its tetragonal crystal form; massive variety distinguished by its ready fusibility and intumescence in blowpipe flame. May be used as a gemstone.

Villiaumite NaF. H=2-2½. Dark red, pink, orange finely crystalline or massive. Transparent; vitreous. Occurs in nepheline syenite rocks.

Vinogradovite $(Na, Ca, K)_4Ti_4AlSi_6O_{23} \cdot 2H_2O$. H=4. Colourless to white fibrous and spherical aggregates; prismatic crystals less common. Transparent; vitreous. Occurs in nepheline syenite rocks.

Weloganite $Sr_3Na_2Zr(CO_3)_6 \cdot 3H_2O$. H=3½. Transparent lemon-yellow to orange-yellow, colourless, prismatic crystals terminated by pyramids; also massive. Conchoidal fracture. Vitreous lustre. Effervesces in HCl. New mineral found at Francon quarry and named for Sir William E. Logan, first director of the Geological Survey of Canada.

Willemite Zn_2SiO_4. H=5½. Colourless, yellow, green, white, reddish brown massive or granular; also prismatic crystals. Vitreous lustre. Soluble in HCl. May fluoresce (green). Non-fluorescent variety difficult to identify in hand specimen. Minor ore of zinc.

Wilsonite An altered scapolite. Pink, rose red, mauve to purple in colour. Clear variety used as gemstone. Was named for Dr. J. Wilson of Perth where it was originally found.

Wohlerite $NaCa_2(Zr, Nb)Si_2O_8(O, OH, F)$. H=5½-6. Yellow, brown, orange tabular or prismatic crystals. Vitreous lustre. Occurs in nepheline syenite. Rare mineral.

Wollastonite $CaSiO_3$. H=5. White to greyish white compact cleavable or fibrous masses with splintery or woody structure. Vitreous to silky lustre. May fluoresce under ultraviolet rays. Distinguished from tremolite (H=6) and sillimanite (H=7) by inferior hardness and by its solubility in HCl. Used in ceramics and paints.

Wulfenite $PbMoO_4$. H=2½-3. Yellow, orange to brown tabular or prismatic crystals; also massive. Transparent; resinous to adamantine lustre.

Wurtzite (Zn, Fe)S. H=3½-4. Brownish black pyramidal, tabular striated crystals; also fibrous, columnar, concentrically banded crusts. Resinous lustre. Associated with sphalerite, marcasite and other sulphides.

Yofortierite $Mn_5Si_8O_{20}(OH)_2(OH_2)_4 \cdot 4\text{-}5H_2O$. H=2½. Pink to violet radiating fibres. Associated with analcime, serandite, eudialyte, polylithionite, aegirine, microcline and albite in pegmatite veins cutting nepheline syenite at the Mont St-Hilaire quarry, Quebec, the type locality. It was named in honour of Dr. Y.O. Fortier, Arctic geologist and director (1964-1973) of the Geological Survey of Canada.

Zircon $ZrSiO_4$. H=7½. Reddish to greyish brown tetragonal prisms terminated by pyramids; also colourless, green, grey. May form knee-shaped twins. Vitreous to adamantine lustre. May be radioactive. Distinguished by its crystal form, hardness and colour. Ore or zirconium and hafnium. Used in moulding sand, ceramics and refractory industries; transparent varieties used as gemstones.

CHEMICAL SYMBOLS FOR CERTAIN ELEMENTS

Ag – silver
Al – aluminum
As – arsenic
Au – gold
B – boron
Ba – barium
Be – beryllium
Bi – bismuth
C – carbon
Ca – calcium
Cb – columbium (niobium)
Ce – cerium
Cl – chlorine
Co – cobalt
Cr – chromium
Cu – copper
Er – erbium
F – fluorine
Fe – iron
H – hydrogen
K – potassium
La – lanthanum
Mg – magnesium
Mn – manganese
Mo – molybdenum
Na – sodium
Nb – niobium
Ni – nickel
O – oxygen
P – phosphorus
Pb – lead
R – rare earth elements
S – sulphur
Se – selenium
Si – silicon
Sn – tin
Sr – strontium
Ta – tantalum
Th – thorium
Ti – titanium
W – tungsten
Y – yttrium
Yb – ytterbium
Zn – zinc
Zr – zirconium

INDEX OF MINERALS AND ROCKS