

STUDY OF A TITANIFEROUS IRON DEPOSIT AND  
SURROUNDING COUNTRY ROCKS IN  
LA LIEVRE AREA, QUEBEC

A Thesis

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Guy Lapointe

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## ABSTRACT

The Lyonne township anorthositic complex and related magnetite ilmenite deposit are situated in the Grenville province of the Canadian shield, twenty miles west of Roberval Lake Saint Jean, Quebec. It is the oldest intrusion of the region but is younger than the paragneiss that covers a large part of the area. The complex is locally anorthositic but most of it is noritic.

The norite is a facies of the anorthosite from which it was derived by an accumulation of ferro-magnesian minerals through normal differentiation. The complex has been subjected to regional metamorphism of the granulite or high amphibolite facies. At the close of the period of metamorphism, both gabbro and ore were intruded and metamorphosed by a pink granite which is probably of the Roberval type.

The associated ore deposit contains magnetic iron ore with an unusually low percentage of  $TiO_2$ . This anomaly is believed to be the result of either metasomatism accompanied by metamorphism by the acid intrusive, or by metasomatism alone.

## INTRODUCTION

Interest in the mining possibilities of the titaniferous magnetite deposits of Lyonne township was first aroused in 1956. Discovery of the deposit was followed by intensive staking of claims, and geological and ground magnetic surveys. Titaniferous magnetite deposits are almost ubiquitous in the Grenville province, wherever anorthosites occurs, but very few are of economic interest because the amount of titanium is either too low to be considered as a valuable source of titanium or too high in the same material to produce a marketable iron ore.

The ore from Lyonne township is an exception. The Quebec Department of Mines sent a geological survey party to map the region during the summer period of 1958.

The author spent that summer as a senior assistant geologist with J. G. Bray, and had the opportunity to map the ore deposit, the host, and surrounding country rock in detail.

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## LOCATION AND ACCESS

The east portion of La Lièvre area, mapped during the summer of 1958 is approximately 200 square miles in extent. It lies between latitudes  $48^{\circ}15'$  and  $48^{\circ}30'$  north, and longitudes  $72^{\circ}30'$  and  $72^{\circ}45'$  west, in the electoral district of Roberval, Quebec. The centre of the area is about 21 miles west of the town of Roberval on Lake Saint Jean. The area includes the southern half of Lyonne township, the western half of Ross township, and the northwestern corner of Chabanel township. The southwestern half of the area lies in unsurveyed territory outside these townships.

The Roberval La Tuque private toll road of the Consolidated Paper Corporation crosses the area from east to west near its middle. A road of the International Paper Corporation branching off the main road  $1\frac{1}{2}$  miles east of the area provides access to the southeast corner of the area.

The titaniferous magnetite deposits of Lyonne township are situated 20 miles due west of the town of Roberval, but the distance by roads between these two points is 42 miles. The mining properties are accessible by numerous motor roads.

## PREVIOUS WORK

One of the first geologists to study the Lake Saint Jean area was James Richardson (12) of the Geological Survey of Canada in 1857. His survey was confined mostly to the shoreline of the rivers and lakes from the mouth of the Saguenay river to Lake Mistassini. In 1870 the same author completed his work by ascending the Ashuapmuchuan River, which flows into Lake Saint Jean.

F. D. Adams (1) of the Geological Survey of Canada was first to recognise the anorthosite series of the region. His work was published in 1884.

The petrography and distribution of the various rock types and structural relationship was established by J. A. Dresser (6) 1918.

In 1933, B. T. Dennis (5) (1934) of the Quebec Department of Mines studied the northwest limits of the anorthosite series of the region and concluded:

"Large portions of the area are underlain by rock of the same family (namely anorthosite) but in which the ferromagnesian minerals are so abundant that the rock should be termed a gabbro or a norite".



## FIELD METHODS

Air photographs covering the entire region on a scale of about  $\frac{1}{2}$  mile to the inch were provided for geological work. The part of Lyonne township in which a detailed survey was made had been covered by geophysical surveys and a system of cut-lines provided excellent control.

A base line was cut in a north direction generally parallel to the strike of the orebody and trend of the host rock. Lines were cut at every 400' normal to the base line. These cross lines were chained and marked at 100' intervals. The general field work was conducted by ordinary photo and compass method, and traverses were made at half mile intervals. The detailed mapping of the Lyonne township ore deposit was controlled by the cut-line system. Despite glacial drift, out-crops were numerous. However, some contacts were difficult to establish and approximations had to be made.