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MONT JACQUES-CARTIER AREA

H.S. de Römer

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GEOLOGY OF THE
MONT JACQUES CARTIER AREA
Gaspé-North County

Preliminary Report

by

H.S. de Römer

INTRODUCTION

The centre of the Mont Jacques Cartier area lies about 27 miles SE of Ste. Anne-des-Monts and comprises parts of Boisbuisson, Deslandes, Lapotardière and Lesseps townships. It covers about 30 square miles and is bounded by latitudes 48°54' and 49°00', and longitudes 65°55' and 66°00'.

The area was mapped in the summer of 1970 at a scale of 1 inch to 1,000 feet. It lies immediately south of the western half of the Mont Auclair area mapped in 1969.

The present work is the continuation of an exploration and mapping program begun in 1963 to study the geology and mineralization of the Monts McGerrigle and surrounding areas.

The extreme northern part of the area can be reached from Mont St. Pierre on the Gulf of St. Lawrence using the rough road leading to Mont Jacques Cartier. The rest of the area is accessible only on foot.

Physiographically, the area lies within the Gaspé Appalachians. It comprises the southern 2/3 of the Monts McGerrigle plateau, with Mont Jacques Cartier (4,150 feet) being its highest point. In its southern part, the generally featureless plateau is cut across in a NS direction by the deep, U-shaped valley of the Rivière Madeleine. Drainage is typically deranged with occasional swamps and irregular streams flowing into and out of lakes. The headwaters of the fast-flowing Rivière Madeleine and its tributaries on the southern and eastern margins of the plateau empty eastward through the Grande Rivière Madeleine into the Gulf of St. Lawrence.

Various soil patterns can be observed on top of prominent hills, in particular the Mont Jacques Cartier. This broad, dome-like feature is covered by well-developed stone nets. On the gentle slopes solifluction produced both stone-garlands and stripes. In general, the flat areas are characterized by extensive felsenmeer. Exposures are generally plentiful, particularly on the flanks of the plateau.

GENERAL GEOLOGY

Lithologically, the Mont Jacques Cartier area comprises two units of unequal importance: the Monts McGerrigle Complex making up most of the area, and the Quebec Group. The former consists of granitic and hybrid rocks of varying composition and texture suggesting different times of emplacement. The Quebec Group is made up folded meta-sedimentary rocks exposed in deep embayments marginal to the intrusion. Large, isolated inclusions of Quebec Group rocks are also present within the granitic mass, The contact - metamorphosed rocks

consist chiefly of banded hornfels with minor quartzite and skarn. The metasedimentary rocks are part of the inner high-temperature zone of the alteration aureole that surrounds the Monts McGerrigle Complex.

MONTS MCGERRIGLE COMPLEX

The Monts McGerrigle Complex, largely igneous in nature, occupies 9/10 of the area covering approximately 27 square miles. The trend of the pluton is roughly N-S. It is in intrusive contact with rocks of the Quebec Group as shown by cross-cutting and dragging effects. Contact relations observed 3 miles SSE of Lac Côte, approximately 1000 feet east of the map-area, indicate a steep attitude to the east.

As mentioned in earlier reports (P.R. 594,.....) contact relations and differing lithologies in various parts of the area suggest multiple intrusions.

The rock types composing the Monts McGerrigle Complex are essentially of two kinds: intrusive rocks and areally insignificant patches of metasedimentary inclusions of the Quebec Group.

Relations between the intrusive facies of the Monts McGerrigle Complex are not very clear everywhere. It is fairly certain, however, that they can be classed into four main groups. Each group may comprise several texturally and composionally different facies that, however, are probably similar in age of emplacement.

From older to younger, the groups are: 1) Sporadic areas of dark-coloured basic rocks, volcanic or intrusive in origin. 2) hybrid, quartz-poor rocks of granodioritic composition with inclusions of more basic material in various stages of alteration. This group also includes a sporadically occurring feldspar-rich rock, possibly a trachyte or latite. 3) massive and coarse, red,

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unaltered granite. Subordinate facies comprise a massive fined-grained red granite, a coarse granite porphyry and a red, amphibolite-rich variety. 4) finally, the youngest of the intrusives are aplite and porphyritic dikes, coarse, quartz-feldspar pegmatite veins and basic dikes; quartz veins are also present.

The basic rocks form inclusions within the granitic rocks. They occur in varying dimensions and shapes ranging from small clusters of ferromagnesian minerals to large oval bodies 1000 feet long and 500 feet wide.

Most of the inclusions are located in the northern part of the area, embedded in the hybrid, quartz-poor, granodioritic rock. Here, contacts between the inclusions are largely gradational over one inch or so. At places, however, the distribution of dark and light components becomes so erratic that it is impossible to say whether the rock is a large feldspathized and assimilated xenolith or whether it is contaminated granite.

Few basic xenoliths have also been observed in the massive red, unaltered granite. A large area of basic rocks occurs 1/2 mile ESE of Lac Côte. Here, the contacts between the xenoliths and the granite are sharp with occasional protrusions of the granite penetrating into inclusions. Evidently, there was no obvious reaction between the red granite and the xenoliths.

The texture of the xenoliths varies greatly from place to place. Some exhibit a massive, medium-grained, felty texture with randomly oriented feldspar needles; small, oval vesicles filled with red feldspar, hornblende, sphene and epidote are occasionally present. Other xenoliths consist of irregular clusters of medium-grained hornblende and feldspar, representing a possibly recrystallized volcanic rock.

Contact relations between the basic xenoliths and the acidic rocks suggest that a basic intrusive phase preceded the emplacement of both, the

granodioritic and granitic fractions.

The main mass of the hybrid, granodioritic material covers the northern 1/3 of the area. It is a characteristically grey to pink, medium-grained, quartz-poor rock, heteregeneous in both composition and texture. Ill-defined patches and streaks of mafic minerals grading into acidic fractions indicate largely digested xenoliths in various stages of alteration. At places, indefinite aggregates of mica and amphibole distributed irregularly throughout the rock suggest a contaminated and mixed rock. Although a granodioritic variety prevails, granite, syenite and monzonite fractions, at places porphyritic, are also present. Heaved blocks of the hybrid granodioritic rock arranged in a polygonal pattern can best be observed on the straight road leading to the Mont Jacques Cartier observation tower.

A remarkable feldspar-rich rock was observed SE and NW of Lac Côte. It occurs in large, elongated, but apparently disconnected lenses that seem to be part of a NW trending, probably 1000-foot wide belt extending for approximately 3 miles. The uniformly light-grey rock is massive and fine-to-medium-grained and is largely composed of feldspar needles. Vague contact relations suggest that it may be pre-granodiorite and certainly pre-granite in age. Structural considerations indicate that it was originally a trachyte or latite associated with the Quebec Group. At present, however, this enigmatic rock is grouped with the igneous rocks of the Monts McGerrigle Complex.

The third group of rocks making up the Monts McGerrigle Complex consists mainly of red granite of differing textural varieties. It covers roughly the southern 2/3 of the area and is, together with the hybrid granodiorite, the most important rock type of the intrusive complex.

The prevalent facies is a red, coarse-grained equigranular granite with rare biotite and amphibole. The rock is massive and remarkably fresh and uncontaminated. Occasionally, however, the granite contains irregular inclusions of a recrystallized basic rock, which may be a meta-diorite or gabbro, or the meta-volcanic rock mentioned above. Absence of contact - metamorphic effects between the granite and xenoliths and the fact that the inclusions are recrystallized confirm the previous findings (P.R. 594,*.....), that a separate basic facies preceded the granite intrusion. Representative exposures of the coarse granite can best be observed in the large outcrop areas surrounding lac Fortin.

Two important varieties of the above granite are a reddish fine-to medium grained facies and a coarse granite porphyry. Both occur in large, elongated patches covering 0.4 to 2 square miles. Their contacts with the coarse, red granite are entirely gradational. Furthermore, their distribution suggests that they represent different textural varieties of the main granite and do not constitute separate intrusions.

The fine-to medium-grained facies contains occasional biotite and amphibole and is typically massive. Best exposures can be observed in the valley of the tributary of the Ruisseau des Orignaux in the extreme SW corner of the area. They are part of a large lens extending west and southward beyond the map area. The contact with the coarse granite could not be localized with certainty mainly because the fine-grained variety passes gradually over a distance of several hundred feet into the coarse - grained rock. In this transition zone, both granites become undistinguishable.

The porphyritic variety, on the other hand, is more defined due to its distinctive texture, although contacts here too are, at places, conjectural. Excellent exposures of the granite porphyry are observed in the gorge occupied

* P.R..... (Geology of the Mt Anclair area)

by the headwaters of the Rivière Madeleine, 1.5 miles SW of lac Côte. The outcrops are part of a well-delineated, NW-elongated belt 3 miles long and approximately 4000 feet wide. The grey reddish rock is made up of well developed 1/2" long and twinned feldspar phenocrysts embedded in a medium - grained matrix of quartz and feldspar with accessory biotite and amphibole.

Finally, a third textural variety of the typical granite is a grey, amphibole-rich facies. The rock is massive and medium-to coarse-grained or slightly porphyritic. Although occasional outcrops have been observed 0.5 and 1.5 miles E and S respectively of lac Fortin, their sporadic distribution and isolated nature does not warrant separation on the map.

The youngest of the intrusions of the Monts McGerrigle Complex comprise aplite and porphyritic dikes, quartz-and feldspar-rich pegmatite veins and basic dikes.

Aplite and porphyritic dikes, here grouped together, are localized by vertical joints striking NW. They are generally rare and occur only in the southern half of the area in the part underlain by granite and pelitic hornfels. Generally 10 to 25 feet wide, they are grey to pink and are composed mainly of fine-to medium-grained vitreous quartz and zoned, euhedral feldspar. Swarms of porphyritic dikes can best be observed in the vicinity of Mont Mc Whirter and in the extreme SE corner of the map.

Pegmatite veins have been observed in the immediate vicinity of Les Cônes, S. of lac Fortin. The veins are 10 to 15 feet wide and generally occupy NW-trending vertical joints. The beige to pink rock is very coarse and consists largely of feldspar and some quartz. White quartz veins are at places associated with the pegmatite; they are concentrated in 0.5 square mile area, 2.5 miles SSW of lac Fortin. Here the veins, 2 to 15 feet wide and again striking largely NW, are made

up of vitreous quartz.

Finally, among the youngest intrusives are dikes of probably diabasic composition. They are fine - grained and dark grey - green, 10 - 15 foot wide bodies occupying steeply dipping or vertical joints. Nearly all have a preferred NW orientation and most of them were observed in the part underlain by the red granite. A particular concentration of parallel NW-trending diabase dikes occurs immediately NE of lac Fortin.

Structurally, the Monts McGerrigle Complex is a massive body. The only evident structures observed are vertical to subvertical joints. Most trend NW, although a NE striking set is also apparent. No planar nor linear arrangements of minerals or inclusions was seen. Similarly, features normally associated with plutons, such as radiating joints and faults, are conspicuously lacking.

As mentioned above, the writer considers the Monts McGerrigle Complex to be a product of multiple intrusions. In brief, the sequence of events may have been the following: 1) early intrusion of a basic rock of dioritic or gabbroic composition into interbedded, volcanic and sedimentary rocks of the Quebec Group. 2) intrusion of a granitic mass bringing about widespread contact-metamorphic alteration. Various types of hornfels and skarns making up the alteration aureole originated at this stage. Incorporation and assimilation of country rocks resulted in the hybrid rock of granodioritic composition found in the northern part of the Complex. Actually, circumstantial evidence indicates that this area of mixed rocks is probably a large roof-pendant. 3) introduction of a younger, fresh and red granite, which injected the above rocks, but did not react with them, since they probably had reached chemical equilibrium during earlier intrusions.

Two K/Ar age determinations were carried out on the younger granite and

both indicate undoubtedly a late Devonian time of emplacement (P.R. 594).

Quebec Group

The Quebec Group rocks occupy only about 1/10 of the area. They are the country rocks exposed in large embayments of the Monts McGerrigle Complex, but also form inclusions within the intrusive mass. The rocks consist mainly of hornfels and quartzite, belonging to the inner zone of alteration surrounding the Monts McGerrigle Complex.

The hornfels may be either pelitic, cherty or garnetiferous. The pelitic variety is best exposed in a belt in the SE corner of the area and also SE of lac Fortin. Typically, the rock is mauvish, spotty and soft and is the contact metamorphic equivalent of shales. The cherty hornfels is aphanitic, very hard and is made up of alternating green and mauve bands 1/2 to 2 inches wide. Commonly, however, the rock consists of interlayered pelitic and cherty hornfels reflecting a heterogeneous assemblage of parent silstones, shales and intermediate rocks.

A few ill-defined agglomerations of loose debris of meta-sedimentary rocks were observed in the northern half of the Monts McGerrigle Complex. They consist of both pelitic and cherty hornfels exposed over a fraction of a square mile in surface and undoubtedly represent xenoliths of Quebec Group rocks.

The third variety is a garnetiferous hornfels well exposed in the SE corner of the area. The rock is aphanitic and extremely tough; it is characterized by alternating streaks of 1-inch wide, mauve and apple-green bands. The mauve layers consist largely of finely divided garnet; at places, however, coarsely recrystallized garnet is associated with calc-silicate minerals and the rock may then conveniently be termed a calc-silicate hornfels or skarn. The banding strikes

EW and dips steeply north or south. Identical rocks have been observed on the western contact of the Monts McGerrigle Complex, some 5 miles due west of this location.

The quartzite is of particular significance, because it serves as reliable marker horizon and because its origin is reasonably clear. The main quartzite band about 1000 feet wide is exposed SE of lac Fortin. No structural attitude could be obtained as only debris were available. The rock is typically white and medium-grained and consists of subrounded quartz and sericitized feldspar.

A small area of angular quartzite debris was located within the intrusive mass, about 1 mile NNW of lac Côte. It is fairly certain that it may be correlated with an identical rock on the western margin of the pluton, 4.5 miles SW of lac Côte and about 1/2 mile outside the area.

The above considerations suggest that while at the 48°55' latitude hornfels on both flanks of the pluton can be correlated roughly along an EW line, at the 48°57' latitude farther north, the quartzite NW of lac Côte forms the apex of a cuspate fold-like structure opened to the south.

There is clear evidence that the Quebec Group rocks were severely disturbed during the intrusion as shown by intense folding and dragging at the contacts. Large xenoliths of country rocks were incorporated and some of them partly assimilated. Previous findings have shown that xenoliths found within the pluton have been rotated and disrupted, but not appreciably transported except by normal folding.

In the light of the above evidence, the location of the quartzite area NW of lac Côte suggests that the present erosion surface of the complex, at least of the northern half, represents the upper part or roof portion of the pluton.

ECONOMIC GEOLOGY

Although the regional geologic setting is very favorable, little visual mineralization was located in the area. Particular care was taken to investigate the marginal zones of the pluton as well as the areas within the complex occupied by Quebec Group inclusions.

Minor amounts of disseminated pyrite, pyrrhotite and chalcopyrite were observed in cherty and pelitic hornfels debris 2,800' NNW of the Mont Jacques Cartier observation tower.

A total of 221 stream sediment samples was collected during geological field work. The results of their analyses show an interesting distribution pattern.

Background values for Cu in the granitic rocks are in the order of 6-9 ppm, thus lower than the Cu-values registered in the aureole rocks north and east of the pluton (10-20 ppm). Values of around 18 ppm Cu are confined to the patches of metasedimentary rocks found within the complex. A series of interesting values about twice the background occurs in the east-striking valley, approximately 1 mile ESE of Les Cônes. The area represents the contact zone between mainly quartzite and hornfels, and granitic rocks. The latter consist of old granite and feldspar-rich meta-volcanic rocks complexly injected by younger red granite. This part of the contact zone is economically interesting and warrant further exploration. The highest Cu-value of 39 ppm was recorded in a deep valley, 2.5 mile SE of Les Cônes. It is probable that it represents mineralization associated with meta-sediments concealed below overburden.

Similarly, the background for Zn (40-60 ppm) is lower in the granitic rocks than in the aureole rocks (50-80 ppm). Interesting values (210-348 ppm) were found in the granitic rocks 1/2 mile east of lac Fortin.

Pb-values of 200 ppm, considerably higher than the background (20-30 ppm) are concentrated, together with Cu-values, in the area underlain by meta-sedimentary inclusions SSW of Mont Jacques Cartier.

High values of Mo of 130 ppm reaching a maximum of 400 ppm (background: 10-15 ppm) are found in the wide valley east of lac Fortin. All the interesting Mo-values lie in the northern half of the area.

Anomalous Ni-values (background: 6-8 ppm) were recorded in the vicinity of basic dikes, such as 6,000' ENE of Mont Jacques Cartier, with 64 ppm Ni.

A single high U-value of 180 ppm was registered 1.5 miles SE of les Cônes. Other anomalous values of 30-70 ppm (background: 6-10 ppm) are again concentrated in the valley east of lac Fortin.

Co-values have a background of 6-8 ppm. A high of 62 ppm, associated with 64 ppm Ni ENE of Mont Jacques Cartier, is probably related to diabase dikes. Other anomalous values reaching 80 ppm Co are concentrated east of lac Fortin.

Surprisingly high Mn-values of 12,480 and 24,000 ppm are again found east of the above lake.

Summarizing the above results of geochemical analysis, it seems evident that the bulk of anomalous values falls into two distinct areas, both located on the eastern margin of the map-area.

The northern one lies E of lac Fortin, in the inner alteration zone of the aureole surrounding the pluton. The maxima for Mo (400 ppm), Co (80 ppm) Mn (24,000 ppm), Zn (348 ppm) and Pb (220 ppm) of the area as a whole have been recorded in this 1 sqm. area.

The other area is located about 2 miles directly south of the above. Here, anomalous values for Cu (39 ppm), U (180 ppm), Pb (164 ppm), Co (52 ppm), Mo (84 ppm) and other elements were encountered. They fall within an area underlain by granitic rocks, although they may reflect the presence of metasedimentary inclusions. The actual contact of the pluton is 1000 feet east of the map area.

Further study should be carried out on the eastern contact zone of the pluton and in particular in the areas outlined above. They are extremely favorable loci for mineralization and definitely warrant further exploration.