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GRANITIC GNEISSES IN THE FOCH AREA, ABITIBI, PART B

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PROVINCE OF QUEBEC, CANADA

BUREAU OF MINES

Honourable J. E. PERRAULT, Minister of Mines

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A. O. DUFRESNE, Director

ANNUAL REPORT
OF THE
QUEBEC BUREAU OF MINES
FOR THE CALENDAR YEAR
1932

JOHN A. DRESSER, Directing Geologist

PART B

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COUNTY OF ABITIBI

by *L. V. Bell*

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GRANITIC GNEISSES IN THE FOCH AREA

COUNTY OF ABITIBI

by L. V. Bell

INTRODUCTION

During the months of June and July, 1932, reconnaissance work was carried out by the writer in an area bounded by longitudes $76^{\circ}20'$ and $76^{\circ}50'$ and by latitudes $47^{\circ}50'$ and $48^{\circ}20'$, which includes the following townships: Crusson, Sérigny, Foch, Pétain, Ypres, and Cambrai. This area, lying within the Abitibi district, is traversed in its northern part by the Quebec-Cochrane branch of the Canadian National railways.

The reconnaissance was carried out with the object of supplementing the work of A. M. Bell in delimiting the eastern margin of the Abitibi volcanic-sedimentary belt, which is at present proving of so much interest to the prospector. The results of the reconnaissance are incorporated in the accompanying generalized geological map No. 236, which includes also a part of the contiguous area to the west covered by A. M. Bell in the foregoing report.

It was hoped that the easterly-trending volcanic-sedimentary belt, with which the mineral deposits farther west are associated, would be found to continue into the district under discussion. This hope was not realized, however, and it was definitely established that the belt does not extend eastwards beyond the east boundaries of Haig and Jurie townships. Its eastern end was later determined *within* these two townships by the more detailed work of A. M. Bell.

ACKNOWLEDGMENTS

The writer was capably assisted in the field by R. Grimes-Graeme, F. Morisset, and O. P. Harty. The last named also acted as cook. Grimes-Graeme served as senior assistant and carried out a part of the geological mapping.

The excellent map upon which the geological data is plotted was prepared from aerial photographs taken by the Royal Air Force, and was supplied as an advance copy through the courtesy of the Topographical Survey of Canada. The control for the aerial mapping is provided by the surveys of the Department of Lands and Forests of Quebec.

DRAINAGE, TOPOGRAPHY, TIMBER

DRAINAGE:

The area is in part north, and in part south, of the divide, or 'height-of-land', between the James Bay and the Ottawa-St. Lawrence river systems. Hence there are two systems of drainage, respectively northward and southward. The rivers of the James Bay watershed are the Marquis and its tributaries, and the Attic and its tributaries, which include the Clairry river and Canyon and Jacko creeks. The Chochocouane river and its several tributaries flow southwards. Since these rivers and streams are here represented only by their headwaters, they are for the most part small and not easily navigable. Lakes are quite numerous, but none of them are large. Commonly they are long and narrow, many of them being merely expansions of the streams.

Although most of the streams do not seem to be related to older, or pre-existing, stream-valleys, some of them clearly are of this type. Where this is the case, the stream bed is entrenched in stratified sand and gravel which was deposited by the waters which formerly occupied the same valley. Such valleys are presumably pre-Glacial in age.

As may be seen on the accompanying map, a striking feature of the drainage pattern of the district is the very general northeasterly trend of the streams and lakes. This is believed to be the result of control by the structure of the underlying rocks. Some changes in drainage were effected by glaciation, but these are thought to have been of relatively minor importance. The relation of the drainage to structure is described more fully on a later page.

TOPOGRAPHY:

Topographically, the area is in marked contrast to the 'clay belt' country to the west, including the so-called 'Abitibi belt'. It is much more rugged, with hills rising to upwards of 600 feet above their base, and may well be described as a 'rocky upland'. Heavy till, scattered boulders, occasional winding esker-ridges, and other glacial records are much in evidence, indicating that the country was not covered to any great extent by post-Glacial lakes, as was the area to the west. There are, however, some flatter tracts that have originated as out-wash plains, and also certain restricted areas that undoubtedly were the sites of post-Glacial lakes and ponds. Although most of the hills are drift-covered, they have a core of rock, and occasional rock exposures may be found along their flanks. Low areas of swamp, typical of the districts to the west, are rare here.

Although the area is one of rather sharp relief within the limits stated, it forms part of a very extensive territory in which the relief is nowhere very pronounced. As a rough average, the elevation of the area as a whole is approximately 1,250 feet above sea-level. Where traversed by the railway, the elevation varies between 1,314 feet at Bolger station on the east, and 1,180 feet at the crossing of Jacko creek on the west ①. Senneterre station, near the east end of the clay belt, has an elevation of 1,030 feet.

It is an interesting fact that the change from clay-belt conditions to the more rugged topography of the area under discussion is marked by a change also in the character of the underlying rocks. The clay belt terminates near latitude 77°, and the transition from the volcanic-sedimentary rocks to the prevailing granite gneiss of the present area takes place near latitude 76° 45'. This correspondence would suggest that the character of the bed-rock has had a bearing on the topography, and on the areal extent of the post-glacial lakes in which the clays were deposited.

① White, James, *Altitudes in Canada*; Commission of Conservation Canada, 1915, pp. 176-177.

TIMBER:

The area is for the most part heavily wooded, and relatively small sections have been swept by fire. Those parts that are sparsely timbered are usually found to be underlain by coarse sand and gravel and covered by scattered boulders. The timber growth is of three types. On the uplands, the forests are mainly of birch, white spruce, and balsam, with white pine, yellow birch, and black birch occurring more rarely. This is the predominating forest growth of the area. Large trees are common, and there is an abundance of good timber. Cedar trees, usually rather small in size, may frequently be seen near the borders of the lakes. The sand plains are commonly covered with a uniform growth of jack pine. Black spruce, so characteristic of the clay belt to the west, is found in the rather limited low and swampy areas, with tamarack of fair size rather common near the borders of streams.

Systematic logging has not been carried on in the area, but a little cutting has been done locally in the vicinity of the railway.

ACCESS TO AREA AND ROUTES FOLLOWED

The area may be most conveniently entered from Doucet or Forsythe, stations on the Canadian National railway, or from points where the railway crosses certain lakes or streams.

Upon leaving the railway, the available routes are by canoe with rather frequent portages. The streams are navigable only for light canoes, since, due to the rugged topography and proximity to the height-of-land, they are small and fast-flowing. They thus provide a possible, but not an easy, means of travel in the area. The following routes were utilized, supplemented by land traverses at strategic points, as, for instance, along township lines.

A.—ROUTES TO THE SOUTH OF THE RAILWAY:

1.—From Doucet station, lake Bardet and a connecting lake to the south of it were crossed and thence a two-mile portage was made largely through swampy country, to two small lakes. From these,

a portage was made to a northerly-flowing stream and its connecting and branching lakes, from which the Marquis river was eventually reached and followed to its mouth. For a short distance downstream from the portage leading to the Marquis river there are no rapids, but below this the stream-bed is strewn with boulders, fast water and rapids being the rule until the west boundary of Foch township is reached. Beyond this point, navigation of the stream is easier. The upper part of the route is but little used, and the portages, where cut, are for the most part poor. The route as a whole, and more particularly in its upper reaches, is not recommended, particularly for the up-stream trip.

2.—From lake Bolduc, where crossed by the railway one mile east of Forsythe, the Clairry river was followed up to lake L'Espérance, from which the route led, by way of a series of small lakes and portages, to a lake-like expansion of the Clairry river. From here a portage was made to lake Travers, which forms the headwaters of the Marquis river. From lake Travers, the height-of-land was crossed to the headwaters of a stream with connecting lakes which flows southward into the Chochocouane river. This stream, from the lake just below line of latitude $48^{\circ} 05'$ to another lake a short distance above the junction with the Chochocouane river, is very fast-flowing, its stream-bed being entrenched in an older stream-valley occupied by sand and gravel. Below the stream junction, the Chochocouane river is readily navigable to the south boundary of Ypres township, with only a few short portages at rapids and falls. Above the stream junction, the Chochocouane is but little used, although it may be travelled as far as line of longitude $76^{\circ} 25'$. Above this point, however, the stream bed is for the most part choked with boulders, and these, together with a series of rapids, make further progress almost impossible. In the upper part of this route, portages are very numerous, but they are well cut, and on the whole the route is a good one. It has been maintained by one of the logging companies for fire prevention purposes.

B.—ROUTES TO THE NORTH OF THE RAILWAY:

1.—Canyon creek, flowing south into the Attic river, was followed upstream from the railway as far northeast as the vicinity of line of longitude $76^{\circ} 35'$. Although the stream may be followed, the route is but little used.

2.—Jacko creek, a stream with connecting lakes flowing south into the Attic river, was ascended from the railway crossing as far north as the north boundary of Jurie township. The route is not a good one, but provides one means of access to Faillon (Millie) lake.

PREVIOUS WORK

Geological work carried out in the near vicinity of the railway by W. J. Wilson, and later by J. A. Bancroft, has a direct application to the area under discussion. Wilson ①, in 1906 and 1907, made a geological reconnaissance along and in the vicinity of the railway from the Quebec-Ontario boundary eastward to a point approximately 55 miles east of Doucet; and Bancroft ②, in 1916, examined the geology along the railway between Hervey Junction and Doucet.

GENERAL GEOLOGY

The gneissic rocks which are believed to underlie the entire area examined by the writer, form part of a very extensive series of similar rocks known to extend for many miles to the south and east, and intermittently for a very considerable distance to the north. The age relationships of these rocks are not very clear, and they have been variously classified. All observers agree that they are post-Kewatin in age, and early opinion favoured the view that they are of Laurentian age. It is now recognized, however, that granitic intrusives of *more than one age* are present in this series of granitic and allied rocks.

W. J. Wilson ③ mapped the gneissic, granitic rocks as Laurentian.

M. E. Wilson ④, in his later reports, regards the gneissic rocks of this same general series as later than the Pontiac schist, which is assumed to be Témiscamian in age. According to this view, the gneisses would thus be post-Témiscamian, and therefore post-Laurentian, in age.

① Wilson, W. J., *Geological Reconnaissance Along the Main Line of the National Transcontinental Railway in Western Quebec*; Geol. Surv. Can., Mem. 4, 1910.

② Bancroft, J. A., *Geological Reconnaissance between Hervey Junction and Doucet*; Que. Bur. Mines, Ann. Rept., 1916, pp. 128-168.

③ *Op. cit.*, p. 13.

④ *Timiskaming County, Quebec*; Geol. Surv. Can., Memoir 103, 1918. p.76.

Bancroft ^① regarded the igneous gneisses as Laurentian, and the inclusions of sedimentary nature found within them as remnants of Grenville rocks.

The writer has not studied the relationships of the granitic series to other rock types, but the uniformly banded and gneissic nature of these rocks as a whole, together with the fact that they appear to be largely recrystallized, suggests that they belong to the old granitic complex to which the name 'Laurentian' is commonly applied.

GEOLOGY OF THE MAP-AREA

Owing to the heavy cover of glacial débris, rock outcrops within the area examined are not abundant, and usually they are small. They are, however, sufficient in number to establish the presence of the following rock types as forming part of the essentially granitic complex which may at least be classed as Pre-Huronian in age.

PRE-CAMBRIAN.....PRE-HURONIAN.....	{	Pegmatite, quartz-veins
		Igneous gneisses
		Sedimentary gneisses

SEDIMENTARY GNEISSES

Exposures of gneissic rock, presumably sedimentary in origin, were seen in several places, but they were too small to warrant differentiation on the accompanying map, a procedure that would have been the more difficult owing to the fact that in many of the occurrences they can not easily be distinguished from the igneous gneisses. They usually show some evidence of bedding, however.

The original sedimentary rocks from which these gneisses have been derived have been completely metamorphosed and recrystallized, so that the rocks are now biotite and garnetiferous gneiss and schist. They are commonly intruded in parallel fashion by dykes and stringers of pegmatite and granitic material. Under the microscope there is clear evidence of very complete recrystallization, the constituent minerals appearing very fresh or but little altered. The banded structure of the rock is commonly evident in the parallel orientation of the platy minerals. Quartz, plagioclase, orthoclase, biotite, garnet,

^① *Op. Cit.*, pp. 140, 153.

and hornblende are the more common mineral constituents. All occurrences examined were highly garnetiferous, a typical feature of these sedimentary gneisses elsewhere.

As noted in the foregoing report, A. M. Bell recognizes, in the area to the west, an increase in the amount of sedimentary material in the gneisses near their contact with the rocks of the volcanic-sedimentary belt. He suggests that the sedimentary gneisses in the present area represent the continuation eastward of the sediments of the Pontiac (Témiscamian?) series, highly metamorphosed both regionally and by granitic injection. In this connection, however, it may be noted that no inclusions of Keewatin volcanic rocks, which might be expected under such conditions, were recognized in the sedimentary gneisses within the area examined by the writer, although it is admitted that the metamorphism to which relatively basic volcanic rocks would be subjected under such conditions might result in their transformation to amphibolite. Amphibolite is not uncommon in the area, but most of it is thought to be of igneous origin.

IGNEOUS GNEISSES

As has been noted, the gneisses which are believed to be of sedimentary origin usually show some evidence of bedding, and they are very highly garnetiferous. Such gneisses are present in the area in very minor amount as compared with the igneous gneisses. Bancroft reported a similar preponderance of plutonic gneisses underlying the country adjacent to the railway between Hervey Junction and Doucet ①. In the present area, practically all of the numerous glacial erratics and boulders also are of igneous gneiss. The rock is commonly of a uniform grey colour, more rarely pink to red. Generally, it is a biotite gneiss. Hornblende gneiss and amphibolite occur much more rarely, and though, in the majority of occurrences at least, they are thought to represent differentiates of the more acid, biotite types, in some instances they may be of sedimentary origin.

A very characteristic feature of the rocks as a whole is their banded and foliated nature, which is largely due to the segregation and parallel arrangement of their darker mineral constituents, principally the biotite and hornblende. This feature is also quite marked as seen under the microscope.

① *Op. cit.*, p. 152.

Microscopic examination of a limited number of specimens revealed the following more common mineral constituents: quartz, plagioclase, orthoclase, biotite, hornblende, and garnet. In addition, apatite, pyroxene, magnetite, and pyrite were noted in some of the specimens. For the most part at least, these rocks have been subjected to intense regional metamorphism, in the course of which their deformation, with resulting foliated structure, has been accompanied by the recrystallization of their constituent minerals, which are, in general, fresh and unaltered.

No later granites, intrusive into the gneiss, were seen, but it is quite possible that more detailed work would reveal their presence.

PEGMATITE, QUARTZ VEINS

There were very few rock exposures examined within the district which did not exhibit injections by stringers, dykes, or masses of pegmatite. Such injections have commonly taken place in parallel fashion along the direction of foliation or banding, and may thus, in many cases, be termed *lit par lit* injections. The common pegmatitic types consist almost exclusively of quartz and feldspar. Very coarse pegmatites were not observed.

Of rather rare occurrence, and then usually in association with pegmatite, are segregations and veins of quartz. The quartz is barren-looking, and does not suggest the likelihood of metallic mineralization.

STRUCTURE

With minor variations, the foliation and banding of the gneissic rocks of the area strikes northeast-southwest, and the dip is generally steep to the southeast. In some instances, the banding is no doubt due to flowage in the rock when it was in a plastic condition; but in general it would appear to have resulted from later folding, with foliation parallel to the axes of the folds. This indicates that the rocks were steeply folded and compressed along a northeast-southwest axis.

As already noted, and as may be seen on the accompanying map and also in Plate I, the streams and lineal lakes of the district have a very general northeasterly trend, closely corresponding with the direction of foliation of the underlying rock. This correspondence

in direction of the drainage pattern with the foliation and banding of the rocks indicates a definite relationship between them. It would thus appear that, in spite of glacial modifications, which no doubt have also had an effect on the drainage, direction of drainage has been controlled primarily by the foliated structure of the underlying rocks.

ECONOMIC GEOLOGY

Nothing was seen during the course of the reconnaissance work to suggest that metallic minerals of economic importance occur within the area examined. Broad areas underlain by igneous gneisses of pre-Cambrian age have never been recommended to the prospector in search of metallic minerals. Occurrences of sedimentary rocks within the igneous gneisses do, however, merit attention; but, as has been shown, such occurrences in the present area are for the most part small, are not numerous, and are difficult of determination.

The rather numerous pegmatites offer possibilities as a source of feldspar and of other non-metallic minerals, and also of ores of certain of the rarer metals, although none of these latter were seen.

The widespread occurrence of garnet in the rocks of the area suggests that at some points the mineral may be sufficiently concentrated to constitute a deposit of economic interest.





A.—Northeasterly-trending lakes, linear in outline, Foch township, Abitibi



B.—Oxbows and cut-offs developed in the Attie river where flowing through sandy terrain, Crusson township, Abitibi.

(Photos by Royal Air Force, Dept. National Defence, Canada)



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