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PRELIMINARY REPORT

ON THE

CADILLAC BELT FROM PANDORA TO PAN CANADIAN, QUEBEC

BY

H. C. Gunning & J. W. Ambrose

Paper 36-9

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PRELIMINARY NOTE

Public demand for the results of the 1934-35 geological work in Cadillac and Malartic townships has been so insistent that it has been decided to publish the accompanying preliminary map and report, although the geological work is not yet entirely completed, and the complete results, when obtained, may necessitate some changes in the conclusions here given. The mapping shown, however, is accurate, and, although trenching, drilling, and other mining operations may add further detail, the authors consider it improbable that the deductions as to the course of the Cadillac Belt through the, as yet incompletely mapped, area between Lapa Cadillac and Heva river can be far astray.

INTRODUCTION

The Cadillac Belt is a narrow belt of greenstones, with some interbanded sediments and intensely sheared chlorite schists, that strikes east across the middle of Cadillac township. On it are located all the developed gold mines of the district, including, from west to east, the Graham-Bousquet, Thompson-Cadillac, O'Brien, Canadian Gold, Pandora, and Lapa Cadillac. In spite of intensive prospecting, the belt has not previously been traced eastward beyond Lapa Cadillac.

Detailed geological mapping of the area was undertaken by the Geological Survey, Canada, in 1934 and 1935. Facts

obtained indicate that the greenstone belt probably continues southeast from Lapa Cadillac to Pan Canadian in some such manner as shown on the accompanying map. Field work was done on a scale of 400 feet to 1 inch, but in order to facilitate preliminary publication, much of the detail has been omitted. However, all facts of importance for the present purpose have been included.

CHARACTER AND DISTRIBUTION OF VOLCANIC AND SEDIMENTARY ROCKS

The rocks of surficial origin are early Precambrian in age. The oldest group, exposed in the north and northeast parts of the area, is made up of a series of volcanic rocks of unknown thickness, generally referred to the Keewatin. They are mostly massive or pillowed flows, intermediate to basic in composition, but tuffs, breccias, and rare intercalated sedimentary beds are included in the group.

These volcanic rocks are overlain to the south by a layer of medium- to fine-grained, poorly bedded greywackes with a little conglomerate in some places at the base. The sedimentary rocks are overlain in turn by a layer of volcanic rocks, similar in petrographic character to those of the main group. Near the top of this layer, on the Bell River property, and again on the Malrobic property, there is a distinctive zone of rhyolitic lavas, apparently the eastward continuation of a similar zone mapped in 1934 across the remainder of Cadillac and part of Bousquet townships. The occurrence of the rhyolite on the properties mentioned, together with its persistence westward along the same horizon, enables correlation of the two groups of outcrops to be made with every confidence.

The volcanic layer is succeeded to the south by the main body of sedimentary rocks. This group, generally referred to the Timiskaming, is composed of a series of well-bedded greywackes, argillites, numerous lenticular conglomerates, at least one bed of gritty quartzite, and a few thin intercalations of breccia and tuff. In some places the sediments are chloritized and in others amphibolitized. In addition, it includes beds of siliceous iron formation and magnetite bands that range in thickness from a fraction of an inch to 30 feet.

The main body of sedimentary rocks is bounded on the south by the Cadillac Belt, which, west of Pandora, varies greatly in thickness and, in addition to greenstone, includes some interbedded sediments. At Pandora it is heavily sheared and, where its thickness has not been increased by folding, consists of about 200 feet of chlorite schist. Farther east, at Lapa Cadillac, owing to lack of outcrops its exact width or character cannot be determined, but drilling has cut a wide shear zone bordered on the south by about 150 feet of greenstone. The greenstone at and northwest of Pan Canadian, although up to 1,400 feet thick, contains practically no sediments and is intensely sheared only along the south side.

Greywacke, intruded by large bodies of granitic rocks, is mapped by James and Mawdsley,[1] for several miles south of the Cadillac Belt. Only a small part of it was examined during the present work, but within that part the sediments differ from those between the greenstone layers in the complete absence of conglomerate, iron formation, or magnetite beds. No greenstone is known south of the Cadillac Belt.

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1. Map No. 188A: Fournière Sheet; Geol. Surv., Canada.

STRUCTURE

The bedded rocks of the area have been isoclinally folded, sheared, the folds severely twisted, and then subjected to at least two distinct periods of faulting. The resultant structures are naturally most complex and the major features can be outlined only in a general way.

A well-defined synclinal axis, striking 75 degrees west of north, crosses the Cadillac-Malartic township line about three-quarters mile south of the centre line. The beds here, as over the whole of the area, are nearly vertical; dips of less than 75 degrees either north or south are distinctly abnormal. North of the synclinal axis, to the northern limit of the map, all structure determinations show that the beds face south; south of the axis, at least for 1¼ miles across the strike, the beds as determined face north. The axis, it thus appears, marks the centre of a major syncline that takes in most of the map-area.

The isoclinally folded beds, striking almost due east at the Bell River property, pass eastward into a large bend in which the strike turns from east to south, and then back to southeast in Malartic township. The curvature in the Keewatin greenstone northeast of Central Malartic is gentle, but contortion of the strata becomes progressively more pronounced to the southwest in a broad zone that passes the south end of Revillart lake and continues on to the Maritime-Cadillac property. Thus, opposed to the gentle open curve in the Keewatin strata, the sediments within this zone in Cadillac township are bent sharply, with much contortion and drag-folding. The

form of the bend shows that the rocks on the north side moved east relative to those on the south, a conclusion that is borne out by literally hundreds of small drag-folds as well as by other minor structures in the greywacke.

Major faults have been assumed at Lapa Cadillac and northwest of Pan Canadian. In addition, throughout the area there are a large number of minor faults that cut sharply across the strike of the strata and offset the quartz veins and all rocks except the later gabbro. Generally the offset is a matter of a few inches or feet, but in some places it exceeds 100 feet. These faults fall very consistently into two groups, one striking from north to northwest, in which the offset is always to the right, and a second striking in the northeast quadrant, in which the offset is always to the left.

THE CADILLAC BELT

The Cadillac Belt from the Graham-Bousquet mine to the Lapa Cadillac is notably straight, a feature that has doubtless misled many into looking for its continuation along the same line across Malartic township. Instead, however, if the structural interpretation is correct, the belt swings sharply south at Lapa Cadillac in conformity with the regional trend. Its form is complicated by drag-folds of considerable size, and in addition it is probably offset along three, possibly more, major faults.

The first drag-fold, fortunately well exposed by underground workings in the Pandora mine, is sharp and plunges 65 degrees west. It was formed by movement of the rocks on the north side towards the east relative to those on the south, and is an expression on a smaller scale of the same movements that produced the regional flexure.

The eastward continuation of the belt from Pandora is marked for nearly a mile by surface outcrops. Thereafter it is lost in low ground, but is picked up again in drill holes on the Lapa Cadillac. The conglomerate bed on the north shows some southward curvature, a curvature that is doubtless reflected in the greenstone belt and that may mark the beginning of a second drag-fold similar to that at Pandora. Greenstone, flanked on the north, west, and south by greywacke, outcrops 3,000 feet west of the Lapa Cadillac shaft. Presumably it is part of the Cadillac Belt; its position can be accounted for by a displacement of about 2,500 feet to the west along an east-trending fault.

South of the Lapa Cadillac, on the Maritime Cadillac claims, there is a strip of low swampy ground about 1,500 feet wide, bounded on the west by a low, linear, north-trending scarp of greywacke, and on the east by a large group of greywacke outcrops. If the greenstone belt is continuous to the Pan Canadian, it must pass through this gap, not only in order to conform with the regional flexure, but also because all other possible locations are effectually blocked off by outcrops of greywacke.

The greenstone belt at Pan Canadian, 1,400 feet wide, strikes 55 degrees west of north. It can be followed west at this strike for 1½ miles, and then is lost in drift-covered ground. However, on and south of Heva river, three-quarters mile west of the township line, there is a large body of greenstone that strikes due west. It is flanked on the north, east, and south by greywacke, and is apparently the nose of a third drag-fold, similar to those at Pandora and Lapa Cadillac, but complicated in form by

at least two major faults.

The most westerly outcrop of greenstone in this section is on Heva river, 7,200 feet west of the township line. It is separated from the south end of the Maritime Cadillac gap by a mile-long stretch of heavily timbered country that has not yet been thoroughly searched for outcrops. The belt may lie almost anywhere within this area, limited only by exposures of greywacke to the north and west, and by the small outcrop of greywacke in the centre. Future work may allow somewhat closer definition of the possibilities.

INTRUSIVES

The Heva Lake granite is a plutonic body of large size intruded into greywacke south of Pandora. Its location and form suggests that it may have acted as a buttress during regional flexing.

A great variety of dykes cut both the volcanic and the sedimentary rocks. Serpentine and quartz diorite (older gabbro) dykes, not distinguished from greenstones on the map, are restricted to volcanic areas. Dykes of albite and quartz-albite porphyry that grade locally into holocrystalline, equigranular, albite granite are very common in the northern layer of sediments and in the adjacent Keewatin volcanics to the north. With them are a few associated aplite and biotite lamprophyre dykes. None of the group is known south of the northern layer of sediments.

Numerous small dykes and irregular masses of albite and quartz-albite porphyry are intruded along or adjacent to the southern contact of the Pan Canadian greenstone.

Other interesting bodies of the same rock occur on the southern tip of the faulted greenstone nose north of Pan Canadian, and a body of probably related porphyry has been discovered by stripping on McDeason claims just north of Heva river.

Dykes of albite porphyry and irregular tabular masses of very fine-grained albitite intrude greenstones and associated sediments of the Cadillac Belt at Lapa Cadillac and west to Pandora.

MINERAL DEPOSITS

Developments along the Cadillac Belt for over 10 miles west of Lapa Cadillac have shown that the greenstone, and the associated sediments and intrusives, carry many dark-coloured, gold-bearing quartz veins commonly accompanied by mineralized wall-rock. The veins are generally narrow, but some are very rich in free gold. Arsenopyrite, pyrite, and pyrrhotite are the other principal metallic minerals; galena and chalcopyrite occur in some places. Wall-rock alteration includes intense carbonatization, the development of biotite, talc, and finely divided white mica, and the introduction of albite. Black tourmaline is a very widespread, though not an abundant, gangue mineral. Of the sulphides, fine-grained, needle-like arsenopyrite is the chief gold carrier, but much of the gold is free in quartz. The minor sodic intrusives, including albite porphyries and dense albitite, that occur at all places where gold-bearing veins have been developed may have an important, perhaps essential, genetic relationship to the gold deposits.

The sharp drag-fold at the Pandora mine acted as an important ore control. The two principal veins in the

mine lie in greywacke and albitite ("aplite") within and above the layer of chloritic greenstone schist that outlines the northern synclinal part of the westward-plunging fold. The syncline is, in all probability, succeeded to the south by a similarly tightly folded anticline that deserves further investigation.

Outcrops on the Lapa Cadillac ground are very scarce, and the approximate contacts of the greenstone belt shown on the map are subject to correction. Diamond drilling indicates that the gold-bearing quartz veins and mineralized sodic dykes on this property lie near or in the nose of a fold similar to that at Pandora. The drag-folded area is greatly sheared, and a sheared, possibly faulted, zone may extend to the east, well beyond the easterly nose of the greenstone. If there are intrusives along it, it might be a structure favourable for gold deposition.

The drag-fold with associated porphyries north of Pan Canadian deserves prospecting. In addition, the possibility that there may be other similar drag-folds between there and Lapa Cadillac should not be overlooked.

On the Pan Canadian property, the greenstone is strongly sheared along the south side. Much of the gold-bearing rock is an albitized chlorite schist carrying pyrite and carbonates, but in addition there are some quartz veins and bodies of porphyry that carry gold. Pyrite is the most common sulphide; some arsenopyrite, pyrrhotite, and black tourmaline are present.

The emphasis that has been placed upon the main Cadillac Belt as a favourable zone does not, by any means, imply a condemnation of the rest of the area. Several

gold-bearing veins have been found in parts of the district well removed from the belt; some of the principal properties are shown on the map. Although it is not the purpose of these notes to discuss in detail the structure and gold possibilities over the whole area, a few interesting features may be mentioned.

Gold-bearing quartz veins and veins with exceptionally abundant tourmaline occur adjacent to the synclinal axis that crosses the township line in range 5. This axis may have acted as a structural control of the mineralization, and owners of ground in this area might well consider the advisability of investigating the drift-covered ground along the fold axis.

The Thompson-Malartic and Malrobic properties lie along the contact zone of the northern layer of greenstones and sediments. Because of the lack of outcrops, these properties are the only parts of this contact that have been prospected in Malartic township within the area of the map.

Quartz veins of astonishing variety in size and shape are common in all the rocks of the area. In the bedded rocks they tend to parallel the strike of the strata or to follow a system of regional fracturing striking nearly due east. The majority appear to be barren of gold values.

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