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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA

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TUMI LAKE
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES

(Report and Map 9-1956)

By

J. C. McGlynn

OTTAWA
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Price, 50 cents

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GEOLOGICAL NOTES

The Tumi Lake map-area is about 100 miles northwest of Yellowknife, Northwest Territories. The area can be reached by canoe by way of Great Slave Lake, Marian Lake, and Marian River. Float and ski-equipped aircraft are available for charter in Yellowknife.

Maximum relief in the area is about 500 feet. Areas underlain by granites and older porphyries are generally low with little relief but are rugged in detail. The belts of sedimentary rocks in the north part of the area form high continuous ridges that trend parallel to the strike of the beds. The belt just east of the Marian River fault, in the central part of the map-area, has a similar topographic expression. The Marian River fault and its associated 'giant quartz veins' are marked by a range of hills that are the dominant topographic feature in the map-area. The younger porphyries express themselves as high rugged hills. The contact between Palaeozoic and Precambrian rocks is marked by a low east facing scarp. Areas underlain by Palaeozoic rocks are flat and featureless, and contain lakes with round or smooth shorelines.

The Precambrian rocks are well exposed, especially the sedimentary rocks and younger porphyries. Exposures of Palaeozoic rocks are rare, occurring mostly along the scarp, around outcrops of younger porphyries, and where quartz stockworks project through them.

The oldest rocks in the area are the Proterozoic sedimentary strata (1-3), which are part of the Snare group[1]. In

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[1]Reference cited at end of report.

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the northern part of the area the oldest rocks (1) consist predominantly of metamorphosed black argillites and dark grey, thin-bedded quartzites with interbeds of laminated colour-banded cherty rock, calcareous argillites, and knotted mica schists. Locally dark green epidote-rich rocks occur that are probably the result of metamorphism of calcareous rocks. Some of the rocks weather a rusty colour, due to the presence of small amounts of sulphide. Locally the argillites and quartzites are cut by numerous quartz veins,

lenses or veinlets, some of which contain hematite, or by quartz-epidote veins. Towards the top of the succession the rocks are more calcareous and tend to grade into the overlying dolomitic rocks. The dolomites (2) vary considerably in composition and the variations are emphasized by metamorphism. In general, they are thin-bedded (1 inch to 2 inches) dolomite or altered dolomite (skarn rock). The outcrops are deeply ribbed owing to differential weathering of layers of difficult composition. Locally some beds are crumbled. Some beds consist of white to buff or pale green rocks consisting essentially of carbonates with minor amounts of pyroxene. Others are dark green or greenish brown and consist of dense fine-grained skarn minerals. In places calcareous argillites are interbedded with the dolomites. Higher up in the sequence the rocks tend to be thick bedded (4 to 8 inches), fine grained, crystalline, white to very pale green dolomites, containing less skarn material than those mentioned above. Several bands, up to 3 feet wide, of colour-banded pink, white, and green cherts occur in the dolomites. The quartzites (3) for the most part consist of coarse bedded, white to light pink or grey, fine-grained rocks. A few narrow beds of crystalline limestone or more usually dolomite occur near the base of the sequence. The quartzites commonly contain narrow discontinuous bands and lenses of light green epidote-rich rock, which probably is metamorphosed quartzite that originally contained carbonate cementing material or carbonate sand grains. In the upper part of the quartzites the epidote lenses are much less common. South of Treasure Lake, pink to light red quartzites seem to overlie the white quartzites. They are probably arkosic in composition. Throughout the quartzites a few narrow bands of dark grey argillites were observed. Poor crossbedding that suggests tops facing north was noted in several places in the most southerly band of quartzites. The band of sedimentary rocks east of the Marian River fault in the central part of the map-area is lithologically similar to the rocks described above. Isolated bands of lithologically similar rocks occur scattered through the granitic rocks in other parts of the area but may be of slightly different ages, that is they were probably formed at different times in the regional Proterozoic sequences.

All granitic rocks in the map-area are later than the Proterozoic strata. The most widespread type is a porphyritic rock (4) that probably varies in composition from granodiorite to quartz monzonite. It is buff weathering, faintly to strongly gneissic, medium to coarse grained and contains phenocrysts of grey to flesh coloured plagioclase and/or pink to red microcline varying in size from 3/4 inch to 3 inches. The ratio of plagioclase to microcline varies considerably. Other essential minerals are quartz, biotite, and hornblende. The quantity of quartz varies considerably, locally becoming almost non-existant, and the mafic minerals also vary both relative to each other and in total amount.

Alignment of feldspar phenocrysts and mafic minerals impart a gneissosity to the rock. Field evidence suggests that these porphyries are formed by granitization of pre-existing sedimentary rocks and, therefore, should more properly be called porphyroblastic gneisses.

Granitized rocks (5) are found in the contact area between the porphyries (4) and the sedimentary rocks (1-3). They vary greatly in composition but in general consist of an even fine-grained gneissic rock composed of feldspar, quartz, biotite, and probably hornblende. They are biotite rich where associated with argillaceous rocks and quartz rich where associated with quartzites. As the porphyry contact is approached, porphyroblasts of feldspar (probably plagioclase) occur along foliation planes and increase in number, so that the granitized gneisses can be said to grade into the porphyries. Inclusions of partly replaced sedimentary rocks are common in the granitized gneisses.

Even-grained granitic rocks of various compositions (6) form the bulk of the granites west of the Marian River fault. These are generally buff weathering, faintly gneissic and with a fine-grained texture. They consist of both grey to flesh coloured plagioclase and salmon pink microcline; other constituents include quartz, biotite, and locally amphibole. The types of feldspar vary relative to each other over a wide range and the amount of quartz also varies. These granitic rocks are chiefly granodiorites or quartz monzonites but include some more basic types. Most commonly variations were such that it was not possible to map them as distinct units on the scale used. However, certain rather large areas of more basic rocks (6b) were distinguished. These are syenites close to the Marian River in the northwest part of the map-area, and diorites and quartz diorites in the central part. They are distinguished by their low quartz content and high content of mafic material most of which is amphibole. They are gneissic, reddish brown weathering, and fine grained. Plagioclase tends to have a greenish hue on the fresh surface. A more basic rock (6c) occurs near Maryleer Lake. It is fine grained, gneissic, dark grey weathering and is composed of aggregates of hornblende, biotite, grey plagioclase, and minor and local quartz. The mafic minerals form almost 50 per cent of the rock. Locally hornblende or biotite resembles porphyroblasts. The origin of the rock is uncertain. Some evidence suggests that it is an altered metamorphosed sediment, but in other areas it appears to be an ordinary intrusive gabbro or diorite. Another variation mapped as a special unit consists of a porphyroblastic gneiss (6a). It is a buff weathering gneissic rock with flesh coloured plagioclase, salmon pink microcline, quartz, and biotite. The feldspar porphyroblasts measure up to 3/4 inch in length and are aligned parallel to the foliation. The gneiss occurs for the most part near sedimentary rocks. This rock grades into granitized sediments

on one side and into even grained granitic rocks (6) on the other. Small irregular bodies of porphyroblastic gneiss are scattered throughout on the granodiorites (6) north of Marian River but are too small to be shown on the map.

Granitized rocks (7) occur mostly in the northern part of the map-area near northwest trending bands of Proterozoic strata (1-3). They consist of buff weathering, even-grained, gneissic rocks containing flesh-coloured to grey feldspar, quartz, and biotite. The mineral composition of these rocks varies over a wide range depending on the completeness of granitization and on the type of rock being replaced. These gneisses grade imperceptibly into sedimentary rocks on the one hand and into porphyroblastic gneiss and even-grained granodiorite on the other. Near the contacts with sedimentary rocks the gneisses contain many partly replaced inclusions.

The granitic rocks described above (4-7) are considered to be related types formed at about the same time, although there may be slight age differences. Evidence for the latter point is conflicting. In places, the porphyritic rocks (4) seem to grade to the even-grained granitic rocks (6) but in other places there is evidence that the even-grained rocks cut the porphyries. Such conflicting evidence in itself suggests that the two rock types are roughly contemporaneous.

Feldspar-quartz porphyries (8) occur both as large masses and as dykes. Dykes of these rocks cut the granitic rocks (6), they are massive, grey, buff, or maroon weathering rocks that consist of small, well-defined phenocrysts (up to 1/8 inch long) of grey, creamy, light green, or flesh-coloured plagioclase and small (1/16 inch) eyes of quartz in a hard, splintery, very fine-grained, maroon, dark grey, or brownish matrix that probably consists mostly of feldspar. Locally, near the border of the porphyry bodies, the matrix is coarser grained, almost granitic, in texture, and biotite can be identified. Locally quartz eyes are not visible.

Aplite dykes (9) cut all the above mentioned rocks. Larger bodies of similar composition but without the aplitic texture have been grouped with aplites. The aplites are pink weathering, generally massive, fine-grained rocks, consisting of quartz and pink feldspar, probably mostly microcline, and very minor amounts of biotite. They occur chiefly as dykes and are widely scattered throughout the granitic rocks and, to a lesser extent, in the sedimentary rocks. In mapping the area, the impression was gained that aplites are most numerous along the Marian River fault zone. Only a few dykes are large enough to show on the map.

A few small basic dykes occur in the granitic and sedimentary rocks, and in the feldspar-quartz porphyries. They are dark grey or black weathering, fine-grained rocks consisting of plagioclase, either amphibole or pyroxene, and minor quartz.

Palaeozoic rocks (11) underlie about one quarter of the map-area. According to Lord[1], these rocks are of Ordovician age. They are nearly flat-lying but probably dip gently to the west or southwest. Some outcrops near the feldspar-quartz porphyry bodies (8) have dips up to 25 degrees away from the porphyry bodies but such dips are local and initial. Most of the outcrops examined are of buff weathering, grey to buff, sandy dolomite or finely crystalline buff dolomite. Locally a few feet of conglomerate occurs between the Precambrian rocks and the dolomites.

The Proterozoic strata (1-3) have been folded. In the large bands in the north part of the area, dips vary between 40 degrees and 90 degrees and average about 60 degrees to the north. Near the Marian River fault the dip is nearly vertical. Field evidence suggests that the most southerly belt north of Marian River faces north. The two northerly bands dip in general rather steeply to the south, but lack of reliable top determinations makes it impossible to decide in which direction they face. If they face south, then, of course, a synclinal axis trends northwest through Maryleer Lake. Small bodies of sedimentary rock in the granitic rocks dip steeply but are too highly metamorphosed to display evidence for reliable top determination.

Many faults occur in the map-area, particularly in or near the northwest trending bands of Proterozoic strata. The major structural feature in the map-area is the Marian River fault, which trends northeast and about bisects the area. The similarity in stratigraphy between the band of sedimentary strata in the central part of the map-area and the band south of Maryleer Lake suggests that one is the faulted extension of the other giving horizontal displacement along the fault of about 6 miles. The history of this fault is complicated in that movement along it took place at different times; certainly three periods of movement can be distinguished and it is probable that movement occurred over a considerable period of time. Parallel faults of shorter length and less, but mappable, horizontal displacement cut the bedded rocks both east and west of the Marian River fault and probably all these faults are related in time and origin. Still other parallel faults are numerous in the sedimentary rocks but are shorter and have small displacement (as low as 10 to 15 feet). The dip of the Marian River fault varies between 70 degrees and 85 degrees to the southeast. All other faults in the area are steeply dipping. Many cut the granitic rocks. They trend both northeast (parallel to the Marian River fault) and approximately northwest. Lack of marker horizons makes it impossible to map displacement, but their presence is indicated

by crush zones, fracture zones, hematite staining in the granitic rocks, and in places by alteration of mafic minerals to chlorite and slickensides where the actual fault planes are visible. Associated with the Marian River fault are numerous small subsidiary faults that extend a short distance from the main fault. Horizontal movement on such faults, measured on quartz veins is small, rarely over 50 feet and commonly about 10 feet. Such faults seem to be most numerous where the Marian River fault changes slightly in strike.

'Giant' quartz veins occur in the Marian River fault and, to a lesser extent, in other similar faults. These are not simple veins but stockworks of milky white quartz. The country rock, where it is not in fault contact with the quartz veins, is silicified to the extent that in many places there is a gradation between granite and quartz veins. At least three ages of quartz can be distinguished in the stockwork. Other mineralization is sparse and occurs generally where the quartz has been fractured. Hematite or specular hematite is the most common mineral found, with minor, local copper minerals and in several places with pitchblende also. In the central parts of many veins, quartz is banded, displaying a comb structure and, here and there large vugs have zoned quartz crystals projecting into the open spaces. There is some evidence that localization of stockworks in the faults is partly controlled by slight variation in the strike and possibly in the dip of the faults.

Space does not permit detailed descriptions of mineral occurrences. Pitchblende deposits are the only ones of economic interest so far found. A study of the many showings demonstrate that all are in fault zones or fracture zones. The mineral-bearing structures occur in granitic rocks, granitized sediments, quartz stockworks, and sedimentary rocks. The most promising occurrences so far discovered (e.g. Rayrock Mines) are found in subsidiary faults or fracture zones within 1/8 mile from the Marian River fault. Prospectors working in this or in nearby areas should, therefore, direct their attention to faults, particularly long major faults, paying special attention to those parts containing quartz stockworks and having many associated subsidiary faults. The subsidiary faults are commonly marked topographically by well defined draws, curving off from or trending parallel to the main fault. However, all suspected faults and their immediate vicinity should be examined carefully for radioactivity.

REFERENCE

Lord, C. S.: Snare River and Ingray Lake Map-Areas, Northwest Territories; Geol. Surv., Canada, Mem. 235, 1942.