GEOLOGY OF PARTS OF THE BURNT HILL MAP AREA (2D/5), NEWFOUNDLAND

by

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INTRODUCTION

Mapping of the Burnt Hill area was started in 1978 (Colman-Sadd, 1979) and continued in 1979. Access to most of the area is by aircraft; much of the Northwest Gander River is navigable by canoe, even in dry weather, and is a great aid to mobility. Peripheral parts of the area can be reached from the Bay d'Espoir Highway (eastern edge, and northern edge via the Great Rattling Brook road), Round Pond and the Long Pond reservoir (southwest corner), and the Grand Falls transmission line (southern edge).

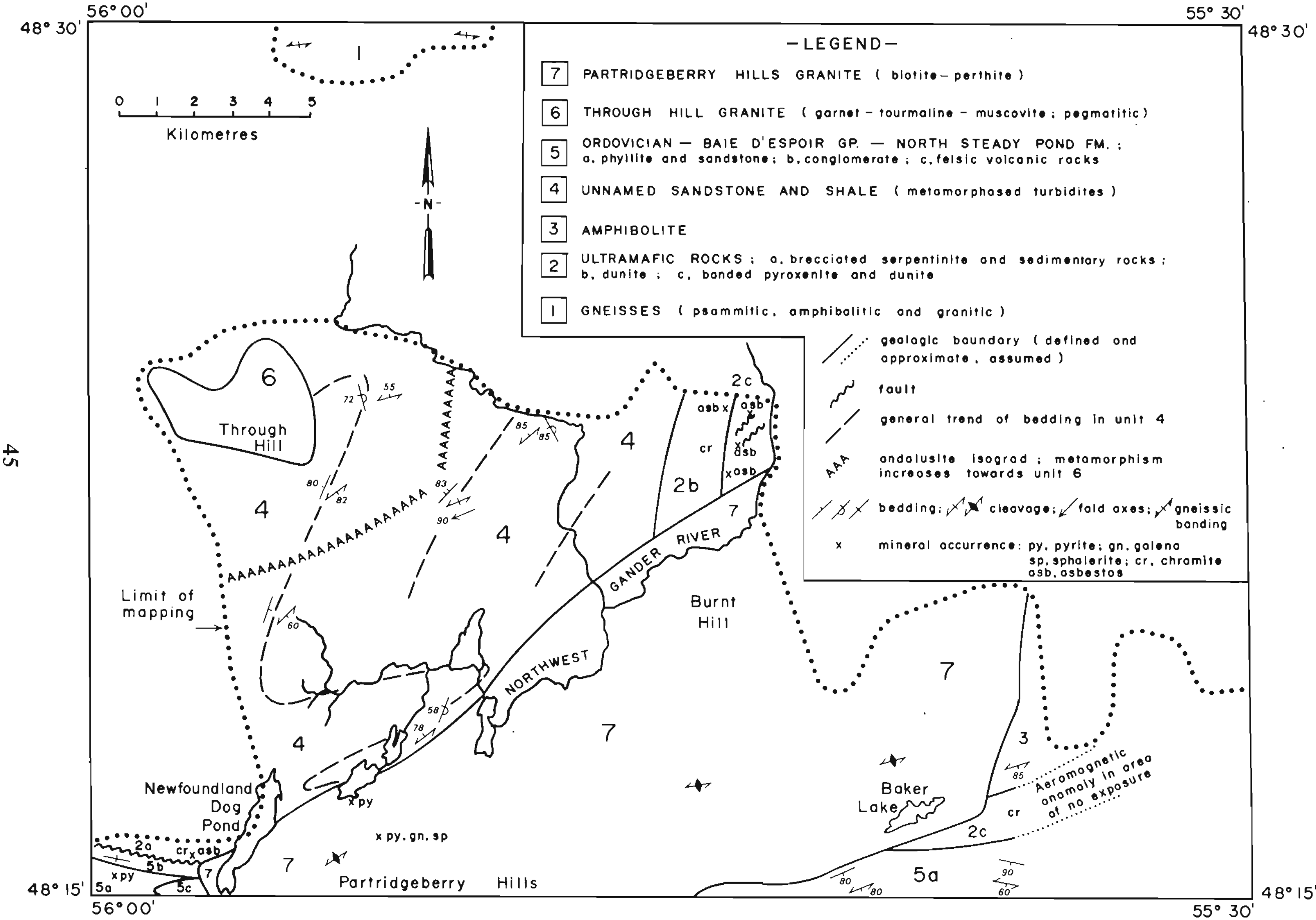
The area was mapped previously by Anderson and Williams (1970) at a 1:250,000 scale. Grady (1953) mapped the ultramafic rocks north of Burnt Hill for the Newfoundland Government, and these were further investigated by NALCO geologists (Harrison, 1953; Gates, 1954; Potter, 1955) and Bell Asbestos Mines Ltd. (1963). McCabe (1955) mapped the Baker Lake ultramafic body for NALCO. Butler and Davenport (1978) did a lake sediment geochemistry study through the whole area.

Rocks of the Burnt Hill area are divided into four main groups: gneisses (Unit 1), ultramafic rocks (Unit 2), sedimentary and volcanic rocks (Units 3, 4, 5) and granitic intrusions (Units 6 and 7). The gneisses have been examined in one isolated locality and their relationship to the other rocks is unknown. They are much more deformed and metamorphosed and appear to have different original compositions from any of the other units. The ultramafic rocks are known to be in fault contact with the Baie d'Espoir Group (Unit 5) near Newfoundland Dog Pond, and it is thought that their other contacts with the group and Unit 4 are faulted. It is possible that they are related to the amphibolites (Unit 3), if the latter originated as part of an ophiolite suite. The Baie d'Espoir Group has not been seen in contact with Unit 4 and may be separated from it everywhere by faults and ultramafic rocks. The rock types and structural attitudes of the two units are distinct. The Through Hill granite intruded Unit 4 after the main period of folding. The Partridgeberry Hills Granite intruded Unit 4, the Baie d'Espoir Group and the ultramafic rocks after the main deformation in each; there are parts of the granite, however, which have been deformed and a late deformation in the Baie d'Espoir Group appears to have occurred during or after intrusion. The name, Through Hill granite, is used informally throughout this report. It will formally proposed in a later publication.

GNEISSES (Unit 1)

Three varieties of gneiss have been recognized, although it is not practical to separate them on the map. The first is a medium to coarse grained rock of granitoid composition, in which biotite-rich foliae and quartz-feldspar domains define a very strong, segregated foliation. The spacing of the foliae is in the order of 1 to 2 cm and intrafolial folds are common. The gross homogeneity and composition of the gneiss sugggest derivation from a plutonic intrusion. It contains inclusions of banded psammitic and amphibolitic gneiss, which originally may have been xenoliths.

The second group of gneisses are well banded. They consist mainly of



56°00'
55° 30'
48° 30'
48° 15'
0 1 2 3 4 5
Kilometres
N
— LEGEND —
7 PARTRIDGEBERRY HILLS GRANITE (biotite – perthite)
6 THROUGH HILL GRANITE (garnet – tourmaline – muscovite ; pegmatitic)
5 ORDOVICIAN — BAIE D'ESPOIR GP. — NORTH STEADY POND FM. ; a. phyllite and sandstone ; b. conglomerate ; c. felsic volcanic rocks
4 UNNAMED SANDSTONE AND SHALE (metamorphosed turbidites)
3 AMPHIBOLITE
2 ULTRAMAFIC ROCKS ; a. brecciated serpentinite and sedimentary rocks ; b. dunite ; c. banded pyroxenite and dunite
1 GNEISSES (psammitic, amphibolitic and granitic)
geologic boundary (defined and approximate, assumed)
fault
general trend of bedding in unit 4
andalusite isograd ; metamorphism increases towards unit 6
bedding ; cleavage ; fold axes ; gneissic banding
x mineral occurrence : py, pyrite ; gn, galena sp, sphalerite ; cr, chromite asb, asbestos
Through Hill
Limit of mapping
Newfoundland Dog Pond
GANDER RIVER
NORTHWEST
Burnt Hill
Baker Lake
Partridgeberry Hills
Aeromagnetic anomaly in area of no exposure
x py, gn, sp
x py
cr
asb
2a
2b
2c
5a
5b
5c

coarse grained, biotite-rich psammite and foliated amphibolite; the bands are 10 cm to 1 m wide. Although these gneisses may have had a sedimentary protolith, they have no vestige of sedimentary structure and the banding is not considered to be related to bedding.

The third group of gneisses consists of regular bands of fine grained psammite and coarse grained, biotite-rich pelite. The bands are 2 to 5 cm thick and could well represent bedding in an originally rhythmically bedded sandstone and shale sequence. The origin of these rocks may be more obvious when their relationship to the sedimentary rocks farther south has been determined.

The gneissic rocks contain and are cut by pods, lenses and small veins of undeformed, medium grained, biotite granite.

ULTRAMAFIC ROCKS (Unit 2)

Ultramafic rocks occur at three locations. At the first of these, near Newfoundland Dog Pond, they form part of a breccia that includes volcanic and sedimentary rocks of the Baie d'Espoir Group. This locality was described by Colman-Sadd (1979).

The Baker Lake ultramafic body, at the southeast corner of the Partridgeberry Hills Granite, is on trend with that at Newfoundland Dog Pond, and the two may have been continuous before the intrusion of the granite. The eastward extension of the Baker Lake body is uncertain because of lack of exposure, but aeromagnetic evidence (Geological Survey of Canada, 1968) suggests that it may continue in a northeasterly direction to the edge of the map area. It consists of massive pyroxenite, massive dunite and irregularly banded pyroxenite and dunite; all the rock types are more or less serpentinized. Dunite occurs as blocks in the pyroxenite, but also forms veins that cut across it. Disseminated chromite and minor asbestos veins occur in the dunite, and veins of magnesite have been found cutting both the dunite and pyroxenite. A few exposures of very sheared pyroxenite are thought to indicate faulting; one of these, at the south edge of the body, suggests an overthrust relationship with the Baie d'Espoir Group.

Only a part of the ultramafic body north of Burnt Hill has been mapped. Although its structural trends are discordant to the other bodies, its rock types are similar to those of the Baker Lake body, and it is considered to be related. Dunite, with disseminated chromite and small asbestos veins, forms a mappable entity in the west. This is bounded to the east by banded pyroxenite and dunite, massive pyroxenite, and sheared serpentinite. Dunite occurs both as irregular blocks in the pyroxenite and as veins cutting across dunite and pyroxenite. Asbestos veins, up to 1 cm wide, seem to occur preferentially near the contact of the massive dunite with the pyroxenite, but more mapping will be required to determine whether this is a consistent relationship.

SEDIMENTARY AND VOLCANIC ROCKS (Units 3-5)

Amphibolite (Unit 3)

Amphibolite is exposed at two localities along the eastern edge of the Partridgeberry Hills Granite. It is the only rock type, other than granite, that has been found in the area mapped so far between the ultramafic bodies at Baker Lake and north of Burnt Hill. The amphibolite is fine grained. At the southern exposure it has a moderate planar cleavage, but at the northern one, poorly defined massive blocks lie in a slightly coarser matrix with an undulating foliation. The original nature of the amphibolite at both localities is obscure, although the massive blocks at the northern exposure may possibly be pillows.

Unnamed Sandstone and Shale (Unit 4)

The rocks of Unit 4 occur in the central part of the map area, and at present their age and relationship to other sedimentary rocks in Newfoundland is unknown.

They consist of turbidites with sandstone beds typically 10 cm or more thick and shale beds varying from 1 cm to 1 m. The sandstones are much more mature and quartz-rich than those of the North Steady Pond Formation (Unit 5) farther south. They are medium to fine grained and commonly show graded bedding, load structures and ripple drift lamination.

The rocks of Unit 4 are tightly folded around axes that plunge vertically or steeply to the southwest. A well developed axial planar cleavage strikes southwest and, in general, is nearly vertical. Bedding cleavage intersections allow vergence determination in most exposures and the probable pattern of large-scale folding is shown on the map. The folding appears, in the field, to be the first deformation. However there is some conflict in the facing directions of bedding on the cleavage, which may indicate an earlier disturbance.

Most of Unit 4 has been metamorphosed in the greenschist facies. A very narrow zone of hornfels is developed adjacent to the Partridgeberry Hills Granite where the shales have a metamorphically induced spottiness. A much broader zone of amphibolite facies metamorphism surrounds the Through Hill granite; andalusite porphyroblasts have overgrown the cleavage in the shale beds and the andalusite isograd has been superimposed on the earlier folds (see map). At the edge of the Through Hill granite the sedimentary rocks are crosscut by granite dikes, and partially assimilated blocks of sandstone and shale are found in the granite. Bedding and other sedimentary structures are preserved even at the highest grades of metamorphism, and there is no doubt that all these rocks belong to the same unit.

North Steady Pond Formation (Unit 5)

The rocks of this formation occur along the southern edge of the map area and form the northern continuation of the Baie d'Espoir Group. They are, therefore, probably of Middle Ordovician age, on the basis of fossil localities in the Great Gull Lake (Anderson and Williams, 1970) and St. Alban's (Colman-Sadd, 1976) areas.

The formation consists mainly of immature turbidites containing clasts of fresh feldspar and volcanic rock fragments. It includes minor resedimented conglomerate, and felsic and intermediate lavas and pyroclastic rocks. The descriptions of the formation by Colman-Sadd (1979, in press) apply to its continuation in the Burnt Hill area and are not repeated here.

GRANITIC INTRUSIONS (Units 6 and 7)

Through Hill Granite (Unit 6)

The Through Hill granite is a pegmatitic leucogranite. Almost all exposures contain abundant garnet, and tourmaline is also common. Muscovite is the principal mica, but biotite is also present in most places particularly where there has been assimilation of the surrounding metasedimentary rocks.

The granite is undeformed and postdates the structures in the country rocks.

Partridgeberry Hills Granite (Unit 7)

The granite forms a large intrusion, elongated in a west-southwest direction parallel to the regional structural trend. It varies from predominantly granite in the west to predominantly granodiorite in the east (P. Elias, personal communication). It is medium to coarse grained, gray or pink, locally vuggy and pervasively altered. The alkali feldspar is perthite, indicating a high level of intrusion; it forms subhedral phenocrysts in the northern half of the intrusion and these have a slight southwesterly alignment. The principle mica is biotite, but in most places this has been altered to chlorite; primary muscovite is rare. The granite is cut by numerous quartz veins, but aplites and pegmatites are very scarce.

The southeastern half of the intrusion has a moderate foliation. In most places the foliation is not attributed to deformation of the granite, but rather to the partial assimilation of foliated country rocks (Colman-Sadd, in press). There are parts of the granite, however, that have been deformed and have a cataclastic fabric.

OTHER INTRUSIONS

The following minor intrusions are not separated on the map:

a single undeformed diabase dike, intruded into the Through Hill granite (P. Elias, personal communication), 10 m wide felsite dike with pyrite, galena and sphalerite mineralization, cutting the southwestern part of the Partridgeberry Hills Granite, and a large dike of vuggy quartz, also cutting the Partridgeberry Hills Granite.

MINERALIZATION AND ECONOMIC POTENTIAL

Disseminated chromite occurs throughout the ultramafic rocks, but nowhere are there any significant concentrations. Asbestos occurs in the serpentine breccia near Newfoundland Dog Pond; however the best fibre and the most widespread occurrences are in the ultramafic body north of Burnt Hill, where they have been mapped by NALCO geologists (Harrison, 1953; Gates, 1954; Potter, 1955) and drilled by Bell Asbestos Mines Ltd. (1963). No economic concentrations have yet been discovered.

Potential in the volcanic and sedimentary rocks lies in the amphibolite (Unit 3) and the North Steady Pond Formation (Unit 5); Unit 4 appears to consist entirely of barren turbidites. A tentative interpretation of the amphibolite as forming the upper part of an ophiolite suite (based at present on only two exposures), would suggest the possibility of Cyprus-type massive sulphide deposits. The North Steady Pond Formation is on strike with and probably laterally equivalent to the mineralized Great Burnt Lake volcanic belt. It is considered to have been deposited on the eastern flank of the pre-Caradocian island arc of Dean (1977). As such it holds potential for Kuroko-type massive sulphide deposits associated with its included felsic volcanic rocks. A grab sample from a pyritiferous felsic crystal tuff at Newfoundland Dog Pond brook (Colman-Sadd, 1979) assayed 60 ppm Pb, 67 ppm Zn, 17 ppm Cu, 10 ppm Ag.

The Through Hill granite is an excellent example of a two-mica granite. It may therefore have potential for uranium mineralization, although no anomalous radioactivity was discovered during mapping. The two mineral occurrences in the Partridgeberry Hills Granite are associated with the quartz and felsite dikes that have intruded it. A pyritiferous sample of granite adjacent to the quartz vein assayed 393 ppm Pb, 22 ppm Zn, 105 ppm Cu, 1 ppm Ag. A grab sample from the felsite dike assayed 2170 ppm Pb, 233 ppm Zn, <10 ppm Cu, <1 ppm Ag, 0.4 ppm Au. No anomalous radioactivity has been recorded from this granite.

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