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DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 67-33

GOOSE BAY MAP-AREA, LABRADOR

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I. M. Stevenson

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ABSTRACT

The map-area, which lies entirely within the Grenville Province, is underlain mainly by a mixed assemblage of quartzo-feldspathic gneisses of probable sedimentary origin. Intrusive into these gneisses are granitic rocks with abundant associated pegmatitic material. Anorthosite with related basic and acidic rock types is apparently intrusive into the gneisses. Relatively unmetamorphosed sediments of the Double Mer Formation are poorly exposed on Churchill River.

Most of the gneisses and granitic rocks lie well within the epidote-amphibolite facies of metamorphism, whereas a granulite facies is indicated for at least some of the anorthositic rocks.

INTRODUCTION

Accessibility

The area is readily accessible to float-equipped aircraft operating out of the seaplane base near Goose Bay village. The airport at Goose Bay serves as an emergency landing field for transoceanic jet-liners as well as for local military and civilian air traffic. Daily service to the Island of Newfoundland is provided by Eastern Provincial Airways, and Air Canada operates a bi-weekly flight to and from Montreal. Two well-stocked modern stores operated by the Hudson's Bay Company serve the town of Happy Valley and the village of Northwest River. Sea-going freighters dock in Terrington Basin, close to the seaplane base.

Topography

The map-area forms part of the Laurentian plateau which in this area averages about 1,200 feet above sea-level. Locally, resistant hills rise several hundreds of feet above the surrounding terrain and in the extreme northwest corner of the area a maximum elevation of 2,490 feet is recorded. In contrast the lowland areas which border Lake Melville and Goose Bay have an average elevation of about 300 feet above sea-level. South of Churchill River, the irregular surface of the Mealy Mountain intrusive complex is apparently the result of differential erosion of various rock types that have an extremely complicated fracture pattern.

Drainage

The area is drained by several major east-flowing rivers, chief of which is the Churchill River with its vast power potential. Naskaupi and Crooked Rivers flow south and empty into Grand Lake. The larger rivers flow in pre-glacial valleys, the cross-sectional shape and size of which preclude the possibility that they could have been carved by the present rivers. Churchill, Goose, Naskaupi and Minipi Rivers each occupy typical U-shaped glacial valleys that are out of proportion to the streams that now flow in them. During Pleistocene time, these ancient Tertiary[1] river valleys were filled with glacial debris, remnants of which remain high up on the present valley walls. Only the lower portions of the larger rivers are readily navigable by canoe, strong currents in the upper reaches making upstream passage difficult and downstream descent dangerous. Churchill River is an exception, being navigable within the boundaries of the mapped area except for a portage around Muskrat Falls where the river makes two drops totalling some 40 feet vertically. Grand Lake, with a maximum depth in excess of 90 fathoms, is navigable throughout its length and permits access to the northwest part of the region. Naskaupi River, navigable by canoe within the limits of the map-area, has a very strong current. Most of the larger lakes are suitable for fixed-wing aircraft landings but the smaller lakes are commonly shallow with boulder covered bottoms.

Black spruce is the prevailing tree type, with minor intermixed birch and poplar on some hill slopes. The forest is entirely second growth with extensive recently burned tracts. The heavily forested Churchill River valley supports valuable stands of timber suitable for pulp.

GLACIAL GEOLOGY

The entire area has been glaciated and the resulting deposits include outwash plains, raised beaches and terraces, sand dunes, drumlins, eskers, moraines, and marine and lacustrine sediments. Glacial striae have for the most part been obliterated by erosion and drift, but abundant evidence remains to indicate that the last great ice-movement was dominantly eastward. The Mealy Mountains in the southeast corner of the area are an exception, for there ice-movement was almost due north. The outlines of many of the lakes, are controlled by recessional moraines Huge outwash deposits of sand and gravel occur at the mouths of the major rivers; for example Goose Bay airport is built on deltaic material about 100 feet above sea-level. Many of the major rivers were undoubtedly deflected into new channels by the advance and retreat of the ice-sheet. The great depth of glacial debris immediately north of the resistant knob of bedrock which juts into Churchill River at Muskrat Falls suggests that Churchill River at one time occupied a channel some distance north of its present position, and the river probably emptied into Goose Bay through Terrington Basin. Numerous strand lines and river terraces, preserved along many of the major rivers including Churchill, Goose, and Naskaupi Rivers, indicate an emergence of more than 300 feet for much of the area since the retreat of the ice. Tracts of muskeg in many poorly drained areas of low relief are probably underlain by relatively impervious beds of laminated clay; an excellent example is at the mouth of the small river that joins Goose River about 12 miles from the mouth of the latter.

Outcrop is poorly exposed in areas of low relief, but the summits of the hills are generally bare. In the northwest corner of the mapped area the high hills, known locally as Red Wine Mountains, are for the most part destitute of trees. Elsewhere, wherever the drift cover is thick, the structural pattern of the underlying bedrock is sometimes reflected in the drift and may readily be outlined from air photographs.

GENERAL GEOLOGY

Most of the area is underlain by a mixed assemblage of gneisses (units 1-3) composed mainly of feldspar, quartz, biotite, amphibole, and garnet. The gneisses range from fine- to coarse-grained equigranular varieties to coarse augen gneisses. Lack of continuous outcrop and suitable horizon markers make separation of the various types extremely difficult on the present scale of mapping, particularly in areas where intense recrystallization has obliterated the original character of the rocks and imparted a uniformity of appearance. Relict bedding is however easily recognized in many places, and many of the gneisses are definitely of metasedimentary origin. The numerous bands of quartzite (resistant to granitization during metamorphism) and the presence of garnetiferous and aluminous layers, indicate that most gneisses are probably paragneisses. Almost all have been invaded by aplitic and pegmatitic material and locally veined and migmatitic phases predominate. Although the various types of gneisses are in sharp contrast with each other, they are usually gradational. Some of the granitic gneisses may have been derived from ancient intrusives, but no definite proof was recognized. Although in hand specimen many of the gneisses are massive and closely resemble granite in appearance, practically all display well developed foliation in outcrop. Numerous small stock-like bodies of unfoliated granite, many of which are too small to be outlined on the present scale of mapping, are included in units 1-3. Almost invariably, however, these "granites" are concordant with the surrounding gneisses, and probably are closely related to the abundant pegmatitic and aplitic material that has resulted in the formation of migmatites and injection gneisses found at random throughout the area. Porcupine Hill, at the extreme west end of Grand Lake, is an excellent example of such an injection gneiss. There grey quartz-feldspar-biotite gneiss of unit 3 is injected _lit-par-lit_ with lenses of pink microcline and quartz.

Intermediate to Basic Gneiss (Unit 1)

Intermediate to basic gneiss (1) consisting primarily of hornblende, plagioclase, and variable amounts of quartz with abundant accessory garnet, surrounds the intrusive complex south of Red Wine River. Locally these gneisses contain little quartz and may consist almost entirely of hornblende and plagioclase, resulting in a coarse, foliated amphibolitic rock (1a). In some instances, the gneisses are extremely garnetiferous (1b), the garnets occurring in narrow bands resistant to weathering; the exposed surface of the rock may have a laminated appearance. The gneisses of unit 1 apparently originated by metamorphism of the surrounding sedimentary host rocks upon intrusion of the Red Wine complex (5, 6), and the contact between units 1 and 2 is believed to be gradational.

Table of Formations

Era	Major map-units	Lithology
Hadrinian (?)	Double Mer Formation (8)	Conglomerate, arkose, sandstone, shale.
Helikian	Gabbro dykes (7)	Gabbro, diabasic gabbro.
	Syenite-monzonite 'Series' (6)	Mainly monzonitic rocks, undivided. 6a, syenite; 6b, monzonite; quartz-monzonite, granite.
	Anorthosite 'Series' (5)	Mainly gabbroic ròcks, undivided. 5a, anorthosite; 5b, gabbro; 5c, diorite; 5d, meta-volcanics.
	Granite (4)	Granite to granodiorite. Much pegmatitic material. May be porphyritic.
	Grey gneiss (3)	Mainly quartz-biotite-feldspar gneiss of probable sedimentary origin. 3a, porphyritic veined augen gneiss; 3b, garnetiferous gneiss; 3c, sillimanite gneiss; 3d, amphibolitic gneiss; 3e, meta-quartzite.
	Pink gneiss (2)	Mainly quartzo-feldspathic gneiss of probable sedimentary origin. 2a, garnetiferous biotite-hornblende gneiss; 2b, amphibolitic gneiss; 2c, porphyroblastic gneiss; 2d, sillimanite gneiss.
	Intermediate to basic gneiss (1)	Mainly grey, hornblende-plagioclase-quartz gneiss. 1a, amphibolitic gneiss; 1b, garnetiferous gneiss.

Note: The map-units are not necessarily in chronological order.

Pink Quartzo-feldspathic Gneiss (Unit 2)

The quartzo-feldspathic gneisses of unit 2 are remarkably similar in composition and appearance to those of unit 3. The chief difference is one of colour, the gneisses of unit 2 being dominantly pink and those of unit 3 grey. The cause of this colour variation is not known definitely, but it may have been caused by intrusion of granitic material into the gneisses of unit 2, resulting in secondary crystallization of the feldspars. Rocks of unit 2 are primarily well foliated quartz-feldspar-biotite gneisses, in places highly sheared and tightly folded. Locally, where garnets are abundant (2a) the mafic material is dominantly hornblende with minor biotite. Narrow amphibolitic bands (2b) may be remnants of ancient gabbroic sills or dykes most of which are too limited in extent and too poorly exposed to serve as useful horizon markers. Porphyroblastic gneiss (2c) forms a distinct unit in the gneiss along Goose River near the centre of the area. According to Podolsky[2] this latter rock is a metamorphosed porphyritic quartz diorite that originally intruded the surrounding gneisses with resulting chilled contacts, but no such contacts were seen during the present field work, and wherever the contact between the gneisses and the porphyritic gneiss was examined it is gradational. Large porphyroblasts of perthitic feldspar, set in a matrix of biotite, plagioclase, quartz, and minor garnet are aligned parallel to the foliation of the adjacent gneisses. In outcrop, the porphyritic gneiss closely resembles a highly metamorphosed conglomerate with the original pebbles appearing as elongated feldspathic blebs in the rock. Sillimanite-rich zones (2d) occur at random throughout the gneisses of unit 2 but because the formation of sillimanite is dependent not only upon the original composition of the rock but upon the degree of metamorphism as well, sillimanite-bearing zones were found to be lensitic and useless as horizon markers over appreciable distances. In general, sillimanite is concentrated in rather small areas that have locally been intensely deformed.

Grey Gneiss (Unit 3)

By far the greater part of the area is underlain by a mixed assemblage of dominantly grey gneisses (3), whose original structures have generally been obliterated by metamorphism although certain features remain to indicate a sedimentary origin for the majority of these gneisses. "Pepper and salt" texture, normally regarded as characteristic of paragneiss, is a common feature of many of the least metamorphosed gneisses of this unit, and relict bedding has been preserved almost unaltered in some regions. In most instances where the original structure of the gneiss has been completely obliterated by metamorphism, the composition of the gneiss indicates that it probably originated as an impure sandstone or greywacke. Some of the homogeneous white gneisses were undoubtedly derived from quartzites. Included with the gneisses of unit 3 are discontinuous areas of grey, medium-grained gneissic granite with poorly defined to excellent foliation. The origin of this gneissic granite is in doubt, but it is suggested that it may have originated during a late stage in the formation of the gneisses of unit 3, having formed by granitization of the original basal quartzitic-feldspathic sedimentary gneiss by "invading" granite. The composition of the granitic gneiss is similar to that of the sedimentary gneiss and the former grades transitionally into the latter. Some of the recrystallized quartzitic gneiss is remarkably similar in appearance and composition to that of fine-grained intrusive granite and it is difficult to separate one from the other in the field. All rocks of unit 3 have been cut by numerous pegmatite and aplite veins, and in some localities the gneisses have been altered to veined gneisses and migmatites. Porphyritic augen gneiss (3a) outcrops along Susan River and elsewhere. The albite phenocrysts, some of which are 2 inches or more long, were apparently originally composed of microcline which later altered to albite. The augen gneiss is gradational into the surrounding gneisses, the elongated feldspar crystals being approximately parallel to the foliation of the surrounding gneiss. Locally, where sufficient hornblende is present, the augen gneiss has the appearance of a metamorphosed quartz diorite. Several outcrops of a peculiar augen gneiss were encountered in the heavily drift covered area west of Naskaupi River at the northern border of the map-area. This rock has a distinct porphyroblastic texture, with porphyroblasts of buff-coloured potash feldspar up to one inch long set in a matrix of hornblende and minor quartz. The feldspar crystals are slightly rounded, some are crushed and broken and the entire rock has a cataclastic appearance as though it has been subjected to considerable deformational stress. Brummer and Mann[3] postulated that the granitic gneisses in this area formed a granitic buttress that was thrust northward, resulting in deformation of the Seal Lake group of sedimentary and volcanic rocks adjacent to the Goose Bay map-area, and the general appearance of these augen gneisses would confirm this theory. Most of the gneisses of unit 3 contain abundant garnets (3b), and where the gneiss is garnet-rich, hornblende invariably predominates over biotite. Locally the gneisses that were obviously derived from quartzites have well pronounced garnet-rich layers that are in striking contrast to the remainder of the rock. Garnets are particularly abundant in those gneisses adjacent to the intrusive rocks of units 4, 5, 6. As in the gneisses of unit 2, sillimanite-rich zones (3c) are not extensive, and tend to be concentrated in local, highly deformed and metamorphosed zones. Bands of amphibolite (3d) consisting primarily of hornblende-rich concordant masses in the gneisses occur at various localities. The origin of these is not known, but they may in part represent the remnants of old intensely metamorphosed gabbroic dykes and sills. Included with the gneisses of unit 3 are several areas of white, medium-grained, in places crossbedded, dense quartzites (3e) that in some outcrops are remarkably fresh and undisturbed. These extend for a considerable distance across the northern part of the mapped area, but only rarely are well exposed. Where they could be examined, they were found to range from relatively undisturbed, crossbedded quartzites to quartz-sericite-chlorite-epidote schists, gradational into the adjacent black and white biotite gneisses. The origin of the quartzitic rocks is not definitely established, but they may be metamorphosed equivalents of quartzitic members of the Croteau and/or Seal Lake Groups, described by Fahrig[4] in the adjoining area to the north. Structural trends appear to coincide in the quartzitic rocks and the surrounding gneisses.

Granite to Granodiorite (Unit 4)

Coarse, pink, massive to poorly foliated biotite-hornblende granite to granodiorite (4) was recognized at a few localities in the area, but as is common elsewhere in the Grenville Province, it is difficult to draw a boundary between true granitic rocks and the gneisses that surround them. Distinct crosscutting contacts were only rarely encountered during mapping of the Goose Bay map-area, and in outcrop most of the granitic rocks of unit 4 have at least a faint foliation, parallel to that of the adjacent gneisses. In the thickly drift-covered southwest corner of the area, small stock-like bodies of pink, massive biotite-hornblende granite appear to intrude the gently dipping gneisses of unit 3, and include angular fragments of the latter. It is possible that in this area the gneisses may be underlain at shallow depth by an extensive body of granite. Whitecock Head and Berry Head are hills composed mainly of granite, formed by the intrusion of sill-like masses of coarse pink and black granitic rock into a foliated, medium-grained, sandy textured pinkish brown gneiss. Faintly foliated, coarse, pink biotite hornblende granite and granodiorite form a distinct unit in the northeast corner of the area in contrast to the black and white gneisses to the south. The contact between the two rock types was not observed, but in the adjacent area to the east it is gradational (Eade)[5]. Associated with the granitic rocks of unit 4 are numerous pegmatite and aplite dykes, composed mainly of coarsely crystalline potash feldspar, albite, biotite, and smoky quartz, that cut the older gneisses and granites indiscriminately. From their crosscutting relationships, it is apparent that these dykes are of several ages, but they probably all originated from a late phase of the granite melt. Most of the pegmatites are less than 20 feet wide, and they may occur either as discordant bodies cutting the gneisses or as concordant tabular bodies. Locally they are intensely folded and may exhibit boudinage structure.

Anorthosite Suite (Units 5, 6)

Rocks of the anorthosite suite (5,6) vary widely in composition and appearance but are believed to be related in origin. As in the map-area to the south[6], they have been divided into an anorthosite series (5) and a syenite-monzonite series (6), but it is emphasized that this distinction is one of classification rather than genesis. Mapping of individual units is generally difficult because areal distribution of the various rock types is extremely complex, contacts between the different members are gradational, and intermediate phases are everywhere prevalent.

Anorthosite 'Series' (Unit 5)

The best exposures of anorthosite (5a) were found in the area between Goose Bay and Grand Lake. There outcrop is well exposed in characteristic 'whaleback' hills typical of areas underlain by anorthosite, which result from erosion controlled mainly by a well defined fracture pattern of the bedrock. The weathered surface of the anorthosite is commonly light grey, fresh surfaces having a faint purple tinge. The anorthosite is normally coarse with individual anhedral plagioclase crystals up to 2 inches long, but finer grained phases are also common. Magnetite occurs abundantly in the anorthosite, either as individual grains or as segregations several inches in diameter. The anorthosite apparently intrudes the gneisses, and although the contact is rarely exposed, the intrusive nature of the anorthosite may be observed along the shores of a small lake at lat. 53°33'N., long. 60°23'W. At several localities the gneiss adjacent to the anorthosite appears to have been transformed into granite over a rather extensive contact zone. South of Churchill River, typical purplish grey anorthosite (5a) was not recognized but it may be present. By far the greater proportion of rocks of the anorthosite series is composed of gabbroic (5b) and dioritic (5c) rock types, gradational into each other and the anorthosite (5a). The range of northeast-trending hills in the extreme northwest corner of the area, known locally as Red Wine Mountains, is underlain mainly by foliated to massive gabbro (5b) and diorite (5c) with the latter rock type prevalent. In the adjacent area to the west, Lee[7] described a fine-grained gabbro-anorthosite as one of the main rock types prevalent in that part of the Red Wine Mountains and it undoubtedly forms a part of the complex in Goose Bay area as well. The resistant basic rocks of Red Wine Mountains appear to intrude the older surrounding gneisses of unit 3, the mafic gneisses of unit 1 being metamorphosed equivalents of the latter, with the degree of metamorphism becoming progressively greater toward the contact. Elsewhere, several intrusive sill-like bodies of anorthositic gabbro and diorite (5a, b, c) intrude the folded gneisses of unit 3, the resistant rock forming prominent hills visible for many miles. About 4 miles south of the mouth of Red Wine River is a hill of predominantly basic volcanic rocks (5d) with several included sills up to 50 feet thick of massive dark brown to purple anorthosite. The volcanics, particularly well exposed along the northeast side, are mainly fine grained, dark grey, porphyroblastic meta-andesites with feldspar porphyroblasts up to one inch long, interlayered with several pale mauve, fine-grained, massive beds of tuff or rhyolite less than one inch thick. Phenocrysts of altered hornblende are also present. The anorthosite appears to have intruded the older volcanics, for at the contact, the volcanics have sometimes been altered in a zone up to 3 inches wide that is more resistant to weathering than the rocks adjacent to the contact. Flow-banding is a prominent feature in the volcanics.

Syenite-monzonite 'Series' (Unit 6)

A complex series of genetically related rock types (6) ranging from syenite (6a) through monzonite and quartz monzonite (6b) to granite, outcrops over much of the region south of Churchill River and at various localities north of the river. These rocks are undoubtedly closely related to those of the anorthosite series (5) and are believed to form a broad border zone marginal to the latter. Because of its association with the anorthosite, a post-gneiss age for the syenite-monzonite complex may be postulated and the regional distribution of the complex suggests that it formed through replacement of the older gneisses by the parent basic magma of the intruding anorthositic rocks. In addition, the more silicic members of the syenite-monzonite complex generally lie adjacent to the gneisses whereas those close to the anorthositic rocks tend to be more mafic in composition and appearance. Also, replacement features are invariably more common in the silicic rock types than in those close to the parent anorthosite. Outcrops of the syenite-monzonite complex (6) generally occur as rounded hills with bedrock exposed only on the summits and along the steep sides. Typically the monzonitic varieties of the complex which have a distinctive resinous, greenish brown lustre on fresh surface develop a dull rusty crumbly brown surface on weathering and from a distance may readily be mistaken for anorthosite. Both syenites and monzonites occur immediately west of Goose Bay airport, and also as a marginal facies of the large anorthosite body north of Goose Bay[8]. Isolated hills such as Mokami Hill north of Sebaskachu Bay bear striking affinities to rocks of the syenite-monzonite complex and have therefore been included in this series.

Locally the syenitic rocks grade into granite by an increase in quartz, and there are outcrops of massive, pink granite well within the perimeter of the syenite-monzonite complex. Pegmatite and aplite dykes cut all members of the complex indiscriminately, but are most numerous in those areas underlain by or adjacent to the more silicic rock types. It is believed that the dykes probably originated as late differentiates during recrystallization of the syenite-monzonite rocks. Only rarely were pegmatites found cutting the more mafic rocks of the anorthosite series (5).

Gabbro Dykes (Unit 7)

Although dioritic and gabbroic dykes (7), some with well defined ophitic texture, cut rocks of the syenite-monzonite (6) and anorthosite series (5) indiscriminately, they are more prevalent in the former. No gabbroic dykes of appreciable size were encountered in the older gneisses (2, 3), but such dykes probably do occur near anorthositic intrusives. The marked similarity in appearance and composition between rocks of the anorthosite suite and the gabbroic dyke rocks suggest that the latter may have formed as late differentiates of the former, but they may possibly be much younger. No gabbroic dykes were found cutting the Double Mer Formation (8).

Double Mer Formation (Unit 8)

Rocks of the Double Mer Formation (8), poorly exposed along the north and south banks of Churchill River, consist of non-fossiliferous, little deformed, thick-bedded, predominantly red conglomerate and sandstone with gradational layers of maroon shales. The conglomerate, containing well rounded cobbles of chert up to 6 inches in diameter in a matrix of arkose, is exposed on the north shore of Churchill River at long. 61°03' west. The bedding in the conglomerates is irregular, but well defined crossbeds indicate deposition by a current movement from west to east. The matrix is a coarse arkosic grit containing numerous angular fragments of feldspar and quartz up to one-half inch long. About 4 miles farther upstream, an outcrop of flat-lying, maroon, well-bedded sandstone and shale is exposed for some 50 feet along the south bank of the river at high water mark. The Double Mer Formation in Churchill River valley is covered by thick sand deposits which effectively obscure the contact with the older rocks, but the conglomerates, sandstones and shales must lie upon the older metamorphosed underlying rocks with marked angular unconformity.

STRUCTURAL GEOLOGY

Evidence of extensive faulting may be found practically everywhere throughout the area, but most of the criteria commonly used to determine the actual displacement along individual faults are effectively obscured by drift or have been eroded. Suitable marker horizons for determining the amount and direction of movement along the faults are generally absent, and in most cases the actual fault plane is not exposed. Several prominent northeast-trending topographic lineaments, readily recognizable on air photographs of the area between Goose River and Churchill River, are believed to be faults. The valleys are partly filled with drift and critical regions are not exposed, but bedrock exposed along the valley walls displays sufficient criteria such as shear zones parallel to the strike of the lineaments, fault breccia, slickensides, chloritization, and injection veinlets of quartz, feldspar, and calcite, to infer that at least some of the lineaments are faults. Field and air photographic examinations indicate a horizontal displacement to the west of the hanging or south walls of the faults, but the absence of suitable horizon markers does not permit determination of the amount of displacement. Slickensides indicate the faults to be normal, with the hanging-walls having moved down relative to the footwalls. Smaller northeast-striking faults with visible offsets are common, and as with the larger faults, the hanging-walls have moved down and to the west relative to the footwalls. South of Churchill River, rocks of the anorthosite suite are cut by numerous, prominent, well-developed fractures that, because of insufficient evidence, could not definitely be classified either as faults or joints. In many places, minor joints were found parallel to the larger lineaments and it is probable that most linear features in the anorthositic rocks formed as cooling joints. Two prominent sets of joints occur in these rocks, an early, northwest-striking set and a later, northeast-striking set. The older gneisses and granite (1-4) are cut by numerous sets of joints with diverse attitudes. Many of the cuesta-like hills in the area underlain by gneisses are believed to have formed as a result of steep-dipping joints which cut the gently dipping foliation of the gneisses. The south shore of Grand Lake is a typical example of such a joint pattern, for there steep-dipping joints, striking approximately parallel to the foliation in the gneisses, cut at a steep angle across gently southwest-dipping gneisses.

All gneisses and granitic rocks (1-4) have been intensely folded, whereas the anorthositic rocks (5, 6) are relatively undisturbed. The sedimentary rocks of the Double Mer Formation (8) are flat lying or gently folded. South of Goose River the regional strike of the foliation is easterly, whereas north of the river the gneisses strike southerly. Between Churchill River and Goose River, the gneisses form a large open syncline that plunges southwest, the foliation being approximately parallel on each limb of the fold. The eastern end, or nose of the fold is well exposed but the drift cover becomes progressively thicker to the west, and the shape of the western end of the fold is in doubt. Foliation trends are readily apparent on air photographs elsewhere throughout the area, but in most instances the axial planes of the folds cannot be accurately located. Also, in many places, the present foliation may not represent true folding, but rather is the result of metamorphic differentiation of the rock constituents, the original bedding and foliation in the gneisses having been destroyed by intense metamorphism.

METAMORPHISM

The area forms part of the Grenville Province, and all rocks, with the exception of those of the Double Mer Formation (8), have been metamorphosed. Most of the gneisses and granites (1-4) lie well within the epidote-amphibolite facies of metamorphism, but locally the presence of abundant chlorite and epidote is indicative of a lower degree of metamorphism for some of these rocks. The anorthositic rocks (5, 6) commonly contain garnet, pyroxene, and green plagioclase, a mineral association normal to the granulite facies.

MINERALIZATION

No mineralization of economic importance was recognized in the area, but to date, very little systematic prospecting has been carried out. Numerous narrow sulphide-rich zones carrying small amounts of pyrite and pyrrhotite were encountered throughout the gneisses, none of which are believed to be of commercial importance. Minor amounts of chalcocite are present in some of the pegmatites, particularly in the vicinity of some of the small stock-like granite intrusives. Ilmenite and magnetite commonly occur as small pods and lenses in the anorthositic rocks, and pyrite is almost invariably present in the gabbroic intrusive rocks.

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