Energy, Mines and Resources Canada — Énergie, Mines et Ressources Canada

DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

SYMBOLS

- Areas of extensive glacial overburden
- Geological boundary: defined, approximate, inferred, highly uncertain
- Fault: defined, approximate, inferred
- Thrust fault: approximate, inferred, teeth indicate direction of dip
- Lineament from aerial photograph
- General trend of gneissosity from aerial photograph and outcrop observation
- Gneissosity: inclined, vertical, horizontal, dip unknown
- Bedding, tops unknown: inclined, vertical
- Bedding, tops known: inclined, vertical
- Generalized trend of bedding from aerial photograph
- Lineation: horizontal, inclined, vertical
- Antiform, anticline, showing plunge direction
- Synform, syncline, showing plunge direction
- Fracture cleavage
- Schistosity: horizontal, inclined, vertical, dip unknown (including mylonitic fabrics in shear and fault zones)
- Second generation schistosity or crenulation cleavage where more than one fabric present
- Plunge of small fold, sense of symmetry when viewed along plunge direction — S M N
- Form of folded bedding on flat outcrop surface
- Zone of ultramylonite ± pseudotachylite
- Overturned antiform, synform
- Overturned anticline, syncline

Mineralization

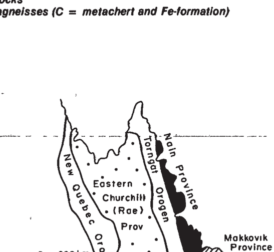
- Fe — magnetite iron formation
- Cu — chalcopyrite veins, malachite stain

Extra Symbols

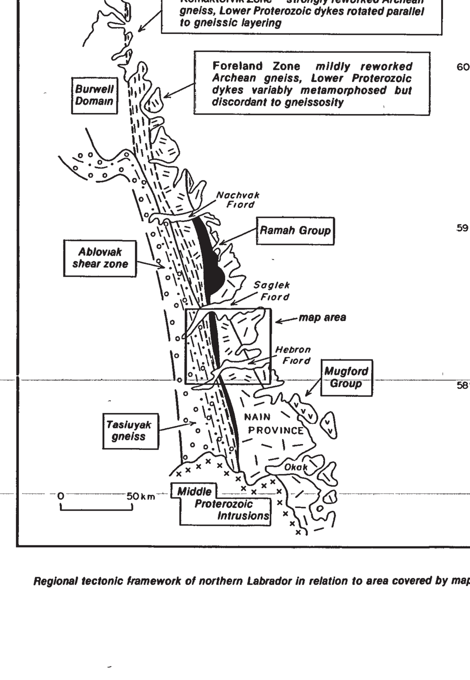
- Agmatite structure in gneiss
- Interpreted areas with high degree of uncertainty — ?
- Kyanite, sillimanite and staurolite localities in Ramah Group — ky, sill, st
- Pseudotachylite localities — P
- Blebby texture in gneisses and granites: blebs are an expression of the retrogression of orthopyroxene or garnet — B
- Granulite facies mineralogy well preserved — G
- Granulite facies mineralogy preserved but with retrogression pervasive — G_R
- Amphibolite facies mineralogy, with either field or microscopic indications of having been at granulite grade — A/G
- Amphibolite facies, no indication of earlier granulite assemblage in thin section (refers both to Archean assemblages and Hudsonian overprint on Archean rocks) — A
- Nebulous or ghost banding in gneisses — N

Nulliak inclusions (schematic designation in areas with numerous small rafts)

- mafic gneiss
- gabbro-anorthosite
- ultramafic rocks
- various paragneisses (C = metachert and Fe-formation)



Orogenic Subdivisions of Labrador



Regional tectonic framework of northern Labrador in relation to area covered by map

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OTTAWA
1992

LEGEND

GNEISSES OF THE CHURCHILL PROVINCE (TORNGAT OROGEN)

ARCHEAN AND EARLY PROTEROZOIC

10 Brown- to greenish grey weathering quartzofeldspathic granulite, locally garnetiferous

9 **Tasiuyak gneiss:** Garnetiferous diatexite and associated paragneiss, lesser mafic granulite, predominant unit is a white- to brown-weathering, blastomylonitic garnet + biotite + quartz + feldspar gneiss containing thin layers rich in sillimanite and graphite that is characterized by mylonitic foliation and a well developed, subhorizontal, quartz lineation

- 9g white-weathering garnetiferous granite, pink granite, and white-weathering pegmatite, locally with graphic texture
- 9p rusty, garnet–biotite–sillimanite gneiss
- 9q grey to black quartzite
- 9m black-weathering, massive to layered, garnetiferous mafic and ultramafic granulite

8 Brown- to buff- to grey-weathering, well-layered, granulite-facies, quartzofeldspathic gneiss, foliation is typically mylonitic and has an associated lineation, garnet is locally present, mafic granulite layers and disrupted, podiform ultramafic and mafic granulite units are a minor component of this unit

7 Mylonitic gneisses derived from Archean gneiss by structural and metamorphic modification during the Early Proterozoic. Subdivisions shown are as follows

- 7m grey- to greenish-grey weathering, biotite + epidote ± muscovite-bearing quartzofeldspathic gneiss
- 7a black- to dark green-weathering amphibolite, locally contains relicts of orthopyroxene
- 7p porphyritic, grey, hornblende tonalite, probably equivalent to 4p
- 7g white-weathering massive to foliated granite

SEDIMENTARY AND IGNEOUS ROCKS OF THE NAIN PROVINCE AND ITS REACTIVATED MARGIN

EARLY PROTEROZOIC

6 **Ramah Group:** quartzite, graphitic slate and siltstone, dolomitic sandstone, minor conglomerate and dolostone, and their metamorphic equivalents, that rests with modified unconformity against Archean Nain Province gneisses and granite. Subdivisions shown are as follows

- 6q,6p undivided white to brown, locally dolomitic, cross-bedded, quartzite, with interbedded slate–mica schist, siltstone, pebble conglomerate and dolostone–tremolite marble. Intensity of deformation and metamorphism in southern belts has modified primary characteristics. The largest pelite–mica schist units are shown as 6p
- 6s kyanite-, garnet-, staurolite- and sillimanite-bearing mica schists derived from graphitic slate and siltstone; minor quartzite
- 6g metagabbro sills

5 Mafic dykes of variable character, probably representing several discrete periods of mafic magmatism

- 5d **Domes dykes:** diabase dykes of at least two generations, mildly altered in eastern part of area, but progressively metamorphosed westwards, no igneous clinopyroxene preserved in dykes in western one-third of Nain Province
- 5π schistose amphibolite dykes (metadiabase, metagabbro, diorite), commonly confined to shear zones
- 5β breccia dykes, brown-weathering dykes containing numerous gneissic and diabasic inclusions
- 5α orthopyroxene-bearing dykes

GNEISSES AND ASSOCIATED INTRUSIVE ROCKS OF THE NAIN PROVINCE

ARCHEAN

4 Granitoid rocks of several generations, in part including intrusions equivalent in age to the numerous thin dykes and veins that occur in most outcrops of the area but that are too small to show at map-scale. Age range of these rocks is ca 3240–2500 Ma. The following subdivisions are indicated

- 4g aplitic to pegmatitic, grey to white tonalitic to granitic rocks, may have a weak foliation, and may be orthopyroxene-bearing in areas of granulite-facies metamorphism
- 4c porphyritic charnockite to gabbronorite
- 4o orthopyroxene- and/or garnet-bearing granitoid rocks, possibly late-kinematic with respect to granulite facies metamorphism in units 2l, 2k
- 4a leucocratic augen gneiss (may be equivalent to Uivak II gneiss (2m))
- 4p grey hornblende tonalite and foliated porphyritic (augen) granite
- 4l Lister gneiss polyphase granitoid sheet

3 **Upernavik supracrustals:** a diverse group of metasedimentary and metaigneous rocks believed to be largely younger than the Uivak gneisses and Saglek dykes, not easily distinguished from Nulliak assemblage in isolated outcrops. Probably comprises several age-packages of rocks, some of which may be pre-Saglek dyke in age. The following subdivisions are shown

- 3s rusty-weathering, garnet + biotite + sillimanite ± cordierite paragneiss, commonly with a layer-parallel to slightly discordant network of garnetiferous leucogranite veins and dykes
- Q grey- and green-weathering (fuchsite-bearing), diffusely banded quartzite, locally garnet- and sillimanite-bearing
- M grey- to dark brown-weathering, massive to nodular marble and calc-silicate rocks
- 3m dark green- to black-weathering, massive to well-banded, locally garnetiferous, amphibolite and mafic granulite
- 3u black, brown, and yellow-orange weathering ultramafic rocks, including variably serpentinized dunite, peridotite and pyroxenite

2 Quartzofeldspathic gneisses of variable character, ranging from diffusely layered, weakly migmatized rocks to lit-par-lit migmatite with over 50 percent neosomal component of several generations. These rocks include the 3800–3300 Ma Uivak gneisses and their younger derivitives, and also gneisses that cannot be confidently correlated with the Uivak gneisses. The following subdivisions are shown

- 2t grey, pink and brown, layered tonalitic to granodioritic gneiss and migmatite (Uivak I gneiss) containing abundant inclusions of Nulliak assemblage. Locally intruded by transgressive Saglek mafic dykes, but more commonly the dykes form subparallel mafic layers and lenses due to Late Archean deformation and metamorphism
- 2m grey to dark grey-green, foliated, megacrystic granodiorite, granodioritic augen gneisses and derived migmatite (Uivak II gneiss) contains rafts of Nulliak assemblages and Uivak I gneiss, and is intruded by Saglek dykes. Like the Uivak I gneiss, the Uivak II was also migmatized and deformed by late Archean events, and throughout most of the area the Saglek dykes now form basic layers within a migmatite
- 2g a layered metagabbro that may be related to 2m plutonism
- 2k well-layered and migmatitic to nebulitic granulite-facies gneiss (**Kiyuktok gneiss**) commonly exhibiting porphyroblasts of garnet and orthopyroxene in quartzofeldspathic segregations that are both concordant and discordant to layering. Derived in part by static melting of Uivak gneisses during ca. 2800–2700 Ma granulite-facies metamorphism. Abundant sheets of orthopyroxene-bearing granite
- 2i well layered and migmatitic to nebulitic gneiss (**Iterungnek gneiss**) derived mainly by structural reworking of the Uivak gneisses under granulite-facies conditions, ca 2800–2700 Ma, abundant sheets of syn- to late-metamorphic granite. Zones of gneiss having Uivak characteristics locally well-preserved

1 **Nulliak assemblage:** a diverse group of metasedimentary and metaigneous rocks, in excess of 3800 Ma, and intruded by the plutonic precursors of the Uivak gneisses and by amphibolite-mafic granulite derived from the Saglek dykes. These rocks are areally distributed as abundant inclusions in younger gneisses, most of which are too small to show at map scale (see symbols), and as larger coherent belts that are generally in tectonic contact with the enclosing rocks. The following subdivisions are discriminated

- 1c grey to white weathering, banded, clinopyroxene-bearing metachert
- 1i massive to well-banded, magnetite iron formation, usually associated with 1c, but also occurs within 1 m
- 1s grey to rusty-brown, biotite + sillimanite-rich paragneiss
- 1q grey, massive to diffusely banded, quartzite and biotite + garnet quartzofeldspathic gneiss
- 1m,1u massive to finely banded mafic (1m) and ultramafic (1u, black) rocks of both intrusive and extrusive origin
- 1q grey-green-weathering, clinopyroxene + biotite-bearing quartzofeldspathic gneiss
- 1a metagabbro and meta-anorthosite (small inclusions only)

MAP 92-18

This map is a joint release of the Geological Survey Branch (Newfoundland Department of Mines and Energy, St John's) and the Geological Survey of Canada (Energy, Mines and Resources Canada, Ottawa). The release comprises two parts: this sheet showing the geological subdivisions and their numerical designators, and a second sheet showing the structural symbols, metamorphic symbols, fault names and additional geographic names

Copies of this map may be obtained from Publications and Information, Geological Survey Branch, P O Box 8700, St John's, Newfoundland, A1B 4J6

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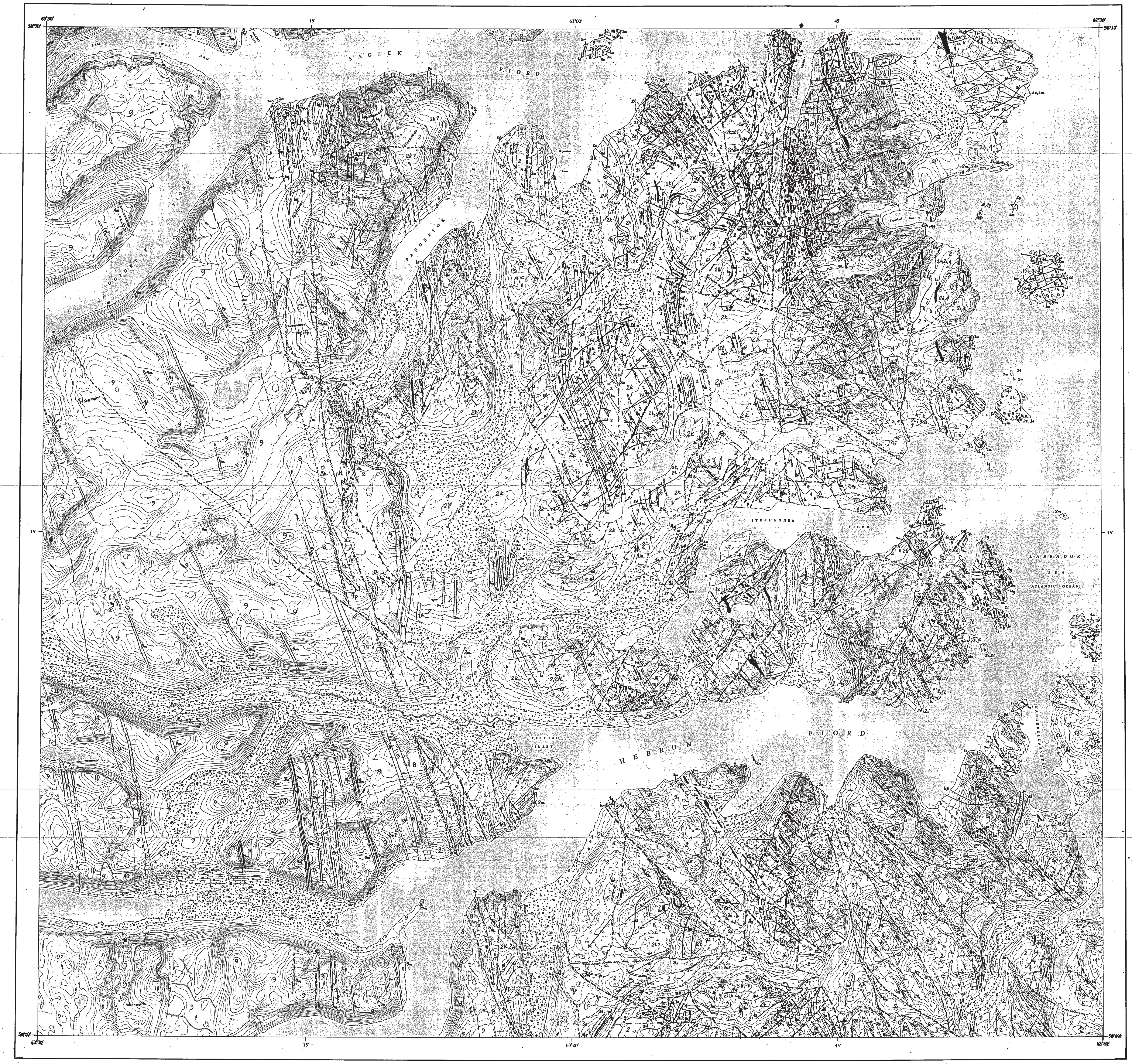


GEOLOGY OF THE SAGLEK FIORD – HEBRON FIORD AREA, LABRADOR (NTS 14L/2,3,6,7)

Sheet 1 of 2

SCALE 1 100 000 ÉCHELLE

Miles 1 0 1 2 3 4 5 Miles

Kilometres 1 0 1 2 3 4 5 6 Kilomètres

EXPLANATORY NOTES

(Italicized numbers in parentheses refer to references listed in 'Suggested Reading')

The area is accessible by boat, helicopter or fixed-wing aircraft. The nearest community is Nain, 230 km to the south. A military radar site having a paved airstrip is situated at Saglek Bay. The community of Hebron, at the entrance to Hebron Fiord, was abandoned in 1959-60, but is occasionally the summer base for Inuit fishermen from Nain. The Saglek–Hebron map area lies north of the tree line, and its ice-scoured coastline offers superb rock exposures. The southern extent of the Alpine topography of the Torngat Mountains can be admired along Saglek Fiord, where fiord walls tower over 1300 m above sea level. Overall, the topography of the map area is characterized by rounded hills and broad valleys, except for steep valley walls along the rivers west of Hebron Fiord

The map depicts the geology of the boundary between the Archean Nain Province and the eastern fringe of the Early Proterozoic Churchill Province. Here, the Churchill Province comprises rocks deformed during development of the Torngat Orogen, a 100-km-wide tectonometamorphic zone resulting from oblique convergence of the Archean Nain and Rae provinces ca. 1860 to 1800 Ma (1). The effect of this Early Proterozoic tectonism on the Nain Province can be evaluated from its imprint on the ca. 2400 to 2200 Ma Domes mafic dyke swarm and on the folded Early Proterozoic Ramah Group supracrustal rocks, which originally rested unconformably upon the western margin of the Nain Province in this area.

NAIN PROVINCE GNEISSES AND GRANITES

The Archean rocks of Nain Province constitute the partially reactivated foreland of the Torngat Orogen, but, except for a structural overprint along its western margin near the Ramah Group, the Nain Province has not been severely reworked during Early Proterozoic thermotectonism. The Nain Province comprises predominantly quartzofeldspathic gneisses derived from intrusive protoliths, interlayered with subordinate belts of supracrustal rocks derived from sedimentary and volcanic successions (2,3,4,5). Radiometric ages indicate an accretionary history ranging from > 3800 to 2500 Ma. The northern part of the Archean block can be conveniently divided across the Handy Fault into a largely amphibolite-facies terrane in the east, and a largely granulite-facies terrane in the west. Major lithological units can be correlated on both sides of the fault and the two terranes are interpreted to represent different structural levels of the same crustal components (2). As a result of the scissor-like movement on the Handy Fault, metamorphic grade on the eastern side increases to granulite facies southward from Tigigakyuk Inlet

The earliest gneissic components are small (1 to 10 m² in area) rafts and belts (10 by 0 5 km) of Early Archean basic and ultrabasic intrusive and extrusive rocks, magnetite iron formation, calc-silicate rock and pelitic gneiss, known collectively as the Nulliak assemblage (Unit 1). The Nulliak assemblage is clearly older (> 3800 Ma) than the regional grey gneisses, forming an areally but unevenly dispersed group of rocks that can be recognized as pre-migmatitic rafts within the grey gneiss (6). The largest belts appear to be bounded by tectonic contacts resulting from structural modification of original intrusive contacts during the Middle and Late Archean. The Nulliak assemblage is also intruded by a swarm of metabasic dykes, the Saglek dykes, and is broken and veined by granitoid rocks that accompanied Middle and Late Archean migmatization

Sediments of the Nulliak assemblage included both chemical precipitates, such as cherty iron formation, and clastic sedimentary rocks such as siltstones and shales. These are now represented by quartz + hedenbergite + magnetite rocks and quartz + feldspar + biotite + garnet + sillimanite gneisses respectively. The largest belt of Nulliak iron formation (1i) occurs on the south shore of Pangertok Inlet, where a grey- to white-weathering, layered (2 to 50 cm) magnetite ironstone and a metachert sequence (1c) is preserved (4). Associated with it are lesser amounts of forsterite marble and basic gneiss. Shales and siltstones of the Nulliak assemblage are represented by rusty biotite + garnet + sillimanite ± cordierite gneisses (1s), such as those that are associated with cherty iron formation in a disrupted belt south of St. John's Harbour, and those that occur with mafic granulite in a recumbent structure west of Kangerdluarsuksoak Inlet. Other paragneisses that appear to be derived from clastic sediments include feldspathic quartzite and grey, well-banded biotite + garnet (1q) gneisses south of Hebron Fiord. A clinopyroxene-rich quartzitic gneiss (1g) at the southern end of Ukkalek Island may be derived from calcareous quartzite or arkose.

Mafic and ultramafic rocks (1m, 1u) assigned to the Nulliak assemblage are prominent on the north and south sides of Pangertok Inlet, as units outlining a domal structure southeast of Kiyuktok Cove, along the coast between the Hare Islands and Cape Nuvotannak, southwest of Winnie Bay, and west of Takkatat Inlet. The basic rocks range from dark-green- to black-weathering, massive, salt-and-pepper and porphyritic-textured metagabbroic rocks, to fine-grained mafic and ultramafic rocks of probable volcanic flow (basalt, komatiite) derivation, to finely laminated rocks that may be metamorphosed volcaniclastic sediments. An association of layered, dark-green, clinopyroxene-bearing amphibolite and brown olivine-pyroxenite rock that occurs in some Nulliak rafts appears to represent differentiated mafic sills or metakomatiitic flows. Dunitic and peridotitic rocks isolated from, but adjacent to, Nulliak basic gneisses, probably represent fragments of once coherent layered intrusions, or else are tectonically disrupted bodies emplaced during younger interleaving of gneisses and supracrustals. Some bodies of the latter type retain mineralogies indicative of primary crystallization at mantle depths and may be fragments of the Archean mantle (7). Leucogabbro and anorthosite (1a) derived from leucocratic, layered intrusions occur only as rafts within younger gneisses, no large belts of these compositions are known.

Quartzofeldspathic gneisses (Unit 2), constituting the major rock type of Nain Province, are younger than the Nulliak assemblage. These felsic rocks are all considered to be part of the 3800 to 3300 Ma Uivak gneisses and their reworked equivalents (4,5), although recent work by K.D. Collerson (personal communication, 1991) indicates the existence of similar quartzofeldspathic rocks of pre-Uivak age in the area. The Uivak gneisses (6,8) are a polyphase quartzofeldspathic suite derived from plutonic protoliths emplaced prior to 3300 Ma, subsequently, the Uivak gneisses were profoundly tectonized under amphibolite- and granulite-facies conditions ca. 2800 to 2700 Ma (9). The Uivak gneisses have been divided into two types: Uivak I, even-grained tonalitic and granodioritic rocks (2t) emplaced ca. 3800 to 3700 Ma and migmatized ca. 3600 Ma (6,10), and Uivak II, megacrystic, Fe-rich granodioritic rocks (2m) emplaced into migmatized Uivak I ca. 3350 Ma (6,10). A layered gabbroic body (2g) exposed on the north shore of Mentzel Island may be a more basic member of Uivak II plutonism. A suite of aphyric to plagioclase-porphyritic basic to ultrabasic dykes, now preserved largely as pods and lenses in the Uivak gneisses, was intruded prior to a major deformational and migmatizing event ca. 2800 to 2700 Ma. These intrusions are known as the Saglek dykes (2,6), and are the most reliable criteria for demarcating the Early Archean gneisses in the map area. Only in areas that have escaped subsequent intense tectonism have discordant relations between the Saglek dykes and older rocks been preserved. One such area is on the mainland opposite Nulliak Island, where Uivak II foliated to gneissose megacrystic granodiorite containing fragments of already migmatized Uivak I gneiss is intruded by several amphibolitized Saglek dykes. The 2800 to 2700 Ma tectonism was such a pervasive crust restructuring event, however, that the original characteristics of Uivak I, Uivak II and the Saglek dykes are seldom preserved. The felsic metaplutonic rocks are instead, on a regional scale, grey to brown amphibolite- and granulite-facies migmatites in which younger pegmatites form 10 to 30 percent of the layers, and the Saglek dykes have been converted to boudinaged and foliation-parallel mafic layers within them. Characteristics that can sometimes be used as field criteria to distinguish the two components of the Uivak migmatites are the preservation of remnant microcline megacrysts and the generally darker colour of the Uivak II gneisses due to their higher content of ferromagnesian minerals. Uivak II migmatites are particularly well displayed on the coastal strip and islands between White Point and Kingmirtok Island.

The 2800 to 2700 Ma tectonothermal event (9) modified the Uivak gneisses to form two types of mesoscopically different gneisses, which in both cases, have transitional contacts with the parent. In situ static partial melting and granitoid neosome injection under granulite-facies conditions, probably triggered by dehydration deeper in the crust, produced a series of migmatitic rocks west of the Handy Fault, collectively known as Kiyuktok gneisses (2k) after the locality (Kiyuktok Cove) where they are well displayed. Kiyuktok gneisses (11,12) have a distinctive concordant to discordant quartzofeldspathic melt component characterized by porphyroblasts of garnet and orthopyroxene. In many exposures, these melts exhibit irregular outlines having blurred and transitional contacts against their hosts, implying little migration from their source. Extremes of mobility within Kiyuktok gneisses have led to large areas of agmatite in which pre-2700 Ma supracrustals occur as rafts in a homogeneous orthopyroxene-bearing granitoid host. The gneisses are also diluted by many syn- to late-metamorphic sheets of orthopyroxene bearing granite. Retrogression of the garnet and orthopyroxene porphyroblasts lends a diagnostic blebby texture to the Kiyuktok gneiss. East of the Handy Fault, granulite-facies gneisses of the Tigigakyuk–Hebron area show more of a dynamic reworking. The gneisses here are termed Iterungnek gneisses (2i), and as a regional unit are migmatites that have been derived by ductile structural modification of an earlier migmatite (13). Small folds having an axial-planar foliation of orthopyroxene may be present, and Uivak gneisses having an early migmatite layering in various stages of transposition are preserved in many places. In situ partial melting and the syn- to post-metamorphic injection of a granitoid component into gneisses of the Hebron area produced rocks that range from *lit-par-lit* migmatites to nebulites in which only a ghost-like biotite foliation is recognizable. In places, these veined rocks resemble the Kiyuktok gneisses. Iterungnek gneisses are well displayed at Jerusalem Harbour, Cape Nuvotannak, and on the Harp Peninsula

Upernavik supracrustals (Unit 3), as originally defined (2,3), are an assemblage of predominantly metaclastic and basic metaigneous rocks not known to be intruded by Saglek dykes, and interpreted to be interleaved with the Uivak gneisses prior to, or coeval with, high-grade metamorphism and deformation ca. 2800 to 2700 Ma. The relationship between the Upernavik supracrustals and Uivak gneisses is everywhere tectonic, but they may have originally been in depositional contact. In the absence of such diagnostic lithological features of the Nulliak assemblage as iron formation and in the absence of discordant Saglek dykes, the Upernavik and Nulliak supracrustal rocks are difficult to subdivide. In cases where diagnostic criteria of the Nulliak assemblage are absent, the rocks have been assigned to the Upernavik supracrustals. The type-area for Upernavik supracrustals is Upernavik Island in Saglek Fiord; the largest belts interpreted to be Upernavik supracrustals occur south of Hebron Fiord. Rocks of the Upernavik supracrustals include garnet + sillimanite + biotite pelitic and semipelitic gneisses (3s), grey and green (fuchsite-bearing) quartzite (shown by Q and symbol), grey to brown marble (shown by M and symbol), and mafic and ultramafic rocks (3m, 3u) that locally retain porphyritic textures and are interpreted to be of volcanic and plutonic origin. The garnet + biotite-rich paragneisses (3s) are conspicuous by their brown-weathering. They commonly have a white-weathering, garnetiferous leucogranite as a foliation-parallel feature. Basic gneisses (3m) of the Upernavik supracrustals are not mesoscopically distinct from those of the Nulliak assemblage, being massive to well-layered amphibolite and mafic granulite. Ultramafic rocks (3u) are commonly marginal to the metasedimentary and basic gneisses, and include compositions such as dunites, harzburgite, pyroxenite and lherzolite. Some supracrustal belts traditionally assigned to the Upernavik supracrustals have recently been found to be cut by metamorphosed dykes that resemble the Saglek dykes (14), implying a correlation with Nulliak assemblage. In addition, zircon geochronology indicates that the Upernavik supracrustals comprise rocks of more than one depositional age (14). The problems posed by these discoveries highlight the complexities of polylithologic gneiss terranes.

Granitoid rocks (Unit 4) of variable character and ranging in age from 3240 to 2500 Ma, severely dilute the Uivak gneisses and the various supracrustal units across the area. Their intrusion shapes range from discordant dykes and veins from several centimetres to several metres in width, to polyphase aplitic–pegmatitic sheets several hundred metres wide having a *lit-par-lit* morphology, to larger massive to weakly foliated stocks and dyke-like intrusions that have stoped into earlier gneisses. The majority of these granitoid rocks are too small to show at 1 100 000 map-scale, but some are worthy of mention. Among the smaller bodies are the ca. 2685 Ma grey to pink, massive to weakly foliated tonalitic and granodioritic dykes in the St. John's Harbour–Maidmonts Island area (15), and the ca. 2520 Ma Igukshuak granite, a stockwork of pink, potassic, pegmatitic to aplitic rocks exposed between Cape Uivak and Saglek Bay (16). The granitic rocks that are portrayed on the map have a wide array of textures and mineralogy. Aplitic, medium-grained, and pegmatitic types are present in adjacent outcrops in some areas, without indications of relative ages. The ca. 3240 Ma Lister gneiss (4l), exposed on the island of that name, is a composite tonalitic to granodioritic intrusion emplaced into older mafic supracrustal rocks, and migmatized by younger pegmatites (9). A schlieric granodiorite to granite sheet underlies the eastern half of Maidmonts Island, it contains many rafts of older basic gneisses and is intruded by younger grey granitoid sheets. Layer-parallel sheets and small discordant bodies south of St John's Harbour are composed of fine- to medium-grained, pale-grey to pink granodiorite (4g). A white-weathering, weakly foliated to massive, medium-grained to pegmatoidal, granitoid of unknown extent underlies the area south of Tigigakyuk Inlet. This granitoid is intrusive into well-layered quartzofeldspathic gneisses on its western margin and has many scattered screens of these gneisses, as well as amphibolite. K.D. Collerson (personal communication, 1991) has suggested that this granite may in fact be a well-preserved phase of Uivak I gneiss in a low-strain zone, implying that the gneisses to the west are pre-3800 Ma rocks. A white-weathering augen gneiss (4a), derived from megacrystic granite that locally contains retrogressed orthopyroxene, forms the core of an isoclinal structure south of Fire Cove. It may be equivalent to Uivak II gneiss, but is tentatively assigned a younger age because it lacks the dispersed Nulliak inclusions and Saglek dykes and it is a more leucocratic rock than typical Uivak II gneiss. White-weathering, leucocratic, weakly foliated to massive granodiorite (4g) containing fragments of adjacent basic and ultrabasic rocks is present inland on Morhardt Point and east of Jerusalem Harbour. A deformed porphyritic charnockitic to gabbronoritic rock (4c), discordant to layering in paragneiss, occupies part of a small fault block south of Winnie Bay. It is a white- to brownish-weathering rock containing plagioclase phenocrysts up to 3 cm in maximum dimension. A partly recrystallized rock, (4p) which is texturally similar to 4c but contains hornblende instead of orthopyroxene and displays both plagioclase and K-feldspar phenocrysts, occurs in the southwest corner of Nain Province. This rock shows an Early Proterozoic metamorphic overprint of biotite, epidote and garnet and may be equivalent to the ca. 2780 Ma Ikarut gneiss (17). Unique to the granulite-facies terrane southward from Kiyuktok Cove are layer parallel intrusions of white-weathering garnet + orthopyroxene–bearing granites (4o) that appear to be broadly coeval with formation of the Kiyuktok gneisses. These white granitoids are probably time equivalents of the pegmatoidal to aplitic sheets that form extensive components within the Uivak gneisses of the Cape Uivak–Tigigakyuk Inlet area (14)

MAFIC DYKES

Mafic dykes (Unit 5) of four different types are present. The Domes dykes (5d) are a swarm of generally east-northeast- to northeast-trending ca. 2400 to 2200 Ma diabase intrusions that vary from a few centimetres to tens of metres wide (18). They are especially conspicuous where they occur in the white-weathering amphibolite-facies rocks underlying the Domes west of the Saglek airstrip and on Maidmonts Island. Airphoto interpretations indicate that mafic dykes having other orientations intersect the generally east-northeast to northeast ones but, without absolute age data, these too are assigned to the Domes dyke swarm. Relative ages based on field relationships have not been established for all dykes but some north-trending dykes are younger than the northeast-trending set. The Domes dykes are augite + plagioclase-bearing rocks that show only very minor secondary alteration in the east, but are progressively amphibolitized to the west (18). The dykes appear to be rotated counterclockwise into a more northerly trend by sinistral shear west of Pangertok Inlet. Immediately adjacent to the Ramah Group they become foliated amphibolites parallel to layering in the mylonitized gneiss at the basement-cover interface.

Rare schistose amphibolite dykes (5π) are present locally across the whole area. These occur in areas where nearby Domes dykes are undeformed and fairly fresh, implying that the schistose amphibolites are an earlier set. Some of these dykes are confined to mylonite along shear zones, or are themselves the loci of shear

Several dykes (5β) in the Jerusalem Harbour–Hebron Fiord area and one just north of White Point are characterized by abundant entrained fragments of the surrounding gneisses and diabase. These dykes are brown-weathering, but dark grey-green on fresh surface. The matrix to the fragments is a finely comminuted mixture of igneous minerals and material from the country rock. These are interpreted as volatile-charged intrusions, their age is unknown.

Two orthopyroxene-bearing diabase dykes (5α) are known from the region. One of these is a folded dyke in the Ramah Group, 2 km south of Saglek Fiord, the other is a northeast-trending dyke 4 km west of Hebron village.

RAMAH GROUP

The Ramah Group (Unit 6) is a sequence of arenitic and pelitic sedimentary rocks and basic sills that unconformably overlies the Archean gneisses and mafic dykes (19). The depositional contact with peneplaned Archean basement is well-preserved north of Saglek Fiord. Binocular observations suggest that it may also be present in the inaccessible faces and felsenmeer-strewn mountain tops immediately south of the fiord

The Ramah Group along the south shore of the fiord is composed largely of interbedded white, grey, and buff quartzite, brown dolostone, and interbedded black to grey pelite belonging to the Rowsell Harbour and Reddick Bight formations (6q). Two diabase sills (6g) outcrop within the sequence at the highest stratigraphic levels exposed. The quartzites are well-bedded to massive rocks, preserving primary heavy-mineral crossbedding and carbonate-cemented sandy crossbedding. Pelitic rocks (6p) are dominated by black slate and biotite + muscovite schists containing chloritoid, kyanite and staurolite. Brown dolostone, interbedded with quartzite in the east, is converted to a pale-green tremolite marble in the west as a result of increasing metamorphism from east to west across the Group. The Ramah Group is largely bounded by steep reverse faults on its western edge, but a sheared and folded contact with basement is exposed on the plateau just south of Saglek Fiord. In this area, steeply dipping gneissic foliation is drawn into conformity with the cover along a subhorizontal mylonite zone that separates the older and younger rocks, the mylonitized contact is folded by eastward-overturned open folds. Southward from Saglek Fiord, the Ramah Group narrows markedly in outcrop width, is entirely bounded by tectonic junctions, and is increasingly tightly folded and metamorphosed (4,5). Approximately 15 km south of the fiord it bifurcates into narrow belts, generally less than 1 km in width. Just north of the bifurcation, an extensive area of black, muscovite + biotite ± garnet schist (6s) may be an expression of the Nullataktok Formation (19). The quartzite sequence to the east of the schists is tectonically thinned, and the eastern contact is a folded décollement surface. The southernmost narrow belts of the Ramah Group in the Pangertok Inlet area are dominated by white quartzite, biotite + muscovite + sillimanite schist and minor calc-silicate rocks possibly belonging to the Rowsell Harbour Formation. Bedding has been largely obliterated by deformation and metamorphism in these belts, although many of the quartzites retain relicts of primary sedimentary structures and an alternating pelite - quartzite compositional layering that represents original bedding. All contacts are tectonic, on both margins of the belts, recognizable Ramah Group is separated from basement gneisses by a 1- to 15-m-wide zone of tectonic schist, phyllonite, and mylonite derived both from cover and basement (18). The present configuration of the belts is due to later folding of the Ramah Group and its décollement. Discordances between basement and Ramah Group are interpreted on the basis of large-scale map patterns. These discordances are attributed to thrust excision of parts of the cover sequence that have juxtaposed varying stratigraphic levels of the cover against the basement. The only vestiges of Ramah Group south of the Freytag Inlet Fault are two narrow subvertical slivers of white quartzite south of Hebron Fiord, one of which has retained a regolith along its contact with basement (M Van Kranendonk, personal communication, 1989).

CHURCHILL PROVINCE (TORNGAT OROGEN) GNEISSES

Gneissic rocks of Torngat Orogen are exposed west of Ramah Group and are divided into four units (i) mylonitically refoliated Archean gneisses, (ii) two-pyroxene quartzofeldspathic granulite, (iii) Tasiuyak gneiss, and (iv) enderbitic gneiss.

Immediately adjacent to Ramah Group is a fault-bounded strip of mylonitically foliated amphibolite-facies rocks (Unit 7) derived from Archean gneisses of the Nain Province and from a younger dark-grey tonalite. The quartzofeldspathic gneisses (7m) are all grey- to green-weathering rocks characterized by biotite + epidote ± muscovite fabrics, relict orthopyroxene is preserved in some basic gneisses (7a), a remnant of their once higher grade assemblage. The grey tonalite (7p) shows no indication of having been strongly metamorphosed prior to the mylonitic overprint since primary dark-green hornblende is well preserved. It may be equivalent to Unit 4p. As in the gneisses, a biotite + epidote fabric denotes the effect of Proterozoic deformation. On its western border, in the Hebron Fiord area, the tonalite is transformed into a spectacular black ultramylonite that marks the Ugjuktok Fiord fault. Gently dipping gneisses (7m), which have mylonitic biotite + epidote ± muscovite fabrics that occur astride and east of Ramah Group south of Pangertok Inlet, are interpreted as eastward-directed thrust sheets of the reworked Archean rocks west of Ramah Group. The easternmost klippe has a white-weathering, massive- to mylonitically-foliated granite (7g) along its southern border.

Buff-weathering, granulite-facies charnockitic to gabbronoritic gneiss (Unit 8) forms a continuous narrow unit west of the Ugjuktok Fiord fault. This gneiss locally contains mafic granulite pods and layers that are probably derived from basic dykes and has textures reminiscent of the Kiyuktok gneisses, suggesting the protolith was Archean gneiss of the Nain Province (4,5). However, where it is not fault bounded, it has an interfingering contact with the Tasiuyak gneiss (garnetiferous diatexite) to the west. Tasiuyak gneiss also occurs as lenses within the granulite unit suggesting an original intrusive contact. The protolith for Unit 8, whether an Archean gneiss or younger plutonic rock, is therefore uncertain. The granulite unit is split into two narrow units by a septum of diatexite in the Hebron Fiord area.

The Tasiuyak gneiss (Unit 9), a garnetiferous diatexite, is a regionally monotonous white- to rusty-weathering garnet + biotite + quartz + feldspar rock (4,5). Mesoscopically, it is well layered and in hand specimen, has an apparent medium-grained granitoid texture. However, mineral subdomains are polycrystalline and the rock, in fact, has a blastomylonitic microstructure. Locally, lenticular grey quartz is slightly oblique to the compositional layering. A pronounced mineral rodding lineation, plunging gently (2 to 10°) north and south, is evident throughout the unit. Two phases of garnet growth, predating and postdating the main tectonic fabric, are present. Intrafolial folds of an earlier gneissosity can be recognized locally, but in most cases the foliation is a composite one derived by transposition of earlier layering. Lenticular grey quartz forms the axial plane fabric in these folds. Tasiuyak gneiss locally has the characteristics of a garnetiferous leucogranite, but also shows indications of derivation from pelitic and semipelitic to quartzitic protoliths. The metasedimentary protolith composition is represented by purplish to rusty layers in which graphite + biotite + garnet + sillimanite form a restite assemblage. Narrow belts of pelitic gneiss (9p) and grey quartzite (9q) are separately distinguished on the map from the more typical Tasiuyak gneiss. Garnetiferous leucocratic granitic pegmatite and pink foliated granite (9g) form narrow lenses locally within Tasiuyak gneiss. Unique to Tasiuyak gneiss, especially west of Hebron Fiord, are narrow (5 to 50 m) belts of black- to dark-brown-weathering, dense, garnetiferous mafic granulite and hornblende + spinel-bearing olivine websterites (9m) that have a marked continuity along strike. These rocks are characterized by dark-red garnets disposed either within discrete layers or as irregular polycrystalline clots scattered through the rock

A grey- to brown-weathering enderbitic (hypersthene tonalite) to opdalitic (hypersthene granodiorite) gneiss forms a discrete unit (Unit 10) within Tasiuyak gneiss along the west margin of the map area (5). Although it superficially resembles the eastern felsic granulite unit (Unit 8), it differs from it in being less well-layered and lacking clinopyroxene. It is interpreted to be derived from a plutonic rock and has an interdigitating (modified intrusive ?) contact with the Tasiuyak gneiss, adjacent to which it is locally garnet-bearing.

METAMORPHIC PATTERNS

Metamorphic assemblages of the map area reflect the influence of both Archean and Proterozoic events (18). The gneisses of the Nain Province exhibit the imprint of Late Archean (2800–2700 Ma) granulite-facies metamorphism, with the exception of the northern one-third of the area east of the Handy Fault, which experienced only amphibolite-facies conditions (2,14). Subsequent zonal retrogression, probably due to fluid flushing accompanying emplacement of some of the younger granitoids, overprinted the area. As a result, orthopyroxene in quartzofeldspathic gneisses was transformed to orthoamphibole, giving rise to gneisses having a distinctive green, blebby texture. Following intrusion of the Domes dykes and deposition of the Ramah Group, the area was variably affected by tectonometamorphic processes that accompanied formation of the Early Proterozoic Torngat Orogen (1). The imprint of this thermotectonism is evident in the change in the metamorphic and structural stability of the dykes and the cover (18). The dykes are transformed from subophitic rocks having minor chlorite in the east to foliated amphibolites in the west, a line drawn from Kiyuktok Cove in Saglek Fiord to Winnie Bay in Hebron Fiord approximates the westward extent of igneous clinopyroxene in the dykes. West of this line, pyroxene is replaced by actinolitic amphibole, plagioclase is partly recrystallized, and metamorphic biotite is present. On the south side of Hebron Fiord, the existing data do not allow definition of such zones because of a pervasive development of actinolite and epidote in all dykes examined east of Winnie Bay. Within the quartzofeldspathic gneisses, dark-green, ragged, biotite coronas of Early Proterozoic age on orthopyroxene pseudomorphs contribute to the blebby texture of rocks in the central and eastern parts of the Nain Province. In the west, the orthoamphibole + biotite assemblage of the blebs is replaced by an assemblage of granoblastic quartz + feldspar containing disseminated biotite, muscovite, epidote and sphene. Directly adjacent to the Ramah Group, the Archean quartzofeldspathic gneisses have been refoliated by Early Proterozoic basement-cover translation, and have a mylonitic ribbon-like foliation of biotite + muscovite + epidote. Within the Ramah Group, metamorphic minerals are chiefly biotite, muscovite and epidote. Chloritoid, chlorite, kyanite and staurolite are common in the north, whereas garnet and fibrolitic sillimanite are characteristic of the pelites in the southern belts, indicating the attainment of higher temperature metamorphic conditions to the south

West of the Ramah Group, mylonitically foliated amphibolite-facies gneisses represent original Archean granulite-facies rocks overprinted by Early Proterozoic metamorphism. West of these, all rocks contain Early Proterozoic granulite-facies assemblages.

STRUCTURE

There is an obvious map-scale structural contrast between the Nain and Churchill provinces. The Nain is typified by alternating orthogneiss and supracrustal gneiss units having a general north-northwest grain, displaying refolded folds and dome-and-basin type interference patterns. Layering and fold axial planes are commonly steep, the most obvious exceptions being a compositionally layered mafic gneiss (metagabbro) and metasedimentary gneiss sequence that forms a recumbent structure west of Kangerdluarsuksoak Inlet, and the shallowly dipping gneisses that underlie Cape Uivak. The Churchill Province on the other hand, lacks this folded and closely alternating polylithological pattern, but, instead, is typified by broad gneiss belts having a steeply dipping north-northwest trend in which the intensity of Hudsonian deformation has destroyed or effectively masked any fold closures. A few fold closures in the southwestern part of the map-area have been interpreted from airphoto study, but they have not been verified by ground examination. A very prominent feature of the Churchill Province gneisses is a subhorizontal mineral rodding lineation that is especially prominent within Tasiuyak gneiss, where it is chiefly defined by grey quartz, graphite smears, and minute rutile needles (4). Aluminous paragneisses have sillimanite as a lineation-forming mineral, and in the basic and quartzofeldspathic granulites elongate orthopyroxene produces the lineation. This lineation and associated mylonitic fabric define the Abloviak shear zone, a ductile, sinistral, transcurrent fault of crustal scale generated by Early Proterozoic oblique collision between Nain and Rae provinces (1).

The Ramah Group, on the western margin of Nain Province, is the best indicator of the effects of Early Proterozoic deformation on the edge of the Archean craton (18). The original unconformable relationship between basement and cover has been largely obliterated by early translation along the interface between the Nain gneisses and Ramah Group. The result of this tectonic sliding is a mylonite zone, marking the transition from recognizable supracrustals on one side to recognizable basement on the other. Internally, the Ramah Group shows the effects of at least three periods of deformation. Primary bedding and a bedding-parallel foliation, probably the result of thrust nappe formation, have been reoriented by upright to easterly and westerly overturned, moderately doubly plunging F_2 folds having a general north-south orientation. These folds and the regional foliation are in turn crenulated by small-scale chevron structures with generally east-trending axes. The regional muscovite + biotite schistosity is particularly well developed in the pelitic rocks, where it is locally enhanced by quartz segregations. The upright folds that produced the present outcrop distribution of the Ramah Group may have been generated during development of the Abloviak shear zone, however, fold axes in the Ramah Group are consistently more steeply plunging than lineations and folds associated with the Abloviak shear. South of Pangertok Inlet, mylonitically refoliated gneisses having a biotite + epidote + muscovite fabric appear to sit astride folded Ramah Group and more steeply dipping gneisses. This discordance is interpreted to be the result of post-F_2 thrusting of Unit 8 gneisses eastward.

Faults are a prominent feature of the map area. Some of the faults south of St John's Harbour truncate the Domes dykes yet other faults are cut by the dykes, indicating the existence of more than one age of faulting and/or dyke intrusion. One of the most significant faults is the Handy fault (2), a major subvertical structure having scissor-like movement extending north-south through St John's Harbour and separating different crustal levels of the Nain Province. It is characterized by a rusty fault gouge and local pseudotachylite veining. The Ugjuktok Fiord fault is a similar structural break that juxtaposes granulite-facies gneisses of uncertain origin within Torngat Orogen against retrogressed (amphibolite facies) gneisses and foliated tonalite of Nain Province parentage. Pseudotachylite veining is common in the area of the Ugjuktok Fiord Fault, and the southern expression of the fault is a spectacular, generally west-dipping, black, pseudotachylite ultramylonite having a down-dip lineation. The Ugjuktok Fiord fault and other faults in this area appear to be late features in the evolution of Torngat Orogen. This is based on the map pattern south of Pangertok Inlet, interpreted to indicate that the Pinguksoak Fault, which is subparallel to and probably coeval with the Ugjuktok Fiord fault, disrupts second-generation folds in Ramah Group and truncates a belt of shallowly dipping, amphibolite-facies, mylonitic gneisses interpreted to be a thrust sheet that structurally straddles these folds. Shallow- to moderate-dipping layering and map-scale discordancies imply two klippen of similar mylonitic rocks occur east of Ramah Group in this area

There are a few shallow-dipping faults in the map area that are of unknown age and significance. These include several thrusts interpreted from narrow, shallow-dipping mylonite zones west and southwest of St John's Harbour, on Nulliak Island, on the south shore of Pangertok Inlet, and on the north shore of Iterungnek Fiord.

ECONOMIC GEOLOGY

The Archean iron formation that occurs in several belts of Nulliak supracrustals in the Pangertok Inlet area is the largest concentration of mineralization of economic interest, but it is not present in commercially exploitable quantities (20). Sulphide mineralization in the area is present as disseminated grains within the metasedimentary gneiss, a feature that contributes to the rusty colour of these rocks. No other minerals of economic interest are known from the supracrustals, but by analogy with similar Archean rocks in western Greenland (21), some of these gneisses have potential for scheelite mineralization. Anomalous gold values have been detected in stream sediments adjacent to some paragneisses (22), indicating potential for gold mineralization

Chalcopyrite veinlets accompanying malachite staining in a basic dyke on the east shore of Kiyuktok Cove is the only indication of sulphides in the dykes. The Ramah Group is apparently devoid of mineralization, the exception being a zone of rusty pyrite mineralization below the easternmost sill on the south shore of Saglek Fiord

Significant concentrations of graphite are present within Tasiuyak gneiss west of the map area (23). Small nodules of graphite in restite layers occur sporadically along the south shore of Ugjuktok Fiord, but none are of economic interest. A grey quartzite lens in Tasiuyak gneiss near the mouth of Ugjuktok Fiord contains disseminated pyrrhotite. Garnet-rich sands from erosion of Tasiuyak gneiss characterize some of the shoreline areas of Ugjuktok Fiord

Suggested Reading

Details on specific aspects of the geology of the map area can be found in the following

1 Wardle, R.J., Ryan, B. and Ermanovics, I., 1990, Geoscience Canada, 17, 217-222.

2 Bridgwater, D., Collerson, K.D., Hurst, R.W and Jesseau, C.W., 1975, Geological Survey of Canada, Paper 75-1, 287-296

3 Bridgwater, D., Collerson, K.D. and Myers, J.S., 1978, in *Evolution of the Earth's Crust* (ed Tarling, D.H.) 19-69 (Academic Press)

4 Ryan, B., Martineau, Y., Bridgwater, D., Schiøtte, L. and Lewry, J., 1983, Geological Survey of Canada, Paper 83-1, 297-304.

5 Ryan, B., Martineau, Y., Korstgard, J. and Lee, D., 1984, Geological Survey of Canada, Paper 84-1, 545-551

6. Collerson, K.D. and Bridgwater, D., 1979, in *Trondhjemites, Dacites and Related Rocks* (ed. Barker, F.), 205-273 (Elsevier, Amsterdam).

7. Collerson, K.D., Campbell, L.M., Weaver, B.L. and Palacz, Z.A., 1991, Nature, 349, 209-214.

8 Bridgwater, D. and Collerson, K.D., 1976, Contributions to Mineralogy and Petrology, 54, 43-59.

9 Schiøtte, L., Compston, W. and Bridgwater, D., 1989, Canadian Journal of Earth Sciences, 26, 1533-1556.

10. Collerson, K.D., 1983, in *Abstracts for Early Crustal Genesis Workshop* (Ashwal, L.D. and Card, K.D., eds.) Lunar and Planetary Institute, Report 80-03, 28-33.

11 Kerr, A., 1980, M.Sc. thesis, Memorial University of Newfoundland, St John's, 267 p.

12 Collerson, K.D., Kerr, A., Vocke, R.D. and Hanson, G.N., 1982, Geology, 10, 202-208.

13. Ryan, B., 1977, M.Sc. thesis, Memorial University of Newfoundland, St John's, 230 p.

14 Bridgwater, D., Mengel, F., Schiøtte, L. and Winter, J., 1990, Newfoundland Department of Mines and Energy, Report 90-1, 227-236

15 Schiøtte, L. and Bridgwater, D., 1990, in *Granulites and Crustal Evolution* (Vielzeuf, D. and Vidal, P., eds), 157-169 (Kluwer Academic Publishers).

16 Baadsgaard, H., Collerson, K.D. and Bridgwater, D., 1979, Canadian Journal of Earth Sciences, 16, 951-961

17. Collerson, K.D., Kerr, A. and Compston, W., 1981, Geological Society of Australia, Special Publication 7, 205-222

18 Ryan, B., 1990, Geoscience Canada, 17, 276-279.

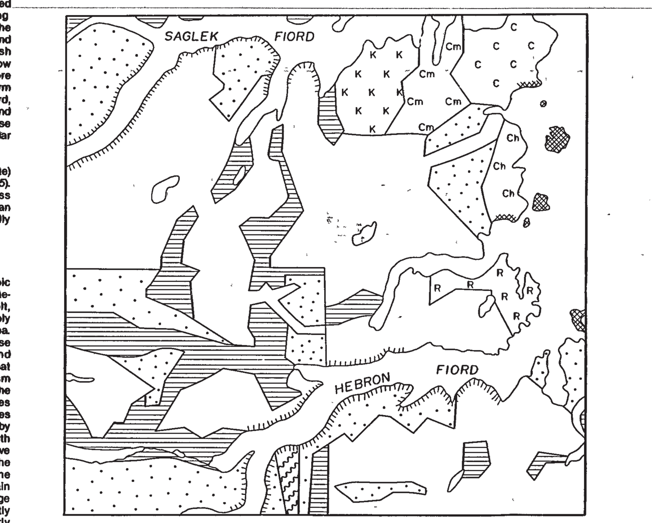
19 Knight, I. and Morgan, W.C., 1981, Geological Association of Canada, Special Paper 81-10, 313-330.

20 Schlobohm, S.F., 1958, Unpublished BRINEX report, 6 p.

21 Appel, P.W.U. and Garde, A.A., 1987, Grønlands Geologiske Undersøgelse, Bulletin 156, 26 p.

22 Geological Survey of Canada, 1987, Open File 1354

23 Meyer, J.R. and Dean, P.L., 1988, Newfoundland Department of Mines, Report 88-1, 247-259.



- Foot traversed, with helicopter fill in
- Helicopter reconnaissance mapping
- Area worked in detail by D. Bridgwater, A. Nutman and L. Schiøtte
- Cm — Modified after Collerson and Bridgwater (Ref 6)
- C — Compiled from Collerson and Bridgwater (1979) with additional data supplied by K.D. Collerson, 1985
- Ch — Compiled from above with minor helicopter reconnaissance, additional data supplied by K.D. Collerson 1985
- K — Modified after Kerr (Ref 11)
- R — Modified after Ryan (Ref 13)
- Shoreline boat traverses
- Not examined areas with heavy glacial debris cover, areas compiled from other sources air photo interpretation
- Foot traversed by M. Van Kranendonk 1989

Compiled by B Ryan 1983 84 1989

Based on mapping by B. Ryan and Y. Martineau 1982 1983 under the Canada Newfoundland Co-operative mineral program 1982 1984 Project 820028

Additional mapping by D. Bridgwater 1982-83 and J. Korstgard, 1983

Contributions to compilation also made by J. Lewry, 1982 D. Lee, 1982 83, L. Schiøtte 1982 83, K. Collerson 1983, A. Nutman 1983, F. Mengel 1983, M. Van Kranendonk 1989

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