The Precambrian Shield of northernmost Baffin Bay: correlation across Nares Strait

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The northern rim of the North American craton outcrops in the Baffin Bay – Nares Strait region where it forms large parts of southeastern Ellesmere Island and northwestern Greenland. Between 76°N and 78°N the Precambrian Shield comprises high-grade gneiss and metasediments which show a comparable chronological history in Ellesmere Island and Greenland. Two major features that emphasise the close relationship between the Shield on either side of Nares Strait are the presence of marble-rich metasedimentary tracts and a distinctive suite of late Archaean granitic to basic plutonic rocks which have locally been transformed by intense Proterozoic (probably Hudsonian) deformation into complexly folded orthogneisses.

Marble-rich tracts are common throughout southeastern Ellesmere Island: in northwestern Greenland they are restricted to Inglefield Land north of 78°N. The regional structure suggests that the marble-rich tracts constitute a single marble province and that those on opposite sides of Smith Sound at Cape Isabella (Canada) and Sunrise Pynt (Greenland) may well represent on-strike parts of the same belt of supracrustal rocks.

Correlation of the distinctive features of the Shield in southeastern Ellesmere Island and northwestern Greenland is entirely consistent with there having been no major strike-slip movement along Nares Strait.

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The oldest rocks of the Nares Strait region are those of the Precambrian Shield that outcrop between 76°N and 79°N in northernmost Baffin Bay up to the Kane Basin. The Shield is overlain extensively in parts of northwestern Greenland, less so in southeastern Ellesmere Island, by unmetamorphosed Neohelikian strata of the Thule Basin (Fig. 1). The Precambrian rocks are bordered to the west, in Ellesmere Island, and north, in the region of 79°N, by Palaeozoic strata of the Arctic platform and Franklinian geosyncline.

The aim of this paper is to describe some distinctive features of the Precambrian Shield between 76°N and 79°N which bear on geological correlations between Canada and Greenland.

Field work and scope of the paper

There is little doubt that the Shield terrains of Greenland and Canada are parts of the same Archaean–Proterozoic crustal block. Several workers, e.g. Allaart et al. (1969) and Bridgwater et al. (1973), have emphasised the close similarities between the Precambrian chronologies of the Labrador – Baffin Island coast and West Greenland, in some cases to the extent that a much closer pre-drift geographical proximity is predicted. This close similarity is also evident in the present study area where, as early as the turn of the century, Per Schei and Albert P. Low, geologists to the 2nd Fram Expedition 1898–1902 (Schei 1904, Holtedahl 1917) and the Dominion Government Expedition 1903–1904 (Low 1906) respectively, recognised similar rock suites on opposite sides of Smith Sound — the narrowest part of the Baffin Bay – Nares Strait region. These early discoveries in the Smith Sound region have been confirmed by our field work which has enlarged on the geological detail and placed it in its regional setting.

In this context a brief review of our investigations in the region may be in order. Dawes began work in the Thule district of Greenland in 1971 and has spent six seasons studying the entire Precambrian terrain from Inglefield Land to southern Melville Bugt (75°N). Frisch mapped in the Shield terrains of Ellesmere Island and Devon Island in 1977, 1978 and 1980 and worked in Greenland with Dawes in 1978 and 1980.

These studies have established the general similarity in the evolution of the Shield in northwestern Greenland and adjacent Canada on a par with that recorded

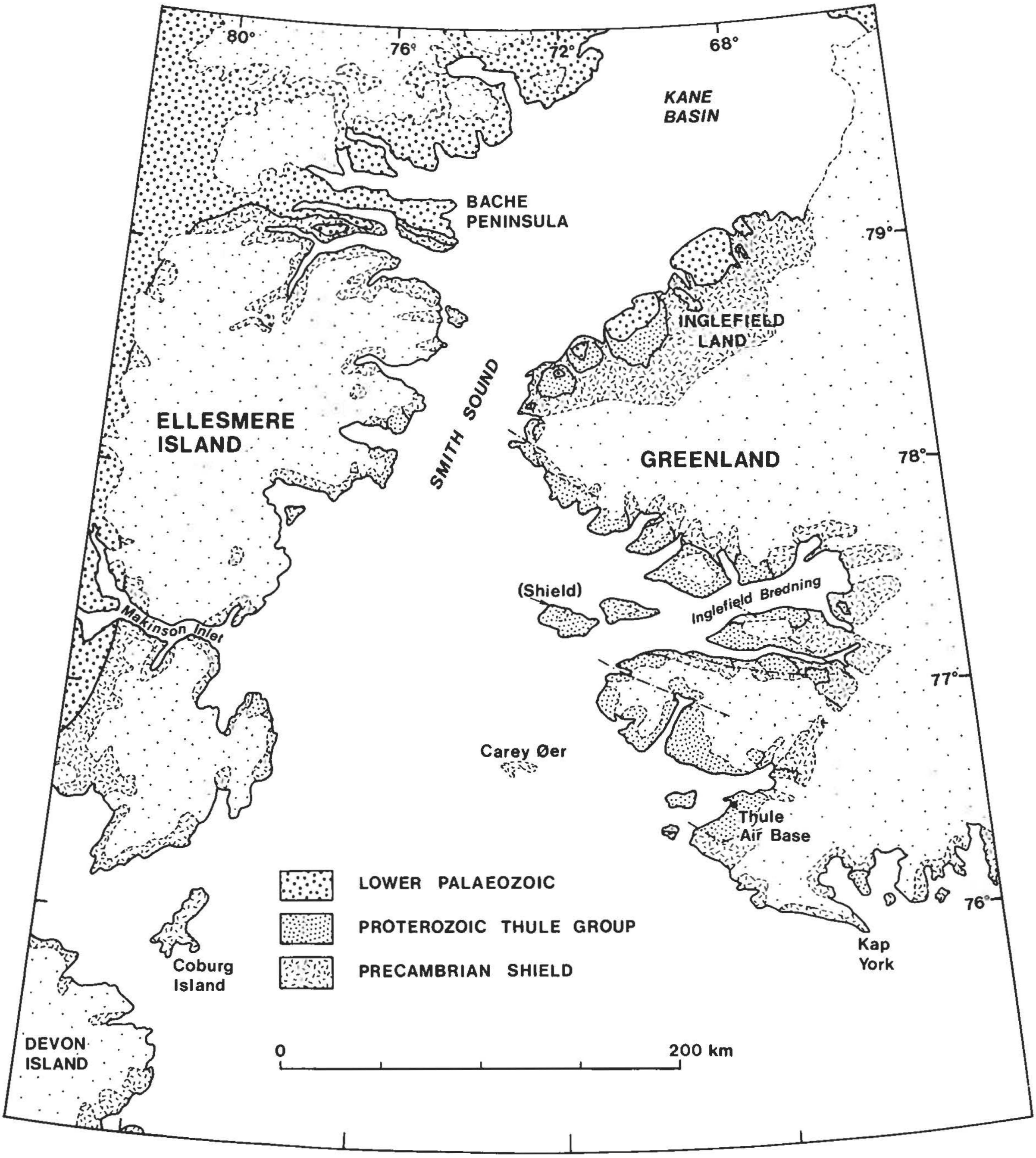

Fig. 1. Simplified geological map of northernmost Baffin Bay and Smith Sound showing outcrop of the Precambrian Shield. The location in the Nares Strait region is shown in Fig. 6. Main areas of ice indicated by widely spaced dot symbol.

between Baffin Island – Labrador and the West Greenland coasts mentioned above. Only a brief summary of the regional geology and evolution is given in this paper, enough to establish that the Shield in Ellesmere Island and adjacent Greenland shows a comparable plutonic and tectonic history. For the purpose of this symposium we prefer to focus on Smith Sound (Fig. 2) which, as the narrowest part of the seaway, is the region most likely to provide data meaningful to the question of displacement along Nares Strait.

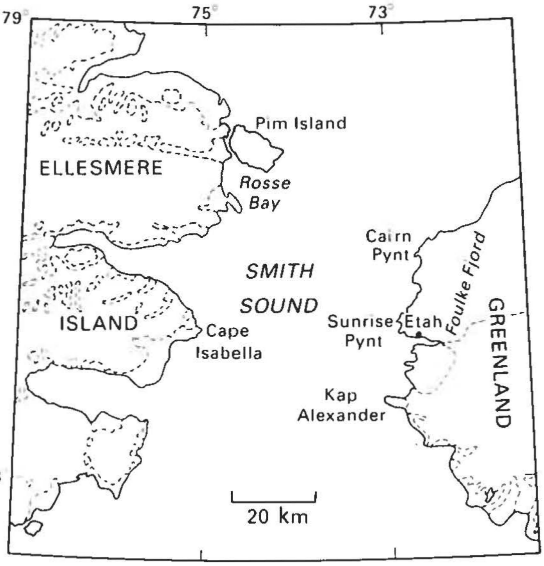

Fig. 2. Index map of the Smith Sound area showing the main ice limits.

Regional chronostratigraphic history

In both southeastern Ellesmere Island and northwestern Greenland the Precambrian Shield is composed of a variety of highly metamorphosed and deformed gneisses, metasediments and meta-igneous rocks which represent both Archaean and Proterozoic crustal material. The metamorphic grade of the Shield varies from amphibolite to granulite facies and in both areas the amphibolite facies, more common in Greenland, is regarded as having been downgraded from granulite facies.

The crystalline rocks have been described both in Greenland and Ellesmere Island in terms of a number of rock associations. Dawes (1976) mentioned six main lithostratigraphic units in northwestern Greenland (gneiss-schist and granite, anorthosite, psammite and amphibolite, pelite and marble, gabbroic to granitoid rocks, and variable melanocratic to quartz-rich gneiss) while Frisch et al. (1978), building on the early reconnaissance work of Christie (1962a, b), divided the adjacent terrain of Ellesmere and Coburg Islands into five broad groups (massive to foliated quartzo-feldspathic granulites, metasediments, amphibolites, granulite gneisses and granitic rocks). Frisch et al. (1978: 136) concluded that "in lithology, grade of metamorphism and tectonic style, the crystalline basement of Ellesmere Island bears many similarities to that of northwestern Greenland". In addition, these authors emphasise that all the granites present in Ellesmere Island are at least in part foliated, being pre- or syn-tectonic; indeed, the basement is characterised by the absence of post-tectonic intrusions. This is equally true of the crystalline terrain of northwestern Greenland.

Much of the Shield has undergone polyphase deformation and metamorphism, and age relationships between many rock units are still uncertain. Ice and snow form a significant cover, particularly in Ellesmere Island, where the regional structure and rock relationships have had to be pieced together in nunatak terrain. However, a fairly detailed chronostratigraphic history can be erected for both Ellesmere Island and Greenland

Table 1. Chronostratigraphic history of NW Greenland and SE Ellesmere Island (75°N–79°N).

Eon	Era	NW GREENLAND	Age m.y.	SE ELLESMERE	Age m.y.
PROTEROZOIC	HADRYNIAN	Basic dykes	600	Basic dykes	600–800
		THULE GROUP, sediments extrusives, intrusives	1100–1200	THULE GROUP, sediments extrusives, intrusives	1000–1200
	HELIKIAN	Basic dykes	1550	?Basic dykes	
	APHEBIAN	(5) HUDSONIAN OROGENY – high-grade mixed gneiss complex	1610 1960	(5) HUDSONIAN OROGENY – high-grade mixed gneiss complex	1760
		(4) Metasedimentary and meta-igneous rocks		(4) ?	
ARCHAEAN		(3) Meta-igneous complex basic to acid suite	2700	(3) Meta-igneous complex basic to acid suite	
		(2) Metasediments, marble, pelite, psammite, garnet schist, amphibolite		(2) & (1) High-grade multiphase gneiss and metasedimentary complex. Marble, pelite, psammite, amphibolite	
		(1) High-grade multiphase gneiss complex with amphibolite, anorthosite			

The isotopic ages quoted are both K/Ar and Rb/Sr ages reported in Christie (1962b), Larsen & Dawes (1974), Dawes (1976), Kalsbeek & Dawes (1980) and Frisch & Christie (1982).

(Table 1). In both regions a number of correlatable rock complexes and events are apparent.

In Greenland a basement–cover relationship is preserved in the Inglefield Bredning area which establishes the age relationship between the high-grade gneiss complex (1) and at least some of the metasedimentary and meta-igneous rocks (2). In Inglefield Land, about 100 km to the northwest, a thick metasedimentary sequence characterised by abundant marble (Etah Group of Dawes 1972) is regarded as a possible equivalent of this cover sequence (2). No basement–cover relationship has been recognised in Ellesmere Island and supracrustal rocks are everywhere intimately associated with the high-grade gneiss complex (1).

The meta-igneous rocks of complex (3) form large areas in both Ellesmere Island and Greenland and they intrude the supracrustal rocks referred to complex (2). Rb/Sr isotope work on igneous rocks of the Etah and Kap York areas in Greenland indicates that the intrusions are of Archaean age (c. 2700 m.y.) although the rocks are severely overprinted by Proterozoic metamorphism (Larsen & Dawes 1974, Kalsbeek & Dawes 1980).

Complex (4) is only known from the Melville Bugt area of Greenland where certain pelitic schist sequences post-date igneous rocks assigned to complex (3) (Dawes 1979, Dawes & Frisch 1981). However, supracrustal rocks of this complex may also be present elsewhere in NW Greenland and Ellesmere Island possibly represented by some of the supracrustal rocks that are associated in the high-grade gneisses of complex (1).

A mixed gneiss complex (5) derived from rocks of complexes (2) and (3) during the Hudsonian orogeny is well documented in both Ellesmere Island and Greenland. This major tectonometamorphic period is dated as Aphebian by K/Ar and Rb/Sr isotopic ages which fall between about 1600 and 1900 m.y. (Christie 1962b, Larsen & Dawes 1974).

Cross-cutting, undeformed dolerite dykes intrude the crystalline terrain in both Ellesmere Island and Greenland, but many of these dykes post-date the Thule Group and are of late Proterozoic (Hadrynian) age. However, at least some dykes in Greenland are of middle Proterozoic (Helikian) age; it is uncertain whether Helikian basic dykes are represented in southeastern Ellesmere Island (Table 1).

Smith Sound

The Shield on either side of Smith Sound (78° to 79°N) is composed of rocks belonging to complexes (2), (3) and (5) as defined in Table 1. The rocks of the three complexes are intimately associated and severely deformed; isoclinal folds are common. The regional foliation attitude varies, but steep to vertical gneissic and lithostratigraphic dips predominate. In coastal Ellesmere Island the regional gneissic trend varies from northerly to northeasterly, while in Greenland a conspicuous NE to ENE trend is formed by steeply-dipping linear belts of marble-rich metasediments flanked by gneisses and granitic rocks (Figs 3 and 4). Two typical metasedimentary-rich successions in Ellesmere Island and Greenland are shown in Fig. 7, illustrating the steep dips, lithological heterogeneity and presence of marble.

Two rock groups, one of sedimentary, the other of igneous origin, are described and their importance in correlation between Greenland and Ellesmere Island is outlined.

Marble-rich metasedimentary belts

Coarse-grained, white marble with diopside, forsterite, wollastonite and spinel is a characteristic component of supracrustal belts in Ellesmere Island and Inglefield Land. The major outcrops of marble and marble-rich supracrustal units are plotted in Fig. 5.

The presence of marbles in the Smith Sound area has

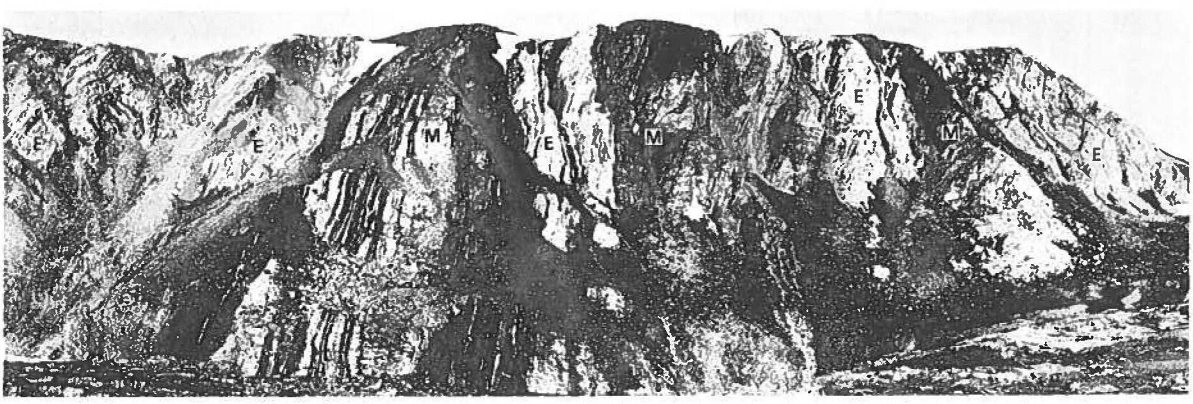

Fig. 3. Southern part of the Sunrise marble belt, Greenland, viewed inland along the regional strike. Vertical marble (M) and darker pelitic schists of the Etah Group are invaded by granitic and quartz dioritic rocks (E) of the Etah meta-igneous complex. Height of the cliff is about 350 m. From Dawes (1976: fig. 228).

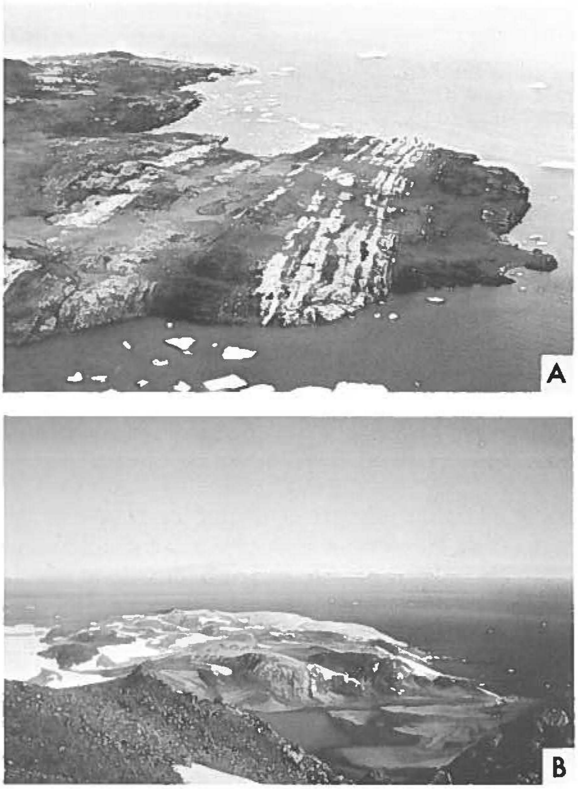

Fig. 4. A: The Sunrise Pynt marble belt, viewed from the east, at the low-lying outer coast striking towards Ellesmere Island. The white units are marble, darker units pelitic schists invaded by igneous rocks; in the far left granitic gneiss. B: View of Cape Isabella with the Greenland coast in the background. White marble at the actual cape is bordered by pelitic gneiss and pink hypersthene-bearing granite; hypersthene gneiss in the foreground. This locality is the most easterly marble occurrence on Ellesmere Island — less than 50 km from the Sunrise Pynt marbles on Greenland (see Fig. 5).

been known for some time. Low (1906: 208) recorded crystalline limestone at both Cape Isabella in Canada and in the region of Foulke Fjord (Sunrise Pynt) in Greenland. He correlated the two sequences and astutely noted that in both regions "great masses of granite" had invaded the metasediments. Koch (1929, 1933) referred the crystalline limestones of Inglefield Land, as well as those on the Ellesmere Island side of Smith Sound, to the Etah Formation (now the Etah Group of Dawes 1972).

The Cape Isabella and Sunrise Pynt marbles remain the best known occurrences in the region (Figs 3 and 4). At Cape Isabella, marble forms a substantial part of a meta-igneous/metasedimentary assemblage bordered by granite-veined hypersthene gneiss. The supracrustal rocks comprise interlayered belts, trending northeast, of marble, calc-silicate rocks, (cordierite-sillimanite-) garnet gneiss, and two-pyroxene quartzo-feldspathic rock (meta-igneous? granulite), all isoclinally folded and severely faulted. Red granite and pegmatite have intruded marble and other metasediments and, despite later intense deformation, transgressive contacts are preserved. Subsequent flowage of marble has disrupted much of the pegmatite and trains of fragments mark the sites of former pegmatite sheets.

Sunrise Pynt offers an extremely well-exposed cross-section through the thickest of the numerous supracrustal belts of Inglefield Land. Vertically-dipping marble and pelitic (sillimanite-) garnet schist are intercalated with meta-igneous pink granite, pegmatite and hypersthene-bearing quartz dioritic to granitic rocks in a cliff section about 1 km long (Fig. 3). This supracrustal belt strikes northeast, parallel to the regional trend, and is bordered on both sides by hypersthene gneisses veined by granite. The southern contact of the marble belt is subconcordant to the lithostratigraphic layering of the metasediments and the discordant intrusive contact with the bordering pink granitic rocks is preserved on a regional scale. Isoclinal folding — as seen by, for example, tightly-folded inclusions in marble — has not destroyed original intrusive contacts but boudinaged

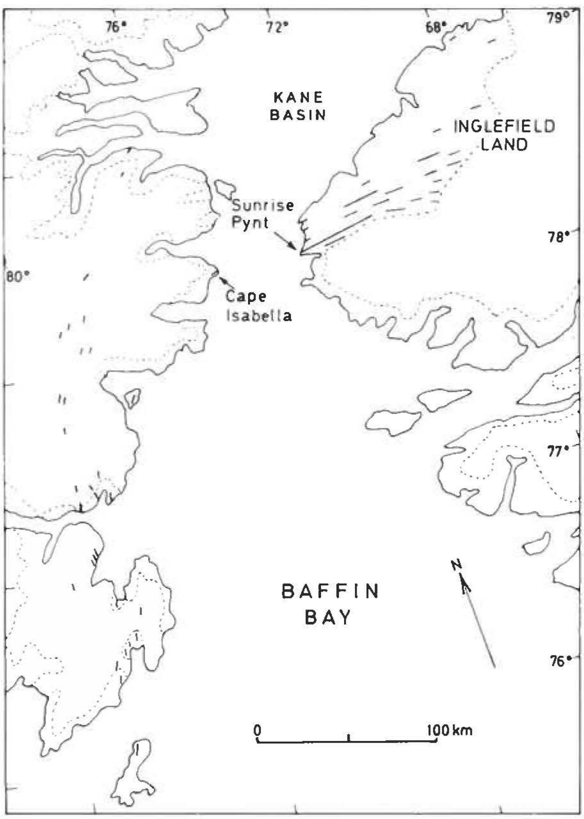

Fig. 5. Distribution of known marble outcrops of the Ellesmere Island – Inglefield Land marble province. The dashes represent single outcrops. In Inglefield Land the dashes are generally longer since the ice-free terrain allows each marble unit to be traced along strike; in Ellesmere Island marble units are less continuous due to the nunatak terrain.

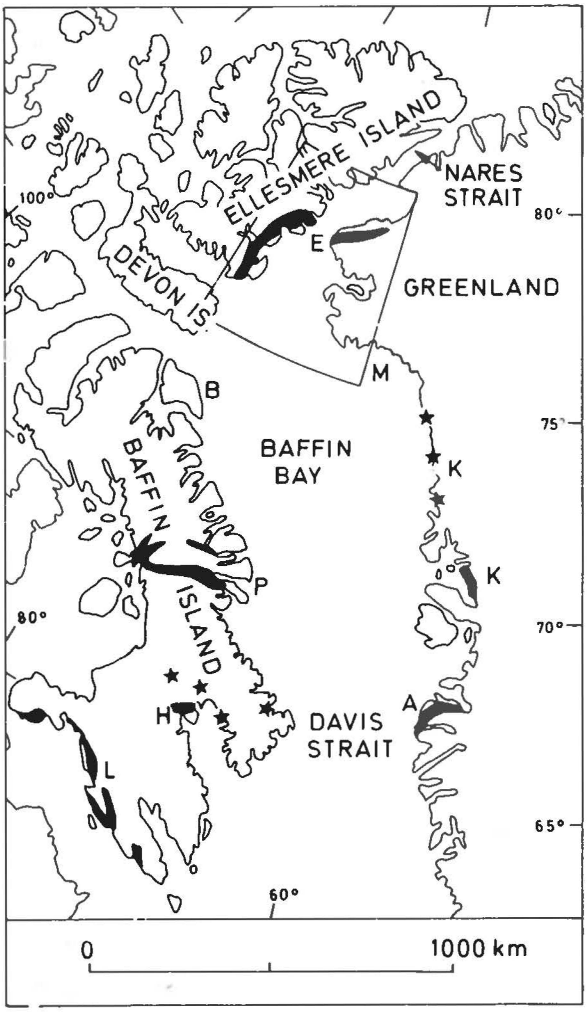

Fig. 6. The regional distribution of marble in the Precambrian Shield of the Baffin Bay – Davis Strait region. Black areas indicate important marble provinces, stars minor occurrences. E = Etah Group; P = Piling Group, Foxe fold belt; K = Karrat Group, Rinkian mobile belt; L = Lake Harbour Group, Dorset fold belt; H = Hoare Bay Group; A = Agto supracrustals, Nagssugtoqidian mobile belt; B = Bylot Island; M = Melville Bugt. Data for Baffin Island and West Greenland from Jackson & Taylor (1972), Escher & Pulvertaft (1976), Escher et al. (1976), Escher (in press). Frame locates the present study area as shown in Fig. 1.

remnants and other fragments of meta-igneous rock are common in marble.

The similarities of lithology, structure and chronology of geologic events at Cape Isabella and Sunrise Pynt are striking. Further, the two localities are in close proximity, roughly on strike, and the marble belts in Greenland and Ellesmere Island are known to have regional persistency. The Sunrise Pynt belt can be traced inland for at least 90 km towards the Inland Ice margin, and although the Cape Isabella outcrop cannot be mapped continuously inland because of extensive ice cover, it forms part of a marble-rich metasedimentary zone that can be traced for 300 km throughout the nunatak terrain of southeastern Ellesmere Island (Fig. 5). The evidence thus points to the two coastal supracrustal complexes having once been joined in a single belt or, at least, belonging to the same family of supracrustal belts. To the north, between Sunrise Pynt and Cairn Pynt, several thinner linear belts of marble reach the coast and strike towards the Cape Isabella area. Each of these displays a similar lithology and has the same age relationships to the surrounding high-grade granitic rocks as described for the Sunrise Pynt section. We regard the presence of on-strike marble belts invaded by comparable igneous material, on opposite sides of the 50 km wide seaway, as particularly noteworthy, and strongly suggestive of a direct correlation of the two regions.

Further evidence for this correlation is provided by the regional distribution of marble sequences in the Baffin Bay – Davis Strait region, the main occurrences of which are indicated in Fig. 6. The Sunrise Pynt marble belt represents the southernmost marble occurrence in northwestern Greenland; in the entire Thule – Melville Bugt region (75° to 78°N) no marble has been reported (Dawes 1976, Dawes & Frisch 1981). The next marble outcrops to the south belong to the Rinkian mobile belt (Escher & Pulvertaft 1976): between latitudes 75° and 73°N, thin horizons of calc-silicate rock form part of the Proterozoic Karrat Group (Escher & Stecher 1978, 1980, Escher in press), while to the south, in the Mârmorilik region of central West Greenland (71°N), marble constitutes an important rock type of the early Proterozoic metasedimentary sequences (Garde 1978).

In Ellesmere Island the 300 km belt of marble-rich metasediments peters out south of 76°N, i.e. marble is present on Coburg Island but is practically absent from the metasedimentary belts of Devon Island (Frisch 1981a). No marble has been reported from northern Baffin Island or Bylot Island (Blackadar 1970, Jackson & Davidson 1975) and the closest marbles to the south occur in central Baffin Island at about 70°N. These marbles occur as extensive units in the Proterozoic (Aphebian) Piling Group of the Foxe fold belt (Jackson & Taylor 1972) that in lithology, geological setting and age has much in common with the Karrat Group of central West Greenland, suggesting direct correlation (J. C. Escher, J. R. Henderson, G. D. Jackson, T. C. R. Pulvertaft, pers. comms). One can suggest correlation of the marble and metasedimentary successions farther south in Baffin Island and West Greenland (Fig. 6). Whatever the value of such long-range correlations, we consider the grouping of marble and metasedimentary provinces on either side of Baffin Bay – Davis Strait highly significant, and regard the Etah Group marbles as constituting a discrete lithologic province, hereby termed the Ellesmere Island – Inglefield Land marble province, an entity separate and distinct from adjacent areas of Precambrian Shield.

Quartzo-feldspathic plutonic rocks

Close correlation can also be made between a distinctive suite of magmatic rocks on both sides of Smith Sound. Eighty years ago Per Schei (Schei 1904, Bugge 1910, Holtedahl 1917) recognised the similarity of the hypersthene-bearing quartzo-feldspathic rocks in the Foulke Fjord – Etah area and in Rosse Bay and Pim Island (Fig. 2). Recent work by us has confirmed and extended Schei's conclusion (Frisch 1981b). In both areas the main rock types are orthopyroxene-bearing quartz diorite and granodiorite (termed granulite by Frisch et al. 1978) and intrusive granite, which together far outweigh in abundance the Etah Group supracrustal rocks described above. This magmatic suite has been termed the Etah meta-igneous complex in Greenland (Dawes 1972), but we suggest extension of the term to cover the corresponding terrain of southeastern Ellesmere Island.

The orthopyroxene-bearing rocks are medium- to coarse-grained, dark, often brownish weathering, generally massive or weakly gneissic. Fresh surfaces show typically the greenish colour and waxy sheen, characteristic of quartzo-feldspathic rocks of the granulite facies. The rocks are composed mainly of oligoclase, alkali feldspar, quartz, orthopyroxene, olive-green hornblende and biotite, with local garnet. The feldspar is typically green and some blue quartz occurs.

Whereas the orthopyroxene-bearing rocks appear to be primarily meta-igneous and can be seen at Sunrise Pynt to intrude the Etah Group supracrustals, they are themselves invaded by pink to red granite in veins a few centimetres thick to sheets or irregular bodies many tens of metres thick, as well as more extensive masses. Although commonly discordant in detail the granitic intrusions are broadly concordant with the regional structure; indeed, granulite-granite layering in places constitutes the main structure. Where deformation was particularly intense, granulite injected lit-par-lit by granite has been transformed into well-banded gneiss and various stages of the process are preserved in outcrop. Similarly, gradations from massive granulite to granulite gneiss are commonplace in both Inglefield Land and Ellesmere Island and attest to major deformation after intrusive activity.

Another notable feature of the quartzo-feldspathic

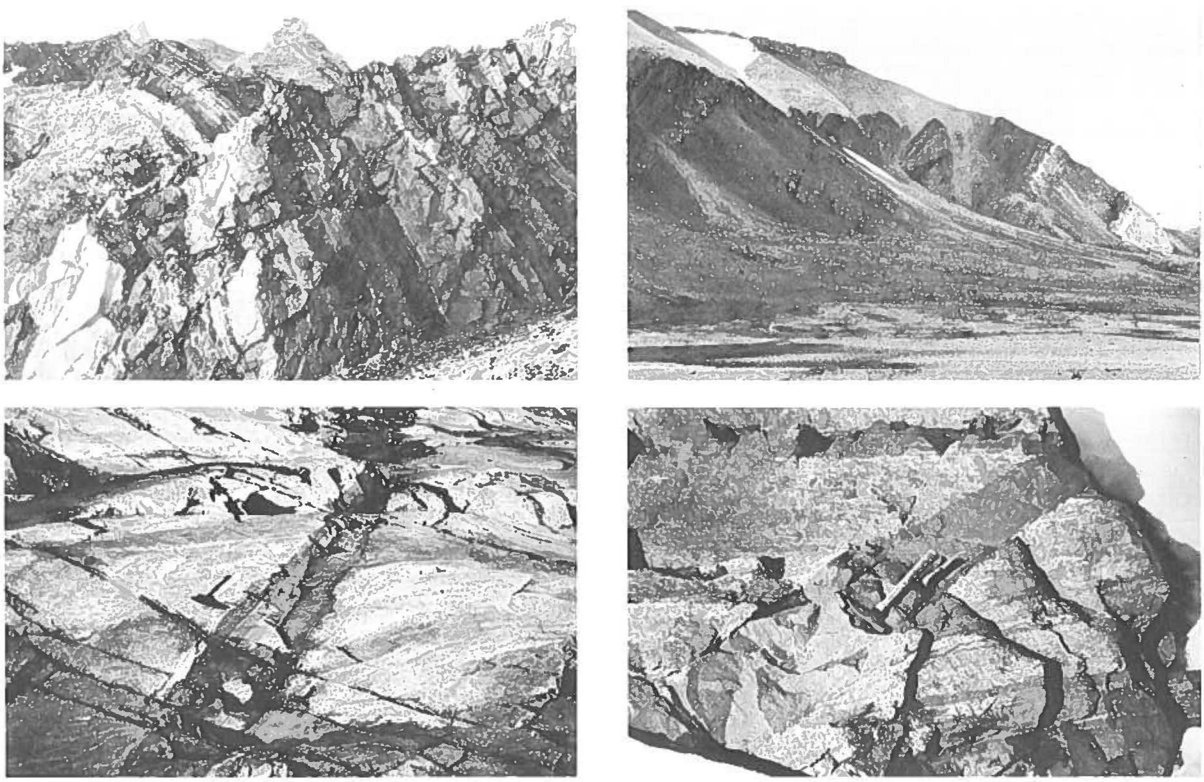

Fig. 7. Comparison of common rock associations of the Shield on opposite sides of Smith Sound. Ellesmere Island examples on the left, Greenland on the right. Upper: typical steeply-dipping metasedimentary/meta-igneous succession including conspicuous marble (white) and quartzo-feldspathic plutonic rocks. In the Greenland outcrop, north of Sunrise Pynt, the Shield is unconformably overlain by the Proterozoic Thule Group. Ellesmere Island locality is from the south shore of Makinson Inlet (photograph by G. R. Dunning). Lower: typical outcrop of hypersthene-bearing granulite (dark) veined by reddish granite, cut by basic metadykes. The examples are from Kjöthaugen, Pim Island (see Bugge 1910: fig. 5, p. 11) and the coast north of Cairn Pynt.

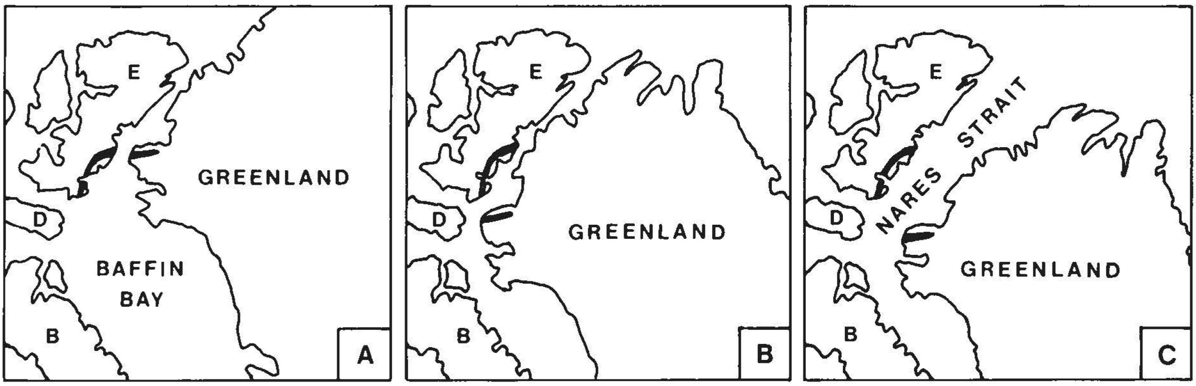

Fig. 8. Locations of the Precambrian Ellesmere Island – Inglefield Land marble province (black) in present-day geography (A) compared with two pre-drift reconstructions, early Tertiary (B) and late Cretaceous (C). Position of lands in (B) and (C) are redrawn from Srivastava (1978). E = Ellesmere Island, D = Devon Island, B = Baffin Island.

rock terrains on both sides of Smith Sound is the sporadic occurrence of thin tabular bodies of metabasite composed of primarily pyroxene-hornblende-biotite-plagioclase. The contacts of these bodies vary from sharp to diffuse and some are discordant, suggesting that the bodies are metadykes or remnants thereof (Fig. 7). The metadykes cut both the dark hypersthene-bearing and later red granitic rocks and they could represent several ages of intrusion. The metadykes are everywhere thoroughly metamorphosed and are also veined by granitic material.

Isotopic age determinations from Greenland provide evidence that the Etah meta-igneous rocks are of late Archaean age and underwent major deformation in Hudsonian time (c. 1800 m.y.) (Larsen & Dawes 1974, Kalsbeek & Dawes 1980). Further geochronological work is in progress but, whatever the precise age of the events, the evidence of intrusion of the same distinctive suite of plutonic rocks followed by major deformation can be easily documented in the field on each side of Smith Sound.

Inferences on continental drift

The opening of Labrador Sea and Baffin Bay by sea-floor spreading, the resultant lateral separation of Greenland and Baffin Island as separate plates and the consequent strike-slip movement along Nares Strait are ideas that have gained wide support (e.g. Keen et al. 1974, Sclater et al. 1977, Srivastava 1978, Jackson et al. 1979) and they form a central theme in this symposium. With regard to the question of the movement of Greenland relative to Ellesmere Island, we wish to emphasise two main aspects of correlation related to the Precambrian Shield:

1) The Precambrian crystalline rocks in southeastern Ellesmere Island and northwestern Greenland (76°–79°N) show clear similarity in chronostratigraphy and magmatic-tectonic history which conclusively establishes that the two areas form parts of the same Shield terrain.

2) At Smith Sound, where the crystalline rocks of Ellesmere Island and Greenland are in closest geographical proximity (50 km), *directly* correlatable metasedimentary and meta-igneous rock associations characterise the Shield. The evidence of this correlation is summarised as follows.

   a. The marble-rich metasedimentary belts (Etah Group) in Inglefield Land and Ellesmere Island form a lithologic province separate and distinct from the Shield areas farther south.
   b. In both Inglefield Land and Ellesmere Island the marble belts are regionally persistent.
   c. The marble belts, including the coastal outcrops at Cape Isabella and Sunrise Pynt, have similar lithology and mineralogy and are roughly on strike.
   d. The marble belts on both sides of Smith Sound have the same relationship to a suite of younger plutonic rocks (Etah meta-igneous complex).
   e. The Etah meta-igneous complex is a distinctive suite of granitic to basic rocks that, on both sides of Smith Sound, is composed of identical rock types and the same sequence of intrusion phases.
   f. The Etah meta-igneous rocks have been transformed locally into highly folded orthogneisses in the granulite facies; rock types of the granite or quartz diorite to gneiss transition on either side of Smith Sound are indistinguishable.

These two aspects of correlation can be considered as two categories of correlation refinement. Hence, data of category 1, although essential in establishing the broad temporal and regional setting of Ellesmere Island and adjacent Greenland, can contribute little to a leading question of this symposium, i.e. has there been displacement along Nares Strait and if so, how much? On the other hand, evidence from category 2 is of direct significance to this question and we regard the marble-rich metasedimentary belts intruded by distinctive magmatic rocks as a geological marker across Nares Strait.

The present-day distribution pattern of marble-rich metasedimentary belts and associated magmatic rocks in Ellesmere Island and Inglefield Land is entirely consistent with there having been no strike-slip movement along Nares Strait. However, the data cannot be used for a precise definition of the amount of net displacement permissible, although a dextral displacement of Greenland relative to Ellesmere Island of as little as 50 km disrupts the continuation of the Cape Isabella/Sunrise Pynt – Cairn Pynt marble belts. Nevertheless, such is the nature of Shield terrain, developed through complex structural histories, that exclusion of such a 50 km offset reconstruction solely on the basis of data from the Precambrian Shield would be dangerous.

At the other end of the movement scale, a dextral offset of 300 km (envisaged by, for example, Newman 1977, Newman & Falconer 1978 and Srivastava 1978, to accommodate a corresponding sinistral movement in the Tertiary) places the Inglefield Land marbles south of the southern termination of the Ellesmere Island metasedimentary zone at about 75°N (Fig. 8B and C). The Inglefield Land linear marble belts thus strike towards Devon Island, an area devoid of marble-rich metasedimentary belts. However, a convenient postulate might be that the Greenland marbles, rather than being a northeasterly continuation of the Ellesmere Island metasedimentary zone, as present-day geography suggests, form an across-strike correlation, perhaps with the Inglefield Land marbles depicting one limb, and the Ellesmere Island marbles the other, of a large-scale, southerly-closed fold structure, the axial trace of which is in Nares Strait.

We have considered various reconstructions of the region and the realms of geological improbability which each involves, but we cannot favour complex and speculative explanations over fundamental and straightforward correlation of metasedimentary and plutonic complexes directly across Nares Strait. We are aware that the types of geological structures and boundaries commonly preserved in Precambrian crystalline rocks — often the products of repeated orogenic disturbances and transformations — generally are less likely to be of use as geological markers in precise correlation between landmasses than, for example, unmetamorphosed, undeformed and fossiliferous sequences, the age, character and structure of which can be unequivocally determined. We thus regard it as very significant that the conclusion on strike-slip displacement based on data from the Archaean and early Proterozoic crystalline rocks is entirely consistent with that based on a variety of stratigraphical and structural aspects from the late Proterozoic and Palaeozoic sediments, reported elsewhere in this volume.

Conclusion

Field and laboratory studies of the onshore region between 76° and 79°N in northernmost Baffin Bay have extended the geological correlation across the Labrador Sea – Baffin Bay seaway to the northern extremity of the North American craton. Our data demonstrate that correlation at Smith Sound, the narrowest part of the seaway, can be based on the same supracrustal group and the same plutonic complex. It is thus considerably more refined than the general and regional correlation based on similar rocks, structures and events of comparable ages that can only be made farther south where the landmasses are widely separated. This correlation across Smith Sound militates against any large-scale net strike-slip displacement along Nares Strait.

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