

DESCRIPTIVE NOTES

Map-area 46 P/5 contains a broad, complexly folded belt of the basement complex in its central half, flanked by rocks of the Penmyth Group to the north and south. Biotite and hornblende-bearing, quartz monzonitic and granodioritic gneissic rocks (Aggdn), predominantly leucocratic, are the common lithologies of the complex. Schistose and continuous layers of amphibolite lie within the gneisses. Some appear to be associated with rocks of the Penmyth Group, others may be allied with metasediments of the complex. Many small bodies are likely tectonically disrupted dykes.

GENERAL GEOLOGY

The Foxe Fold Belt extends in an east-northeast direction from southern Melville Peninsula, central Baffin Island. It is composed of granitoid gneissic rocks of Archaean age (2500 to 1700 Ma) overlain by meta-sedimentary rocks of Early Proterozoic age (approximately 2000 to 1700 Ma) of the Penmyth and Pilling Groups. These have undergone polyphase deformation and metamorphism mostly during the Hudsonian orogeny. Generation and emplacement of plutonic rocks preceded, accompanied and followed deformation. Diabase dykes of presumed Late Proterozoic age cut older rocks.

The Archaean rocks form a basement complex predominantly of granitoid gneiss (Aggdn) and foliated gneiss (Ag) with relatively minor amounts of amphibolite (Am) and paragneiss (An) and other meta-sedimentary rocks (Am-An). The gneissic and plutonic rocks are largely of quartz monzonitic to granodioritic composition. Leucocratic and mafic varieties of gneiss are also common but do not constitute a large volume of the complex. Gneissic layering and mineral foliation formed of biotite and hornblende are ubiquitous but not always clearly visible. Plutonic rocks emplaced during at least three episodes of igneous activity can be differentiated locally but cannot easily be mapped regionally because they are compositionally similar to one another and to the gneiss which appears to be both host and parent to them. Deformed amphibolites, presumed to be dykes, are often observed within the complex and sometimes at the contact with the Penmyth Group. With few exceptions they have not been observed within the group and are presumed to pre-date it. Meta-sedimentary and meta-volcanic rocks not demonstrably part of the Penmyth Group have in some places been assigned to the basement complex but their affinity is uncertain given the evident intricacies of stratigraphy and structure. Some lithologic similarity to rocks of the Prince Albert Group in northern Melville Peninsula exists but such correlation is tenuous at best.

The Penmyth Group consists of paragneiss (Am-An) and marble (Am) with some quartz-biotite psammite (Am-An) and calc-silicate gneiss (Am) and minor quartzite (Am), garnet, biotite and sillimanite schists (Am), and hornblende amphibolite (Am). Complete understanding of the stratigraphic succession is lacking as most units are discontinuous and lensoidal and the possibility of the existence of facies changes, unconformities and cryptic early tectonic structures renders its delineation difficult. A general order to the units can be indicated, nonetheless. A thin (50-100 m) basal sequence includes orthogneiss, quartz monzonite, schist, a suspected meta-igneous and minor amphibolite, marble and quartz-felspathic gneiss. This sequence is overlain by a predominantly calcareous unit of marble, calc-silicate gneiss and interbedded quartz-biotite schist. The calcareous unit is followed by a thick block unit of paragneiss overlain by a thin bed of schistose paragneiss at its base, and a unit of marble, calc-silicate gneiss and biotite quartzite. At the highest observed structural and stratigraphic levels is a unit of quartz-biotite psammite and gneiss. The top of this unit has not been observed. The relationship of present to original thickness and structure is well disguised by the rapid processes of thinning during deformation, repetition by folding and dilation by syntectonic plutonism.

The Penmyth Group appears to lie unconformably on the basement complex. Tectonism has obliterated any angular discordance and unconformable relationships are inferred because of the clear lithologic contrast and the common presence of the thin quartzite unit with rare felspathic grit beds lying upon a variety of rock types in the complex. The uppermost unit of the Penmyth Group may be separated from the rest of the group by an unconformity. Contrasts in intensity of metamorphism and deformation and unexplained structural discontinuities support such an interpretation but rapid transpositions or faulting remain viable alternate explanations.

Metamorphism of the Penmyth Group produced two lithologic suites. Most of the group is in uppermost amphibolite facies and contains the assemblages garnet-biotite-sillimanite and cordierite-sillimanite-garnet in paragneiss and in marble. Diopside-forsterite-calcite as well as scapolite and a hornblende group mineral. Rocks of the uppermost unit of the group are in greenschist facies and contain chlorite-muscovite-quartz in pelitic units. Porphyroblasts of a mineral tentatively identified as andalusite are common in meta-sedimentary units and tremolite occurs sporadically in calcareous rocks.

Polyphase structures indicating numerous episodes of deformation of the basement complex and the Penmyth Group exist throughout the fold belt but unequivocal sequential relationships among them are rare. The earliest deformational phase (D1) is inferred to have affected the basement complex prior to deposition of the Penmyth Group. Little is known of this phase. The second phase (D2), the earliest observed in the Penmyth Group, is believed to have formed attenuated folding, foliation and minor foliation (S2). In all but a few outcrops S2 is parallel to bedding (S0). Mesare evidence suggests that the trend of D2 structures may have been northerly. The effects of D2 on the Penmyth Group remain problematical, but may be responsible for some of the observed discontinuity of units described above.

The third and fourth phases (D3 and D4) produced prominent meso- and megascopic folds that impose an east-northeast structural grain in the Foxe Fold Belt. D3 folds are tight to nearly isoclinal and usually recurrent. Axial plane foliation (S3) is nearly parallel to limbs (S0) and hence to S2, rendering separation of phases D3 and D4 very difficult. D4 folds are coaxial, or nearly so, with D3 but are more open and generally upright or slightly overturned. Mesoscopic D4 folds can often be observed to have deformed earlier structures.

North to northeasterly trending broad transverse flexures (D5) alter the plunges of pre-existing folds. Few mesoscopic structures associated with this phase were observed. Steeply dipping fractures and faults, many with northerly and northeasterly trends are evidence of the last phase of deformation (D6). Most fault displacements appear to be left-lateral and east-side-up.

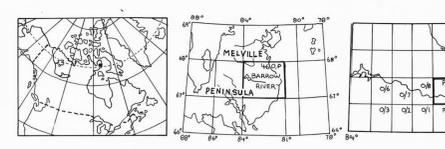
Metamorphism is believed to have accompanied all phases of deformation except D3 and D6. It possibly reached its zenith during D3 but mineral recrystallization outlasted much of the penetrative deformation.

Massive and foliated plutonic rocks (A), chiefly of hornblende and biotite granodiorite, quartz monzonite and granite intrude the basement complex and the Penmyth Group, resembling granitoid rocks of the complex. Separation of these is based largely on field relationships. Foliated plutonic rocks, except where observed to have intruded the Penmyth Group, are assigned to the complex (Ag). Where intrusive into the group they (Am) are considered to be pre- or synchronous with the main phases of deformation. In some localities intimate mixing with and partial melting of paragneiss has created rock mappable only as migmatite (Am) although large screens and xenoliths can be distinguished in places. Common local formation of pegmatite and leucocratic granitic rock (An) is believed to be related to deformation also. Massive, often cross-cutting plutons (A) invaded the Penmyth Group after cessation of deformation.

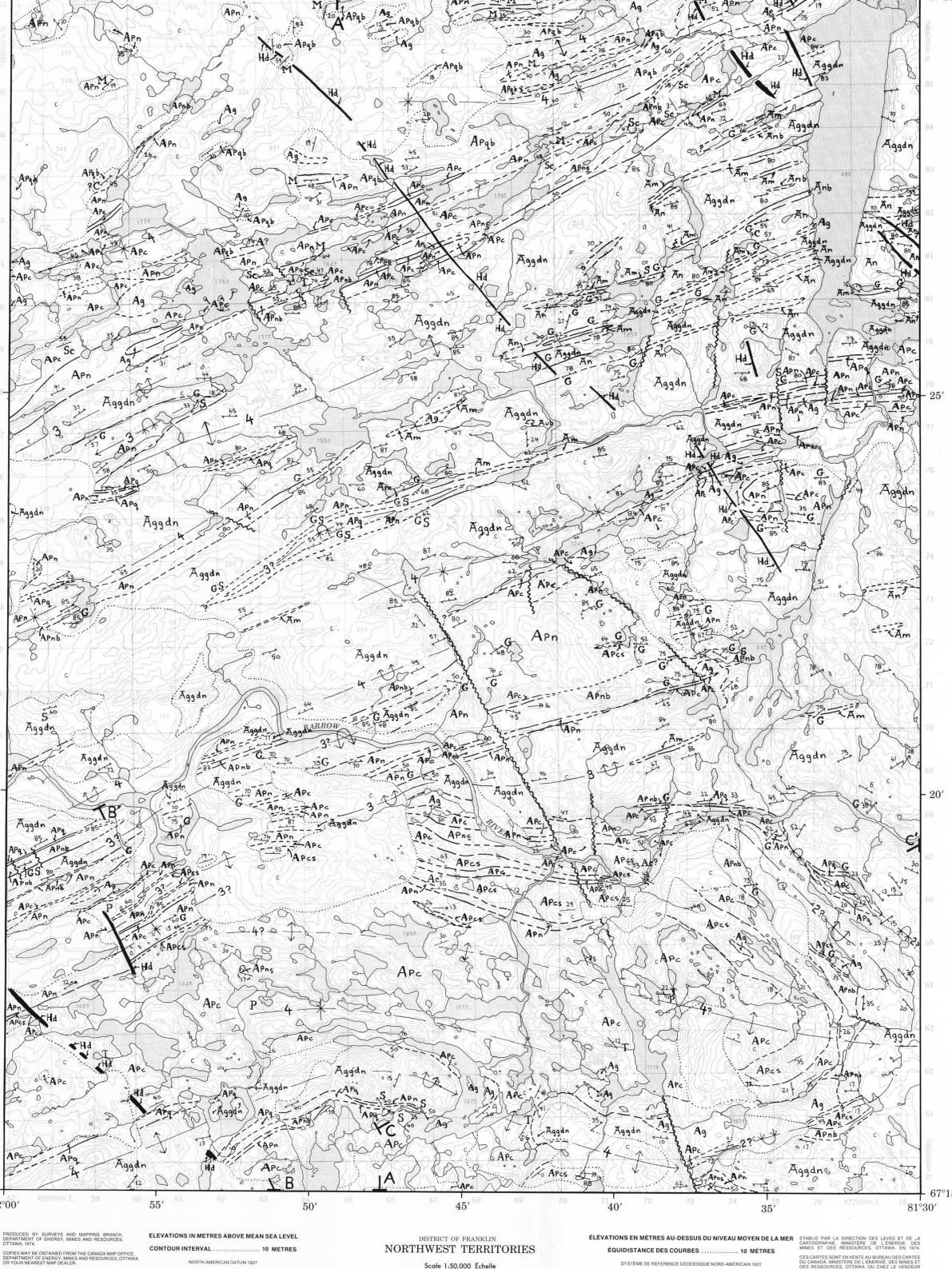
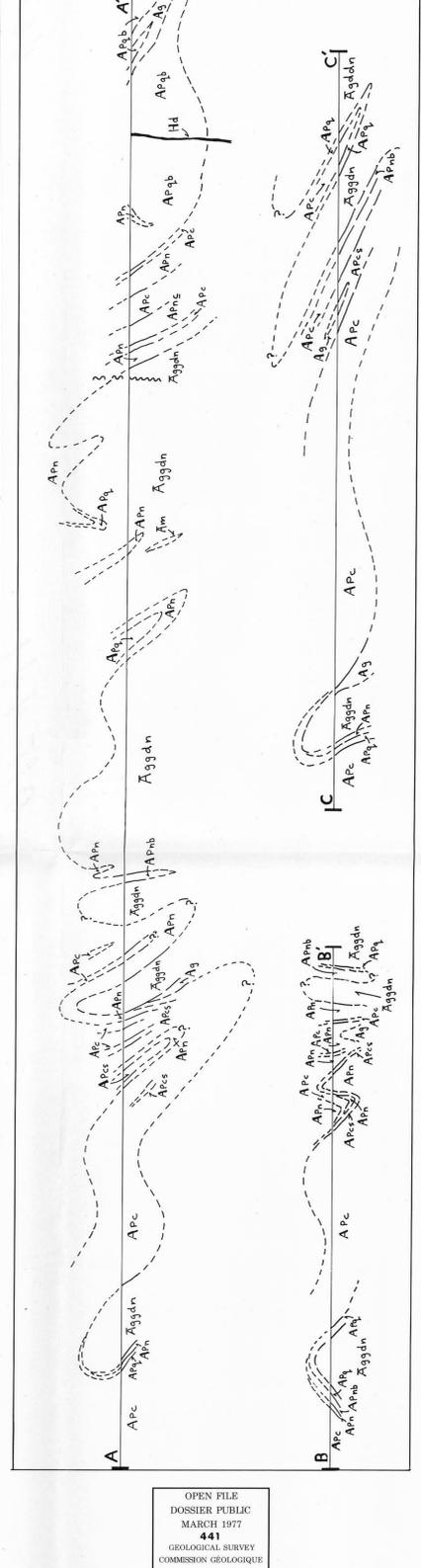
Available results of radiometric analyses indicate formation of the basement complex prior to 2500 Ma with some events occurring possibly as long as 3000 Ma ago (R.K. Wanless, personal communication, 1975). Deformation of the basement and the Penmyth Group may have taken place 2150 Ma ago (Jackson and Taylor, 1972) and again during the Hudsonian orogeny (c. 1700 Ma ago). Post-tectonic plutons (1500 Ma old; Heywood, 1966) were emplaced into the fold belt late in the orogenic history. Following extensive uplift and erosion, diabase dykes (M4) presumed to be part of the Tackenzie dyke swarm of c. 1000 Ma age (Fahrig, 1970) cut rocks of the fold belt. These are spatially associated with faults and fractures formed during D6 tectonism. Subsequent uplift and erosion was followed by deposition of Proterozoic carbonate rocks, remnants of which lie north and south of the fold belt.

- REFERENCES: Fahrig, W.F., 1970, Diabase Dyke Swarms in Geology and Economic Minerals of Canada, Geological Survey of Canada, Economic Geology Report Number One, pp. 131 - 134. Heywood, H.K., 1967, Geological Notes Northwestern District of Baffin and Southern Melville Peninsulas, District of Franklin, Northwest Territories (Part of 46, 47, 50, 51), Geological Survey of Canada, Paper 64-4. Jackson, G.D. and Taylor, F.C., 1972, Correlation of Major Proterozoic Rock Units in the Northern Canadian Shield, Canadian Journal of Earth Sciences, Volume 9, pp. 1650 - 1669.

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LEGEND section containing symbols and descriptions for geological units (Late Proterozoic, Early Proterozoic, Archaean), structural features (planar, linear, faults, folds), and metamorphic minerals.



LEGEND - LÉGENDE section containing symbols and descriptions for roads and related features, landmarks, relief features, and conversion scales.

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ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL CONTOUR INTERVAL 10 METRES. ELEVATIONS EN MÈTRES AU-DESSUS DU NIVEAU MOYEN DE LA MER ÉQUIDISTANCE DES COURBES 10 MÈTRES.

CONVERSION SCALE FOR ELEVATIONS ÉCHELLE DE CONVERSION DES ÉLEVATIONS. METERS 0 100 200 300 400 500 600 700 800 900 1000. FEET 0 100 200 300 400 500 600 700 800 900 1000.