CANADA

EDITION 1 46-O/1

SERIES A 701
MAP 46-O/1 CARTE
EDITION 1 MCE EDITION

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DESCRIPTIVE NOTES

MAP-AREA 46 O/1 IS UNDERLAIN BY ROCKS OF THE BASEMENT COMPLEX IN ITS SOUTHERN ONE-THIRD AND BY THE PENRHYN GROUP OVERLYING THE COMPLEX ELSEWHERE. THE COMPLEX CONSISTS PRIMARILY OF GRANODIORITIC AND OTHER GRANITOID GNEISSIC ROCKS (Aggdn) WITH MUCH INTIMATELY INTERMESHED INTRUSIVE ROCK. SMALL LENSOID BODIES OF AMPHIBOLITE (Am) SOME LYING NEAR THE UPPER SURFACE OF THE COMPLEX, ARE COMMON. ALONG THE SOUTHERN BORDER AN IRREGULAR BELT OF PARAGNEISS (Ap) AND AMPHIBOLITE (Amp) WITH MUCH FOLIATED AND MASSIVE GNEOUS ROCK FORMS A MIGMATITIC TERRANE OF UNCERTAIN AFFINITY. LACK OF CARBONATE UNITS SUGGESTS THAT IT IS NOT PART OF THE PENRHYN GROUP.

THE BASAL SEQUENCE OF ORTHOQUARTZITE (Arq) WITH RARE FELDSPATHIC GRIT AND SILLIMANITE, CORDIERITE AND GARNET-BEARING PARAGNEISS (Arn) OF THE PENRHYN GROUP OVERLIES THE BASEMENT COMPLEX IN A STRUCTURALLY COMPLEX BELT THAT CROSSES THE CENTRAL PART OF THE AREA. ROCKS NEAR THE BASEMENT-COVER CONTACT USUALLY POSSESS HIGHLY SHEARED AND CATACLASTIC TEXTURES SUGGESTING SOME DIFFERENTIAL MOVEMENT. MOBILIZATION AND RESULTING INTERMINGLING OF GNEISS, GRANITIC ROCK AND ORTHOQUARTZITE IN A NARROW (LESS THAN 10 m.) ZONE IS COMMON. THE BASAL SEQUENCE IS FOLLOWED BY A MARBLE UNIT (Arc) THAT THICKENS MARKEDLY TO THE NORTH AND BY PARAGNEISS (Arn) WHICH IS THE UPPERMOST UNIT SEEN IN THIS REGION. THE BASAL SEQUENCE HAS BEEN REPEATEDLY BROUGHT TO THE SURFACE BY FOLDING IN THE NORTHERN PART OF THE AREA. THERE IT INCLUDES GREY-GREEN DIOPSIDE-ACTINOLITE-CHLORITE AGGLOMERITIC ROCK POSSIBLY A META-BASOLITE AND GARNET-SILLIMANITE SCHIST. THE OVERLYING MARBLE UNIT IS THICK AND GENERALLY MASSIVE BUT IN ITS NORTHERMOST OUTCROPS, TOWARD THE BODY OF BASEMENT GNEISS NEAR THE NORTH BORDER, APPARENTLY PASSES THROUGH A FACIES CHANGE INTO AN INTERBEDDED SUCCESSION OF MARBLE, PARAGNEISS AND CALCIUM-SILICATE GNEISS. CROSS-SECTION B-B' ACCOMPANYING MAP-SHEET 46 O/2 ILLUSTRATES THESE VARIATIONS.

COMMONLY LEUCOCRATIC INTRUSIVE ROCKS OF GRANODIORITIC, QUARTZ MONZONITIC AND GRANITIC COMPOSITION BEARING BIOTITE AND HORNBLENDE, OR IN PLACES, HORNBLENDE ARE PLENTIFUL IN THIS AREA BUT GENERALLY OCCUR ONLY IN SMALL BODIES. MANY ARE FOUND ALONG THE COMPLEX SOUTHERN MARGIN OF THE PENRHYN GROUP WHERE THEY OBSCURE STRUCTURAL AND STRATIGRAPHIC FEATURES. SIGNIFICANT AMOUNTS OF INTRUSIVE ROCK WERE INTRUDED ALONG THE BASEMENT-COVER CONTACT ALONG THE SOUTHERN BORDER OF THE LARGE ELONGATE DOMAL STRUCTURE IN THE NORTH PART OF THE AREA. POSSIBLY THE PRESENCE OF WATER IN THE SEDIMENTS FACILITATED MELTING NEAR THE UNCONFORMITY OR ELSE THAT PLANE FAVOURED PASSAGE OF THE PLUTONS.

EARLY DEFORMATION OF THE BASEMENT COMPLEX AND THE PENRHYN GROUP (D_2) PRODUCED PERVASIVE FOLIATION NEARLY PARALLEL TO COMPOSITIONAL LAYERING AND IS BELIEVED RESPONSIBLE FOR ATTENUATED RECUMBENT FOLDS AND GNEISSIC SHEETS FOUND ALONG THE SOUTHERN MARGIN OF THE PENRHYN GROUP. SHALLOW DIP OF MOST STRUCTURES AND LOW RELIEF COMBINE TO COMPLICATE THE OUTCROP PATTERN AND MAKE UNDERSTANDING OF THE STRUCTURES DIFFICULT. THE MAJOR FOLD SHOWN ON THE CROSS-SECTION MAY BE AN EXTENSION OF THE FOLDED GNEISSIC SHEET SOUTHWEST OF QUARTZITE LAKE IN MAP-AREA 46 P/4. STRUCTURES ASSOCIATED WITH D_2 ARE FOUND ONLY IN WESTERN PARTS OF THE AREA AND ARE BEST SEEN ON CROSS-SECTION B-B' (MAP-SHEET 46 O/2). THE SMALL RECUMBENT FOLDS FOUND WEST OF THE MAJOR RIVER IN THE NORTHWESTERN PART OF THE AREA MAY BE RELATED TO EITHER D_2 OR D_3. RELATIONSHIPS BETWEEN EARLY FOLIATION (S_2) AND THESE STRUCTURES WERE NOT OBSERVED. LARGE UPRIGHT AND OPEN FOLDS TRENDING NORTH-NORTHEASTERLY ARE ASSIGNED TO D_4 AND CLEARLY AFFECT EARLIER STRUCTURES. VARIATIONS IN PLUNGE OF THESE FOLDS TO FORM ELONGATE DOMAL BODIES OF BASEMENT GNEISS MANTLED BY THE PENRHYN GROUP ARE ATTRIBUTED TO THE EFFECTS OF D_5. LONG, NORTH-NORTHWESTERLY TRENDING FAULTS WITH APPARENT LEFT-LATERAL DISPLACEMENTS OF ABOUT 1/2 KM FORMED DURING D_6.

GENERAL GEOLOGY

THE FOXE FOLD BELT EXTENDS IN AN EAST-NORTHEAST DIRECTION FROM SOUTHERN MELVILLE PENINSULA TO CENTRAL BAFFIN ISLAND. IT IS COMPOSED OF GRANITOID GNEISSIC ROCKS OF ARCHAEAN AGE (2500 Ma AND OLDER) OVERLAIN BY META-SEDIMENTARY ROCKS OF EARLY PROTEROZOIC AGE (APPROXIMATELY 2500 TO 1700 Ma) OF THE PENRHYN AND PILING 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 GRANITIC ROCKS (Ag) WITH RELATIVELY MINOR AMOUNTS OF AMPHIBOLITE (Am) AND PARAGNEISS (An) AND OTHER META-SEDIMENTARY ROCKS (A_{rc}-A_{mb}). 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 GNEOUS 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 AMPHIBOLITIC BODIES, PRESUMED TO BE DYKES, ARE OFTEN OBSERVED WITHIN THE COMPLEX AND SOMETIMES AT THE CONTACT WITH THE PENRHYN 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 PENRHYN 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 PENRHYN GROUP CONSISTS OF PARAGNEISS (Arn Amp) AND MARBLE (Arc) WITH SOME QUARTZ-BIOTITE PSAMMITE (A_{rb}-A_{rqb}-A_{rp}) AND CALCIUM-SILICATE GNEISS (A_{rcs}) AND MINOR QUARTZITE (A_{rq}), GARNET, BIOTITE AND SILLIMANITE SCHISTS (A_{rmb}), AND META-VOLCANIC ROCKS (A_{rv}-A_{rvb}-A_{rvp}). COMPLETE UNDERSTANDING OF THE STRATIGRAPHIC SUCCESSION IS LACKING AS MOST UNITS ARE DISCONTINUOUS AND LENSOID AND THE POSSIBILITY OF THE EXISTENCE OF FACIES CHANGES, UNCONFORMITIES AND CRYPTIC EARLY STRUCTURES RENDERS ITS DELINEATION DIFFICULT. A GENERAL ORDER TO THE UNITS CAN BE INDICATED, NONETHELESS. A THIN (50-100 m) BASAL SEQUENCE INCLUDES ORTHOQUARTZITE, RUSTY SILLIMANITE SCHIST, A SUSPECTED META-BASOLITH AND MINOR AMPHIBOLITE. MARBLE AND QUARTZO-FELDSPATHIC GRIT. THIS SEQUENCE IS OVERLAIN BY A PREDOMINANTLY CALCAREOUS UNIT OF MARBLE, CALC-SILICATE GNEISS AND INTERBEDDED QUARTZ-BIOTITE-FELDSPAR PARAGNEISS. THE CALCAREOUS UNIT IS FOLLOWED BY A THICK UNIT OF PARAGNEISSIC ROCKS WITH A THIN NECK OF SCHISTOSE PARAGNEISS AT ITS BASE AND A UNIT OF MARBLE, CALCIUM-SILICATE GNEISS AND BIOTITE QUARTZITE. AT THE HIGHEST OBSERVED STRUCTURAL AND STRATIGRAPHIC LEVELS IS A UNIT OF QUARTZ-BIOTITE-MUSCOVITE PSAMMITE AND PSAMMACHE. THE TOP OF THIS UNIT HAS NOT BEEN OBSERVED. THE RELATIONSHIP OF PRESENT TO ORIGINAL THICKNESS OF THE GROUP IS WELL DISGUISED BY THE RIVAL PROCESSES OF THINNING DURING DEFORMATION. REPETITION BY FOLDING AND DILATION BY SYNTECTONIC PLUTONISM.

THE PENRHYN 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 ORTHOQUARTZITE UNIT WITH RARE FELDSPATHIC GRIT BEDS LYING UPON A VARIETY OF ROCK TYPES IN THE COMPLEX. THE UPPERMOST UNIT OF THE PENRHYN GROUP MAY BE SEPARATED FROM THE REST OF THE GROUP BY AN UNCONFORMITY. CONTRASTS IN INTENSITY OF METAMORPHISM AND DEFORMATION AND UNEXPLAINED STRUCTURAL DISCORDANCE SUPPORT SUCH AN INTERPRETATION BUT RAPID TRANSITIONS OR FAULTING REMAIN VIABLE ALTERNATE EXPLANATIONS.

METAMORPHISM OF THE PENRHYN 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 PSAMMITES AND/IN MARBLE. DIOPSIDE-FORSTERITE-CALCITE AS WELL AS SCAPOLITE AND A HUMITE 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 ANDALUCITE ARE COMMON IN META-PSAMMITIC UNITS AND TREMOLITE OCCURS SPORADICALLY IN CALCAREOUS ROCKS.

POLYPHASE STRUCTURES INDICATING NUMEROUS EPISODES OF DEFORMATION OF THE BASEMENT COMPLEX AND THE PENRHYN GROUP EXIST THROUGHOUT THE FOLD BELT BUT UNEQUIVOCAL SEQUENTIAL RELATIONSHIPS AMONG THEM ARE RARE. THE EARLIEST DEFORMATIONAL PHASE (D_1) IS INFERRED TO HAVE AFFECTED THE BASEMENT COMPLEX PRIOR TO DEPOSITION OF THE PENRHYN GROUP. LITTLE IS KNOWN OF THIS PHASE. THE SECOND PHASE (D_2), THE EARLIEST OBSERVED IN THE PENRHYN GROUP, IS BELIEVED TO HAVE FORMED ATTENUATED ISOCLINAL FOLDS AND UBIQUITOUS FOLIATION (S_2). IN ALL BUT A FEW OUTCROPS S_2 IS PARALLEL TO BEDDING (S_0). MEAGRE EVIDENCE SUGGESTS THAT THE TREND OF D_2 STRUCTURES MAY HAVE BEEN NORTHERLY. THE EFFECTS OF D_2 ON THE PENRHYN GROUP REMAIN PROBLEMATICAL, BUT MAY BE RESPONSIBLE FOR SOME OF THE OBSERVED DISCONTINUITY OF UNITS DESCRIBED ABOVE.

THE THIRD AND FOURTH PHASES (D_3 AND D_4) PRODUCED PROMINENT MESO-AND MEGASCOPIC FOLDS THAT IMPOSE AN EAST-NORTHEAST STRUCTURAL GRAIN IN THE FOXE FOLD BELT. D_3 FOLDS ARE TIGHT TO NEARLY ISOCLINAL AND USUALLY RECUMBENT. AXIAL PLANE FOLIATION (S_3) IS NEARLY PARALLEL TO LIMBS (S_0) AND HENCE AT D_3 RENDERING SEPARATION OF PHASES D_2 AND D_3 VERY DIFFICULT. D_4 FOLDS ARE COAXIAL OR NEARLY SO. WITH D_3 BUT ARE MORE OPEN AND GENERALLY UPRIGHT OR SLIGHTLY OVERTURNED. MESOSCOPIC D_4 FOLDS CAN OFTEN BE OBSERVED TO HAVE DEFORMED EARLIER STRUCTURES.

NORTH TO NORTHEASTERLY TRENDING BROAD TRANSVERSE FLEXURES (D_5) 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 NORTHWESTERLY TRENDS ARE EVIDENCE OF THE LAST PHASE OF DEFORMATION (D_6). MOST FAULT DISPLACEMENTS APPEAR TO BE LEFT-LATERAL AND EAST-SIDE-UP.

METAMORPHISM IS BELIEVED TO HAVE ACCOMPANIED ALL PHASES OF DEFORMATION EXCEPT D_5 AND D_6. IT POSSIBLY REACHED ITS ZENITH DURING D_3 BUT MINERAL RECRYSTALLIZATION OUTLASTED MUCH OF THE PENETRATIVE DEFORMATION.

MASSIVE AND FOLIATED PLUTONIC ROCKS (A_g), CHIEFLY OF HORNBLENDE AND BIOTITE GRANODIORITE QUARTZ MONZONITE AND GRANITE INTRUDE THE BASEMENT COMPLEX AND THE PENRHYN 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 PENRHYN GROUP, ARE ASSIGNED TO THE COMPLEX (A_g). WHERE INTRUSIVE INTO THE GROUP THEY (A_g) ARE CONSIDERED TO BE PRE- OR SYNTECTONIC WITH THE MAIN PHASES OF DEFORMATION. IN SOME LOCALITIES INTIMATE MIXING WITH AND PARTIAL MELTING OF PARAGNEISS WAS CREATED ROCK MAPPABLE ONLY AS MIGMATITE (A_{mg}) ALTHOUGH LARGE SCREENS AND ZENOLITHS CAN BE DISTINGUISHED IN PLACES. COMMON LOCAL FORMATION OF PEGMATITE AND LEUCOCRATIC GRANITIC ROCK (A_g) IS BELIEVED COEVAL WITH DEFORMATION ALSO. MASSIVE, OFTEN CROSS-CUTTING PLUTONS (A_g) INVADED THE PENRHYN 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, 1976). DEFORMATION OF THE BASEMENT AND THE PENRHYN GROUP MAY HAVE TAKEN PLACE 2139 Ma AGO (LACKSON AND TAYLOR, 1972) AND AGAIN DURING THE HUDSONIAN OROGENY (CLIRKE 1700 Ma AGO). POST-TECTONIC PLUTONS (1600 Ma OLD; HEYWOOD, 1966) WERE EMPLACED INTO THE FOLD BELT LATE IN THE OROGENIC HISTORY. FOLLOWING EXTENSIVE UPLIFT AND EROSION, DIABASE DYKES (Hd) PRESUMED TO BE PART OF THE MACKENZIE DYKE SWARM OF CIRCA 1000 Ma AGE (FAHRIG, 1970) CUT ROCKS OF THE FOLD BELT. THESE ARE SPATIALLY ASSOCIATED WITH FAULTS AND FRACTURES FORMED DURING D_6 TECTONISM. SUBSEQUENT UPLIFT AND EROSION WAS FOLLOWED BY DEPOSITION OF ORDOVICIAN 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, W.W. 1967. GEOLOGICAL NOTES NORTHEASTERN DISTRICT OF KEEWATIN AND SOUTHERN MELVILLE PENINSULA, DISTRICT OF FRANKLIN, NORTHWEST TERRITORIES (PARTS OF 46-O, 56, 57). GEOLOGICAL SURVEY OF CANADA, PAPER 66-40.

JACKSON, G.D. AND TAYLOR, F.C. 1972. CORRELATION OF MAJOR ARCHEAN ROCK UNITS IN THE NORTHERN CANADIAN SHIELD: CANADIAN JOURNAL OF EARTH SCIENCES, VOLUME 9, PP. 1650 - 1669.

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