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Aller au sommaire du numéro

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THE ATLANTIC GEOSCIENCE SOCIETY

The following is a resume of the geological and geophysical research being carried out by many institutions and individuals in the Atlantic Provinces of Canada. These projects were presented to a meeting of the Atlantic Geoscience Society in early 1979, and were submitted later to MARITIME SEDIMENTS by Howard Donahoe, Nova Scotia Department of Mines and Energy, on behalf of his colleagues on the organizing committee: Lain Ferguson (Mount Allison University), and Gunter Muecke (Dalhousie University). The meeting was chaired by the Society's president, Dr. Sandra Barr (Acadia University) and included 40 papers covering several major topics. More than 110 geoscientists from the Maritime Universities, federal and provincial government organizations, and exploration companies attended the colloquim.

Stratigraphy and Sedimentation

DEPOSITIONAL AND ENVIRONMENTAL INTERPRETATION OF THE MEANDER RIVER CARBONATE SHEET, AVONDALE, HANT CO., NOVA SCOTIA

DAVID E. BROWN, Department of Geology, Dalhousie University, Halifax, Nova Scotia

Detailed investigation of the Lower Carboniferous Meander River carbonate sheet (Limestone 2, Subzone D of the Windsor Gp.) exposed at Avondale, Hants Co., Nova Scotia reveals a pair of incomplete, asymmetrical transgressive and regressive cycles.

Lithologies present are (1) ostracodal biosparite; (2) oosparite; (3) biosparite-calcisiltite; (4) flat-lying laminated pelsparite; (5) algal laminated pelsparite; (6) undulating laminated pelsparite; (7) pelsparite breccia and pesudobreccia; (8) sparitic mudstone and grainstone; (9) interbedded red and brown mudstones, siltstones, sandstones and conglomerates; and (10) laminated algal sparite.

Nine lithofacies were identified and they are (in ascending order): (1) marginal marine marsh; (2) oolitic shoals; (3) shoal lime sands, (4) subtidal to intertidal lagoon; (5) supratidal lagoonal fringe; (6) lagoonal intertidal flats; (7) calcrete soil; (8) alluvial fan mudflows and fluvial sediments bounded above and below by massive red and green fluvial siltstones.

The initial transgression of the carbonate complex is represented by lithofacies 1-3. A very rapid regression prevented the deposition of an inversion of lithofacies 1-3 over the initial transgressive units, and resulted in the seaward progradation of the nearshore lagoonal facies 4. This is transitional to lithofacies 5 which is slightly eroded and overlain by pelsparites of lithofacies 6, representing a second, subdued transgressive pulse. Lithofacies 6 probably continues on as a shallowing upwards sequence, but is obscured due to the later formation of a calcrete soil (lithofacies 7), on the subaerally exposed sediments of lithofacies 6. This soil is preserved by the rapid deposition of fanglomerate sediments of lithofacies 8. Lithofacies 9 is located within the sediments of lithofacies 8.

The probable mechanism which controlled the rise and/or fall of the ancient sea level was basinal faulting and warping. Only very slight changes in bottom slope and/or elevation were required since water depths probably only ranged from 0-4 in this area.

PROVENANCE AND DEPOSITIONAL HISTORY OF THE MCARAS BROOK FORMATION, ANTIGONISH COUNTY, NOVA SCOTIA

PHILIP W. FRALICK, Department of Geology, Dalhousie University, Halifax, Nova Scotia

The McAras Brook Formation is a continental, sedimentary and volcanogenic unit which was deposited in the Merigomish Structural Basin during the Late Paleozoic. It may be subdivided into two members. The lower conglomeratic member is composed of fanglomerates which accumulated along both sides of the fault-bounded basin. Intervals of basement instability during this depositional episode are reflected by basaltic flows present in the lower member. One such interval of instability along the Hollow Fault caused a major change in the drainage pattern. A fluvial system advanced over the fanglomerate at the type section. The fault movement causing this may have been the southern Antigonish Massif rising while the northern section sank with the fluvial system transgressing over this sunken area.

During deposition of the lower member at the type section, the Knoydart Formation (Devonian) was exposed to the south of the Hollow Fault. The Browns Mountain Group (Precambrian to Ordovician?) gradually became exposed during deposition of the upper member. The upper strata of this Group was composed mostly of green quartzite during the Mississippian. These units have been completely eroded since Mississippian time.

A similar investigation to the one carried out on the McAras Brook Formation is planned for the River John Group and possibly younger strata. This inquiry will be intended to shed more light on source areas for the Stellarton Gap sediments and how these source areas and dispersal patterns changed through time due to tectonic activity.

HOLOCENE SEDIMENTATION ON THE NOVA SCOTIAN CONTINENTAL SLOPE

P.R. HILL, Department of Geology, Dalhousie University, Halifax, Nova Scotia

Investigation of 33 gravity cores and 3 piston cores from the upper slope off Nova Scotia has shown that three Holocene lithologies are present: (a) olive grey sand to muddy silt (b) olive grey mud (c) dark yellowish brown mud. The surficial olive grey sand shows a continuous downslope gradation in grain-size characteristics to the olive grey mud. Bioturbation is pervasive, but cross-core correlations suggest an alternation between the olive grey and dark yellowish brown muds during the Holocene. After further characterisation of the facies, using benthonic foraminifera and mineralogy, it is intended to construct feasible models for the surficial sediment distribution using continuous current-meter data

available on the slope, and to postulate differences in the gross oceanographic circulation which affected sedimentation conditions in the earlier Holocene.

STILL WATER SETTLING RATES OF MARINE SEDIMENT AND THEIR EFFECTS ON SEDIMENT TEXTURES

KATE KRANCK, Atlantic Oceanographic Laboratory, Bedford Institute, Dartmouth, Nova Scotia

As part of general research on the transport and flocculation dynamics of suspended particulate matter the settling of artificial sediment suspensions has been studied. The results demonstrate profound differences in the size-rate relationships in fresh and salt water settling. Fresh water settling follows Stokes' law whereas the settling rate in salt water is an exponential function of the concentration. The grain size distribution of clastic sediment reflects the type of settling and the concentration of the suspension from which the sediment from various environments show features indicative of settling conditions and allow distinction between material settled as single grains and as flocs.

THE WHITE ROCK FORMATION (UPPER ORDOVICIAN-LOWER SILURIAN) OF NOVA SCOTIA: A GLACIO-EUSTATIC EVENT

E. LANE, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

Mixtite and quartz arenite rock types appear in an isolated position between Ordovician and Upper Silurian black graptolitic slates in the White Rock Formation. Their presence is related to extreme changes in geography and sedimentation at the end of the Ordovician.

Mixtites constitute part of a shallow glacio-marine sedimentary rock assemblage which includes slates, storm-bed arenites, rhythmites, shelly fauna, pillow basalts, and ash flow felsic volcanic rocks. The Halifax Formation of slate, directly below, lacks evidence of shallow-marine origin. The mixtites contain extrabasinal clasts of meta-quartzites and metavolcanic rocks enclosed in poorly sorted arenaceous slates. Finely laminated rhythmites of pure silt and clay were deposited under unusual conditions such as an ice-covered sea.

The quartz arenites appear in most places as amalgamated beds, 10 to 30 m thick which regionally are a minimum of 150 km long by 20 km wide. The lower sheet abruptly overlies the glacio-marine rock assemblage, and is separated by the upper "sheet arenite" from a black slate unit. The arenites are considered to be the products of large-scale erosion and reworking of sand that occurred during major postglacial sea transgressions in the Early Silurian.

The mixtites and "sheet arenites" are significant time-rock units which reflect important events of widespread ice (glaciation) and major marine transgression during postglacial eustatic readjustment. A similar stratigraphic record of events is preserved in other areas where the Ordovician-Silurian is present.

Also, cold climate rock types, such as mixtites, aid in defining the close paleogeographic association between Saharan Africa and the eastern Appalachians during the Ordovician.

DEPOSITIONAL AND DIAGENETIC MODELS FOR THE SILURIAN OF THE N. APPALACHIANS

J. NOBLE, Department of Geology, University of New Brunswick, Fredericton, New Brunswick.

Research involves the comparison of the Chaleur Bay and Avalon platforms during the Silurian in order to test the conflicting hypotheses concerning the closing of the Iapetuc Ocean. In particular, detailed studies by the author in the Tetagouche area (Chaleur Bay platform) of New Brunswick are compared with published studies in the Arisaig area (Avalon platform) with respect to faunas and sediments. Both areas have rich faunas and both are known with reasonable certainty to be intertidal to shallow subtidal in their depositional environments, throughout most of the Silurian.

ASTROPOLITHON HINDII - A PHYSICAL OR BIOGENIC SEDIMENTARY STRUCTURE

R.K. PICKERILL, Department of Geology, University of New Brunswick, Fredericton, New Brunswick

Trace fossils in the Cambro-Ordovician Meguma Group of Nova Scotia are poorly documented and generally remain undescribed. One exception concerns the structure *Astropolithon hindii*, which was first described by Dawson as long ago as 1878 and interpreted by him as biogenic in origin. Subsequent workers, both in the Meguma Group and elsewhere, have accepted Dawson's interpretation and recent workers in ichnology have erected new ichnospecies based on subtle morphological variation from the type *A. hindii*. It is suggested here that *A. hindii* is a physical as distinct from a biogenic sedimentary structure and merely represents one variation in a whole spectrum of morphologically variable tectonically deformed sand volcanoes produced as a result of fluidization of rapidly deposited turbiditic sheet sandstones. If this interpretation is accepted *Astropolithon* should from henceforth be regarded as a pseudofossil and its name removed from ichnological literature.

DALHOUSIE COASTAL SEDIMENTOLOGICAL RESEARCH

D.J.W. PIPER, Department of Geology, Dalhousie University, Halifax, Nova Scotia

The Department of Geology at Dalhousie has a low cost mapping programme (funded principally by Canada Department of Energy, Mines and Resources) in the nearshore zone of the South Shore of Nova Scotia, extending from the coastline to the 50-m isobath. Sedimentological studies are concerned principally with the historical development of the sediment distribution pattern, and the process presently active in moving sediment. The work is relevant to problems concerning nearshore aggregate resources, placer mineral concentrations, dispersal of pollutants and beach erosion. Other Dalhousie coastal research elsewhere in Nova Scotia and in Labrador will also be reviewed.

Windsor Group Stratigraphy

TIME MARKER BEDS WITHIN THE WINDSOR GROUP SEDIMENTS

IAN A. AUSTIN, Department of Geology, Acadia University, Wolfville, Nova Scotia

Litho- and biofacies studies of Windsor sediments, undertaken to correlate stratigraphically the various units, have been hampered by facies variations across the depositional basin. This study has attempted to resolve this difficulty on the supposition that airfall volcanics might be present in the basin providing marker horizons.

Two such events, one in the A subzone and one in the C subzone have been discovered.

The main thrust of the study has been to identify the occurrences and the appearance of such "beds" in various energy settings.

GEOCHEMISTRY OF GRANITOID PLUTONS OF CAPE BRETON ISLAND

SANDRA M. BARR, Department of Geology, Acadia University, Wolfville, Nova Scotia

A study of the petrology and geochemistry of granitoid plutonic rocks in Cape Breton Island has been undertaken with support from the Nova Scotia Department of Mines and Energy. This project was initiated during the summer of 1978. Six plutons, selected to represent different ages, geographic areas, and lithologies (both mineralized and unmineralized) were mapped and sampled in detail. Petrographic studies and chemical analyses for major elements and 18 minor and trace elements are nearing completion. Selected plutons studied in detail will serve as "type plutons" to which others may be compared. It is anticipated that in this way a relatively complete petrological and chemical characterization of plutonic rocks in Cape Breton Island can be completed within a few years. These data will be useful in interpreting geological and tectonic history, and in mineral exploration programmes.

THE LINDSAY BROOK MARKER: A LOWER WINDSORIAN CALCRETE

STEVEN HARNISH, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

The Lindsay Brook Marker, recognized only in the Musquodoboit Valley, is a prominent stratigraphic marker at or near the top of the Meaghers Grant Formation of the Windsor Group.

The Marker consists of an alternating sequence of partially recrystallized carbonates and maroon siltstones, with interbedded evaporites. Calcrete pisolites, coarse-blocky calcite, pedodeses, meniscus cement, and polygonal, mottled and clotted textures indicate that the carbonates have undergone calcretization. Nodular evaporite and anhydrite-filled pores indidate a sabkha. Massive evaporites suggest a basinal precipitate.

Provenance of the clastic sediments (quartz, feldspars) and scanty paleocurrent data obtained from the Meaghers Grant Formation strongly indicate that allochthonous calcrete isolites below the Lindsay Brook Marker were derived from the east.

This evidence suggests deposition in a semi-arid coastal desert which underwent multiple regressions from an easterly to north-easterly direction. Paleotopography indicates that the Lindsay Brook Marker was an early Windsorian strandline. Shark Bay, Australia could be considered a recent analog to the Lindsay Brook Marker.

THE WINDSORIAN MACUMBER LITHOLOGY - REVISITED

P.E. SCHENK, Department of Geology, Dalhousie University, Halifax, Nova Scotia

A decade ago I interpreted this laminated carbonate to be an algal mat unit deposited within the intertidal zone of a very irregular shoreline. Today in arid settings, such algal mats reach 5 km width. The unit would record a specific environment, not a specific time, and should recur repeatedly during the many Windsorian transgressions. Usually the lithology is exploded by subsequent growth of gypsum nodules. Since 1969 extensive drilling has recorded a very extensive, apparently continuous sheet of the lithology near the base of the Windsor Group. Alternative environments are possible. Constraints are episodic processes to cause lamination, absence of burrowers to preserve the laminations, a hostile environment almost to exclude skeletal debris, processes to construct particulate pellets, peloids and coated grains, and rare sun-crack polygons, and a lithotope capable of making a widespread sheet best developed early in Windsorian time.

Subtidal settings do not satisfy all constraints. Processes invoked include sulfate-reducing bacteria, subtidal algal mats, and debris-turbidity flows. Main support comes from the Gays River mound (B. Hatt) where Macumber lithology overlain by thick sulfate does occur far down at 40° primary dip, and where slump blocks also occur near the base of the mound.

High supratidal settings in a humid environment would use the analogy of western Andros Island, Bahamas. Storm-swash carries peletoidal debris over a 10x160 km intertidal-supratidal area including a fresh-water marsh up to 8 km wide. The optimal preservation of the Macumber lithology early in Windsorian time could be due to a climatic change from humid Hortonian time. Associated evaporites must be explained.

The easiest environment is in the intertidal-supratidal zone of a serpentine, ulti-lagoonal coast subject to frequent storms in an arid environment. In general the lower Windsor Group is remarkably similar to the still controversial Salina Group of the Michigan Basin, Winnipegosis Formation of the Williston Basin, and the Messinian sediments of the Mediterranean Basin.

Paleontology

TRACE FOSSILS IN THE MATAPEDIA BASIN

J. ALLISON and R.K. PICKERILL, Department of Geology, University of New Brunswick, Fredericton, New Brunswick

The Grog Brook and Matapedia Groups of the Matapedia Basin (Upper Ordovician-Lower Silurian) of northwestern New Brunswick represent c. 10,000 of resedimented clastic and calcareous flysch. Thus far, 19 ichnogenera have been identified from this flysch assemblage and an additional 4 tentatively assigned. These ichnogenera include *Belorhaphe, Buthotrephis, Chondrites, Cochlichnus, Cosmorhaphe, Dactylophcus, Fucusopsis, Glockeria, Gyrochorte, Helminthoida* spp., *Helminthopsis, Neonereites, Paleodictyon, Planolites, Protopaleodictyon, Saerichnites, Scalarituba, Spiro-*

phycus, Taenidium and possibly *Asterosoma, Bifasciclus, Scolicia, Yakutatia* and other as yet unrecognizable traces. The trace fossil assemblage is clearly a deep water association. The age range of a few forms may now be extended back into the Upper Ordovician-Lower Silurian. The presence of a highly diverse Upper Ordovician-Lower Silurian ichnocoenosis makes suspect previous models on flysch trace fossil diversity proposed for example by Crimes and Seilacher. The turbiditic nature of the sediments and their marked thickness, the relatively narrow width of the basin and the deep water ichnoassemblage suggests that the Matapedia Basin was tectonically controlled.

A NEW DEVONIAN FLORA FROM NOVA SCOTIA

W.H. FORBES, Department of Geology, University of Maine at Presque Isle, Presque Isle, Maine
A.E. KASPER, Department of Botany, Rutgers University, Newark, New Jersey.
H.V. DONOHOE and P. WALLACE, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia

For the last few years the Nova Scotia Department of Mines has been involved in mapping the Cobequid Highlands which lie to the north of the Minas Basin in the Bay of Fundy. During the summer of 1977, Wallace discovered plant fossils along a section of Murphy Brook which flows into the Economy River. Subsequent collecting during the 1977 and 1978 field seasons have produced one of the most unique and diversified assemblages of Devonian-age plant fossils to date in Nova Scotia.

The plant fossils are found in rocks belonging to the Portapique-Parrsboro Succession. This succession consists of approximately 3 km of graywacke, siltstone, mudstone, red shale, rhyolite and basalt. The succession is intruded by a granitic pluton that is Late Devonian to Early Carboniferous in age.

The 280 m thickness of plant-bearing beds on Murphy Brook is a fault bounded cyclically bedded siltstone, graywacke, and conglomerate sequence, with the fossil plants consistently found immediately below a well-sorted volcanic conglomerate 1-2m thick, in a black, fine-grained siltstone. Fertile *Taeniocrade*, a lycopod similar to *Drepanophycus*, and several pseudomonodial axis and sporgania referable to the genus *Psilophyton* are recorded to date.

DEVONIAN PALEOBOTANY IN MAINE AND ATLANTIC CANADA

ANDREW E. KASPER JR., Department of Botany, Rutgers University, Newark, New Jersey, U.S.A.

The Devonian continental strata in the Maritimes and adjacent Maine and Gaspe Peninsula hold the best preserved record of early land plant evolution in the New World. These now classical localities were first studied by J.W. Dawson in the second half of the 1800's. This region is at present undergoing intensive re-investigation.

The recent reclassification of early land vascular plants or "psilophytes" has shown the presence of three apparently natural complexes and has established a framework for speculation regarding their evolutionary trends.

ECOLOGY AND TAPHONOMY OF RECENT BRACHIOPODS

J.P. NOBLE, Department of Geology, University of New Brunswick, Fredericton, New Brunswick
A. LOGAN, Department of Geology, University of New Brunswick in Saint John, Saint John, New Brunswick

Comparative studies of life and associated death assemblages of the North Atlantic brachiopod Terebratulina septentrionalis shed considerable light on the processes of fossilization of brachiopod populations. Comparison of size frequency distributions, growth curves, morphologic variation and other parameters in the natural environment and in experimentally controlled sea-water tanks allow the assessment of factors of population dynamics in producing fossil populations, and the separation of these factors from taphonomic factors. Patterns of recruitment appear more important than patterns of mortality and both appear more important than taphonomic factors in controlling the age-structure and other aspects of the fossil population.

Mineralogy

ANDALUSITE, BIOTITE, CORDIERITE AND GARNET IN THE GRANITES OF SOUTHERN NOVA SCOTIA

R.N. ABBOTT, D.B. CLARKE, and M.A. MACDONALD, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

The South Mountain batholith and its associated intrusions are highly peraluminous (molar $Al_2O_3/CaO + Na_2O + K_2O = 1.09\text{-}126$) in their chemical compositions. Some of the excess alumina is held in the siderophyllite-eastonite molecule of the trioctahedral micas, and the rest appears as andalusite, cordierite and garnet of magmatic origin. Chemical compositions of co-existing biotite-cordierite, biotite-andalusite and biotite-garnet are given, and these are related to the trend of chemical evolution in the granites.

ORDER-DISORDER PATHS IN ALKALI FELDSPARS

M. CHERRY and L.T. TREMBATH, Department of Geology, University of New Brunswick, Fredericton, New Brunswick

Refined unit cell parameters have been obtained from X-ray diffraction patterns of samples of a microcline perthite heated at 1025°C and 1 atm. and at 700°C and 1 kb H_2) pressure. The disordering path that results from heat treatment has been traced by calculating the Al distribution among the tetrahedral sites in the feldspar samples. This path, previously assumed to follow-up a one-step process, has been shown to comprise: (1) Na-K homogenization without a change in degree of order, (2) rapid movement of Al from the T_1O, T_2M and T_1M sites until monoclinic symmetry is attained and (3) slower movement of Al from the T_1 sites into the T_2 sites of the monoclinic structure until maximum disorder is attained.

GEOCHEMICAL EVOLUTION OF THE SOUTH MOUNTAIN BATHOLITH, NOVA SCOTIA: RARE EARTH ELEMENT EVIDENCE

G.K. MUECKE, and D.B. CLARKE, Department of Geology, Dalhousie University, Halifax, Nova Scotia

The South Mountain batholith consists of a differentiated, peraluminous suite of early biotite

granite, intermediate stage two-mica adamellites, and a number of minor late-stage intrusions of porphyry, leucoadamellite, aplite, pegmatite and greisen. Chemical and petrographic data by McKenzie and Clarke (1975) suggest that the rocks comprise a single comagmatic suite related by the fractional crystallization of biotite and plagioclase. Rare earth elements (La, Ce, Sm, Eu, Tb, Yb, Lu) have been determined for all members of the suite and show a regular depletion through the evolutionary sequence. All analyzed samples show negative europium anomalies (Eu/Eu*) which increase more or less regularly with advanced differentiation. La/Sm decreases regularly through the sequence and Tb/Yb shows a tendency to increase. The factors instrumental in causing the observed rare earth element variation have been assessed by considering the respective roles of fractional crystallization, assimilation of Meguma metasediments, and partitioning of elements into a volatile phase.

Assimilation of Meguma metasediments by partial or complete melting cannot account for depletion of the rare earths in the differentiation squence, since such melts would increase the light rare earth content of the rocks. Fractional crystallization of biotite (+ poikilitically enclosed zircon, apatite etc.) and plagioclase in the approximate ratio 55:45 can generally account for the evolution of average granodiorite to average late-stage rock. The possibility of partitioning of the rare earths into a volatile phase is difficult to assess. Erratic behaviour of the heavy rare earths in some of the highly evolved rocks and greisen samples suggests that rare-earth fluoride complexes in a fluid phase may have affected rare earth distributions during the final stages of crystallization.

CLAY MINERAL ANALYSIS OF MESOZOIC-CENOZOIC SEQUENCES, LABRADOR AND NORTHEAST NEWFOUNDLAND SHELVES

G.R. STEVENS, and J.A. COLWELL, Department of Geology, Acadia University, Wolfville, Nova Scotia
D.C. UMPLEBY, Atlantic Geoscience Centre, Bedford Institute of Oceanography, Dartmouth, Nova Scotia

Clay minerals separated from Mesozoic and Tertiary sediments of the Labrador and northeast Newfoundland Shelves have been analyzed to show the stratigraphic relevance of the clay mineral content, and to evaluate the degree of diagenesis of these minerals in relation to the hydrocarbon potential of the areas.

Results from five wells on the Labrador Shelf show good stratigraphic correlation. Kaolinite, for example, is dominant in early Cretaceous sandstones whereas mid-Cretaceous to early Paleocene dark shales are montmorillonite-rich. The diagenetic conversion of montmorillonite to illite, which is thought to be important in providing water to move hydrocarbons from source beds to reservoirs, is indicated in one well. Gas and condensate discoveries in two of the wells are in a horizon adjacent to the montmorillonite-rich shales.

The investigation has recently been extended to the northeast Newfoundland Shelf. Samples from two wells analyzed to date cover the interval from early Jurassic to mid-Cretaceous, which is generally absent on the Labrador Shelf. Illite is generally dominant, but a few samples in the early Cretaceous have more montmorillonite and one has kaolinite dominant. Diagenesis of montmorillonite and, possibly, kaolinite to illite is suggested.

Correlation of fabric and crystallinity with depth and diagenesis is being attempted by means of texture diffractometry, using the larger cuttings.

Igneous and Metamorphic Petrology

PETROGRAPHY AND GEOCHEMISTRY OF THE CAMBRIAN BOURINOT VOLCANICS OF CAPE BRETON ISLAND, NOVA SCOTIA

KEVIN CAMERON, Department of Geology, St. Mary's University, Halifax, Nova Scotia

The lower Middle Cambrian Bourinot Group of Cape Breton Island consists of volcanic and sedimentary rocks. Rocks of this group are exposed in a narrow belt approximately 30 km long and 1 km wide on the Boisdale Hills, northwest of East Bay in central Cape Breton. The volcanic rocks of the Bourinot Group exhibit a bimodal distribution with basalts and andesites comprising the basic rocks and with rhyolites corresponding to the acid members. Rocks of pyroclastic origin are also present. These volcanics have been metamorphosed to greenschist facies.

The distribution of major and selected trace elements suggests that the Bourinot volcanics are island arc calc-alkaline rocks. The presence of these rocks indicates the existence of a subduction zone in central Cape Breton Island during lower Middle Cambrian time. Geologic evidence indicates that the Bourinot volcanics were emplaced on relatively thin continental crust and near the trench. The thickness of this crust was probably between 25 and 30 km with the trench perhaps 200 km distant. The available trace element data is consistent with the derivation of parental magma from a large-ion-lithophile-element (LILE) enriched upper mantle spinel peridotite overlying the Benioff zone. The rhyolites associated with the Bourinot were probably derived by crustal anatexis caused by the ascending mafic magma.

THE CHARACTER AND ORIGIN OF FLOW-LAYERING IN THE LAVAS OF LEUCITE HILLS, WYOMING, U.S.A.

G.E. PAJARI, JR., W.D. GUNTER, and L.T. TREMBATH, Department of Geology, University of New Brunswick, Fredericton, New Brunswick.

The late Cenozoic Leucite Hills volcanic field in southerwestern Wyoming is composed of rare ultrapotassic silica deficient lavas. Orendite and Wyomingite, two of the more abundant lava types, are occasionally found as alternating centimeter-scale layers in a single lava flow. The major mineralogical difference between wyomingite and orendite is that the groundmass of the former contains leucite while the latter contains sanidine and some leucite. The layering is generally concentric to the outer surfaces of the lava flow although late stage movements have produced folds which vary in style from open warps to isoclinal.

Major element analyses of adjacent wyomingite and orendite layers show no significant chemical differences. Differences in the volume of vesicules are common in adjacent layers and the groundmass of the more vesicular layers are always sanidine rich

(orendite). Atenuation and disruption features indicate that the orendite layers were the less viscous of the two.

The layers were formed during the flow stage and adjacent layers represent the planes of shear and non-shear respectively. The layers which underwent shear were enriched in volatiles and crystallized sanidine.

LIQUID IMMISCIBILITY IN A MINETTE SILL FROM NORTHERN NEW BRUNSWICK

E. SIMPSON, U.N.B., Fredericton, New Brunswick

Globular structures (ocelli) observed in a mica-lamprophyre (minette) sill from northern New Brunswick indicate the possibility that liquid immiscibility has taken place in these rocks. Similarity in composition of common groundmass phases inside and outside the ocelli is evidence for chemical equilibrium between the ocelli and the matrix rock. Preliminary melting experiments on the natural rock have produced two distinct glasses, one clear and one greenish in colour, when approximately 10 weight percent KOH is added to the charge at 1 atm. and 1180°C.

Regional and Structural Geology

ANATOMY OF THE COBEQUID FAULT AND ITS RELATION TO THE GLOOSCAP AND CABOT FAULT SYSTEMS

H.V. DONOHOE, and P.I. WALLACE, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia

The east-west trending Cobequid Fault and adjacent parallel faults form the southern boundary of the Cobequid Highlands over a distance of 155 km. The Cobequid Fault contains many lenticles which range in size from 100 m to 50 km in length and have varied lithologies, structural histories, and ages. One lenticle of Precambrian schists and gneisses has been intruded by a Late Devonian to Early Carboniferous granite and then the granite and rocks in the lenticle were mylonitized along a broad east-west fault zone.

Laterial movement on the Cobequid Fault probably began in Siluro-Devonian time at the onset of the Acadian Orogeny. Episodes of primarily dip slip movement on the Cobequid Fault are recorded by thick wedges of detritus in rocks of Middle Devonian, Westphalian A and B-C, and Middle Triassic to Early Jurassic time. At least 20 km of right lateral movement has taken place in pre-Jurassic time on the Cobequid Fault. Faults parallel to the Cobequid Fault displace Late Triassic-Early Jurassic basalt 3 km by right lateral movement. These faults and the Cobequid Fault are dislocated first by northwest faults, then by northeast and north-trending dip slip faults, some of which are the locus for barite and base metal mineralization.

At the eastern end of the Cobequid Highlands, the Cobequid Fault trend changes to northeasterly and becomes the Alma-Hollow Fault of the Cabot System. Lateral movement on this part of the Cabot System ended with the formation of the Stellarton "graben" in Westphalian time. The faults parallel to the Cobequid trend eastward into the Chedabucto Fault (Glooscap System). Westward the Cobequid Fault merges with the major northeasterly trending faults of southern New Brunswick beneath the Triassic and younger cover of the Bay of Fundy.

THE GEOLOGY OF THE BEAR RIVER AREA, NOVA SCOTIA

EIBHLIN DOYLE, Department of Geology, Acadia University, Wolfville, Nova Scotia

The purpose of this project is to describe in detail the geology of the Bear River area of southwestern Nova Scotia. The area of study covers approximately 200 sq. km and stretches from Acacia Valley in the southwest to Clementsport in the northeast. Mapping was completed on a scale of 1:15,840 during the summer of 1978. The rocks have been mapped as Halifax Formation (Ordovician), White Rock Formation (Ordovician-Silurian) and Torbrook Formation (Devonian). These have been intruded by large numbers of mafic igenous sills of at least two types. Petrographic studies and geochemical analyses for major and minor immobile elements are being done to determine the petrogenesis and tectonic settings of these intrusions. Structural data including bedding, cleavage, fold axes, lineations, kink bands, joints, and fault orientations have been collected. In the field two cleavages were recognized. The earlier cleavage is interpreted to be a compaction cleavage, whereas the later cleavage is related to folding in the area and is axial planar. Kink bands and joints formed later. Analysis of these structures is continuing.

PRECAMBRIAN TECTONICS OF NOVA SCOTIA

J. DUNCAN KEPPIE, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia

The Precambrian rocks of the Avalon Zone in Nova Scotia occur north of the Glooscap Fault System and are divided into three subzones, each of which is subdivided into two domains. From east to west, they are: 1. Cape Breton Island Subzone; (a) Louisburg domain; calc-alkaline, cratonic island arc volcanics (Fourchu Group); (b) Ingonish domain meta-volcanics and meta-sediments (Clyburn Succession and George River Group), unconformably overlying a pre-Hadrynian gneissic basement (Kelly Mountain Complex); 2. Antigonish Highlands Subzone; (a) Cheticamp domain: metavolcanics and metasediments overlying an ultramafic complex; (b) Antigonish domain: submarine volcanics, metasediments and volcaniclastic flysch (Georgeville Group), possibly underlain by ultramafic rocks; 3. Cobequid Highlands Subzone; (a) East Cobequid domain: gneiss, metasediments and metavolcanics (Mt. Thom and Bass River Complexes); (b) West Cobequid domain: volcanics and sediments (Jeffers and North River Successions). Amphibolite facies metamorphism is generally confined to the Ingonish and East Cobequid domains. Intermediate - basic plutonism is predominant in the Antigonish domain, whereas acidic-intermediate plutonism is typical of the Cape Breton Highlands Subzone. All of these late Precambrian rocks were deformed by one or more phases of the Late Hadrynian Wapnakian Orogeny. Tectonic interpretation of these subzones includes a northwesterly dipping subduction zone beneath a cratonic volcanic island arc (Cape Breton Island Subzone), a marginal basin (Antigonish Highlands Subzone) and a remnant cratonic area (Cobequid Highlands Subzone). The caledonian Highland Subzone in southern New Brunswick is correlated with the Cape Breton Island Subzone, displaced by later faulting. These subzones do not appear in the Avalon Zone in Newfoundland, but may occur offshore.

STRUCTURAL AND METAMORPHIC RELATIONSHIPS IN LATE PRECAMBRIAN ROCKS OF NORTHERN CAPE BRETON ISLAND

A.S. MACDONALD and P.K. SMITH, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia

During the summer of 1978, Cape North was mapped in detail and critical sections were examined on St. Paul Island to the north, and in Ingonish area to the south. Similar geological relationships amongst Late Precambrian crystalline rocks appear to exist in this area over a strike distance of at least 60 km. Low- to medium-grade schistose volcanic and sedimentary rocks occur along the eastern margin of the area, abutting a medium- to high-grade gneissic terrain to the west. The latter consist mainly of paragneisses (with a distinctive horizon of marble and pelitic gneiss) extensively injected by a variety of granitoid sheets and lenses. The two sequences of metamorphic rocks appear to be essentially conformable, with no evidence for a major erosional or tectonic break between them. In addition, both sequences have apparently been affected by the same events, although there are obvious differences in tectonic style and metamorphic grade. Two episodes of penetrative folding occurred, with the peak of metamorphism having been attained synchronously with the second episode. This metamorphism is defined as an intermediate-pressure, medium- to high-temperature type. Metamorphic grade increases rapidly towards the west (from biotite, through cordierite and staurolite, to kyanite and sillimanite zones), with higher grade assemblages coinciding spatially with a granitoid lit-par-lit injection complex which is developed mainly in the gneissic sequence but which also overlapped and obscured the contact with the schistose sequence to the east. Older foliated granitic plutons in the area are believed to be late kinematic products of this same metamorphic-anatectic event. This sequence of events is presumed, on the basis of limited available radiometric age dates, to be of Late Precambrian-Early Cambrian age.

CAMBRO-ORDOVICIAN ROCKS IN THE NORTHERN ANTIGONISH HIGHLANDS, NOVA SCOTIA

J.B. MURPHY, Department of Geology, McGill University, Montreal, Quebec,
J.K. KEPPIE, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia , and
A. HYNES, Department of Geology, McGill University, Montreal, Quebec.

Two groups of Cambro-Ordovician rocks have been identified in the northern Antigonish Highlands: Iron Brook and Sugarloaf Groups. The Iron Brook Group consists of red conglomerate, breccia, sandstone and siltstone overlain by a unit of interbedded red slates and thin fossiliferous limestones, succeeded by calcareous tuff, quartzite and ironstone capped by a unit of fossiliferous, green siltstones and slates. On the other hand, the Sugarloaf Group is predominantly volcanic rocks overlying a unit of red conglomerate, breccia, sandstone and slate. Fossiliferous limestone fragments similar to those in the Iron Brook Group occur in the mafic tuffs of the Sugarloaf Group. These two groups are tentatively regarded as laterally equivalent. These rocks have been intruded by a suite of intrusive igneous rocks including gabbro, syenodiorite and feldspar porphyry. The rocks of the Iron Brook and Sugarloaf Groups have been deformed by thrusts and recumbent F1 folds with a penetrative axial plane cleavage, and refoled by NE-SW upright F2 folds, followed by N-S folding. On the basis of style and orientation, the F2 folds are correlated with the major Acadian folds in Silvo-Devonian rocks immediately north of the Hollow Fault. .The age of the F1 folds is inferred to be post-Arenig and pre-Silurian.

THE NOVA SCOTIA - MOROCCO CONNECTION: NEW EVIDENCE

P.E. SCHENK, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

The Meguma Zone fits neither into the Appalachian framework nor into its early Paleozoic history. The Zone is a shoaling succession from deep-sea fan, slope, and outer shelf (Meguma Group) to inner shelf and paralic assemblages (White Rock through Torbrook Formations). The source area was a low-lying, vast, granodioritic and metasedimentary terrain (supported by geochemical study by Mike Liew) to the present southeast. The White Rock Formation is a glacio-genetic unit related to Saharan glaciation (supported by T. Lane) at a time when North America and the Avalon Zone were equatorial. Regional comparison suggests that the Meguma Zone is a displaced chip of Morocco.

New support for this hypothesis comes from widespread evidence in northwest Africa of an Acadian Orogeny which raised a mountainous zone off Morocco during Early and Middle Devonian time.

Deep-crustal study (J.P. Lefort and R. Halworth) suggests that equivalents of the Meguma Zone should be sought between two east-west strike-slip faults in north Africa and southern Portugal. In Morocco, the Bou Regreg Formation lies immediately north of the southern fault, and appears to be identical to Goldenville lithologies of the Meguma Group. A dispersal study last summer of the Bou Regreg indicates westward moving currents which could dovetail with those of the Meguma Group. The two units were deposited in the same environment, at the same time, by a similar dispersal pattern, from a similar host rock, and possibly upon the same crustal slice. Cambro-Ordovician turbidites and shales along the Mediterranean are of Meguma aspect but severely deformed by Alpine tectonics.

Offshore Geology

ORGANIC TYPE AND COLOUR AND HYDROCARBON POTENTIAL, OFFSHORE EASTERN CANADA

J.P. BUJAK, M.S. BARSS and G.L. WILLIAMS, Geological Survey of Canada, Bedford Institute, Dartmouth, Nova Scotia

Diverse views on the meaning of the term kerogen highlight the general absence of a standard terminology in visual studies on dispersed organic matter. At present there is no objective, purely morphological classification of organic material observed in transmitted light. Thus the terms amorphogen, phyrogen, hylogen and melanogen have been proposed for the four types recognized in our studies. Over 250,000 metres of sediments from 75 wells drilled on the Scotian Shelf, Grand Banks and Labrador Shelf have been examined for organic type and colour. Organic

type is closely related to the age of sediments, geographic location and depositional environment, amorphogen being most common in marine strata and hylogen in nonmarine sediments. In most wells examined the combination of organic type and colour indicates poor source rock potential for hydrocarbons. Exceptions are the Labrador Shelf and locally on the Scotian Shelf and Grand Banks, where the strata may reach maturity.

DSDP RESULTS - AN OVERVIEW

A.C. GRANT, Geological Survey of Canada, Atlantic Geoscience Centre, Bedford Institute, Dartmouth, Nova Scotia

Geological samples have been recovered from 451 of the 462 sites drilled to the end of DSDP leg 62 (July, 1978). Oceanic 'basement' rocks were reached at 186 of these sites. These rocks were intrusive into marine sediments or were obviously extruded on sediments at 51 sites. At 59 of the remaining 135 sites basement penetration was less than 10 m; only 15 sites penetrated more than 100 m. Although the crust of the oceans is thus only sparsely sampled, these limited data have important implications because 1) they do not support the 'tape recorder' model for the generation of linear magnetic anomalies on the sea floor, 2) they do not show the hydrothermal alteration prescribed by the plate-tectonic model, and 3) they do not necessarily support current ophiolite models.

ON THE SUBSIDENCE AND THERMAL HISTORY OF RIFTED CONTINENTAL MARGINS

C.E. KEEN, Atlantic Geoscience Centre, Bedford Institute of Oceanography, Dartmouth, Nova Scotia

The subsidence histories of the Labrador and Nova Scotia rifted, continental margins have been determined from biostratigraphic data for 11 deep exploratory wells off Nova Scotia, for 5 wells off Labrador, for 3 wells northeast of Newfoundland, and for one well off the northeast United States coast. The components of subsidence, due to sediment loading, and when possible due to loading by changes in eustatic sea level, were removed, leaving that part of the subsidence - the tectonic subsidence - caused by cooling of the lithosphere or by other deep-seated processes. The thermal cooling model theoretically predicts a linear relationship between tectonic subsidence and $t^{\frac{1}{2}}$, where t is the time since subsidence began. This relationship should be obeyed during the first tens of Ma of subsidence. The slope of this curve depends upon the temperature to which the crust and upper mantle were heated during the initial rifting stage and can be used to derive the temperature - time history within the sediments, the present temperature distribution, and geothermal gradient. The data show that the observed subsidence curves behave in accordance with the thermal cooling model, at least during the first 80 Ma after subsidence began and obey the equation $y = 300(\pm 80)\ t^{\frac{1}{2}}m$ where y is the tectonic subsidence. The slopes of the subsidence curves are similar for the Labrador Shelf, the Nova Scotian Shelf, and the shelf off the northeastern United States. More rapid and variable subsidence occurs northeast of Newfoundland and this may be associated, in a way yet to be established, with the anomalous foundered continental crust near Orphan Knoll and Flemish Cap micro-continents which lie close to this area. After 80 Ma, the subsidence appears to depart from the linear $t^{\frac{1}{2}}$ law in a manner similar to the subsidence curves for oceanic crust but this is not well established by the data. The present temperatures and temperature gradients computed using the slope of the subsidence curves show good agreement with measured values; geothermal gradients of $17.5^{\circ}C\ km^{-1}$ and $26^{\circ}C\ km^{-1}$ are calculated off Nova Scotia and Labrador respectively, and mean values of about $23^{\circ}C\ km^{-1}$ are observed. The computed temperature - time history within the sediments was used to estimate values of vitrinite reflectance, an indicator of the degree of organic metamorphism. These values show reasonable agreement with the measured values and suggest that only the Upper Jurassic and Lower Cretaceous sediments off Nova Scotia and the Paleocene sediments off Labrador are sufficiently mature to be good sources of petroleum. The linear $t^{\frac{1}{2}}$ behaviour of the subsidence, and the good agreement between predicted and observed temperatures support the contention that cooling is largely responsible for the observed tectonic subsidence. The similarity of results from different areas suggests that the usefulness of the method is not restricted to a particular geographical area and may be applied to other rifted continental margins. Comparisons between the subsidence rates, thermal histories and crustal structure at rifted margins on a worldwide scale may provide insights concerning the processes controlling their development. The temperature - time histories of the sediments estimated from the subsidence may be useful in establishing the potential of a rifted margin area for petroleum generation when little other information is available.

RESEARCH PROGRAM OF THE ATLANTIC GEOSCIENCE CENTRE

M.J. KEEN, Atlantic Geoscience Centre, Geological Survey of Canada, Dartmouth, Nova Scotia

The Atlantic Geoscience Centre is a Division of the Geological Survey of Canada, and one of the constituent laboratories of Bedford Institute of Oceanography. Its mandate is to provide advice and information about the earth beneath the sea, and the activities are concentrated - not at all exclusively - upon the coastal regimes, continental margins and adjacent oceans off eastern Canada and the Canadian Arctic. Facets of its work not covered by this statement would include the studies of Paleozoic basins of eastern Canada (including coal in Nova Scotia for example), and palynological and lithostratigraphic studies of material in Deep Sea Drilling Project holes in the Atlantic Ocean basin.

The Division has a staff of about 100 people. The work it does can be broadly divided into the following categories, where specific examples within each category are given.

(1) Modern marine geological processes (sediment in the Bay of Fundy; ice-scour on the shelves).
(2) Basin analysis (regional geology, leading to assessment of resources - hydrocarbons and coal).
(3) Crustal processes (formation of the rifted margins of eastern Canada).

These studies demand work by biostratigraphers, seismologists, experts in potential fields, sedimentologists, geochemists and so on, support in work at sea and in the field, and technological development (such as Ocean Bottom Seismometers). A good deal of

work is done with industry, provincial governments and other federal government agencies. Numbers of graduate students work with the Atlantic Geoscience Centre, and anyone interested should write to the Director, Atlantic Geoscience Centre, Geological Survey of Canada, Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia, Canada B2Y 4A2.

DRILLING ON THE SEA-FLOOR

PATRICK J.C. RYALL, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

Study of two areas of the Mid-Atlantic Ridge at 45°N and 37°N have shown a much more complex geology than was supposed from earlier work. Many of the results point to tectonic disturbance as a feature of the slowly spreading North Atlantic crust. What is needed now is to survey and sample the ridge in fine detail to establish the actual geological framework.

Sampling in such an environment requires a tool which can be positioned accurately. Such a tool exists in the form of the Bedford Institute of Oceanography electric drill. This drill has been operated down to slightly more than 600 m depth. Developments are now underway to extend the capabilities of the drill to greater depths, around 2500 m. Preliminary tests have shown that the drill mechanism itself should be capable of working to that depth. Major effort will have to go into developing handling procedures and ship positioning while drilling.

Geophysical Techniques

ACOUSTIC VELOCITY DETERMINATIONS FROM HUMPBACK REFRACTIONS

A.G. MCKAY, Nova Scotia Research Foundation Corporation, Dartmouth, Nova Scotia.

Conventional shallow penetration seismic reflection equipment can be used to determine acoustic velocities in the seabed material from refracted arrivals if one has available a hydrophone on a sufficient length of cable. This technique is limited by the depth of water covering the area of interest, because extension of the hydrophone cable to lengths sufficient to meet the geometrical requirements for receiving a refraction will eventually lead, with increasing water depth, to a separation between source and receiver which is so great that the desired signals are too weak for detection. The conventional remedy for this problem is to use a source of lower frequency. An alternative is to put both source and receiver closer to the seabed so that the problem reduces once more to what is encountered in shallow water. Two advantages accrue from this approach. First, there is no need to have available a low frequency acoustic source. Second, there is less constraint on the choice of a suitably flat piece of seabed for the velocity measurement, because of the reduced horizontal spread of the source and receiver.

THE ENERGETIC SEARCH FOR COAL BY LOGS

K. HOWELLS, and D. ZWICKER, Nova Scotia Research Foundation Corporation, Dartmouth, Nova Scotia

For the past 200 years, coal has been one of the most important mineral products of Nova Scotia. Geophysical borehole logging has been an integral part of the ongoing coal inventory program. Natural gamma ray and scattered gamma ray (or density) logs provide excellent coal-seam identification due to the low density and low natural gamma ray activity of the coal. The natural gamma ray log may also be used for lithological and coal-seam correlation between boreholes. Modifications to the density probe have improved the resolution to about 2-2.5 inches, the equivalent of a bed resolution density (BRD) tool.

Economic Geology

GEOSCIENTIFIC PROGRAMS OF THE MINERAL DEVELOPMENT DIVISION, NEWFOUNDLAND DEPARTMENT OF MINES AND ENERGY

B.A. GREENE, Newfoundland Department of Mines and Energy, St. John's, Newfoundland

Most of the geoscientific programs of the Newfoundland Department of Mines and Energy are administered by the Mineral Development Division, with funding provided by the Provincial and Federal Governments under the Canada-Newfoundland Mineral Development Subsidiary Agreement and the Uranium Reconnaissance Program. Major field programs currently in progress are: (1) bedrock geological mapping, for publication at the 1:50,000 and 1:100,000 scales; (2) reconnaissance lake sediment geo-chemistry, with detailed follow-up geochemical surveys; (3) mineral commodity evaluation and assessment projects, currently concentrating on gemstones, mineral aggregate, and mineral deposits associated with the Carboniferous and (4) surficial mapping, in support of mineral exploration. Programs without a field component include the establishment and maintenance of a computerized mineral deposits file, the establishment of drill core storage facilities, and various programs related to publications and information services.

APPRAISAL OF COAL SEAM QUALITY IN BOREHOLES USING SIDEWALL CORE SAMPLES

PETER A. HACQUEBARD and M.P. AVERY, Geological Survey of Canada, Atlantic Geoscience Centre, Dartmouth, Nova Scotia

In the offshore coal drilling program at Sydney, Nova Scotia, the coal seam intersections have been sampled with a series of sidewall cores spaced at intervals of 3-6 cm. Position of the cores relative to the seam section was verified with the density and gamma-ray logs. Proximate and maceral analyses were carried out on composite samples in 15-cm increments.

The reliability of the sidewall sampling method has been tested on 1.8-3 m thick intersections of the Harbour seam in three wells. This was done by (1) a comparison with analytical results from conventional core obtained at the same intersection, and (2) a study of the variability in coal petrographic profiles between wells and in relation to the known

pattern previously determined for the seam in the coalfield.

Results show that the sidewall core technique can provide representative and reliable seam data on coal quality and petrography, but not as precise with regard to positioning within the seam section as conventional cores.

THE GEOLOGICA SETTING AND ENVIRONMENT OF BASE METAL DEPOSITION AT THE MINDAMAR MINE, STIRLING, RICHMOND COUNTY, CAPE BRETON

CRAIG MILLER, Department of Geology, Dalhousie University, Halifax, Nova Scotia

The Mindamar Mine exploited a group of irregular lenses of sulphides that occurred within a persistent, wide and steep shear zone. The mineralization consists of extremely fine-grained pyrite and sphalerite with minor amounts of chalcopyrite, galena and tennantite. The host rocks for the deposit have been correlated, on lithologic similarities, to the Bourinot Group of Middle Cambrian age.

The genesis of the deposit, as well as the relative ages of the host rocks and mineralization, have been a matter of controversy. This study was undertaken to clarify the geologic setting, geologic history, and environment of base-metal deposition at the Mindamar Mine.

The geometry of the rock types at the mine was interpreted from diamond drill core found abandoned on the mine property. Descriptive drill logs of a previous program, and mine plans of the early workings were re-interpreted and their data was incorporated into a new interpretation for the deposit, using a new nomenclature for the rock-types. This nomenclature was established from specimens collected from the drill core, outcrops and from the mine dumps.

The bulk of the ore occurred within a northeast-striking, westward-facing, steeply dipping rock sequence which consists of felsic to mafic lava flows, pyroclastic rocks and related volcaniclastic and chemical sedimentary rocks, all of which were intruded by mafic sills and dykes. The ore zone, comprised of a quartz-carbonate rock, massive sulphides, and siliceous siltstones, is stratigraphically controlled, occurring between two chemically distinct volcanic piles, with felsic flows predominating in the footwall, and intermediate tuffs in the hanging wall. The most important concentrations of sulphides occur stratigraphically above the quartz-carbonate within the siltstones. Graded beds and sedimentary layering are present in both the massive banded sulphides and the siltstones.

Superimposed shearing and carbonization (calcite) processes have modified the primary textures in all lithologies, including the ore and the intrusions which transect it. The introduction of calcite into sheared rocks of all lithologies is not related to the processes that formed the quartz-carbonate rock of the ore zone.

The ore zone at the Mindamar Mine was deposited subaqueously as a result of volcanic-related hydrothermal processes, rather than by a younger replacement mechanism. The deposit is interpreted to be a distal type of the volcanic-exhalative-sedimentary model, analogous to the geologic situation responsible for some of the Kuroko deposits in Japan.

GEOLOGICAL PROGRAMS OF THE NOVA SCOTIA DEPARTMENT OF MINES

D.A. MURRAY, Nova Scotia Department of Mines and Energy, Halifax, Nova Scotia

With the advent of the Canada-Nova Scotia Mineral Agreement in 1974, the Mineral Resources Division of the Nova Scotia Department of Mines greatly expanded its geoscience program. The programs carried out under this agreement were initiated to accelerate the level of activity in the mining industry and hopefully, to lead to the opening of new mines. To carry out this objective, the geological data base for the province had to be greatly increased. To this end, the programs carried out included mapping, detailed investigations of selected rock units, metallogenic studies, geochemical surveys, industrial mineral surveys, airborn geophysical surveys, mineral inventory and coal studies.

Should a new Mineral Development Agreement be forthcoming, the Mineral Resources Division will be continuing some programs and, in addition, will be looking at problem areas identified over the past five years.

MINERAL RESOURCES PROGRAMMES IN NEW BRUNSWICK

P.R. POTTER, Mineral Resources Branch, New Brunswick Department of Natural Resources, Fredericton, New Brunswick

Geological investigations in New Brunswick were initiated in 1838 when the first geological survey was approved by the Provincial Legislature. Excellent maps and reports were published in subsequent years, both by staff of the University of New Brunswick and the Geological Survey of Canada. Detailed geological mapping by the Province began in 1953 after the discovery of base metals in the Bathurst-Newcastle area, and since that time, the Department of Natural Resources, in co-operation with the Canada Department of Regional Economic Expansion, has accelerated its efforts to map and evaluate the Province's mineral potential.

The Mines Division of the Department of Natural Resources has two Branches, the Mines Branch and the Mineral Resources Branch. Geological, geochemical and geophysical surveys, inventories, commodity studies and other research, to promote and encourage the orderly exploration for and development of the Province's mineral resources, are carried out by the latter. Also, this Branch has many responsibilities under various Acts relating to the Province's mineral resources.

The Mineral Resources Branch has always been development oriented, and programmes are designed to evaluate our resource potential and to attract exploration and development capital to the Province. Although programmes are of an applied nature, there are many areas of interesting research that deserve follow-up by universities, individuals or other interested parties.

A STUDY ON THE USE AND SUITABILITY OF ROCK MATERIAL IN THE BAY OF FUNDY AREA FOR RIP-RAP IN CONSTRUCTION OF A TIDAL POWER BARRIER

GERARD A. STANLEY, Department of Geology, Acadia University, Wolfville, Nova Scotia.

This study is an investigation in the Bay of Fundy region of rock material may potentially be used in the construction of any type of tidal barrier.

Field work during the summer of 1978 resulted in sampling of forty locations around the Bay of Fundy from Digby, through Parrsboro and Cape Chignecto (in Nova Scotia), to Wood Point, St. Martins and St. George (in New Brunswick). The rocks from these locations are being tested for suitability as armour protection of a tidal barrier. Tests include durability, point load strength density and uniaxial compressive strength together with the dynamic determination of Young's modulus and Poissons' ratio.

Rip-rap sizes have been specified by design engineers and these were a major consideration in the site investigation programme. Therefore, discontinuity surveys were taken at many locations, as well as photographic records.

Work is continuing at present on the engineering classification of the rocks, by accepted standards and a determination of the suitability of the rocks for a tidal barrier. Transport and economic factors are also being considered in a general way.

Education

THE NOVA SCOTIA MUSEUM AND THE EARTH SCIENCES

ROBERT G. GRANTHAM, Nova Scotia Museum, Halifax
Nova Scotia

The Nova Scotia Museum had its roots in the Halifax Mechanics Institute which was formed on the evening of December 30, 1831. Two years later it became the repository for the provincial collection of rocks, minerals, and fossils. In 1868 by Act of Legislature the provincial museum was established. The collections of the museum now total in excess of 24,000 specimens.

The museum now has one of the best collections of Carboniferous fossil plants east of Ottawa, thanks to Dr. Erwin Zodrow and Keith Mc Candlish both of the College of Cape Breton. In 1976 Dr. Chester Arnold from the Palaeontological Museum of the University of Michigan was visiting scientist to the museum and to the College of Cape Breton where he did taxonomic work on the collection.

The museum also provides a public service in the earth sciences. This ranges from public lectures and slide shows, to exhibit creation, publications and enquiries. Over 400 geological enquiries are received by the museum each year, ranging in scope from a simple identification to the gathering and presentation of information on the geology of a particular area.

Because museums by their nature take the "long look" at things, conservation of geologically signficant areas is a major concern. Nova Scotia is blessed with a varied geology and has many unique and rare occurrences. Two examples are the Joggins area and the Arisaig section. Conservation and protection is a reality at one site (Joggins) and is about to be proposed for the Silurian section at Arisaig.