

## Current Research

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# Current Research

Some Current Research in Sediments, Department of Geology, Acadia University, Wolfville, Nova Scotia.

Stratigraphy of the Upper Member of the Horton Bluff Formation in the Area of the Type Section Near Hantsport, Nova Scotia by DONALD JACK MACDONALD:

The stratigraphy of the Upper Member of the Horton Bluff Formation (Lower Carboniferous) is described and interpreted for an area adjacent to the originally designated type section at Horton Bluff (Bell, 1929). The lower contact of the Upper Member is redefined and a new type section is established on Hurd Creek, two miles northwest of Hantsport, Hants County, Nova Scotia. The Upper Member is divided into eight cyclic lithofacies based upon a fluvial model of deposition. Each of the inferred substratum channel deposits and topstratum over bank deposits comprising the type section is described in detail and correlated with similar sections as they occur on various brooks and quarries in the surrounding area.

Paleocurrent determinations and mineralogic investigations indicate that the source area lay to the south-southwest of the study area. The source rock types are inferred to have been the older Horton Bluff sediments, the Lower Ordovician (Meguma Group) metasediments and Devonian granite. The relief of the source area is believed to have been moderate and erosion was apparently mild and continuous with corresponding uniform sedimentation.

Biostratigraphy of the Upper Mississippian Kennetcook Limestone in the Fundy Epieugeosyncline, Maritime Provinces, by PAUL DAVID MCCULLOCH:

The Kennetcook Limestone Member of the Windsor Group (late Middle Mississippian) and its lateral facies equivalents in Nova Scotia and the Magdalen Islands were deposited from a shallow epicontinental sea within a series of interconnected basins which collectively comprise the Fundy Basin. The sediments were deposited in environments very near sea level, and had considerable lateral extent. Three major lithofacies are recognized within the member, these being related to three benthic environments; infralittoral, intertidal, and supratidal, representing deposition just below, at, and slightly above mean sea-level. Small fluctuations in sea level, changing energy levels and nearness to uplifted source areas resulted in the distinct lateral and vertical lithofacies changes observed within each sub-basin.

The three facies of the Kennetcook Limestone existed contemporaneously, that is, lateral to one another, within the Windsorian sea. Locally, but through time, the facies were present in varying proportions and relationships such that a close correlation of lithofacies among the sub-basins is not possible. Sedimentation as a whole, however, reflected the same transgressive-regressive cycle throughout the Fundy Basin. Deposition of the carbonate sediments began on supratidal flats marginal to the sea but with gentle subsidence, was followed by sedimentation on areally extensive tidal flats. Continuing subsidence eventually resulted in deposition below wave base but within the infralittoral environment. Regression of the Windsor sea began with the onset of gentle uplift of the Fundy area.

Distinct biofacies occur in the Kennetcook Limestone correlative with the lithofacies for the separate sub-basins. *Tornquistia kennetcookensis* sp. nov., a guide fossil to the member, is described and figured in this thesis and is characteristic of one of the biofacies. Other biofacies are characterized by an abundance of *Diaphragmus tenuicostiformis* Bell, *Linoproductus lyelli* Verneuil, *Camarotoechia atlantica* Bell, *Martinia galataea* Bell and *Amplexisaphrentis minas* (Dawson). *Modiola hartti* Bell and *Schizodus* sp. are characteristic species in areas of considerable silt deposition. Laterally shifting lithofacies through time were a major factor controlling the migration of many species and those forms which could easily adapt to these changes such as *Buxtonia cogmagunensis* Bell and *Productus avonensis* Bell, are useful guide fossils to the Kennetcook Limestone Member.

Clastic Sedimentation in Arctic Fluvial-Deltaic-Marine Systems, District of Franklin, Canada by B.R. PELLETIER:

This study was undertaken as a joint research project between Acadia University (Department of Geology), Wolfville, Nova Scotia, and the Atlantic Geoscience Centre (Department of Energy, Mines and Resources, Canada), Dartmouth, Nova Scotia. At Acadia University the following graduate students participated: A.P. Beardow, A.C. Durocher, J.D. Hill, D.J. Macdonald, J.P. Thompson and L.R. Thorpe. A suite of sediments from an Arctic river and associated delta on the south side of Marie Bay, Melville Island, was subjected to textural analyses at Acadia University, while a comparable suite of sediments from the north side of Marie Bay, as well as samples from adjacent channels, was analyzed in the laboratories of the Atlantic Geoscience Centre. The direction and co-ordination of the project was under Dr. B.R. Pelletier of the A.G.C.

The analytical data were studied and assembled into six main categories based on environmental and geographical parameters. These are as follows: North River, North Delta, South Delta (inshore), South Delta (offshore), and the channels. North and South river were distinguished as separate environments because of the contrasting physiography in the source area. The local relief in the North River System ranges from sea level to 300 feet. Whereas in the South River system it ranges from sea level to altitudes of 2,000 feet. Because of the immediate high relief adjacent to South Delta, a mechanical difference in inshore and offshore sedimentation resulted, and two sub-systems to South Delta developed. The channel environment varies in depth but essentially the samples showed similar properties.

From the 90 samples studied, the textural parameters examined include the following: mean diameter, standard deviation, entropy, modality, percent gravel, percent sand, percent mud, percent silt, percent clay, and the silt clay ratio. The average value of these characteristics were compared for each environment. This approach revealed a separate pattern of sedimentation for these environments. In some cases a trend could be detected where the concept of distance versus change in textural property was examined. However the main reason for the study was to distinguish separate sub-systems of sedimentation in the main framework of clastic sedimentation in Arctic waters.

Geochemistry of the Herbert River Limestone Member of the Windsor Group C Subzone in Nova Scotia by RICHARD S. BLAKENEY:

The Herbert River Limestone Member is the lowermost of the Upper Windsor limestones of Nova Scotia and is the major member of the C subzone. Its outcrops stretch from the type section at Windsor, N.S. to Antigonish. There may also be correlatives in Cape Breton and on the Magdalen Islands.

The purpose of this study is to look at the geochemistry (both major and minor element) of this limestone and to attempt to determine the controls on the geochemistry. Preliminary work seems to indicate that the geochemical analyses show more inter-regional than intra-regional variation and that such factors as the amount of insoluble residue have a direct bearing on the minor element geochemistry. It has also been determined that for any given outcrop of the member the inter-lithologic-unit chemical variations are more significant than intra-unit variations. It is hoped to eventually be able to make some statement relating the geochemistry to the environment of deposition through the use of such tools as factor analysis.

Stratigraphy and Geochemistry of the Scots Bay Formation Upper Triassic by JOHN THOMPSON:

The Upper Triassic of the Scots Bay formation is the youngest preglacial sediment exposed in western Nova Scotia. It disconformably overlies the North Mountain basalt and is seen to outcrop in six minor synclinal folds on the south shore of the Bay of Fundy in the vicinity of Scots Bay. Geophysics (Huntec Limited, 1965) has shown that the formation extends out under Scots Bay to the northwest and underlies the Recent sediments in the Minas Channel. This lacustrine strait formation is composed of thin bedded, brown and green calcareous sandstone, siltstone and shale, inter-stratified with green and buff impure limestone which is extensively replaced by red and grey chert.

Geochemistry of the soluble portion of the limestone has shown it to be composed of almost pure  $\text{CaCO}_3$  with less than one percent  $\text{MgCO}_3$ . Paleocurrent data, heavy mineral and clay mineral analyses indicate the source of the sediments is to the southeast from the Devonian granite and Mississippian to Early Triassic sediment. The climate has been determined to have been warm and humid with alternating wet and dry seasons. The flora and fauna collected by the author have included linear plant fragments, fish bones and scales, gastropods and ostracods.

This research was instituted with the purpose in mind of obtaining a greater understanding of the stratigraphy of the Scots Bay formation and the geochemistry of its fresh water limestone and replacement chert.



New Books.THE MEDITERRANEAN SEA: A Natural Sedimentation Laboratory, Edited by DANIEL J. STANLEY, Curator of Sedimentology, Smithsonian Institution, Washington, D.C.:

The last decade has witnessed greatly expanded investigations into Mediterranean sediments and sedimentary rock employing a whole array of sophisticated new instrumentation and techniques of deep-water oceanographic analysis. Now a leading oceanographer has assembled all significant research findings resulting from these efforts in a single comprehensive volume which details the current state of knowledge on virtually every aspect of sedimentation and related structural geology of the Mediterranean region. The contributions of 74 specialists from 14 countries in the fields of geology, physical oceanography, marine biology and chemistry provide a wealth of new insights into the processes which have shaped this unique sea.

Forty-eight chapters consider the geographic, climatic hydrological, and stratigraphic structural setting of the region. Detrital and carbonate sediments are examined in their coastal, shallow water, and basin settings; and recent results of JOIDES deep sea drilling are presented in addition to geophysical, geochemical, and geotechnical studies. Special problems treated include suspended sediments, Holocene states of oxygen deficiency, climatic and eustatic changes affecting sedimentation, the possible reversal of currents at the Strait of Gibraltar, and the role of tectonic activity in controlling basin sedimentation and ponding. The compendium is also concerned with pollution and outlines criteria for an urgently needed international effort to limit man's negative influence on this almost totally enclosed, and now endangered, region.

The book is profusely illustrated with line drawings and photographs. A new full-color physiographic chart of the Mediterranean Sea is enclosed in a sleeve at the end of the volume.

available early 1973      about 800 pages      373 illustrations      pre-publication price \$25.00

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Box 699, 532 Sarah Street,  
Stroudsburg, Pennsylvania 18360, U.S.A.

ORIGIN OF SEDIMENTARY ROCKS by HARVEY BLATT (University of Oklahoma), GERRARD MIDDLETON (McMaster University) and RAYMOND MURRAY (Rutgers University):

Three eminent geologists from the United States and Canada collaborated to produce this outstanding, up-to-date and broad treatment of sedimentary rock origin.

Emphasizing formative processes rather than areal distribution, ORIGIN OF SEDIMENTARY ROCKS presents its material in six major divisions: aims and methods in the study of sedimentary rocks, physics of sedimentary processes, terrigenous clastic sediments, carbonate rocks and evaporates, and other sedimentary rocks and conclusions.

The introductory portion describes the importance of field work, outcrop sections, sampling and numerical analysis, fundamental and derived properties of sediments, grain properties, properties of grain aggregates, and rock classification and interpretation.

Part II covers such topics as the geological cycle, sedimentary textures, sediment movement by fluid flow, sedimentary structures, and facies models.

Chapters in the third part deal with weathering processes and products, mineral composition of clastic silicate rocks, classification of sandstones, natural waters and diagenesis of sandstones, and mudrocks.

Origin of limestones, diagenesis and classification of limestones, dolomite, and evaporites and native sulphur are included in Part IV. Concluding chapters are devoted to chert, phosphates, zeolites, iron-rich rocks and sedimentary manganese deposits, and major external controls of sedimentation.

PRENTICE-HALL, Inc., Englewood Cliffs, New Jersey.

Recent Publications by the Geological Survey of Canada including Open File listings.

Massive ice and icy sediments throughout the Tuktoyaktuk Peninsula, Richards Island, and nearby areas, District of Mackenzie, by V.N. Rampton and J. Ross Mackay, Illus., table, figs. Paper 71-21.

Quaternary geology of Canada, by V.K. Prest. Illus., fig. Reprinted from Geology and Economic Minerals of Canada, Economic Geology Report No. 1, 5th edition, 1970. Chapter XII.

Principal Mineral Areas of Canada, 22nd edition, 1972. One copy free of charge to residents in Canada. Extra copies 50 cents each. Map 900A.

Geology of the resurgent cryptoexplosion crater at Mistastin Lake, Labrador, by K.L. Currie. 1971. 62 p. Illus., tables, figs. (1 figure folded in pocket). Bulletin 207.

Geology and engineering description of the soils in the Welland-Port Colborne area, Ontario, by E.B. Owen, 7 pp., figs. Map 8-1971 and 1 figure folded in pocket. Paper 71-59.

Economic geology report No. 22: Geology of iron deposits in Canada Vol. III - Iron ranges in the Labrador geosyncline, by G.A. Gross, 1968. Reprinted 1972.

The following items are being placed on Open File by the Geological Survey of Canada at its libraries at 601 Booth Street, Ottawa K1A 0E8, Ontario; Institute of Sedimentary and Petroleum Geology, 3303-33rd Street N.W., Calgary T2L 2A7, Alberta, and the British Columbia office, 100 West Pender Street, Vancouver 3, British Columbia.

O.F. 96 List of published measured lithologic sections in the Canadian Arctic Islands with index map showing number of section and location. Compiled by K.J. Roy. The item comprises an unedited report and map, list of lithologic sections of geological formations in the Arctic Islands measured and described by officers of the Geological Survey and by J.C. Troelsen, prior to 1971. Locations and numbers of sections are shown on the index map and the author, name of publication, location co-ordinates and other pertinent information are given in the text. 38 pages of text and 1 index map. Copies may be obtained at the user's expense from Orhan's Reproductions and Photomapping Ltd., 907 - 9th Avenue S.W., Calgary, Alberta.

O.F. 106 Preliminary drafts of 16 surficial geology photomosaic maps and a legend (8p.), of part of southern Labrador (13E) by Dr. R.J. Fulton, Mr. D.A. Hodgson, Miss G.V. Minning and Mr. R.D. Thomas, compiled from data collected during the 1969, 1970 and 1971 field seasons. Scale: 1:50,000. These maps show the distribution of surface materials and landforms; map-units are based on the genesis of the material, its morphology, and where appropriate, its texture. Geologic data have been plotted on uncontrolled airphoto mosaics. Copies of the maps and legend may be obtained at the user's expense by application to Campbell Reproductions Limited, 85 Sparks Street, Ottawa, Ontario, K1R 6K7.

O.F. 111 Unedited drafts of geological maps with legends of Sawyer Bay (39G), Dobbin Bay (39H & 29G) and Kennedy Channel - Lady Franklin Bay (120B & 120C); all parts of the Canadian Archipelago. Geology by J.W. Kerr and R.L. Christie during the 1961 and 1962 field seasons. Scale: 1:250,000. Copies of the maps and legend may be obtained at the user's expense by application to Riley's Data Share International, Limited, 631-8th Avenue, S.W., Calgary, Alberta.

O.F. 112 "Regional geochemical lake bottom sediment and till sampling in the Timmins'Val d'Or region of Ontario and Quebec". The project was initiated under the Special Employment Plan of the federal Winter Works Program. It was planned and supervised by E.H.W. Hornbrook and carried out under contract by C.F. Gleeson & Associates Ltd. The objectives of the project were to evaluate various aspects of exploration geochemistry in the clay belt environment of this region; to provide data useful for mineral exploration, and to provide winter employment within the area. The report consists of two large data books containing field records, analytical data, and simple statistical treatment, together with location maps for the sample sites. Because of the size of this report, individual copies will not be available for sale.

O.F. 113 Stratigraphy of Botwood map-area, northeastern Newfoundland, by Harold Williams, Memorial University, 1969. This unedited report consists of a description of the formations and development of stratigraphic nomenclature with 117 p., no figures. Photocopies of the report may be obtained at the user's expense by application to Campbell Reproductions Limited, 85 Sparks Street, Ottawa, Ontario, K1P 5A7.

O.F. 126 Thickness of Recent (Post-Glacial?) mud in Beaufort Sea. Manuscript map showing thickness of recent mud in Beaufort Sea using Canadian Hydrographic Service Chart 7080 (Demarcation Point to Cape Bathurst) at a scale of 1:500,000 as a base map. The data was determined from soundings taken by CHS Parizeau in 1970-71 and CHS Baffin in 1970. Blackline prints may be obtained at the user's expense by application to Campbell Reproductions Limited, 85 Sparks Street, Ottawa, Ontario; West Canadian Graphic Industries Limited, 810 - 5th Avenue, S.W., Calgary, Alberta; and Riley's Data Share International Limited, 1130 West Georgia Street, Vancouver, British Columbia.

O.F. 138 An unedited report on palynologic analyses of rocks ranging in age from Late Albian to Pleistocene from the Grand Banks, Atlantic Continental Margin by G.L. Williams, (Atlantic Geoscience Centre, Dartmouth, Nova Scotia); and W.W. Brideaux, (I.S.P.G., Calgary, Alberta). The report consists of 78 pages of text, 1 appendix, 47 plates and 15 figures. It is based on detailed palynologic analyses of 104 samples from 8 core-holes drilled in 1965. Original plates are available for viewing in Calgary only. Xerox copies of the report and plates may be obtained at the user's expense by application to Orhan's Reproductions and Photomapping Limited, 907-9th Avenue, S.W., Calgary, Alberta.