

Current Research

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CURRENT RESEARCH

Bedrock Studies:University of Edinburgh, Edinburgh, Scotland

1. Sedimentological aspects of part of the Pennsylvanian section exposed near Joggins, Nova Scotia, by E. K. Walton and D. P. McL. Duff.
2. Sedimentary features in rocks of the Goldenville Formation in the Eastern Shore region of Nova Scotia, by Ian MacK. Harris.

Both of these studies will be reported in a future issue of MARITIME SEDIMENTS.

New Brunswick Department of Natural Resources, Fredericton, New Brunswick, Canada, summarized from R. R. POTTER

1. Pennsylvanian sedimentation in the central basin of New Brunswick by H. W. van de Poll. The results of paleocurrent studies within the Petitcodiac Group (Pennsylvanian) of the Moncton Basin are included with similar studies of the southwestern part of the Central Carboniferous Basin to gain a better understanding of the stratigraphy, structure, basin configuration and basement topography.
2. Metallogenic Investigation, Kennebecaus Zone by R. R. Potter. Because of the intense economic interest of various structural-metallogenic zones much of the history of the sedimentary rocks in New Brunswick is coming to light. Various stages of mineralization are linked with rocks of different ages and origins including surficial deposits.
3. Geological mapping in the St. Andrews-St. George area by P. W. Hay. Sedimentary and volcanic rocks between St. Andrews and St. George were mapped during the summer of 1966 on a scale of one inch to one-half mile. These rocks, lying south of the St. George batholith constitute the Mascarene Series, and are considered equivalent to a similar succession of Silurian and Devonian volcanic and sedimentary rocks on the west side of Passamaquoddy Bay in Maine. The purpose of the mapping was to examine the stratigraphy of the Mascarene Series, determine the structure of these rocks, and evaluate their economic potential. Results of this program have been summarized in a provisional geological map.
4. Geochemical survey of southwestern New Brunswick by W. J. Wolfe. This is a large-scale regional program of the geochemistry of stream sediments to provide a useful guide to unexposed bedrock ore in unexplored terrain. Samples were collected at 1,000- to 1,500-foot intervals and pH and water temperature were recorded. Estimates of sediment composition and stream flow were made, as well as an attempt to examine the bedrock geology along the streams. In such an area of widely diverse rock types, important background variations for each element may be related to bedrock.
5. Geology of the Mataquac - Woodstock Section of the Saint John River by A. J. Gordon. The Lower Paleozoic sedimentary rocks of the Saint John River between Mataquac and Woodstock were examined recently. Details of lithology, paleontology and structure, together with current-direction structures (chiefly sole markings) were recorded, and specimens were taken for petrographic analysis in the hope that such studies would aid in the interpretation of the paleogeography of the region.
6. The geology of the Shaft and Hachey ore bodies, Quebec Sturgeon River Mines Limited, Gloucester County, New Brunswick by J. L. Davies. Although this report deals essentially with mining interests, a description of the sedimentary bodies containing the ore is given along with a geological map of the area.
7. Industrial mineral investigations by J. B. Hamilton. This report covers investigations underway on economic sedimentary bodies. Occurrences of high-silica sandstone in the southern part of the province were mapped and sampled. In addition a number of sand dunes and beach ridges in the Northumberland Strait area were located, described, and sampled. Several lakes were sampled in order to determine the quality and quantity of diatomite present. A geological assessment of a limestone property in Samphill, Kings County area was made and included chemical analyses.
8. Reconnaissance Geology, southern and western New Brunswick by E. V. Jackson. Reconnaissance traverses were made in several areas of the province in which special emphasis was placed on the Lower Paleozoic stratigraphy between Long Reach and Havelock, and the granitic areas north and south of the Plaster Rock - Renous highway. Brief visits were made to

the areas northwest of Plaster Rock and St. Stephen. Several fossil localities were re-visited and new collections made.

Submarine physiography and Recent Sediments:

Smithsonian Institution, Washington, D. C., by DANIEL J. STANLEY

At present the author is completing various Scotian Shelf and Slope projects some of which have been reported previously. A study has just been initiated on the sediment dispersal patterns in some submarine canyons off the East coast of the U. S. (Norfolk and Washington canyons). Of particular interest is the comparison of sedimentation patterns in these and possible fossil canyons preserved in the rock record (i. e. in a similar vein to the study of the Gully, Nova Scotia) versus Maritime Alps canyons as discussed by Stanley at the 7th International Sedimentological Congress in the U. K.). Also involved in this study are Jack W. Pierce, Division of Sedimentology of the Smithsonian Institution in Washington, Gilbert Kelling of the University College of Swansea (presently on a Smithsonian Institution post-doctoral fellowship, and Peter Fenner, presently with the American Geological Institute in Washington, D. C. Four cruises have been organized this year involving the U. S. Coast Guard vessel ROCKAWAY. The first programs include seismic profiling from the shelf edge to the sub-sea fans, analysing of bottom morphology, and collecting cores and bottom photographs. Bottom currents will be monitored and sediments, both in suspension and moving along the bottom, will be studied in detail. This information will be correlated with data collected in other modern canyons with the hope of determining a more precise model to explain the funneling of shallow sediments to the deep sea.

Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada by KATE KRANCK

A cruise to Northumberland Strait, lying between the provinces of New Brunswick and Prince Edward Island, Canada, was made to obtain information on the currents and suspended sediments in the strait for a study of the relationship between the transport of sediments and the amplitudes and types of tidal currents. A P-63 Suspended Sediment Sampler, Van Veen and Dietz LaFond bottom samplers and Kelvin Hughes and Geodyne current meters were used.

The aim of the suspended sediment sampling was to study the relationship between current velocities and the concentration and grain size of the sediment transported in suspension. Whenever possible, sampling was carried out during a 24 hour period. The Kelvin Hughes current meter was used to obtain current data at the same time and depth at which suspended sediment samples were taken. Continuous recording current meters were installed to obtain a long term picture of the current pattern and to measure the residual current present. From this data long term transport ratios will be estimated. Bottom sediments were sampled at slack and running tide using different types of samplers as well as diving, to determine if any measurable difference exists in grain size composition at different stages of the tide, as well as to evaluate sampling techniques.

The installation and recovery of the Geodyne current meter were successfully completed. Sufficient suspended sediment samples were recovered to provide preliminary results and allow evaluation of the methods. Visual inspection of the suspended sediment as well as bottom samples showed a marked relationship between grain size and current velocities. Some difficulties were experienced with the suspended sediment sampler due to leakage of salt water into the electrical systems. SCUBA diving proved an essential aid in all phases of the work.

Woods Hole Oceanographic Institution, Woods Hole, Massachusetts by DAVID ROSS

Considerable effort is being spent on investigations of sediments from the continental shelf. John D. Milliman is working on the detrital and carbonate sediments on the continental margin and Charles D. Hollister is studying the texture of the sediments, generally, from the continental margin. John C. Hathaway has partially completed his extensive catalog of the samples collected by the joint U. S. G. S. - W. H. O. I. continental margin program. Volume I of this catalog contains the location and field descriptions of the approximately 2500 samples collected by this group. Volume II containing the laboratory data is in preparation. R/V CHAIN recently completed two 3-week cruises obtaining continuous seismic profiles from

the continental slope and rise between Nova Scotia and Bermuda. Chief scientists were Elezar Uchupi and Sidney Knott, both of W. H. O. I. Several members of the Institution have spent part of the summer making dives with our deep submersible ALVIN. Frank T. Manheim, John D. Milliman, and Richard M. Pratt made four dives on the Blake Plateau. James V. A. Trumbull and John Hathaway dove in Oceanographer Canyon and David A. Ross dove in Corsair Canyon; both of these canyons are on the southeastern part of Georges Bank. Several manuscripts are in preparation concerning the results of these dives.

Micropaleontology and Recent Sediments:

Carleton University, Ottawa, Ontario, Canada by KENNETH HOOPER

A detailed study of microfauna from the Grand Banks of Newfoundland is being carried out along three main lines of investigations: 1) the distribution of both planktonic and benthonic foraminifera; 2) distribution of calcareous and arenaceous foraminifera; 3) the substituted magnesium content of the tests of a limited number of foraminiferal species from the continental shelf. A computer program for processing foraminiferal data has been written, tested and run. The program allows for a maximum of 50 stations and 350 species. The output has been submitted as input in the IBM 7090 Factor and Vector analysis program of Manson and Imbrie. The control Data G. 20 computer is used to process foraminiferal data and to produce matrices which are, in effect, distribution tables. The data contained in these output matrices is punched on cards which are suitable for use as input for a program of factor and vector analysis in the Q mode.

Other work currently in progress includes: (a) Distribution of Recent Foraminifera off Gaspé, Quebec by factor and vector analysis; (b) Distribution of Recent Foraminifera of the continental shelf and slope off Cape Breton, by factor and vector analysis; (c) Distribution of fossil Foraminifera of the post-Wisconsin transgression (Champlain Sea) in the Maritime Provinces and Quebec, (Northeast of Quebec City); (d) Detailed taxonomic studies of several genera of Pleistocene and Recent Foraminifera from eastern Canada and (e) Electron microscope studies of pollen grains found in sediment samples from eastern Canada.

The author gratefully acknowledges support from the Department of Energy, Mines and Resources and from the National Research Council of Canada.

Queen's University, Kingston, Ontario, Canada

A study of the Recent history of Northumberland Strait using cores by JILL H. E. McROBERTS. A study is to be made of the Recent history of Northumberland Strait, using palaeontological and sedimentological data from three piston cores. Northumberland Strait is located between Prince Edward Island, and the North shore of Nova Scotia and New Brunswick (46°N, 63°W).

The sedimentological analysis of the core samples will be carried out using standard pipette and sieve procedures, at the Bedford Institute of Oceanography. The palaeontological analysis will be done by the author at Queen's University, at Kingston, Ontario, using in particular the Foraminifera and shell fragments. From these studies, information concerning the ecology, and dynamics during deposition should be obtained.

It is hoped that through the study of the microfauna of the core, in particular the Foraminifera, that the author will be able to obtain information on salinity, temperature and depth of the depositional environment, as well as the age. From the sedimentological data some idea of the amount and kind of energy present at the site of deposition should be found. This information should give a general picture of the Late Pleistocene to Recent history of Northumberland Strait.

The author would like to thank Miss Kranck for providing the author with the core samples and pertinent information, as well as Dr. Grant A. Bartlett for his suggestions and help. The author also thanks the Bedford Institute of Oceanography for making this research project possible.

2. Analysis of Foraminifera found in Miramichi Estuary by SANDRA TAPLEY. The relationship of foraminiferal species to the distinct conditions of climate and topography in which they are known to flourish, is a vital factor in the reconstruction of ancient environments. Correlations of

foraminiferal species with present day assemblages known to inhabit a cool, temperate, brackish estuary, such as the Miramichi Estuary, will facilitate the identification of similar past estuarine occurrences. The purposes of this study are: (1) to determine which foraminiferal species inhabit a typical cool temperate brackish estuary, and (2) to define the nature and the ranges of the environmental parameters which possibly affect the special assemblage.

The Miramichi River and Bay drain eastern and central New Brunswick. The river and bay together form an estuary approximately forty miles long; while the mouth of the bay is approximately fifteen miles wide. The bay empties into the Gulf of St. Lawrence, but complete exchange of water is prohibited by a string of barrier islands and sand bars which effectively block extensive intermingling of bay and sea water. Hence, the estuary varies from essentially brackish water in the bay, with bottom salinities ranging from 20.7‰ to 25.1‰ to fresh water in the Northwest and Southwest Arm, with bottom salinities ranging from 2.3‰ to 7.4‰. Strong tidal currents in the river create turbulence which induces active sediment transport, imparting a brownish colour to the water.

A programme of systematic sampling of the estuary was carried out during August 1967. This involved the collection of bottom samples, a description of the bottom environment from which the samples were collected, and the measurement of a various environmental parameters which may have governed the special assemblage. Sixteen samples of the substrate were collected from various stations by means of an Echmann bottom grab sampler. Hydrogen ion (pH) and some oxidation reduction (Eh) measurements were made on the samples as soon as they reached the surface. This was followed by a physical description of the substrate. Care was taken to ensure that only the top layer of sediment was collected. The volume of sample (10 cm X 10 cm X 1 cm) was, thus, fairly constant. In addition, at each station a salinometer was used to obtain top and bottom readings of the conductivity, salinity and temperature of the water. Top and bottom water samples of each of these areas was obtained for chemical analysis using the Hach Kit technique.

The mechanical and chemical analysis of this data will be carried out at Queen's University during the winter of 1967-68. The samples will be divided into two portions: (1) a portion for sediment analysis and (2) a portion for foraminiferal identification.

Sieve and pipette analysis will be made from which a statistical analysis will be compiled. Foraminifera will be concentrated by heavy liquid (perchloroethylene) separation. These foraminiferal concentrates will then be examined in order to indicate the size of the species and their distribution. Pollution will be analyzed statistically using the chemical data obtained from the top and bottom water from each location by the method described above.

Geochemistry and Recent Sediments:

Mineralogisches Petrographisches Institut Universitat Heidelberg, Heidelberg, Germany by
THOMAS HOFFMANN

Approximately 700 samples were obtained from the Scotian Shelf, Canada, many of which were supplied by L. H. King and J. I. Marlowe of the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, and R. A. Gees and G. Drapeau of Dalhousie University, Halifax, Nova Scotia. The natural distribution of minor elements will be studied in relation to the sedimentary units already established by King for the Scotian Shelf. Some time will be devoted to the clay mineralogy of the sample suite. The German participation in this project is supported by the Deutsche Forschungsgemeinschaft.

McMaster University, Hamilton, Ontario, Canada by DOUGLAS MACDOUGALL

The study area includes Marie Bay, located on the northwestern part of Melville Island, as well as a portion of Fitzwilliam Strait adjacent to Marie Bay. Fourteen piston cores and two gravity cores were obtained from this area, ranging in length from 22 cm to 155 cm. As well, eleven terrestrial samples were collected from land areas draining into the study region; five of these are soil samples, two are taken from ice-pushed ridges along the shoreline, and four from mud bars in flowing streams.

This project will be primarily a study of the geochemistry of the platinum metals in an arctic weathering regime. As well some silica solubility experiments, using silica-free artificial sea water, will be carried out on the soil samples. Another problem which may be investigated is the fractionation of element pairs such as Fe-Mn or K-Rb in the weathering cycle, and the mobilization of Fe and Mn below the sediment-water interface due to reducing conditions. The sequence of soil, river sediment and marine sediment samples is ideal for this type of study.

The techniques used to determine the platinum metals will be those of neutron activation that are presently being used for various trace metals at McMaster. It is hoped that Au, Pd, Ir, and Os values in particular can be determined. Very little data is available for these metals at the present time. If the Fe-Mn investigations are carried out, the method used will be X-ray fluorescence.

University of Missouri, Columbia, Missouri, U. S. A. by JOHN ADSHEAD

Approximately 150 samples from estuarine waters emptying into the west side of Hudson Bay will be studied geochemically to determine the relationship between the clay mineral assemblage and the content of certain trace elements in the sediments; also to determine influence of oceanographic factors and nearshore processes on the content of trace elements in the estuarine sediments. The research program will involve the following general approach: (1) obtain X-ray diffraction data for bulk samples; (2) centrifuge off the clay-size fraction and work out the mineralogy of this component using X-ray and other clay mineral techniques; (3) prepare the analyses on bulk samples; (4) run analyses for Ca, Ni and possibly Ag; (5) analyse for gasometric carbonate carbon and, on a separate split, for total carbon by combustion to arrive at values for organic carbon.

Research Awards:

1. Geological Survey of Canada

The following grants to geologists in the universities of the Atlantic Provinces were amongst those amounting to \$185,000 awarded by the Geological Survey of Canada, Department of Energy, Mines and Resources, Ottawa. Initiated in 1951 at the instigation of the National Advisory Committee on Research in the Geological Sciences, the grants stimulate and support research projects in the universities. Applications are made by members of university faculties to the director of the Geological Survey, reviewed by the National Advisory Committee and grants made by the Survey on the basis of the committee's recommendations.

Acadia University--\$9,480. Professors R. H. MacNeil, R. G. Moore, and G. R. Stevens.

Dalhousie University--\$6,620. Professors M. J. Keen, O. Knop, G. C. Milligan and R. Ravindra.

Memorial University of Newfoundland--\$5,660. Professors W. D. Brueckner, E. R. Deutsch,

M. J. Kennedy and W. G. Smitheringale.

University of New Brunswick--\$8,520. Professors E. Z. Latjai, D. J. C. Laming, A. L. McAllister and G. E. Pajari.

Nova Scotia Technical College--\$1,500. Professor R. A. Cameron.

2. Atlantic Provinces Inter-University Committee on the Sciences (APICS)

Summer Research scholarships are awarded to students in the Atlantic Provinces to cover all the sciences. The program is designed to foster some mobility in the student body by placing highest priority on a university to university exchange. This summer a student in earths sciences was one such recipient.

Miss Patricia Ann Fitzgerald, a B.Sc. student at the Nova Scotia Technical College, Halifax, has this summer been involved in the development of a new seismic recording system which is to be a further step in the continuing program of seismic investigations of the earth's crust, conducted by Dalhousie University in the Atlantic Region. The development of the system is part of a Masters project being undertaken by a Dalhousie student, David Simpson, and the facilities for the research have been provided by Dalhousie and the Bedford Institute of Oceanography.

Exploration Notes:Mobil Drilling Program, Sable Island, Nova Scotia

This project is nearing its expected completion depth of 15,000 feet. Because of the tight security on this drill hole, no information is available. However on a recent flight over Sable Island, the drill was reported to be still working. Company officials released the news that gas was present but the extent was not known. Depth of this discovery was not given.

Global Marine Inc. of Los Angeles and Houston have taken out large, widely scattered permits in the Arctic archipelago covering more than two million acres over the Sverdrup Basin in the Queen Elizabeth Islands. Marine drilling is anticipated particularly in view on new techniques in ice-bound offshore drilling together with the development of new ice-breaking vessels.

Matachewan Canadian Gold Ltd. of Montreal has taken out considerable acreage directly offshore of the southeast coast of Nova Scotia. Some two thousand licenses to explore for minerals have been granted to Matchewan Canadian Gold Ltd., of Montreal. The area involved extends along the south shore of Nova Scotia from Berry Head in Guysborough County to Mouton Island in Queens County.

The technical staff of this Canadian controlled Company thinks that concentrations of heavy minerals such as gold or tin may have been deposited along preglacial shore lines which are now covered by submarine glacial drift. Work will involve mapping of the under seas bedrock surface followed by investigation of irregularities in this ancient surface. Such irregularities may have controlled the location of mineral deposits.

This was released Thursday, September 7, 1967. In addition, acreage extending to Cape Sable on the south has now been filed by this company.