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May 1976-April 1977

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Compiled by  
THOMAS E. BOLTON



P. G. KILLEEN  
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**GEOLOGICAL SURVEY  
PAPER 77-5**

**CANADIAN GEOSCIENCE COUNCIL**

**CURRENT RESEARCH IN THE GEOLOGICAL  
SCIENCES IN CANADA, MAY 1976 - APRIL 1977**

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THOMAS E. BOLTON

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# CONTENTS

	Page
INTRODUCTION.....	v
Use of the compilation .....	v
AREAL MAPPING, 1:50 000 OR LESS .....	1
Alberta .....	1
British Columbia .....	1
Manitoba .....	2
New Brunswick.....	2
Newfoundland/Labrador.....	2
Northwest Territories .....	3
Nova Scotia.....	3
Ontario .....	3
Quebec .....	5
Saskatchewan .....	5
Yukon Territory .....	5
AREAL MAPPING, GREATER THAN 1:50 000 .....	6
British Columbia .....	6
Manitoba .....	6
New Brunswick.....	6
Newfoundland/Labrador.....	6
Northwest Territories .....	6
Ontario .....	7
Quebec .....	7
Saskatchewan .....	8
ENVIRONMENTAL GEOSCIENCE.....	9
GEOCHEMISTRY .....	11
Analytical methods and analysis .....	11
Exploration, organic .....	12
Exploration, non-organic .....	13
Theoretical .....	20
General.....	21
GEOCHRONOLOGY .....	24
GEOLOGICAL COMPUTER APPLICATIONS .....	27
GEOMATHEMATICS .....	28
GEOMORPHOLOGY .....	28
GEOPHYSICS .....	30
Electrical .....	30
Exploration .....	32
Geomagnetism-paleomagnetism.....	33
Geothermal .....	37
Gravity.....	37
Seismology and physics of interior .....	37
General.....	39
GEOTECHNIQUE .....	40
Engineering geology.....	40
Muskeg .....	42
Permafrost.....	42
Rock mechanics .....	42
Soil mechanics .....	43
Snow and ice .....	43
GLACIOLOGY.....	44
HYDROGEOLOGY .....	44
MARINE GEOSCIENCE.....	49
MINERAL/ENERGY GEOSCIENCE.....	50
Coal geology .....	50
Industrial minerals.....	51



CONTENTS (cont'd.)	Page
Mineral deposition exploration/evaluation .....	52
Petroleum exploration/evaluation .....	58
General .....	59
MINERALOGY/CRYSTALLOGRAPHY .....	61
PALAEONTOLOGY .....	65
Invertebrate .....	65
Vertebrate .....	71
Paleobotany/palynology .....	73
PETROLOGY .....	77
Experimental .....	77
Igneous .....	77
Metamorphic .....	82
Sedimentary .....	85
General .....	86
QUATERNARY GEOLOGY .....	87
REMOTE SENSING .....	94
SEDIMENTOLOGY .....	95
Ancient sediments .....	95
Recent and unconsolidated sediments .....	99
SOIL SCIENCE .....	101
STRATIGRAPHY .....	105
Precambrian .....	105
Paleozoic .....	107
Mesozoic .....	109
Cenozoic .....	111
STRUCTURAL GEOLOGY/TECTONICS .....	111
Alberta .....	111
British Columbia .....	112
Manitoba .....	112
Newfoundland/Labrador .....	112
Northwest Territories .....	112
Nova Scotia .....	113
Ontario .....	114
Quebec .....	115
Yukon Territory .....	115
General .....	116
VOLCANOLOGY .....	118
ORGANIZATIONS REPORTING .....	119
LIST OF GRANT AWARDS IN THE EARTH SCIENCES FOR 1976 .....	123

## CURRENT RESEARCH IN THE GEOLOGICAL SCIENCES IN CANADA

May 1976 – April 1977

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### INTRODUCTION

The present publication recording research in progress in Canada from May 1976 to April 1977 is the result of a survey based on a questionnaire completely revised from the unsuccessful computer-oriented 'box' questionnaire of the previous year. This new form was distributed between January and March, 1977. The response to this questionnaire by Canadian researchers in the earth sciences was excellent.

The research projects listed in this compilation have been obtained mainly from universities, federal and provincial department of mines, and non-industrial institutions carrying on research in the geological sciences. Data on industrial research although limited to one mining company includes input from seven oil companies. In addition, many projects in geographical and soil research not formerly included in previous annual surveys are listed. Accordingly, a relatively complete review of research activities in the geological and allied sciences is available for this period.

Using the data supplied for this compilation by the respondees, some indication as to the lines of research receiving the greatest attention, and conversely the least, can be formulated. Research projects undertaken as graduate thesis in the universities during the survey period are so specified wherever possible. Information on "Graduate and Post-Graduate Theses on Geologic Research Related to Mineral Deposits", completed between July 1973 and January 1976, many of which were listed in previous current research surveys, can be found in the Bulletin of the Canadian Institute of Mining and Metallurgy, volume 69, number 774, pages 135-141, 1976, R.W. Hodder. At least 550 research projects commenced in the 1976-77 report period; the greatest increase was in Geochemistry and Mineral/Energy Geoscience research.

Additional details on research in the earth sciences underway in Canada during 1976 can be obtained through many of the annual reports prepared by the individual universities, research councils, and museums. Projects in geophysics again are not completely reported in this year's publication; comprehensive reports on geophysical research in Canada are published annually in the Canadian Geophysical Bulletin by the Earth Physics Branch of the Department of Energy, Mines and Resources. Summaries of progress and short research reports related to hydrology/water-related environmental research and glaciology are provided annually by the Water Resources Branch of the Department of Fisheries and Environment Canada and the Associate Committee on Hydrology, National Research Council.

In order to provide as much data as possible on geological research in Canada, the present publication includes a listing of the 1976 awards provided within the Research Agreements programs of the Departments of Energy, Mines and Resources and Environment, and the Grants in the Natural Sciences Program of the Department of Indian and Northern Affairs. The National Research Council of Canada also provided for publication herein a computer printout of the operating grants actually awarded in 1976. Last year's listing unfortunately included non-recipient applicants as well.

#### Use of the compilation

The projects are grouped under main headings that cover the different branches of the geological and allied sciences. These groupings are only slightly modified from previous compilations (Geological Survey of Canada, Paper 76-5, 1976) and are only slightly broader than the disciplines reported upon in Canadian Geoscience Council status reports (Geological survey of Canada, Paper 75-6, 1975 and 77-6, 1977). Readers of both publications can readily relate the research in progress in the fields in which they are interested.

A complete list of organizations contributing to the present survey is provided (p. 120). Acknowledgment is made in particular to those who assembled and forwarded the data on research projects in the organizations under their direction.



AREAL MAPPING, 1:50 000 OR LESS

ALBERTA

1. DOUGLAS, R.J.W., Geol. Surv. Can.:  
Central Foothills of Alberta, 1971-.
2. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
Fort Chipewyan District, Alberta, 1970-77.
3. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
Alexander Lake, Wylie Lake map areas, Alberta,  
1971-77.
4. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
Ryan Lake, Fletcher Lake map areas, Alberta,  
1972-77.
5. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
Bocquene Lake, Turtle Lake map areas, Alberta,  
1973-78.
6. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
South Fitzgerald, Myers Lake, Daly Lake map  
areas, Alberta, 1973-78.
7. GODFREY, J.D., LANGENBERG, C.W., Alberta  
Research Council (Geology Div.):  
North Fitzgerald, Tulip Lake, Mercredi Lake map  
areas, Alberta, 1974-78.  
  
All projects include geochemistry, geochronology  
and petrology disciplines.
8. MORAN, S.R., YOUNG, R.V., PROUDFOOT, D.N.,  
BLACK, K., NOWAK, R., Alberta Research Council  
(Geology Div.):  
Geology of the Calgary urban area and environs,  
Alberta, 1974-78; Ph.D. theses (Nowak, Proudfoot).  
  
Surface mapping 90% complete. Grid drilling  
complete; problem oriented drilling not yet com-  
pleted. Laboratory analyses of textural, mineral-  
ogical/petrological, and geotechnical parameters  
begun - ~10% complete. Major geotechnical con-  
straints to development that are delineated in  
three dimensions and evaluated, include land  
sliding, high water table and elevated potenti-  
ometric head in confined aquifers, corrosion of  
concrete, gravel resources are evaluated in terms  
of use and removal from use by conflicting land  
use.
9. OLLERENSHAW, N.C., Geol. Surv. Can.:  
Geology of the southern Alberta Foothills,  
Highwood River to Athabasca River, 1970-.

BRITISH COLUMBIA

10. MULLER, J.E., Geol. Surv. Can.:  
Geology of Victoria map-area, Vancouver Island,  
British Columbia, 1973-.

See:

Magnetic susceptibility as a diagnostic parameter  
of Vancouver Island volcanic rocks; Geol. Surv.  
Can., Paper 76-1B, p. 97-98, 1976.  
  
Metchosin volcanics and Sooke intrusions of south-  
ern Vancouver Island; Geol. Surv. Can., Paper 77-  
1A, p. 287-294, 1977.

11. RICHARDS, T., Geol. Surv. Can.:  
Hazelton map-area, British Columbia, 1972-.

See:

Geology of Hazelton map-area, British Columbia;  
Geol. Surv. Can., Paper 77-1A, p. 247-248, 1977.

Zeolitization of the Telkwa volcanics, Smithers,  
British Columbia; *ibid.*, p. 249-250, 1977.

12. SIMONY, P.S., Univ. Calgary (Geology):  
Gneiss - volcanic relations near Trail, British  
Columbia, 1974-77.

The contact between a mass of gneiss and the  
eugeosynclinal late Paleozoic-Mesozoic succession  
can be followed for 8 km in a zone north of Trail,  
British Columbia. The gneiss mass consists of  
granitoid gneisses, amphibolite layers and masses, a  
suite of gneissic granitoid masses, aplite and  
pegmatite. Near the contact the grain is strongly  
laminated and mylonitic. The gneiss is overlain by  
a thick sequence of siltstone, graywacke argillite  
and conglomerate which faces away from the  
gneiss. These sediments belong to the Mt. Roberts  
Formation of Carboniferous age. The Mt. Roberts  
is overlain unconformably by the Lower Jurassic  
Rossland Group of clastic sediments, volcanogenic  
sediments, volcano-clastics and volcanics of domi-  
nantly andesitic composition. To the east of Trail  
the gneisses are thrust over a northwest dipping  
and facing panel of Rossland volcanics and sedi-  
ments. Northwest from Trail the metamorphic  
grade rises through garnet to sillimanite zone, a  
new phase of migmatization reworks both cover  
and basement to produce one of the gneiss sheets  
of the Valhella complex. The Jurassic Volcanic  
complex is interpreted to have been floored by a  
westward extension of the North American Craton.

13. TAYLOR, G.C., Geol. Surv. Can.:  
Operation Smoky, British Columbia-Alberta, 1968-.
14. TIPPER, H.W., Geol. Surv. Can.:  
Taseko Lakes map-area, British Columbia, 1961-.
15. TIPPER, H.W., Geol. Surv. Can.:  
Smithers map-area, British Columbia, 1969-77.

See:

Jurassic stratigraphy and history of north-central  
British Columbia; Geol. Surv. Can., Bull. 270, 1976.

16. WAGNER, J., SIMONY, P.S., Univ. Calgary (Geology):  
The Malton Gneiss and its upper contact with  
Hadrynian metasediments, 1976-79; Ph.D. thesis  
(Wagner).

A portion of the upper contact of the Malton  
Gneiss has been mapped west of the Rocky Mt.  
Trench in southern Canoe River area. Near the  
contact the grain is strongly laminated and at the  
contact there is a mylonite zone. The Malton mass  
consists primarily of gray, granitoid gneiss with  
amphibolite layers and masses, some layers of mica  
schist were also found. Overlying the gneiss is a  
sequence of metasediments of the Hadrynian  
Horse Thief Creek Group. These are metamor-  
phosed in staurolite kyanite zone, and have not  
been migmatized. Some 800 m above the contact,  
the sequence becomes involved in a series of  
recumbent folds with gently plunging hinges and  
south-dipping axial planes. The metamorphic grade  
rises staurolite virtually disappears and migmatite  
appears. The sequence overlying the gneiss can be  
summarized as follows: ~300 m semipelite and  
pelite with flaggy amphibolite and thin marble  
beds; ~30 m marble and calc silicate beds with

some pelite and quartzite; ~300 m staurolite-kyanite-garnet pelite with psommitic and semipelite layers; 20 m marble and calc silicate layers in semipelite; 200 m semipelite and staurolite pelite with psommitic and grit beds.

#### MANITOBA

17. BAILES, A.H., Manitoba Geol. Surv. Br.:  
File-Morton-Woosey Lakes area, Manitoba, 1970-77.
18. BAILES, A.H., Manitoba Geol. Surv. Br.:  
Saw Lake area, Manitoba, 1976-78.
19. CORKERY, M.T., WEBER, W., MCRITCHIE, W.D., HAUGH, I., FROHLINGER, T.G., Manitoba Geol. Surv. Br.:  
Lower Nelson River project, Manitoba, 1968-79.  

Survey mapping in the Little Assean Lake area was carried out during the 1976 field season with emphasis on the locations of the extension of the major fault zone through Assean Lake to Gull Rapids. Mapping in the Northeast end of Split Lake, scheduled for the 1977 field season will complete the mapping in the area from Split Lake to Kettle Rapids.
20. GILBERT, H.P., HUBREGTSE, J.J.M.W., ELBERS, F.J., Manitoba Geol. Surv. Br.:  
Greenstone belt, 1971-77.  

Project is at the final reporting stage, aimed at production of a comprehensive geological report and maps at final scale of 1:50 000.
21. GILBERT, H.P., ZWANZIG, H., SYME, E., Manitoba Geol. Surv. Br.:  
Arbour Lake, Manitoba, 1976-78.  

The project analyses the stratigraphy of the volcano-sedimentary rocks of the Lynn Lake area in order to relate these rocks (1) to environments of deposition (and subsequent metamorphism and tectonics), and (2) to the regional stratigraphy of this part of the Churchill Province.
22. JANES, D.A., LAMB, C.F., MCRITCHIE, W.D., Manitoba Geol. Surv. Br.:  
Geology of southeast Manitoba, 1974-78.  

Regional mapping is 90% complete in the West Hawk Lake-Rennie section. The Rennie to Winnipeg River section and the Birds Lake Greenstone belt are 60 to 70% complete. All sections other than the Birds Lake volcanics form part of the batholithic-gneiss complex which may be related to the Lac du Bonnet Quartz Monzonite. Planned mapping in 1977 to complete the above areas and geochemical studies underway may indicate whether one major intrusion period or several unrelated intrusion episodes are present.
23. MCRITCHIE, W.D., and staff, Manitoba Geol. Surv. Br.:  
Major crustal elements of the Churchill River segment, Manitoba, 1970-79.
24. WEBER, W., HUBREGTSE, J.J.M.W., Manitoba Geol. Surv. Br.:  
Pikwitonei project, Manitoba, 1974-79.  

Relationships between Superior Province, Pikwitonei Region (Province?), Wabowden Sub-Province (?) and Thompson Nickel Belt area investigated. Present data suggest not necessarily a major break between Pikwitonei and Superior and Webowden, rather a position of areas of different

metamorphic grade due to: (a) vertical displacement along faults; (b) younger (Hudsonian?) metamorphism and granitic activity.

#### NEW BRUNSWICK

25. SKINNER, R., Geol. Surv. Can.:  
Plaster Rock (east half) map-area, New Brunswick, 1970-.

#### NEWFOUNDLAND/LABRADOR

26. BLACKWOOD, R.F., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Gander Lake project, Newfoundland, 1976-81.  

To map two geological corridors through the Gander Zone, northeastern Newfoundland on 1:50 000 scale and provide continuous evaluation of the mineral potential of the project area.
27. BRUECKNER, W.D., Memorial Univ. (Geology):  
Bedrock geology of the St. John's area, southeastern Newfoundland, 1974-78.  

It is anticipated that the resultant map and text will be of use for city and land use planning, for architects and engineers, for teachers and students, and interested laymen in the general public.
28. COLMAN-SADD, S.P., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Regional study of the Bay D'Espoir area, Newfoundland, 1974-82.  

**See:**  
Geology of the St. Alban's map-area, Newfoundland (1M/13); Newfoundland Dep. Mines Energy, Mineral Dev. Div. Rep. 76-4, 1976.  
  
Mapping completed for N.T.S. 1:50 000 St. Alban's sheet (1M/13); Mapping in progress for N.T.S. 1:50 000 Gaultois sheet (1M/12); Mapping proposed for N.T.S. 1:50 000 Twillick Brook (2D/4), Mount Sylvester (2D/3), and east half of Coldspring Pond (12A/1) sheets.
29. HERD, R.K., Geol. Surv. Can.:  
Geology of Red Indian Lake, west half, Newfoundland, 1977-82.  

To revise the geology and evaluate the economic mineral potential of Red Indian Lake, west half 12A, W/2 by mapping at 1:50 000 scale and by compilation where needed.
30. KEAN, B.F., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Victoria Lake project, Newfoundland, 1975-81.  

Field mapping to be supplemented with petrographic studies, rock geochemistry and isotopic age dating.
31. O'DRISCOLL, C.F., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Merasheen project, Newfoundland, 1975-82.  

Work in the Sound Island map area has subdivided rocks mapped previously as the Love Cove Group into three formations - a lowest volcanic formation, a middle red conglomerate and sandstone formation, and an upper green sandstone, black shale formation. These rocks are presently informally named the North Harbour group until definite relationships can be established with the type area of Love Cove Group. Other rocks in map-area include late Precambrian to Cambrian sedimentary and intrusive rocks, and Devonian intrusive rocks.

32. STRONG, D.F., O'BRIEN, S., STRONG, P., EVANS, J., Newfoundland Dep. Mines Energy:  
Geological mapping, southern Burin Peninsula, Newfoundland, 1974-78.  
1:50 000 mapping essentially completed for Morgstaun (1M/3), Grand Bank (1M/4), Lameline (1L/13) and St. Lawrence (1L/14) map sheets.

#### NORTHWEST TERRITORIES

33. BLUSSON, S.L., Geol. Surv. Can.:  
Operation Selwyn, Northwest Territories-Yukon-British Columbia, 1965-.
34. CHRISTIE, R.L., Geol. Surv. Can.:  
Operation Grant Land – northeastern Ellesmere Island and northwestern Greenland, 1963-.

#### See:

Tertiary rocks at Lake Hazen, northern Ellesmere Island; Geol. Surv. Can., Paper 76-1B, p. 259-262, 1976.

Eocene beds at Lake Hazen, northern Ellesmere Island; Geol. Surv. Can., Paper 76-1C, p. 153-156, 1976.

35. COOK, D.G., Geol. Surv. Can.:  
Operation Norman, District of Mackenzie, 1967-.

#### See:

Two cross-sections across selected Franklin Mountain structures and their implications for hydrocarbon exploration; Geol. Surv. Can., Paper 76-1B, p. 315-322, 1976.

36. DOUGLAS, R.J.W., Geol. Surv. Can.:  
Operation Mackenzie, 1957-.
37. EADE, K.E., Geol. Surv. Can.:  
Geology of the Tulemalu Lake map-area, District of Keewatin, 1975-.

#### See:

Geology of the Tulemalu Lake map-area, District of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 209-211, 1977.

38. HENDERSON, J.B., Geol. Surv. Can.:  
Yellowknife and Hearne Lake map-areas, District of Mackenzie, 1970-.
39. HENDERSON, J.B., Geol. Surv. Can.:  
Keskarrah Bay map-area, District of Mackenzie, 1976-.
40. HEYWOOD, W.W., Geol. Surv. Can.:  
Geology of Amer Lake map-area, District of Keewatin, 1976-.

#### See:

Geology of the Amer Lake map-area, district of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 409-410, 1977.

41. HODGSON, D.A., Geol. Surv. Can.:  
Surficial geology, geomorphology and terrain inventory of the Ringnes and adjacent islands, 1976-.

#### See:

A preliminary account of surficial materials, geomorphological processes, terrain sensitivity, and Quaternary history of King Christian and southern Ellef Ringnes Islands, District of Franklin; Geol. Surv. Can., Paper 77-1B, p. 485-493, 1977.

42. HOFFMAN, P.F., Geol. Surv. Can.:  
Geology of the Athapuscow Aulacogen, east arm of Great Slave Lake, District of Mackenzie, 1976-79.

#### See:

Geology of the Athapuscow Aulacogen, east arm of Great Slave Lake, District of Mackenzie, Geol. Surv. Can., Paper 77-1A, p. 117-129, 1977.

43. KERR, J.W., Geol. Surv. Can.:  
Southwestern Ellesmere – western Devon Islands (Operation Grinnell), District of Franklin, 1967-.

#### See:

Stratigraphy of central and eastern Ellesmere Island, Arctic Canada Part III. Upper Ordovician (Richmondian), Silurian and Devonian; Geol. Surv. Can., Bull. 260, 1976.

44. KERR, J.W., Geol. Surv. Can.:  
Boothia Peninsula and Somerset Island (Operation Boothia), District of Franklin, 1974-.

#### See:

Phanerozoic stratigraphy and sedimentology of Somerset Island and northeastern Boothia Peninsula; Geol. Surv. Can., Paper 77-1A, p. 99-106, 1977.

Structural geology of Somerset Island and Boothia Peninsula, District of Franklin; *ibid.*, p. 107-111, 1977.

Marine geological and geophysical activities in Lancaster Sound and adjacent fiords; *ibid.*, p. 495-506, 1977.

45. THOMAS, R.D., Geol. Surv. Can.:  
Surficial geology, terrain inventory, north-central Keewatin, 1976-.

#### NOVA SCOTIA

46. DONOHOE, H.V., WALLACE, P.I., Nova Scotia Dep. Mines:  
Cobequid Highlands survey, 1974-.  
Field surveys were conducted in eastern and central Cobequid Highlands with detailed mapping and study of structural history being the most important phases.

#### ONTARIO

47. AMUKUN, S.E., Ontario Division Mines:  
Geology of the Conglomerate Lake area, District of Thunder Bay, Ontario, 1976-77.

#### See:

Conglomerate Lake area, District of Thunder Bay; Ontario Div. Mines, Misc. Paper 67, p. 50-55, 1976.

48. BENNETT, G., Ontario Division Mines:  
Geology of Jarvis Lake-Garden River area, Ontario, 1974-78.

#### See:

Jarvis Lake-Garden River area, Duncan Township area, District of Algoma; Ontario Div. Mines, Prel. Map, P 1190, 1976.

49. BENNETT, G., Ontario Division Mines:  
Geology of the Two Horse Lake area, Ontario, 1976-77.

#### See:

Two Horse Lake area, District of Algoma; Ontario Div. Mines, Misc. Paper 67, p. 106-110, 1976.

50. BLACKBURN, C.E., Ontario Division Mines:  
Geology of the Boyer Lake-Meggisi Lake area, District of Kenora, Ontario, 1974-77.

#### See:

Boyer Lake area, District of Kenora; Ontario Div. Mines, Prel. Map, P 1187, 1976.

- Meggisi Lake area, District of Kenora; Ontario Div. Mines, Prel. Map, P 1188, 1976.
51. BLACKBURN, C.E., Ontario Division Mines:  
Geology of the Manitou Lakes area, stratigraphy and structure, District of Kenora, Ontario, 1976-77.
- See:**  
Manitou Lakes synoptic project, District of Kenora; Ontario Div. Mines, Misc. Paper 67, p. 33-35, 1976.  
Synoptic study of area covered by NTS 52F/7 with particular reference to stratigraphy and structure of the volcanic/sedimentary sequences, and economic mineral deposits potential. Compilation at 1:50 000. Previous mapping during 1972-1975 outlined major volcanic cycles, now shown to progress from tholeiitic basalt flows, to calc-alkaline andesitic to dacitic pyroclastics, to marginally alkaline flows. At least three centres of volcanism outlined for the calc-alkaline phases. Attendant sub-aerial to sub-marine sedimentation.
52. BREAKS, F.W., BOND, W.D., Ontario Division Mines:  
Geology of the English River Subprovince, Ontario, 1974-77.
- See:**  
Operation Miniss-Tully Lakes, District of Kenora; Ontario Div. Mines, Misc. Paper 67, p. 16-26, 1976.  
Areal mapping in English River Subprovince between longitude 89°00 and Manitoba-Ontario boundary essentially complete; 800 square mile area immediately north of Sioux Lookout to be covered in 1977. Emphasis in 1977 placed upon synoptical evaluation within the previous project areas (15 000 square miles) and metallogenic studies.
53. BRIGHT, E.G., Ontario Division Mines:  
Geology of Cavendish and Anstruther Townships, Peterborough County, Ontario, 1975-77.
- See:**  
Cavendish and Anstruther Townships, Peterborough County, Ontario; Ontario Div. Mines, Misc. Paper 67, p. 122-126, 1976.  
A program of semi-detailed mapping of the Cavendish-Anstruther area, southwest of Bancroft, Ontario commenced in the 1975 field season and continued through the 1976 season. The major aims of this program are: (1) to outline major rock stratigraphic units and regional structures; and (2) to obtain a better understanding of the geological setting of the Bancroft area uranium deposits, which will provide guidelines for future exploration. An important clue to the origin of the uranium in the Bancroft area, resulting from the work to-date is the recognition of a stratigraphic control on the distribution of most of the uranium.
54. CARD, K.D., INNES, D.G., Ontario Division Mines:  
Geology of the Benny area, District of Sudbury, Ontario, 1973-77.  
Detailed geology of the area bounded by latitudes 46°42'N to 46°51'N and longitudes 81°26'W to 81°53'W with emphasis on the stratigraphy, chemistry and mineral deposits of the Benny meta-volcanic-metasedimentary belt.
55. CARTER, M.W., Ontario Division Mines:  
Shining Tree area, Ontario, 1976-78.
- See:**  
Shining Tree area; Ontario Div. Mines, Misc. Paper 67, p. 96-101, 1976.
56. DRESSLER, B., Ontario Division Mines:  
Geology of the Wanapitei Lake area, District of Sudbury, Ontario, 1977-79.
57. EDWARDS, G.R., Ontario Division Mines:  
Geology of the Straw Lake area, Districts of Rainy River and Kenora, Ontario, 1976-77.
- See:**  
Straw Lake area, Districts of Rainy River and Kenora; Ontario Div. Mines, Misc. Paper 67, p. 36-40, 1976.
58. JENSEN, L.S., Univ. Saskatchewan – Ontario Division Mines:  
Petrogenesis of the Abitibi Greenstone belt in the Kirkland Lake area, Ontario, 1972-77; Ph.D. thesis.
- See:**  
A new cation plot for classifying subalkalic volcanic rocks; Ontario Div. Mines, Misc. Paper 66, 1976.  
The Kirkland Lake area is underlain by Archean volcanic rock preserved in a large east-trending synclinorium. The volcanic rocks consist of three volcanic cycles. The first two cycles represent komatiitic-tholeiitic-calcalkalic sequences and the third cycle represents an alkalic sequence associated with clastic sedimentation.
59. JENSEN, L.S., Ontario Division Mines:  
Magusi River area, Ontario, 1972-77.  
The Magusi River area (400 sq. miles) is underlain by a lower sequence of tholeiitic volcanic rock (Kinojevis Group) and an upper of calcalkaline sequence (Blake River Group) of prehnite-pumpellyite-quartz facies metamorphism.
60. JENSEN, L.S., Ontario Division Mines:  
Geology of the Lightning River area, District of Cochrane, Ontario, 1973-77.  
The Lightning River area (400 sq. miles) is underlain by a komatiitic sequence (Stoughton Roquemaure Group) and an upper sequence of tholeiitic volcanic rock (Kinojevis Group). Base of the sequence is felsic volcanic rocks cut by trondhjemite (Lake Abitibi Batholith). The area is transected by the Destor-Porcupine fault and an associated zone of alkalic volcanic rock.
61. JENSEN, L.S., Ontario Division Mines:  
Geology of Ramore area, Districts of Cochrane and Timiskaming, Ontario, 1974-78.  
The Ramore area (400 sq. miles) is underlain by komatiitic, tholeiitic, calcalkalic and alkalic volcanic rocks. The volcanic rocks are intruded by ultramafic, mafic and felsic plutonic rocks. The Destor-Porcupine fault transects the north part of the area.
62. JENSEN, L.S., Ontario Division Mines:  
Geology of the Kirkland Lake area, Ontario, 1976-78.  
To determine the lithology, stratigraphy, structure and economic potential of the volcanic, sedimentary, and intrusive rocks in the area over an area of approximately 1000 square miles.
63. KARVINEN, W.O., FYON, A., CROCKET, J., Ontario Division Mines, McMaster Univ. (Geology):  
Major and minor element geochemistry of gold-bearing carbonates, Timmins area, Ontario, 1976-78; M.Sc. theses (Fyon, Crocket).



64. MACKASEY, W.O., Ontario Division Mines:  
Stratigraphy and structure of the Sturgeon River area, District of Thunder Bay, Ontario, 1976-79.
- See:**  
Stratigraphy and structure of the Sturgeon River area, District of Thunder Bay; Ontario Div. Mines, Misc. Paper 67, p. 47-49, 1976.
65. NORRIS, A.W., Geol. Surv. Can.:  
Operation Winisk, Ontario, 1967-.
66. PIRIE, J., Ontario Division Mines:  
Geology of Crooked Pine Lake area (formerly Trotter Weaver Townships area), Ontario, 1975-76.
- See:**  
Crooked Pine Lake area; Ontario Div. Mines, Prel. Maps 1101, 1102, 1976.
- Report on geology completed. Northern trondhjemitic batholith comprises a number of intrusive phases and high grade remnant of supracrustal rocks. Metavolcanic belt contains mixtures of intermediate pyroclastic and mafic flow rocks. Southern metasediments of the Quetico Belt are progressively metamorphosed from low greenschist facies in north to upper amphibolite facies with associated quartz monzonite diatexites in the south.
67. PIRIE, J., Ontario Division Mines:  
Geology of Balmer, Bateman, Graves and McDonough Townships, Ontario, 1976-78.
- See:**  
McDonough-Graves Townships area; Ontario Div. Mines, Misc. Paper 67, p. 4-7, 1976.
- Detailed mapping and studies to unravel stratigraphy of the metasedimentary-metavolcanic sequence and its relation to gold deposits in the Red Lake area. A sequence of narrow mafic to intermediate metavolcanic and turbidite units face towards the major trondhjemitic batholith in McDonough and Graves Townships, and likely represents the northwest limb of a major anticlinorium structure.
68. PYKE, D.R., Ontario Division Mines:  
Watabeag River area, Ontario, 1974-78.
- See:**  
Watabeag River area; Ontario Div. Mines, Prel. Map P1078, 1976.
69. PYKE, D.R., Ontario Division Mines:  
Radisson Lake area, Ontario, 1975-78.
- See:**  
Radisson Lake area; Ontario Div. Mines, Misc. Paper 67, p. 83-86, 1976.
70. PYKE, D.R., Ontario Division Mines:  
Timmins area, Ontario.
- See:**  
On the relationship between gold mineralization and ultramafic volcanic rocks in the Timmins area, northeastern Ontario; CIM Bull., v. 69, p. 79-87, 1976.
71. ROBERTSON, J.A., Ontario Division Mines:  
Geology of 06 Edack Lake area, Ontario, 1969-77.
72. ROBERTSON, J.A., Ontario Division Mines:  
Geology of the Cutler area, Ontario, 1969-77.
73. TELFORD, P.G., Ontario Division Mines:  
Paleozoic geology of southern Ontario, 1973-.
- See:**  
Paleozoic geology of the Niagara to Collingwood-Nottawasaga areas; Ontario Div. Mines, Maps 2336-2344, 1976.
- Paleozoic geology of the Dunnville and Welland-Fort Erie areas; Ontario Div. Mines, Prel. Maps P988-P989, 1975.
- Surface mapping and subsurface data compilation has been completed for the Simcoe, Brantford, Cambridge, Stratford, Woodstock, Lucan, St. Marys, Grand Bend, Parkhill, Perch 1:50 000 map areas. Further work is planned in the Windsor-Essex, Pelee Island, and Strathroy areas. Particular attention is being given to the stratigraphic relationships of Middle Devonian rock units in these areas and conodont biostratigraphy.
74. WALLACE, H., Ontario Division Mines:  
Geology of the Attwood Lake area, Ontario, 1976-77.
- The Attwood Lake area, a rectangle bounded by latitudes 51°12'N and 51°22'30"N and longitudes 88°20'W and 88°40'W, has been mapped on a scale of 1:15 840. Research continues into structural, stratigraphic and metamorphic problems found during field work with the aim of completing a regional geological synthesis in this part of the Uchi Subprovince.
75. WILSON, B., Ontario Division Mines:  
Geology of the Twopeak Lake area, District of Cochrane, Ontario, 1976-77.
- See:**  
Twopeak Lake area, District of Cochrane; Ontario Div. Mines, Misc. Paper 67, p. 80-82, 1976.
- QUÉBEC**
76. CHARBONNEAU, J.-M., ST-JULIEN, P., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région de Bedford, comté de Missisquoi, Québec, 1976-78.
77. DUROCHER, M., Québec Min. Richesses Naturelles:  
Quart nord-ouest du Canton de Cuvier, 1976-78.
78. GOBEIL, A., Québec Min. Richesses Naturelles:  
Quart nord-est du Canton de Levy, 1976-77.
79. KISH, L., Québec Min. Richesses Naturelles:  
Géologie et mineralisations radioactives dans la région du Lac Patibre, 1974-77.
- SASKATCHEWAN**
80. DAVISON, W.L., Geol. Surv. Can.:  
Milliken Lake - Goldfields mining area, Saskatchewan, 1975-.
- YUKON TERRITORY**
81. BLUSSON, S.L., Geol. Surv. Can.:  
Operation Stewart, Yukon-District of Mackenzie, 1968-.
82. CAMPBELL, R.B., Geol. Surv. Can.:  
Operation Mount St. Elias, Yukon-British Columbia, 1973-.
83. NORRIS, D.K., Geol. Surv. Can.:  
Operation Porcupine, Yukon-District of Mackenzie, 1961-.
- See:**  
The geology of the Bonnet Plume Basin, Yukon Territory; Geol. Surv. Can., Paper 76-8, 1977.
84. TEMPELMAN-KLUIT, D.J., Geol. Surv. Can.:  
Operation Snag-Yukon, 1970-.

## AREAL MAPPING, GREATER THAN 1:50 000

### BRITISH COLUMBIA

85. GABRIELSE, H., Geol. Surv. Can.:  
Operation Finlay, British Columbia, 1970-.
- See:**  
Operation Finlay, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 243-246, 1977.
86. MULLER, J.E., Geol. Surv. Can.:  
Geology of northern Vancouver Island, British Columbia, 1968-.
87. RODDICK, J.A., Geol. Surv. Can.:  
Coast mountains project, British Columbia, 1963-.
- See:**  
Coast Mountains project; Geol. Surv. Can., Paper 77-1A, p. 271-272, 1977.
88. SOUTHER, J.G., Geol. Surv. Can.:  
Cordilleran volcanic project, British Columbia-Yukon, 1970-.

### MANITOBA

89. DAVISON, W.L., Geol. Surv. Can.:  
Geology of Southern Indian Lake, Manitoba, 1968-.
90. DAVISON, W.L., Geol. Surv. Can.:  
Geology of the Seal River map-area, Manitoba, 1968-.
91. SCHLEDEWITZ, D.C.P., MCRITCHIE, W.D., Manitoba Geol. Surv. Br.:  
Munroe-Tadoules Lake project, 1976-77.
- To update existing 4 mile mapping and the correlation of the geology with the geology of the Kasmere project area (1975) which lies to the west between the western boundary of the Munroe-Tadoules project and the Saskatchewan-Manitoba border (i.e. 102° to 100°).

### NEW BRUNSWICK

92. FYFFE, L.R., HAMILTON, J.B., New Brunswick Dep. Nat. Res (Mineral Res. Br.):  
Accelerated mapping, central New Brunswick, 1976-81.

### NEWFOUNDLAND/LABRADOR

93. RYAN, A.B., SMYTH, W.R., Newfoundland Dep. Mines Energy:  
Regional mapping and mineral potential evaluation of the Central Mineral Belt, Labrador, 1974-80.
- See:**  
Geological mapping in the Central Mineral Belt, Labrador: Redefinition of the Croteau Group; Newfoundland Dep. Mines Energy, Mineral Dev. Div., Rep. 76-1, p. 51-74, 1976.
- Continuation of regional 1:50 000 geological mapping and mineral potential evaluation survey of the Moran and Bruce River Groups in the Central Mineral Belt of Labrador, to investigate the regional distribution of rocks of both groups, the environment and mode of formation of uranium occurrences in the area, the recognition of Bruce River Group rocks in the Grenville Province, and the relationship between the Moran/Bruce River and the Aillik Group to the northeast, the latter hosting two uranium deposits.
94. SMYTH, W.R., RYAN, A.B., Newfoundland Dep. Mines Energy:  
Regional mapping of the Central Belt, Labrador - Geologic setting of uranium occurrences, 1974-81.

### **See:**

Geological mapping in the Central Mineral Belt, Labrador: Redefinition of the Croteau Group; Newfoundland Dep. Mines Energy, Mineral Dev. Div., Rep. 76-1, p. 51-74, 1976.

95. WARDLE, R.J., SMYTH, W.R., Newfoundland Dep. Mines Energy:  
Regional mapping and mineral potential evaluation of the eastern margin of the Labrador Trough, 1976-78.
- To continue 1:50 000 and 1:100 000 scale regional mapping of the eastern margin of the Labrador Trough with the purpose of defining the relationship of the Kaniapiskau Supergroup (Trough) to the gneisses and schists of the Eastern Basement Complex.

### NORTHWEST TERRITORIES

96. CAMPBELL, F.H.A., Geol. Surv. Can.:  
Geology of the Bathurst Inlet area, District of Mackenzie, 1974-.
97. EADE, K.E., Geol. Surv. Can.:  
Gibson-MacQuoid Lakes map-area, Northwest Territories, 1972-.
98. FRISCH, T., Geol. Surv. Can.:  
Reconnaissance mapping of the Precambrian geology of southeastern Ellesmere and eastern Devon Islands, District of Franklin, 1976-.
99. FRITH, R.A., Geol. Surv. Can.:  
Indian Lake map-area, District of Mackenzie, 1972-.
100. FRITH, R.A., Geol. Surv. Can.:  
Geology of the Hackett River-Black River area, District of Mackenzie, 1975-.
- See:**  
The geology of the Hackett-Back River Greenstone belt - second preliminary report; Geol. Surv. Can., Paper 77-1A, p. 415-423, 1977.
101. HEYWOOD, W.W., Geol. Surv. Can.:  
Operation northern Melville Peninsula, District of Franklin, 1970-.
102. HOFFMAN, P.F., Geol. Surv. Can.:  
Sloan River map-area, District of Mackenzie, 1973-.
103. HOFFMAN, P.F., TIRRUL, R., Geol. Surv. Can., Queen's Univ. (Geology):  
Rainy Lake igneous complex, Great Bear Lake, Northwest Territories, 1973-80; B.Sc. thesis (Tirrul).
104. HURDLE, E.J., PADGHAM, W.A., ASPLER, L.B., DIAND (Yellowknife):  
Beniah Lake map sheet, Northwest Territories, 1972-77.
105. HYDE, R.S., PADGHAM, W.A., GIBBINS, W.A., DIAND (Yellowknife):  
Takijug-Point Lake volcanic belts, geological mapping, 1976-.
- See:**  
Preliminary geological maps 86I/1, 86I/2; DIAND EGS 17, 18, 1976.
106. JACKSON, G.D., Geol. Surv. Can.:  
Operation Bylot, District of Franklin, 1967-.
107. JACKSON, G.D., Geol. Surv. Can.:  
Operation Penny Highlands, District of Franklin, 1969-.

108. LAPORTE, P., DIAND (Yellowknife):  
Geological mapping of the Amer Lake area, Northwest Territories, 1977-79.  
Prepare 1:31 680 maps of a belt of Aphebian supracrustals which contain at least one major and numerous minor uranium showings.
109. LAPORTE, P.J., BARRETT, K.R., DIAND (Yellowknife):  
Geological mapping of NTS areas 65H/16 Heninga Lake, 55E/13 Turquetil Lake, 55L/4 Carr Lake and 65I/1 Kogtok River, Northwest Territories, 1975-78.  
**See:**  
Preliminary geology map of Heninga Lake area 65H/16; DIAND EGS 1976-1, 1976.  
Geological mapping of the Heninga Lake 1:31 680 map sheet was completed in 1976 and the mapping of the northeast half of the Turquetil Lake sheet (55E/13), the south halves of the Carr Lake (55L/4), and Kogtok River sheets (65I/1) was started. Stratigraphic and possibly geochemical studies of the Archean volcano-sedimentary assemblage will be undertaken in order to determine the relationship between two massive sulphide deposits, one at Spi Lake and one at Heninga Lake.
110. LECHEMINANT, A.N., Geol. Surv. Can.:  
MacQuoid Lake (W 1/2) and Thirty Mile Lake (E 1/2) map-areas, District of Keewatin, 1975-.
- See:**  
Geological studies: Thirty Mile Lake and MacQuoid Lake map-areas, District of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 205-208, 1977.
111. MCGLYNN, J.C., Geol. Surv. Can.:  
Calder River map-area, District of Mackenzie, 1973-.
112. MORGAN, W.C., Geol. Surv. Can.:  
Geology of the Foxe Fold belt, Baffin Island, District of Franklin, 1974-.
113. PADGHAM, W.A., JEFFERSON, C.W., GIBBINS, W.A., DIAND (Yellowknife):  
Extension of 1:12 000 scale mapping over all of Yellowknife volcanic belt, Northwest Territories, 1975-.
114. PETRYK, A.A., Quebec Dep. Nat. Res. (Energy):  
Mesozoic and Tertiary rocks at Lake Hazen, Ellesmere Island, 1976.
115. THORSTEINSSON, R., Geol. Surv. Can.:  
Cornwallis and adjacent smaller islands, District of Franklin, 1965-.
- ONTARIO**
116. BLACKBURN, C.E., BEARD, R.C., Ontario Division Mines:  
Kenora-Fort Frances compilation map, revision, 1973-77.
117. CARD, K.D., Ontario Division Mines:  
Geology of the Sudbury-Manitoulin area, Ontario.
118. SIRAGUSA, G.M., Ontario Division Mines:  
Geology of the Batchawana-Pangis area, Ontario, 1974-77.
119. SIRAGUSA, G.M., Ontario Division Mines:  
Geology of the Quinn Lake area, Ontario, 1977-.
120. TAYLOR, F.C., Geol. Surv. Can.:  
Operation Torngat, Quebec and Newfoundland, 1966-.
121. TROWELL, N.F., Ontario Division Mines:  
Synoptic study - Sturgeon Lake area, District of Kenora and Thunder Bay, Ontario, 1975-77.
122. WOOD, J., Ontario Division Mines:  
Geology of the Mine Centre area, Ontario, 1976-78.  
**See:**  
Mine Centre area, District of Rainy River; Ontario Div. Mines, Misc. Paper 67, p. 41-44, 1976.  
Areal mapping with a view to the understanding of lithologies and stratigraphy of the Mine Centre area. Particular attention is being paid to a) anorthositic and felsic high-level intrusions and their relationship to occurrences of economic minerals, b) the metasedimentary rocks (Seine Series and Couchiching) in order to interpret their depositional environments and mutual relationships, as well as their relationships with the metavolcanic rocks and high-level intrusions.
- QUÉBEC**
123. BEAUDIN, J., SKIDMORE, W.B., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région du lac Cascapédia (groupe de Shickshock), Gaspésie, Québec, 1976-78.
124. BIRON, S., SKIDMORE, W.B., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région des Monts McGerrigle et de Ste-Anne-des-Monts, Gaspésie, Québec, 1976-78.
125. BOURNE, J.H., Geol. Surv. Can.:  
Operation Olomane, Québec, 1976-.
- See:**  
Lac de Morhiban and Natashquan River map-areas, Québec; Geol. Surv. Can., Paper 77-1A, p. 199-204, 1977.
126. CLARK, T., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région du lac Forbes, territoire du Nouveau-Québec, 1976-77.
127. DUBÉ, C., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région des rivières à La Marte et Rupert, territoire de Mistassini, Québec, 1976-77.  
**Voir:**  
Géologie de la région des rivières à La Marte et Rupert, territoire de Mistassini; Québec Min. Rich. Nat., DPV-445, 1977.
128. FRANCONI, A., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la rivière Eastmain inférieure, territoires de Mistassini et du Nouveau-Québec, 1976-77.  
**Voir:**  
Géologie de la région de la rivière Eastmain inférieure, (Partie est de la bande volcanosédimentaire), territoires de Mistassini et du Nouveau-Québec; Québec Min. Rich. Nat., DPV-450, 1977.
129. GLOBENSKY, Y., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région de Lacolle, comtés de Napierville, Laprairie, Saint-Jean, Iberville et Missisquoi, Québec, 1976-77.
130. HOCQ, M., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région du Lac Cadieux, territoire du Nouveau-Québec, 1976-77.

**Voir:**

Géologie de la région du Lac Cadieux, territoire du Nouveau-Québec; Québec Min. Rich. Nat., DPV-433, 1977.

131. LACHAMBRE, G., SKIDMORE, W.B., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Stratigraphie du Siluro-Dévonien de la région de Restigouche, comté de Bonaventure, Québec, 1976-77.

132. REMICK, J.H., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région de Fort George, municipalité de la Baie James, 1976-77.

**Voir:**

Géologie de la région de Fort George, municipalité de la Baie James, Québec; Québec Min. Rich. Nat., DPV-446, 1977.

133. RIVE, M., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région des lacs Cawasachouane et Otanabi, comtés de Pontiac et de Témiscamingue, Québec, 1976-77.

134. RONDOT, J., MAURICE, R., Québec Min. Richesses Naturelles:  
Stratigraphie du précambrien dans la région du Saint-Maurice, Québec, 1976.

135. SHARMA, K.N.M., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région de La Grande Rivière, Québec, 1976-77.

136. VALLIÈRES, A., SKIDMORE, W.B., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie de la région de Rivière-du-Loup, Québec, 1976-78.

**SASKATCHEWAN**

137. FORSYTHE, L.H., Sask. Geol. Surv.:  
Geology mapping, Hunter Bay-Cartier Lake area, Saskatchewan, 1974-77.

**See:**

Precambrian geology, Cartier Lake area; Sask. Geol. Surv., Summ. Investig. 1976.

138. GILBOY, C.F., Sask. Geol. Surv.:  
Semi-reconnaissance geological mapping of the Reindeer Lake South (SE) area, Saskatchewan, 1976-77.

**See:**

Reindeer Lake South (SE); Sask. Geol. Surv., Summ. Investig. 1976.

An area of about 4000 km<sup>2</sup> south and east of Reindeer Lake, comprising largely Kisseynew Gneisses (Burntwood Supergroup and Sickle Formation) has been mapped. A large area of mafic hornblendic rocks occurs in the west and minor base metal anomalies were reported.

139. JOHNSTON, W.G.Q., Sask. Geol. Surv.:  
Royal Lake (E) and Steephill Lake (E) areas, geological mapping, Saskatchewan, 1974-77.

**See:**

Royal Lake (E) and Steephill Lake (E) areas; Sask. Geol. Surv., Summ. Investig., 1976, p. 15-17.

140. LEWRY, J.F., CURRY, A.E., PETROSKI, M.L., REES, C.J., ROBERTS, K., THOMAS, D., Sask. Geol. Surv., Univ. Regina (Geological Sciences):  
Reindeer Lake North (SW) area, Saskatchewan, 1976-77; M.Sc. theses (Curry, Rees, Roberts, Thomas).

**See:**

Sask. Geol. Surv., Summ. Investig., 1976, p. 29-35.

An area of about 2500 km<sup>2</sup> west of Reindeer Lake, Saskatchewan was mapped in 1976 at semi-reconnaissance scale for publication at 1:100 000 scale. The area contains an extension of the Parker Lake Shear Zone and parts of the Wathaman Granite, Rottenstone migmatites and the igneous complex south-east of the Needle Falls Shear Zone.

141. MACDONALD, R., POSEHN, G.A., BELL, K., BLENKINSOP, J., Sask. Geol. Surv., Carleton Univ. (Geology):  
Compilation geology, Pelican Narrows (63M) and Amisk Lake (63L) areas, Saskatchewan, 1975-78.

**See:**

Reinvestigation in the Pickerel River and Limestone-Tulebi Lakes area, Saskatchewan; Sask. Geol. Surv., Summ. Investig., 1976, p. 44-52.

Compilation geology, Pelican Narrows (63M) and Amisk Lake (63L) areas; Sask. Geol. Surv., Summ. Investig. 1976, p. 53-57.

142. PATERSON, D.F., KENDALL, A.C., CHRISTOPHER, J.E., Sask. Geol. Surv.:

Phanerozoic geology of the La Loche area, Saskatchewan, 1975-77.

143. RAY, G.E., Sask. Geol. Surv.:  
Foster River (NW) and Geikie River (SW) areas, geological mapping, Saskatchewan, 1976-77.

**See:**

Foster River (NW) and Geikie River (SW) areas; Sask. Geol. Surv., Summ. Investig. 1976, p. 18-23.

This area is underlain by a presumed Archean basement with relics of the Wollaston Group (Aphebian), and to the north the Athabasca Formation. Uranium appears to be associated with the interface between the Archean/Wollaston Group/Athabasca Fm. and with faulting. The recent Key Lake uranium discovery lies within this area.

144. SCOTT, B.P., Sask. Geol. Surv.:  
Geological mapping, Maynard Lake and Sandy Narrows (West) areas, Saskatchewan, 1975-77.

**See:**

Maynard Lake and Sandy Narrows (West) areas; Sask. Geol. Surv., Summ. Investig. 1976, p. 8-11.

145. SCOTT, B.P., Sask. Geol. Surv.:  
Geological mapping, Steephill Lake (West) area, Saskatchewan, 1976-78.

**See:**

Steephill Lake (West) area; Sask. Geol. Surv., Summ. Investig. 1976, p. 12-14.

The 15-minute sheet was about half mapped. Completion of the fieldwork has been postponed to at least 1978.

146. STAUFFER, M.R., COLEMAN, L.C., LANGFORD, F.F., MOSSMAN, D.J., FUMERTON, S., ASHFORD, K., MACFARLANE, N., Sask. Geol. Surv., Univ. Saskatchewan (Geological Sciences):  
Reindeer Lake North (SE) area, Saskatchewan, 1976-77; Ph.D. theses (Fumerton, Ashford, Macfarlane).

**See:**

Sask. Geol. Surv., Summ. Investig. 1976, p. 24-28.

## ENVIRONMENTAL GEOSCIENCE

147. AZZARIA, L.M., CARRIER, J.A., Univ. Laval:  
Les métaux lourds dans les sédiments, l'eau et l'air, région de Noranda, Québec, 1974-79.  
Nous sommes en train d'interpréter les données sur l'eau et l'air; et en train de faire les analyses des sédiments.
148. DURAND, M., Université du Québec à Montréal (Sciences de la Terre):  
Etude des implications de la géologie urbaine pour l'aménagement et la construction à Montréal, 1975-.  
Relevés continus dans tous les grands travaux publics (fouilles des installations olympiques, tunnels du métro, aqueduc et collecteurs en construction).
149. GILLHAM, R.W., CHERRY, J.A., KUHN, T., REYNOLDS, D., Univ. Waterloo (Earth Sciences):  
Distribution coefficients of  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$  in selected Quaternary deposits (laboratory studies), 1974-77; M.Sc. theses (Kuhn, Reynolds).  
Prediction of the behavior of radionuclides in groundwater flow systems requires knowledge of the radionuclide distribution coefficients for the material through which they may be transported by groundwater. This project involves determination of distribution coefficients by standard batch methods and by new methods that will serve for evaluation of some of the possible errors in the standard approach. A group of representative samples from several types of Quaternary deposits in three provinces are being used in the laboratory experiments.
150. GLOOSCHENKO, W.A., HARPER, N., MAYER, T., CAPOBIANCO, J.A., Environment Canada (CCIW):  
Hudson/James Bay coastal ecology, 1976-78.  
To investigate the sensitivity of coastal wetlands in the Hudson's Bay Lowlands in respect to future possible development. The study will investigate the ecology of coastal areas by: 1) investigating the major physico-chemical factors of soils and sediments influencing the species composition, biomass, and productivity of coastal vegetation with emphasis upon salt marsh communities, 2) determining both the qualitative and quantitative distribution of coastal vegetation in terms of species composition and biomass, 3) determining the nature of food chains in such ecosystems, 4) studying major geochemical cycles in such environments, and 5) developing a predictive model to determine the possible effect of environmental perturbations upon coastal ecology. During 1976, parts 1 and 2 as described above were carried out in the southern portion of James Bay in addition to a reconnaissance coastal survey of coastal ecosystems from Moosonee to north of Winisk. This year's program will emphasize the region from the Albany River to Cape Henrietta-Maria, and studies will be made in cooperation with Lands Directorate, Canadian Wildlife Service, and the Royal Ontario Museum.
151. HARRISON, J.E., Geol. Surv. Can.:  
Environmental geology prototype study, Ottawa-Hull region, 1970-.
- See:**  
Coastal studies in the Ottawa area; Geol. Surv. Can., Paper 77-1A, p. 59-60, 1977.
152. HARRISON, J.E., Geol. Surv. Can.:  
Environmental geology – mountain coal mining, British Columbia and Alberta, 1972-.
- See:**  
Coal mining and surface water quality: Crowsnest Pass, Alberta and British Columbia – preliminary data; Geol. Surv. Can., Paper 77-1A, p. 319-322, 1977.  
Summer soil temperature as a factor in revegetation of coal mining waste; *ibid.*, p. 329-332, 1977.  
Dated organic material below Mazama (?) Tephra: Elk Valley, British Columbia; Geol. Surv. Can., Paper 76-1C, p. 169-170, 1976.
153. KABIR, A., CROCKET, J.H., McMaster Univ. (Geology):  
Geochemical pathways of arsenic, selenium and palladium in fresh water systems, 1974-80.  
Arsenic, palladium, selenium and gold have been determined by neutron activation analysis in dredged bottom sediments from lakes in the Sudbury-Timagami area. Concentration contours decrease radially away from Sudbury with a distinct tendency toward elongation in an approximate northeast-southwest direction which is parallel to prevailing wind. Maximum concentrations are approximately ten to one-hundred time background, dropping to background about 40 to 50 km distant from Sudbury. We interpret these results to indicate that airborne input is one major lake sediment loading mechanism. Limited analyses of cored lake sediment samples show that maximum heavy metal concentrations occur within 5 cm of the sediment-water interface indicating relative recent input.
154. MCCAUGHEY, J.H., Queen's Univ. (Geography):  
Radiation and energy balance components in a forested watershed prior and post logging – Montmorency, Québec, 1974-79.
- See:**  
Temperature and humidity profile measurement over forests using diodes; J. Appl. Meteorol., v. 1, 1977.  
To investigate the effects of logging on the radiation and energy balance components within the IHD basin at Montmorency, Québec. To date experimental data have been collected and analysed on the radiation and energy balances of a Balsam fir forest. The Ponestley and Taylor form of the combination model of potential evaporation has been applied to the forest surface with excellent results for daily totals. Within the next two field seasons the data base of evaporation and energy balance data will be extended to logged surfaces, an attempt will be made to map the net radiation field in this topographically diverse basin, and these data will be used in an experiment to estimate regional evaporation rates.
155. MORIN, F., Geol. Surv. Can.:  
Environmental geology, Hamilton urban area, Ontario, 1973-.
156. ROEGIERS, J.C., BAWDEN, W.F., Univ. Toronto (Civil):  
Underground storage of oil and gas, 1975-.

157. RUKAVINA, N.A., ST. JACQUES, D.A., Environment Canada (CCIW):  
Nearshore sedimentology of the Great Lakes, 1968-.
- See:**  
Nearshore sediments of Lakes Ontario and Erie; Geoscience Can., v. 3, no. 3, p. 1854-190, 1976.
- A study of Great Lakes coastal erosion and sedimentation at a regional scale. The program operates at three levels: 1. the analysis of near-shore survey and bluff erosion data for a coastal reach representing one to two years of field study. Six reports on Lake Ontario and Lake Erie have been completed at this level. Reports on western Lake Erie and southern Lake Huron are in progress; 2. the development of a coastal sediment budget. A preliminary budget is complete for Lake Ontario and in preparation for Lake Erie; and 3. specific studies designed to answer problems raised by the regional synthesis: Photologger studies: Use of an underwater time-lapse camera to record bottom disturbance and sediment transport associated with storm conditions. Nearshore profiles: Analysis of nearshore profiles monitored annually to measure the rate and form of profile change and the supply of sediment generated by sub-aqueous erosion. Nearshore stratigraphy: Analysis of nearshore cores to determine the variation in the rate and type of postglacial sedimentation and its dependence on short- and long-term water level change.
158. RUST, B.R., Univ. Ottawa (Geology):  
Distribution and transport in bed sediments of the Ottawa River, 1972-77.
- See:**  
Mercury and bed sediment in the Ottawa River, Canada; J. Sed. Petrol., v. 46, p. 563-578, 1976.
159. ST. JACQUES, D.A., RUKAVINA, N.A., Environment Canada (CCIW):  
Lake Huron nearshore sediment survey, 1976-77.
- Echo sounder records, bottom samples and underwater photographs were used to map the surficial geology and bathymetry of the Lake Huron nearshore zone (0-20 m) between Sarnia and Goderich, Ontario. The bottom types consist of: 1) glacial drift (76%); 2) modern sediment (20%); 3) bedrock (3%); and 4) undifferentiated glacial drift and bedrock (1%). Glacial drift is exposed in the inshore two thirds of the zone between Sarnia and Kettle Point and throughout most of the zone from Grand Bend to Goderich. The modern sediments occur at the offshore limit of the zone opposite Sarnia and inshore between Kettle Point and Grand Bend. Bedrock crops out at Kettle Point.
160. SLAWSON, W.F., NAPOLEONI, J.G., Univ. British Columbia (Geophysics and Astronomy):  
Alpha particle detection as a possible earthquake predictor, 1976-.
- We have been performing both laboratory and field tests in the use of plastic strips as alpha particle detectors. Certain plastics are sensitive to the 5.5 MeV particles emitted by the Radon-222 decay. The particles produce tracks in the plastic which may be enhanced by a suitable etching technique. To date we have one field test in which we believe natural alpha tracks have been recorded. More detectors have been deployed to assess the Radon emission in a variety of environments around Vancouver. The emission of Radon has been reported as a useful precursor event to earthquakes. From the reading we have done it appears considerable background data is required and we plan to continue the collection of such data subsequent to technique perfection.
161. TERASMAE, J., Brock Univ. (Geological Sciences):  
Dendrochronology and dendroclimatology in northern Québec, 1974-78.
- Eighty cross sections of *Larix laricina* (Du Roi) K. Koch were collected in August, 1974, on the northern treeline east of Hudson's Bay near Ft. Chimo, Ungava, Canada (lat. 58°22'N; long. 68°23'W). Crossdating of the ring widths is of classic quality with considerable high-frequency variation, but low-frequency variations in growth produce a first-order autocorrelation of 0.61. Data for measured radii from 18 trees were standardized by fitting a negative exponential or straight line to derive indices depicted in the figure. In a response function analysis, climatic data for 1947-1974 from Fort Chimo reduced 28% of the ring-width variance, and prior growth reduced 57%. Ring widths respond directly to warmer-than-average temperatures during seven months of the April-November period. Precipitation in the prior July, September, November, December, and the current June is inversely correlated with growth. Narrow rings are often accompanied by frost damage indicating freezing during the growing season. It may be inferred that there were persistent intervals of spring/summer/autumn cold in the first 65 years of the 19th century and that the area has been experiencing a return to this cold condition in recent years. Additional studies are planned for the area between Fort Chimo and Hudson Bay.
162. WANTICERY, A., LENNOX, D.H., LAWSON, D., JUDGE, A., Environment Canada (Water Res. Br.):  
Riverbed temperature on Melville Island, District of Franklin, 1976-78.
- In the Canadian Arctic Islands, the rivers stop flowing early in winter as a result of the freezing of the Arctic layer in the associated river basin. A field investigation was made in 1976 of the active layer thickness and permafrost temperature under the riverbed at two sites on the 'King' River on Melville Island. Thermistor cables had been installed in May into boreholes drilled into the frozen riverbed. The study showed that a) Arctic rivers which flow for only a few months in the summer exert little influence on the thermal regime of their associated stream beds, and b) snow drifts induced by river channel morphology and orientation locally insulate the riverbed from the extremes of winter cold.
163. WANTICERY, A., LENNOX, D.H., LAWSON, D., JUDGE, A., Environment Canada (Water Res. Br.):  
Field investigations of the thaw layer beneath riverbeds in the continuous permafrost zone, 1977-78.
- River basins with extensive lake storage in their associated basins are common in Arctic Canada. This storage may keep such rivers flowing late into the winter in spite of excessive cold. This project is an investigation of the annual changes in the thaw layer beneath the riverbed of such rivers. Riverbed temperatures will be measured at key points such as shallow riffles, river icings and lake outlets.

## ANALYTICAL METHODS AND ANALYSIS

164. ABBEY, S., Geol. Surv. Can.:  
Analysis of international reference samples, 1969-.
165. ABBEY, S., Geol. Surv. Can.:  
Development of methods for the analysis of geological materials, 1969-.
- See:**  
Application of spectrochemical methods to trace element determinations in geological materials; Geol. Surv. Can., Paper 76-1B, p. 11, 1976.  
Improvements in the "screw-rod" method for determination of lithium, rubidium, and cesium; *ibid.*, Paper 76-1B, p. 13, 1976.
166. HÉROUX, Y., CHAGNON, A., INRS-Pétrole, Univ. Québec:  
Compilation of techniques for evaluation of schematic diagenetic/catagenetic zones, 1976-77.
- See:**  
Les méthodes d'étude physico-chimiques de la matière organique; Bull. Centre Rech. Pau-SNPA, p. 89-108, 1976.  
Les méthodes d'étude optique de la matière organique; *ibid.*, p. 109-127, 1976.  
The use of clay minerals and inorganic and organic geochemical indicators for evaluating the degree of diagenesis and oil generating potential of shales; *Geochem. et Cosmochim. Acta*, v. 40, p. 953-966, 1976.  
Corrélation des principaux paramètres de géochimie organique - minéraux index - réflectance et fluorescence pour l'expertise de laboratoire en exploration des caustobioolithes (combustibles fossiles).
167. RIDDLE, C., BANCROFT, G.M., SHAM, T.K., SMITH, T.E., TUREK, A., Univ. Windsor (Geology), Univ. Western Ontario (Chemistry):  
Ferrous/ferric iron ratios in geochemical samples by Mössbauer spectroscopy, 1975-79.
- See:**  
Ferrous/ferric iron ratios in bulk rock samples by Mössbauer spectroscopy. The determination of standard rock samples; *Chemical Geol.*, v. 19, no. 4, 1977.  
Room-temperature  $^{57}\text{Fe}$  Mössbauer spectra have been recorded for a number of USGS and CRPG standard rock powders. The ferrous/ferric iron ratios determined by chemical analysis are compared with those obtained by the Mössbauer method. In low iron-containing rocks chemical analysis appears to considerably overestimate ferric content. Currently spectra are being compiled for whole-rock samples and for individual minerals. In addition to obtaining data on geochemical standards differentiation sequences are being studied.
168. RIDDLE, C., SMITH, T.E., TUREK, A., Univ. Windsor (Geology):  
Instrumental methods and applications in analytical geochemistry, 1975-.
- See:**  
The application of a curve-fitting computer program in XRF spectroscopy to correct for interelement interference in geochemical analysis: Vanadium analyses of a series of standard rock powders; *X-Ray Spectrometry*, v. 6, no. 1, 1977.
- X-Ray fluorescence methods have been supplemented by use of a peak deconvolution program that allows estimation of individual peak areas in mixed-band-envelope situations. Rb and Sr determinations have been improved so that XRF data can yield a Rb/Sr ratio suitable for use in the determination of radiometric ages. Indirect AAS methods have been developed that allow sequential Si and P determinations on most rock samples.
169. ST-AMANT, M., PERRAULT, G., SOQUEM:  
Fluorescence X terrain: développement d'un analyseur à multi-éléments, transportable sur le terrain, 1976-78.  
Nous voulons mettre au point, un appareil capable de mesurer l'abondance d'une trentaine d'éléments chimiques présents dans des carottes de forage dans leur propre boîte sans aucune autre manipulation. On pourra ainsi atteindre les objectifs suivants: 1° raccourcir le délai entre le travail de forage et l'obtention des résultats analytiques. 2° monitorer continuellement la présence du plus grand nombre d'éléments possibles pouvant présenter un intérêt économique.
170. SMITH, T.E., TUREK, A., WALAWENDER, M., RIDDLE, C., Univ. Windsor (Geology):  
Applications of geochemical analysis, 1975-.  
Analysis of major, trace and rare-earth elements, principally by XRF spectrometry, for a series of rock suites is in progress. In general patterns of chemical variation are determined and interpreted to yield a petrogenetic appreciation of each particular suite.
171. TUREK, A., COZENS, B.J., TALERICO, F., RIDDLE, C., Univ. Windsor (Geology):  
Chemical methods in analytical geochemistry, 1975-; M.Sc. thesis (Talerico).
- See:**  
Determination of chemical water in rock analysis by Karl Fischer titration; *Chemical Geol.*, v. 17, p. 261-267, 1976.  
The potentiometric Karl Fischer titration method has been adapted for the determination of combined water in chemical rock analysis. The method is considered to be superior to the well-established Penfield method. A study of methods for the determination of carbon dioxide has led to the development of a synchronous titimetric procedure in which water and carbon dioxide may be determined.
172. TUREK, A., RIDDLE, C., Univ. Windsor (Geology):  
Argon plasma analytical methods, 1976-78.  
An attempt to modify an atomic absorption instrument to emission work using an argon plasma jet flame, and allow determination of several elements that are difficult or impossible to determine by atomic absorption.
173. TUREK, A., RIDLEY, K.J.D., RIDDLE, C., Univ. Windsor (Geology):  
Heterogeneity of rock standards, 1974-78; M.Sc. thesis (Ridley).
- See:**  
The variability of chemical analyses as a function of sample heterogeneity and the implications to the analysis of rock standards; *Geochem. et Cosmochim. Acta*, v. 40, p. 1375-1379, 1976.



Individual analyses reported for the various international geochemical standards show a wide variation in results between contributing laboratories. Our study of a granodionite sample from Nova Scotia established that sample in homogeneity was a probable cause of chemical analysis variability. The same material, when fused to a glass, was analyzed with greater precision than the rock powder. At present we are conducting an international cooperative effort, in which samples of a fused and unfused mock standard are being analyzed by geochemical laboratories in a number of countries. We hope to establish criteria for the preparation of homogeneous rock standard samples in this study.

## EXPLORATION, ORGANIC

174. CLOSS, L.G., Ontario Division Mines:  
Geochemical survey of organic stream sediments in the Beardmore-Geraldton area, District of Thunder Bay, Ontario, 1975-77.

### See:

Distribution of (Cu, Zn, Ni, Mn, Fe, LOI) in organic stream sediments in the Wildgoose Lake area; Ontario Div. Mines, Prel. Maps PI205-1210, 1976.

175. DELL, C.I., KEMP, A.L.W., BOOTH, W.G., HARPER, N., Environment Canada (CCIW):

Weathering of geological materials and characterization of anthropogenic constituents in lakes, 1976-78.

To determine (a) the rates, transformations and processes related to the weathering of geologic materials in lake basins, and (b) the mineralogy, chemistry, distribution, and sources of macroscopic anthropogenic materials in Great Lakes sediments. Work during the past year has consisted of size analysis, size fractionation and X-ray diffraction analysis of shoreline bluff materials and lake sediments, and microscopic and microprobe analyses of anthropogenic particles. All sample materials have been collected and laboratory work will be completed during 1977-78.

176. FYFE, W.S., BEVERIDGE, T., MELOCHE, J.D., Univ. Western Ontario (Geology):

Uptake of metal ions by bacterial cell walls, 1975-80; Ph.D. thesis (Meloche).

177. GLOOSCHENKO, W.A., CAPOBIANCO, J.A., MAYER, T., Environment Canada (CCIW):

Aquatic geochemistry of Hudson Bay Lowlands, 1977-80.

To characterize the chemistry of peat, sediments and water of the Hudson Bay Lowlands, with reference to nutrients, trace metals and potentially toxic chemical substances. Peat, sediment, water and live plant materials will be sampled from representative peatland environments (bogs, fens, marshes and rivers) in the Hudson Bay Lowlands and adjacent subarctic regions. In the case of peat, cores will be taken for determination of important geochemical parameters with depth with particular reference to possible anthropogenic inputs. Living moss samples will be utilized to characterize aerial inputs of trace substances. Analyses to be run include: 1) major nutrients - C, N, P, S including forms, 2) major cations, 3) trace metals including chemical forms of occurrence, 4) organochlorine pesticides, and PCBs, 5) related physico-chemical parameters such as Eh and pH, 6) biochemical parameters of plant tissue such as carbon and lipids. From this, an understanding of both natural

and anthropogenic chemical distribution will be attempted. Elemental cycling will be determined, and atmospheric precipitation sampling feasibility will be investigated. It is hoped that similar samples can be collected from similar environments in the Caribou Range (NWT) in cooperation with Dr. J.S. Rowe, University of Saskatchewan, for comparative purposes.

178. JONASSON, I.R., Geol. Surv. Can.:  
Environmental geochemistry, 1974-.

### See:

Trace metals in snow strata as indicators of silver-arsenide vein mineralization, Camsell River area, district of Mackenzie; Geol. Surv. Can., Paper 76-1B, p. 71-75, 1976.

On the usefulness of water samples in reconnaissance surveys for uranium in the Yukon Territory; Geol. Surv. Can., Paper 76-1C, p. 241-248, 1976.

179. LANGHUS, B.G., Gulf Oil Canada Ltd. (Geological):  
Petroleum geochemistry of Mackenzie Delta region. Petroleum geochemistry of Mesozoic-Tertiary strata, East Coast Offshore, 1976-77.

180. MASRAN, T.C., JACKSON, K.S., MILNER, C.W.D., POCKOCK, S.A.J., Imperial Oil Ltd.:

Experimental alteration of organic matter and comparison with organic debris in recent and ancient sediments, 1975-.

181. OWER, J.R., ORGAN, D.W., Chevron Standard Ltd. (Exploration):

General organic geochemistry related to regional source rock studies and maturation studies.

182. POWELL, T.G., Geol. Surv. Can.:  
Hydrocarbon geochemistry of Arctic Archipelago and Canadian East Coast offshore, 1976-.

183. PURCELL, L.P., Geol. Surv. Can.:  
Organic geochemistry related to the petroleum potential, Atlantic Coast of Canada, 1975-.

184. SAWATZKY, H., GEORGE, A.E., FURIMSKY, E.E., CANMET (EMR):

Investigation of bitumen and heavy oils from Western Canada and products derived from them: Investigation of oils from Frontier areas.

185. SNOWDON, L.R., Geol. Surv. Can.:  
Development of extraction, identification and correlation systems for organic compounds from sedimentary rocks and crude oils, 1973-.

186. SNOWDON, L.R., Geol. Surv. Can.:  
Hydrocarbon geochemistry of northern Interior Plains and Beaufort Sea, 1976-.

187. STAPLIN, F.L., Imperial Oil Ltd.:  
Thermal history from color of particulate organic matter, 1964-.

188. WARREN, H.V., Univ. British Columbia (Geological Sciences):

The trace element content of pollen as a guide in mineral exploration.

The Chemistry Department of Birmingham University has shown that pollen collected in southwest Devon has ten times as much lead as pollen collected from Norfolk. Preliminary work done in British Columbia has convinced us that in pollen we may well be able to develop a new prospecting tool.

189. WARREN, H.V., GOULD, G.E.C., Univ. British Columbia (Geological Sciences – Medicine):  
An investigation into the possible role of some trace elements in the etiology of multiple sclerosis and other demyelinating diseases in humans, 1973-80.  
  
Myelin and cataclase both involve copper and are involved in neurological diseases and cancers respectively. A deficiency of copper in diets or an over abundance of one or more elements antagonistic to copper – such as zinc, molybdenum, or lead – may be a contributing factor to these diseases.
- EXPLORATION, NON-ORGANIC**
190. APPELYARD, E.C., HEALING, D.W., Univ. Waterloo (Earth Sciences):  
Alteration zone geochemistry, Gullbridge Mine, Newfoundland, 1974-77; M.Sc. thesis (Healing).
191. APPELYARD, E.C., PLUNKETT, H.C., Univ. Waterloo (Earth Sciences):  
Occurrence and geochemistry of scapolite in the Haliburton-Renfrew area, Ontario, 1976-77; M.Sc. thesis (Plunkett).  
  
Alkaline gneisses are associated temporally and spatially with scapolitic gneisses in the Grenville Supergroup sequences in Eastern Ontario. Both may be the result of anatexis within the upper crust caused by fusion of saline evaporites under high temperature prograde metamorphism. Geochemical studies are being undertaken to test this hypothesis.
192. ARMBRUST, G.A., Univ. Ottawa (Geology):  
Use of Rb as a tracer in hydrothermally altered rocks, 1975-77.  
  
Research is continuing on the distribution of Rb near various types of ore deposits. During the past year samples from the Seneca massive sulphide deposit in British Columbia have been studied. High Rb and low K/Rb ratios are characteristic of subaerial hydrothermal systems and porphyry copper deposits. However, altered rocks at the Seneca deposit have abnormally low Rb and high K/Rb ratios indicating that the dacitic host rocks equilibrated with a Rb-deficient fluid. This supports the contention that the alteration occurred in contact with heated sea water.
193. BAMWOYA, J.J., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Geochemical dispersion in heavy and light fractions of stream sediments, Burnt Hill, New Brunswick, 1974-77; Ph.D. thesis (Bamwoya).  
  
The distribution of Cu, Pb, Zn, Ni, Co, Fe, Mn, Na, K, Ca, Mg, Mo, Sn, and W in heavy and light fractions of stream sediments from an area of varied and contrasting geology in the Burnt Hill area, New Brunswick is assessed by various statistical techniques. The effect of element distribution in bedrock and environmental factors are being investigated.
194. BINGLEY, J.M., Nova Scotia Dep. Mines: Antigonish Highlands survey, 1974-.  
  
Geochemical surveys and geological field mapping have been completed; compilation of geochemical data and maps is proceeding.
195. BLOY, G., BAADSGAARD, H., Univ. Alberta (Geology):  
A radiometric and geochemical study of the uranium mineralization in the area of the East Arm of Great Slave Lake, Northwest Territories, 1976-77; M.Sc. thesis (Bloy).
196. BRISTOL, C.C., Brandon Univ. (Geology):  
Sphalerite geobarometry of the Ruttan orebody, Manitoba, 1975-77.  
  
**See:**  
Application of the sphalerite geobarometer to regionally metamorphosed terrains; Amer. Mineral., v. 61, p. 661-670, 1976.  
  
To determine Fe and Mn contents of sphalerites from the Ruttan Orebody and to relate these to current experimental data for the system Zn-Fe-S.
197. BRISTOL, C.C., Brandon Univ. (Geology):  
Geochemistry of the alteration zone, Ruttan orebody, Manitoba, 1977-79.  
  
To describe the geochemistry and mineralogy of the alteration zone of the Ruttan orebody as a guide for future exploration. While some evidence has documented alteration in the Noranda and Mattabi areas, this documentation has not been established for Cu-Zn orebodies in Manitoba districts. It is hoped to provide both additional and perhaps new information, and in future to extend this project to the Flin Flon and Snow Lake districts.
198. CAMERON, E.M., Geol. Surv. Can.:  
Regional geochemistry, northern Canadian Shield, 1976-.
199. CAMERON, E.M., Geol. Surv. Can.:  
National geochemical reconnaissance, 1975-.  
  
**See:**  
Geochemical reconnaissance for uranium in Canada: Notes on methodology and interpretation of data; Geol. Surv. Can., Paper 76-1C, p. 229-236, 1976.  
  
Geochemical orientation and reconnaissance surveys for uranium in central Yukon; *ibid.*, p. 237-240, 1976.  
  
Examination of some Cordilleran uranium occurrences; *ibid.*, p. 255-258, 1976.
200. CAMPIGLIO, C., DARLING, R.G., Ecole Polytechnique:  
Petrology, geochemistry of the Bourlamaque Batholith, Val D'Or, Québec, 1970-76; Ph.D. thesis (Campiglio).  
  
**See:**  
The geochemistry of the Archean Bourlamaque Batholith, Abitibi, Québec; Can. J. Earth Sci., v. 13, p. 972-986, 1976.
201. CARIGNAN, J., Québec Min. Richesses Naturelles: Projet Fume Rolle, 1975-78.  
  
Developpement d'une technique d'exploration. Les travaux de terrain sont maintenant terminés.
202. CARIGNAN, J., GELINAS, L., DARLING, R.G., DAVID, M., Ecole Polytechnique:  
Geochemistry of volcanic rocks surrounding one orebody, Millenbach Mine, Noranda, Québec, 1975-78.  
  
Preliminary study completed, final sampling and analyses in progress.

203. CERMIGNANI, C., LENTERS, M., STONELL, R., ANDERSON, G.M., Univ. Toronto (Geology):  
Petrogenesis of the nepheline gneisses of the Bancroft area, 1968-78; Ph.D. thesis (Cermignani), M.Sc. thesis (Lenters, Stonell).  
The origin of the nepheline bearing gneisses is believed to be dominantly metasomatic, and both field and laboratory projects are being pursued to elucidate the reactions involved. The field area is near Tory Hill in Monmouth township where mapping, petrographic and chemical studies are being concentrated on the granite-syenite-nepheline syenite transition zones. Experimental studies are being carried out on reactions involving nepheline, anorthite, cancrinite and aqueous sodium carbonate and calcium carbonate solutions at elevated temperatures and pressures. In addition, a study is being made of the rare earth and other trace element concentrations of the various rock types.
204. CHOINIÈRE, J., TREMBLAY, R., Québec Min. Richesses Naturelles:  
Géochimie des sédiments de ruisseau de la péninsule gaspésienne, 1972-79.
205. CHORK, C.Y., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
The application of sound statistical and computer techniques to the interpretation of soil and stream sediment geochemical data, 1973-77; Ph.D. thesis (Chork).  
**See:**  
A study of the application of regression analysis for trace element data from stream sediment in New Brunswick; *J. Geochem. Explor.*, v. 6, p. 211-232, 1976.  
Seasonal sampling and analytical variations in stream sediments are statistically assessed; seasonal variations is important and the major source of variation is in the sampling. However, the total variation is insignificant in terms of exploration. Factors influencing element dispersion in soils are investigated. Techniques for data processing, display, and interpretation are described.
206. CLOSS, L.G., Ontario Division Mines:  
Reconnaissance geochemistry of Paleozoic rocks in Southern Ontario, 1967-.
207. CLOSS, L.G., SADO, E.V., Ontario Division Mines:  
Exploration geochemistry and Quaternary geology research within the Beardmore-Geraldton gold area, District of Thunder Bay, Ontario, 1974-77.
208. CLOSS, L.G., SADO, E.V., Ontario Division Mines:  
Orientation exploration geochemistry and Quaternary geology investigations of carbonatite-alkalic complexes at Prairie Lake and Killala Lake, District of Thunder Bay, Ontario, 1974-77.
209. COKER, W.B., Geol. Surv. Can.:  
Regional geochemistry, southern Canadian Shield, 1976-.  
**See:**  
Geochemical follow-up studies, northwestern Manitoba; *Geol. Surv. Can.*, Paper 76-1C, p. 263-267, 1976.
210. DARLING, R.G., Ecole Polytechnique:  
Geochemistry of volcanic rocks surrounding the Manitou-Barvue ore deposit, Val D'Or, Québec, 1972-78.
211. DAVENPORT, P.H., Newfoundland Dep. Mines Energy:  
Uranium distribution in the granitoid rocks of eastern Newfoundland, 1976-78.  
To determine whether the uranium content of granitoid plutons in eastern Newfoundland is related to their potential as hosts to uranium mineralization, and also to study the relationship between the uranium content in bedrock and in lake sediment samples. For this study some 1000 samples of granitoid rocks from 35 plutons have been analysed for uranium by neutron activation/delayed neutron counting.
212. DAVENPORT, P.H., BUTLER, A.J., Newfoundland Dep. Mines Energy:  
Uranium distribution in stream sediments in the Codroy Bay-St. George area and the eastern Burlington Peninsula, Newfoundland, 1976-78.  
Stream sediments from the Codroy-Bay St. George area and the eastern part of the Burlington Peninsula, Newfoundland, originally collected in 1974, have been analysed for uranium by neutron activation/delayed neutron counting. Both stream sediment survey areas have also been covered by lake sediment geochemical surveys in order to compare uranium in stream and lake sediment, and to evaluate the usefulness of stream sediment sampling as a technique for following up regional lake sediment surveys for uranium. In the sedimentary terrain of the Codroy-Bay St. George area the total uranium content of stream sediment does not seem to offer an effective method for follow-up uranium exploration, whereas in the predominantly igneous terrain of the Burlington Peninsula uranium in stream sediment closely parallels the distribution of uranium in lake sediments, and is a useful method of further defining the location of uranium concentrations in bedrock.
213. DAVENPORT, P.H., BUTLER, A.J., Newfoundland Dep. Mines Energy:  
Uranium distribution in lake sediment in western Newfoundland and the Avalon and Burlington Peninsulas, Newfoundland, 1976-78.  
The lake sediments from five areas of Newfoundland - the Great Northern Peninsula, the Bonne Bay - Port au Port area, the Codroy Bay-St. George area, the eastern part of the Burlington Peninsula and the Avalon Peninsula, collected between 1973 and 1975, have been analysed for uranium. The samples, about 5500 in number, had been collected originally in regional geochemical surveys conducted to define areas of base metal mineralization, and the <177 $\mu$  fractions have been analysed by neutron activation/delayed neutron counting for uranium.
214. DAVENPORT, P.H., BUTLER, A.J., DIBBON, D., Newfoundland Dep. Mines Energy:  
A lake sediment geochemical reconnaissance survey of the Burin Peninsula, Newfoundland, 1976-77.  
Lake sediment was collected from the central parts of lakes at 1294 sites within a 3900 km<sup>2</sup> area on the Burin Peninsula, Newfoundland, which includes the fluorite deposits. The <177 $\mu$  sieved fraction of the samples has been analysed for U, F and L.O.I. (loss on ignition, a measure of organic carbon content), and is at present being analysed for Cu, Pb, Zn, Co, Ni, Mo, Mn and Fe.

215. DUNN, C.E., Sask. Geol. Surv.:  
Trace element distributions in lake and stream sediments marginal to the Athabasca Sandstone, Saskatchewan, 1975-79.  
Lake sediments (supplemented by some streams) have been collected at an average density of 1 sample per 6 km<sup>2</sup>. In 1975, 534 samples were collected along the southeast edge of the sandstone; in 1976 a further 424 samples were collected along the northeast edge (supplemented by sample splits supplied by companies working in the area). In 1977 the southern edge will be sampled. All dried samples have been analyzed for U, Fe, Mn, Pb, Zn, Ni, Cu, Co, Mo, V and LOI. Additional elements sought on selected samples are As, Se, Bi, Cd, Ag, Ba, Sr, Cr, and F in waters. Data are currently being analyzed and plotted. Raw data maps and contour maps will be published along with geochemical interpretations. It is intended that areas of specific interest (e.g. Rabbit Lake and Key Lake) be studied in detail and separate publications produced.
216. DYCK, W., Geol. Surv. Can.:  
Groundwater geochemistry applied to uranium exploration, 1972-.
- See:  
Well water uranium reconnaissance, southwestern Saskatchewan; Geol. Surv. Can., Paper 76-1C, p. 249-253, 1976.
217. EDGAR, A.D., CONDLIFFE, D., Univ. Western Ontario (Geology):  
Distribution of Ca between coexisting nephelines and feldspars in igneous rocks, 1977-78.
218. ERDOGAN, B., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Geology, geochemistry and genesis of sulphide deposits of Ergon-Maden District, southeastern Turkey, 1974-77; Ph.D. thesis (Erdogan).
219. FALLICK, A., SCHWARCZ, H.P., FORD, D.C., McMaster Univ. (Geology):  
Oxygen isotope analysis of fluid inclusions in speleothem, 1975-78.
- See:  
Stable isotope studies of fluid inclusions in speleothems and their paleoclimatic significance; Geochim. Cosmochim. Acta, v. 40, p. 657-665, 1976.  
Direct analysis of water trapped as fluid inclusions in speleothems, by reaction with BrF<sub>5</sub>, to obtain O-18/O-16 ratios. This water is a sample of original drip water from which speleothem grew, and a sample of meteoric water falling on ground above cave. Analyses will permit observing past meteoric water compositions.
220. FOSCOLOS, A.E., Geol. Surv. Can.:  
Clay and clay minerals investigation, 1968-.
221. FRISKE, P.W.D., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Exploration rock geochemistry and ore genesis at the Sturgeon Lake deposit, Ontario, 1974-78; Ph.D. thesis (Friske).  
About 1000 drill core samples have been collected from the sulphide deposit and up to 2.5 miles away along the ore horizons. These have been analyzed for total Cu, Pb, Zn, Co, Ni, Ju, Fe, Ca, Mg, Na and K. The data are now being interpreted together with mineralogical and petrological information.
222. FRYER, B.J., Univ. Western Ontario (Geology):  
Geochemistry of the Huronian volcanics on the north shore of Lake Huron and Sudbury, Ontario, 1976-77.  
The geochemistry of the volcanic rocks at the base of the Huronian succession and in the Sudbury area is being studied. The results show that the basaltic rocks are continental tholeiites and have often been subjected to continental weathering prior to burial. The acid volcanic rocks of Sudbury have similarly been subjected to weathering but there is strong evidence that they have been produced by partial melting of preexisting sialic crust and amphibole has played a major role in their petrogenesis.
223. FRYER, B.J., EDGAR, A.D., CONDLIFFE, D., Univ. Western Ontario (Geology):  
Distribution of REE between coexisting minerals in the Ilmaussaq intrusion, Greenland, 1976-78.
224. FRYER, B.J., JENNER, G.J., Univ. Western Ontario (Geology):  
Geochemistry and petrogenesis of Archean volcanic rocks, 1975-.
- Modern geochemical techniques are being applied to Archean volcanic rocks in an attempt to elucidate their origins. Rare Earth element distributions are key to this work as they provide the greatest petrogenetic information and are least susceptible to alteration. Work on the Prince Albert Group metavolcanics has shown that partial melting of preexisting crustal material both mafic and sialic is involved in the origin of siliceous volcanics in the Archean. Major differences in geochemistry between various suites are due to variations in depth of origin and degree of partial melting as well as mixing of mafic and sialic sources.
225. FUNG, P.C.F., SHAW, D.M., McMaster Univ. (Geology):  
Partitioning of Tl, alkali and alkaline earths among rock-forming minerals: an empirical and experimental study, 1972-77; Ph.D. thesis (Fung).  
The objective of this study is to measure the partition coefficients (D) of Rb and Tl between coexisting silicate phases. Two approaches have been used: 1. Measurement in natural materials: this consists of separating coexisting rock minerals and analysing them for Rb, Tl (and K), and hence calculating the D's. 2. Experimental: this utilises the conventional hydrothermal method for the equilibration of a solid and a vapour phase. Natural K-feldspar and rhyolite have been used to measure D for the K-feldspar-vapour and rhyolite-vapour pairs, from which to calculate D for sanidine-rhyolite. Experiments were conducted at 500, 600 and 700°C and pressure of 1.5 kbar. In addition another technique has been tried out, in which up to 5 solids were equilibrated with the same vapour, which acts as a transporting agent. The aim of this new technique is to measure D directly between coexisting solids.
226. FYFE, W.S., ANDREWS, A.J., Univ. Western Ontario (Geology):  
Sea floor basalt alteration, 1973-77; Ph.D. thesis (Andrews).
227. FYFE, W.S., KRONBERG, B.I., Univ. Western Ontario (Geology):  
Geochemistry of laterites, 1972-78; Ph.D. thesis (Kronberg).

228. GHANDI, S.M., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Exploration rock geochemistry and ore genesis of the Caribou deposit, New Brunswick, 1974-77; Ph.D. thesis (Ghandi).  
Approximately 1300 samples from drill core and the open-pit from the vicinity of Caribou massive sulphide deposit have been analyzed for Cu, Pb, Zn, Co, Ni, Fe, Mn, Na, K, Ca, and Mg by A.A.S. In addition, selected samples were analyzed by XRF, and water-soluble halides were determined by specific ion electrodes. On the bases of these data, preliminary interpretations indicate that Mg, and K increases in concentration towards the sulphide. Investigations are proceeding to determine whether multivariant statistical treatment of the data will be useful to outline extensive halos.
229. GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Geochemical exploration for deeply buried sulphide deposits and processes of element migrations associated with sulphide deposits, 1968-.
- See:  
Water extracts of volcanic rocks - detection of anomalous halos at Brunswick No.12 and Heath Steele B-Zone massive sulphide deposits; J. Geochem. Explor., v. 6, p. 35-59, 1976.  
The present status of investigations indicate that for volcanogenic sulphides: 1. major element halos (especially Ca, Mg, Ni, K, Fe, and Cu) are measurable in hundreds of metres around deposits in the Ordovician of New Brunswick, the Precambrian of Ontario, the Cretaceous of Turkey and the Cambrian of Australia. The deposit is important but age and location is not; 2. trace element relations appear to be most important in defining regionally favorable areas; and 3. water-soluble components of rocks offer promise for local exploration.
230. GOVETT, G.J.S., GAMBLE, R., Univ. New Brunswick (Geology):  
Processes of element dissolution and migrations around sulphide deposits, 1971-.
- See:  
Detection of deeply buried and blind sulphide deposits by measurement of H<sup>+</sup> and conductivity of closely spaced surface soil samples; J. Geochem. Explor., v. 6, p. 359-382, 1976.  
Emphasis now is on qualification of electrochemical effects on element migration by laboratory experiments and verification and extension of new procedures to detect sulphide deposits that are deeply buried under thick glacial (including clay) overburden.
231. HUANG, Y.F., FARQUHAR, R.M., Univ. Toronto (Physics):  
Determination of uranium in minerals and rocks, and search for fossil fission tracks, 1972-79; Ph.D. thesis (Huang).  
Attempts are currently being made to etch synthetic fission tracks in quartzes as a preliminary to a search for fossil tracks in minerals for geochronological purposes.
232. HUTCHISON, M.N., FARKAS, A., SCOTT, S.D., Univ. Toronto (Geology):  
Phase equilibrium of refractory sulphide systems, 1973-78; Ph.D. thesis (Hutchison, Farkas).  
Refractory sulfides, that is those such as pyrite, sphalerite, arsenopyrite and molybdenite which react sluggishly in nature, hold considerable promise as useful geochemical tools in the elucidation of pressure-temperature-activity of S<sub>2</sub> conditions attending ore-forming or subsequent metamorphic processes. We have undertaken a multi-faceted programme to examine pertinent phase relationships and partitioning of trace elements in these minerals over a wide range of pressure and temperatures. In order to overcome the lack of reactivity of these sulfides in the laboratory we have developed a hydrothermal recrystallization technique which enables us to study sulfide equilibria at geologically pertinent temperatures. Using this and other methods we have: (1) extended our knowledge of the Fe-S system down to 115°C and have determined the stability relations among the various polytypes of pyrrhotite including the monoclinic phase (S.A. Kissin, Ph.D. thesis, 1974); (2) refined phase relations involving arsenopyrite in the Fe-As-S system between 743° and 300°C at 1 bar; results are compatible with arsenopyrite compositions in nature but many natural arsenopyrites are compositionally zoned which drastically reduces the precision of pressure-temperature estimates (U. Kretschmar, Ph.D. thesis, 1973); (3) determined the composition of sphalerite in the Fe-Zn-S system to temperatures as low as 50°C and pressure to 8 kb; when buffered by pyrite and hexagonal pyrrhotite, the iron content of sphalerite is a sensitive geobarometer which is finding wide application in metamorphic petrology; (4) measured the partitioning of Co and Ni between pyrite and pyrrhotite as a potential geothermometer; and, (5) begun to measure the self-diffusion of Fe in sphalerite in order to understand better the reaction kinetics of refractory sulfides.
233. JENSEN, L.S., Ontario Division Mines:  
Trace distribution of copper, zinc and lead in the bedrock of Ossian, Pontiac, Bennevis and Clifford Townships, Ontario, 1970-78.
234. JONASSON, I.R., Geol. Surv. Can.:  
Trace elements in sulphides, 1974-.
235. KISH, L., CLARK, P.T., Québec Min. Richesses Naturelles:  
Radioactivité dans la losse du Labrador, 1976-.
236. KUO, H.Y., WILSON, H.D.B., Univ. Manitoba (Earth Sciences):  
Trace element geochemistry of Archean rocks, 1975-.
237. KUO, H.Y., WILSON, H.D.B., Univ. Manitoba (Earth Sciences):  
Gold in Archean ultramafic and associated volcanic rocks from the Canadian Shield, 1975-77.  
Neutron activation analysis gives average gold values of 1.6 ppb for 12 ultramafic komatiites, 3.8 ppb for 1 basaltic komatiite, 2.0 ppb for 7 basalts, and 0.7 ppb for 6 intermediate to felsic volcanic rocks from the Abitibi greenstone belt. Gold distribution trends in these and other Archean volcanic rocks resemble those of modern rocks suggesting that low-grade metamorphism has not severely altered the primary gold abundance of Archean volcanic rocks.
238. LAHTI, H.R., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Reconnaissance and detailed rock geochemical exploration techniques, Mykonos, Greece, 1973-77; Ph.D. thesis (Lahti).

Regional and detailed rock geochemical surveys in the semi and environment of surveys demonstrated that zones favourable for barite-silver-base metal mineralization can be identified, and that specific drill targets can be located. The geochemical response is complicated by weathering processes that have penetrated bedrock to a depth of at least 30 metres; their weathering effect extends at least 150 metres down some of the mineralized veins.

239. LALONDE, J-P., Québec Min. Richesses Naturelles: Géochimie des eaux de min du Québec, 1977.

Echantillonnage du eaux souterraines dans les miner du Québec en vu d'interpréter les résultats d'universitaire géochimiques des eaux souterraines devant remir à l'exploration minière.

240. LALONDE, J-P., BEAUMIER, M., Québec Min. Richesses Naturelles:

Etude pilute sur l'échantillonnage des horizons "A" des sols développés sur l'argile lacustre en vu d'évaluer son applicabilité à l'exploration minière dans les ceintures d'argile, 1977-78.

241. LALONDE, J-P., BERGERON, R., CHOVINARD, N., Québec Min. Richesses Naturelles:

Géochimie des eaux souterraines des régions habitées du nord-ouest Québécois, 1974-78.

**See:**

Fluorine – an indicator of mineral deposits; Bull. Can. Instit. Mining Metal., v. 69, May, 1976.

242. LETHO, D.Q.W., ARNOLD, R.G., SMITH, J.W.J., Sask. Geol. Surv., Saskatchewan Res. Council:

Multi-media geochemical evaluation of the 1974 GSC-DMR lake sediment survey, Saskatchewan, 1975-77.

**See:**

Sask. Geol. Surv., Summ. Investig. 1976, p. 63-70.

243. LEVINSON, A.A., Univ. Calgary (Geology):

Disequilibrium in uranium mineralization, 1976-.

244. LONGSTAFFE, F.J., MCNUTT, R.H., SCHWARCZ, H.P., McMaster Univ. (Geology):

Oxygen isotope and trace element studies in the Wabigoon greenstone belt and English River gneiss belt, northwestern Ontario, 1973-77; Ph.D. thesis (Longstaffe).

**See:**

Geochemistry of Archean rocks from the Lake Despair area, Ontario: A preliminary report; Geol. Surv. Can., Paper 77-1A, p. 169-178, 1977.

The necessary field mapping has been done and all trace and major element and isotopic analyses are completed.

245. MACNABB, B.E., Nova Scotia Dep. Mines: Cape Breton mineral resources survey, 1974-.

Stream sediment sampling plus mineral occurrence field checking has been done in western Cape Breton to provide information on economic deposition. Compilation of geochemical data and maps is proceeding.

246. MACRAE, W., CROCKET, J.H., McMaster Univ. (Geology):

Gold in Archean greenstone belts: a genetic study by neutron activation analysis, 1976-78; M.Sc. thesis (MacRae).

**See:**

The distribution of gold and some platinum group elements in selected komatiitic ultramafic volcanics from Munro Township, Ontario; Abstracts GAC-MAC Meeting, Vancouver, May, 1977.

An exposure of komatiitic ultramafic volcanic rocks has been well documented physically and chemically in Munroe Township, Ontario. Analysis for gold, platinum, palladium and iridium has been carried out by neutron activation on several flows within the sequence. Samples were taken from the four different lithologic units of two flows. The results of analysis of eleven samples are summarized below:

Lithologic Unit (Flow)	Au	Pt	Pd	Ir	(ppb)
Chilled margins <sub>(3)*</sub>	1.6	2.5	8.9	1.1	
Spinifex zone <sub>(3)</sub>	2.1	14.3	10.7	0.8	
Foliated zone <sub>(1)</sub>	3.3	-	7.5	0.4	
Cumulate zone <sub>(4)</sub>	3.6	11.1	6.3	1.5	

\*<sub>(3)</sub> Number of samples for zone.

There appears to be a slight enrichment of gold in the cumulate zone as well as iridium over the Spinifex zone. This is probably due to the settling of immiscible sulphides as well as olivine before the formation of the spinifex. Platinum and palladium show an increase in the Spinifex zone possibly enriched in the molten silicate phase. The average of the cumulate and spinifex zone for palladium and iridium are the same as the chilled zone while gold and platinum are lower. The latter values are possibly due to seawater leaching.

247. MASSEY, N.W.D., SHAW, D.M., McMaster Univ. (Geology):

Geochemistry of some Keweenaw low-grade metabasites, 1974-79; Ph.D. thesis (Massey).

A suite of Keweenaw volcanic rocks from the Mamainse Point area are being studied to investigate the effects of low-grade metamorphism on the major and trace element geochemistry. In particular, Li and halogens are being investigated to try to identify the nature of the fluids involved. The findings will be compared with similar low-grade metabasites from Black Bay Peninsula, Ontario, and the Keweenaw Peninsula, Michigan.

248. MAURICE, Y.T., Geol. Surv. Can.: Regional geochemistry, eastern and northern Canadian Shield, 1976-.

**See:**

Detailed geochemical investigations for uranium and base metal exploration in the Nonacho Lake area, District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 259-262, 1976.

249. MCMASTER, G.E., MCNUTT, R.H., McMaster Univ. (Geology):

Geochemistry of the volcanics and quartz porphyry near Lake Washeibemaga, 1975-77; M.Sc. thesis (McMaster).

To map the stratigraphy of a volcanic pile from the mafic volcanics upwards into the pyroclastics and the overlying sediments; in addition, the geochemistry of these units and a quartz porphyry intrusive have been done.

250. MCQUADE, B.M., ARMBRUST, G.A., Univ. Ottawa (Geology):

Petrochemistry of the volcanic complex, Bachelor Lake, Quebec, 1974-77; Ph.D. thesis (McQuade).

The volcanic belt has been subdivided into 2 early tholeiitic cycles, followed by calc-alkaline activity at 2 volcanic centres. Differentiation trends,



marked by increasing  $Al_2O_3$ ,  $SiO_2$  and alkalis and decreasing  $TiO_2$ ,  $MgO$  and  $K/Rb$ , have helped resolve structural problems by locating the axis of a major syncline. Three zones of base metal mineralization and a Au deposit are all associated with calc-alkaline volcanic rocks. Differences in major and trace element abundances between rock types of tholeiitic and calc-alkaline suites are being studied to identify possible guides to mineralization. Analytical, mineralogical and textural data are being processed using an IBM-360 computer to investigate the relationship between various combinations of parameters to "barren" vs "productive" rock types.

251. MUEHLENBACHS, K., Univ. Alberta (Geology):  
Oxygen isotope geochemistry of the oceanic crust and its bearing on seawater, 1967-82.
- To quantitatively evaluate the exchange of oxygen between the seawater and the ocean crust as it is weathered, metamorphosed and aged. Materials for study come from dredge bowls and deep sea drilling (DSDP and IPOD).
252. MUEHLENBACHS, K., MORTON, R.D., Univ. Alberta (Geology):  
Oxygen isotope geochemistry of uranium deposits, 1975-79.
- To characterize the oxygen isotope geochemistry of a variety of uranium deposits and thus determine the temperature of ore deposition and the origin of the ore fluids.
253. MUEHLENBACHS, K., SCHAEFFER, H., Univ. Alberta (Geology):  
Oxygen diffusion coefficients in silicate crystals and metals, 1974-80.
- To elucidate the mechanism by which oxygen atoms move in silicate crystals and melts. A gas/solid isotope exchange technique is used to measure oxygen diffusion coefficients.
254. MUEHLENBACHS, K., WESTGATE, J.A., SIGURDSSON, H., Univ. Alberta (Geology); Univ. Toronto; Univ. Rhode Island:  
Oxygen isotope geochemistry of volcanic rocks, 1974-80.
- An on-going survey of volcanic rocks from a variety of localities, in western Canada, Iceland, other places in order to better characterize the primary  $\delta O^{18}$  value of igneous rocks and to understand how that primary ratio is altered.
255. PANAYIOTOU, A., GOVETT, G.J.S., MCALLISTER, A.L., Univ. New Brunswick (Geology):  
Geology and geochemistry of Ni-Cu mineralization, Limmasol Forest, Cyprus, 1975-77; Ph.D. thesis (Panayiotou).
- Detailed field mapping forms the base of the geological and structural setting of the Ophiolite complex and its associated mineralizations. The mineralogy of the mineral deposits is described with extensive chemical analyses (total silicate, geochemical AAC, and electron microprobe) and ore-microscopy.
256. PAUL, D., CROCKET, J.H., McMaster Univ. (Geology):  
Partition of gold and platinum between kimberlite and garnet peridotite nodules, 1976-77.
- Palladium, iridium and gold have been measured in kimberlite and coexisting garnet peridotite nodules from South African and Indian occurrences. The analyses were carried out by neutron activation analysis. The most striking result is that very high iridium values, up to 50 ppb, were found in garnet peridotites from the South African pipes, although not in the coexisting kimberlite. We interpret this result to mean local enrichment in the deep mantle under South Africa as no indication of platinum enrichment was found in the Indian samples. Further, we suggest iridium may be a useful indicator of undepleted peridotite. Lastly, the unique platinum enrichment of the 1950 million year old Bushveld Complex and the garnet peridotite nodules of Mesozoic kimberlites of South Africa may be related in that the deep mantle under South Africa may be very ancient and may have underlain some of the South African continental crust for approximately 2 billion years.
257. PWA, A., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Regional exploration rock geochemical studies in the Bathurst District, New Brunswick, 1974-77; Ph.D. thesis (Pwa).
- Distributions of Cu, Pb, Zn, Na, IC, Fe, Mn, Ca, Mg, in felsic volcanic rocks of the Bathurst District show that all known sulphide occurrences and working mines are located in clearly defined geochemical zones.
258. REARDON, E.J., Univ. Waterloo (Earth Sciences):  
Use of manganese oxide coatings on stream sediments in geochemical exploration, 1977-78.
- This project was initiated to evaluate the feasibility of using trace element concentrations in manganese oxide coatings on stream sediments as a geochemical exploration tool in locating sulphide mineralization. Refinement of techniques already developed for the selective dissolution of manganese oxides over ferric oxides are being carried out in order to analyse bulk coarse grain stream sediment material. An appraisal of trace element/manganese ratio variation with sediment grain size is being evaluated to determine the limitations of this technique if any. Preliminary results as to the constancy of metal/Mn ratios with grain size and total manganese content are encouraging.
259. RUCKLIDGE, J.C., Univ. Toronto (Geology):  
Chlorine in altered ultramafic rocks, 1973-79.
- Chlorine present in other than trace amounts in ultramafic rocks resides in a compound which is readily soluble in neutral and acidic aqueous solution. Iron is also dissolved by the same solutions giving Fe:Cl ratio in solution of about 2:1. Microprobe analyses show positive correlations of Fe and Cl, and negative of Mg and Cl, and S, and Cl. These, and other data have led to the conclusion that the Cl exists in a submicroscopic phase with the composition  $Fe_2(OH)_3Cl$  which is dispersed through the parts of the rock actively undergoing alteration. Wherever the alteration is complete the chloride phase is absent. The micro studies suggest macro mechanisms for metal transport in altering ultramafics, which are currently being tested.
260. SABAG, C., ANDERSON, G.M., Univ. Toronto (Geology):  
Petrology and geochemistry of the Meggisi Lake Pluton, northwestern Ontario, 1976-78; M.Sc. thesis (Sabag).
- In cooperation with the Ontario Department of Mines, the Meggisi Lake area has been mapped. Two phases of granitic intrusives have been



- distinguished, and a petrographic and geochemical investigation of these is planned to determine what can be learned of their water content and depth at the time of intrusion.
261. SCHWARCZ, H.P., MCNUTT, R.H., LONGSTAFFE, F.G., McMaster Univ. (Geology):  
Oxygen isotope and elemental geochemical study of greenstones and gneisses, Wabigoon and English River belts, 1973-77; Ph.D. thesis (Longstaffe).  
Oxygen isotopic analyses of metasediments, volcanics, paragneisses, orthogneisses and intrusive igneous rocks are completed for the Lake Despair-Jackfish Lake area and for selected regions of the English River gneiss belt. Distinctive groupings of whole rock compositions are recognized, and can be related to petrogenetic models. Trace and major element fractionation trends in the Lake Despair area are related to magmatic differentiation.
262. SCHWARCZ, H.P., SCOTT, S.D., KISSIN, S.A., Univ. Toronto; McMaster Univ.; Lakehead Univ. (Geology):  
Paleomanometry of meteorites, 1973-.  
The iron content of sphalerite which occurs as a minor phase in some iron meteorites is strongly dependent on pressure when the sphalerite is in equilibrium with troilite. We have determined iron contents for sphalerite from troilite nodules in several meteorites and, together with published data, have calculated their pressures of formation. Assuming that diffusion of iron in sphalerite ceases at 350°C, calculated pressures range from 0.2 to 3.1 kb corresponding to formation of the studied meteorites at centres of chondritic objects from 140 to 410 km in radius. To date, six iron meteorites of Group I have been examined. The pressures of formation that are estimated for these meteorites show a strong positive correlation with Ni content lending support to the idea that they have originated from different depths of a single chemically-fractionated parent body. Studies are being extended to other classes of meteorites.
263. SHAW, D.M., McMaster Univ. (Geology):  
Trace element behaviour during mantle and crustal melting.  
Theoretical studies of the ways in which trace elements may participate in magma generation processes.
264. SHAW, D.M., VATIN-PERIGNON, N., McMaster Univ. (Geology), and Université de Grenoble:  
Spilitic and other forms of alteration of basic volcanic rocks.  
Li abundance in spilitic rocks is 5x to 10x the level in fresh basalt. The study is concerned with the reason for this, and its implications for spilite genesis.
265. SHEPPARD, N.W., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Rock geochemical exploration and ore genesis at Mt. Lyell deposits, Australia, 1975-78; Ph.D. thesis (Sheppard).  
Preliminary analyses for trace and major elements on about 600 drill core samples (from a total of several thousand) indicate that extensive halos, similar to those shown to occur in New Brunswick, may also be expected around the Tasmanian massive sulphide deposits.
266. SMEE, B.W., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Factors controlling migration and fixation of elements from bedrock through soil to vegetation and atmosphere, 1975-79; Ph.D. thesis (Smee).
267. SPITZ, G., DARLING, R.G., Ecole Polytechnique:  
Geochemistry of volcanic rocks surrounding the Louvem ore deposit, Val D'Or, Québec, 1970-77; M.Sc.A. thesis (Spitz).
268. TINDALL, P., ANDERSON, G.M., Univ. Toronto (Geology):  
Chloride complexes of lead up to 100°C, 1976-78; M.Sc. thesis (Trindall).  
One of the more obvious but so far least understood constraints on hypotheses of origin of hydrothermal sulfide ore deposits is the solubility of metal sulfides in aqueous solutions. Our approach is to measure sulfide solubilities under controlled conditions and to compare these with solubilities calculated from thermochemical data. Satisfactory agreement then allows calculation of solubilities under conditions difficult to achieve experimentally but closer to geological reality. Thus far, we have concentrated on conditions of 150°C or less, and have concluded that for Mississippi Valley-type deposit sulfide solubilities are too small to allow ore formation in reasonable time spans, so that formation by metal transport followed by addition of sulfide at the site of deposition is the favoured hypothesis. It is planned to continue the work to higher temperatures and to consider other types of ore deposits.
269. UTHE, R.E., GOVETT, G.J.S., Univ. New Brunswick (Geology):  
Evaluation of electrogeochemical techniques for soil and rock exploration surveys, 1974-77; Ph.D. thesis (Uthe).  
Techniques of determination of water-soluble elements (cations and anions) and pH and conductance on soil and rock powders have been evaluated. Comparative distributions of these parameters in soil and rock from mineralized areas in central and northern New Brunswick are to be evaluated and interpreted from an exploration point of view.
270. VEIZER, J., HARTREE, R., BRAND, U., Univ. Ottawa (Geology):  
1. Geochemistry and diagenesis of carbonate sediments and fossils. 2. Secular variations in composition of sedimentary rocks during the Precambrian; M.Sc. thesis (Hartree), Ph.D. thesis (Brand).  
See:  
<sup>87</sup>Sr/<sup>86</sup>Sr in Precambrian carbonates as an index of crustal evolution; *Geochim. et Cosmochim. Acta*, v. 40, p. 1387-1395, 1976.  
Evolution of ores sedimentary affiliation during geologic history; in *Handbook of stratiform and stratabound ore deposits*, Elsevier, v. 3, p. 1-43, 1976.  
1. The completed and published studies during the last year describe (a) chemical and mineralogical composition of sponges, (b) diagenetic histories of lithographic limestones from Germany and their environmental interpretation, (c) control of post-depositional alteration in O/paleothermometry, (d) use of Na as a paleosalinity indicator, (e) the results for Paleozoic of Somerset Island - paleosalinities, dolomitization are near completion,

(f) for Cornwallis Island in progress. 2. Completed and published (a)  $^{87}\text{Sr}/^{86}\text{Sr}$  variations in Precambrian sea water, (b) O and C secular variations, (c) secular trends for ores of sedimentary affiliations. In progress: (d) studies of base metals, (e) rates of recycling.

271. WAHL, J.L., GOVETT, G.J.S., Univ. New Brunswick (Geology):

Rock geochemistry, 1973-76; Ph.D. thesis (Wahl).

Analysis for Cu, Pb, Zn, Mn, Co, Mo, K, Ca, Mg, Fe, and Mn by AAS (together with analysis for a dozen other elements on selected samples by Masma Emission Spectrometer) on drill core samples from Heath Steele A-C- and B-zones substantiate and extend earlier conclusions regarding extensive geochemical halos in rocks around volcanogenic sulphide deposits of the Bathurst District. Conclusions on the genesis and relation between these two ore zones are expected to considerably improve the understanding of the local palaeoenvironment and hence be useful for exploration for other ore zones.

272. WHITBY COSTESCU, L.M.A., MACLEAN, A.J., SCHNITZER, M., GAYNOR, J., IHNAT, M., Agriculture Canada (Soil Research Institute):

Agricultural sources, transport and storage of heavy metals, 1975-78.

To determine and assess the relationships between 12 trace metals in streamwater, suspended and bottom sediments and soils within 6 agricultural watersheds, with the aim of elucidating storage and transport mechanisms for trace elements. Soil profiles of the major soils in each watershed have been sampled and analyzed for As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn, as well as carbon, nitrogen, carbonates, organic matter and clay content. Bottom sediments have been collected from the mouths of the watersheds at the same time as suspended materials and streamwater. These were analyzed for the same parameters as soils. Metal loadings to the Great Lakes due to agriculture will be determined and their contribution relative to urban and other point sources will be assessed.

## THEORETICAL

273. CHOU, C.-L., Univ. Toronto (Geology):

Trace element studies of meteorites, 1975-79.

### See:

Allende inclusions: volatile-element distribution and evidence for incomplete volatilization of pre-solar solids; *Geochim. et Cosmochim. Acta*, v. 40, p. 85-94, 1976.

Classification of and elemental fractionation among ureilites; *ibid.*, p. 1449-1458, 1976.

Trace element evidence regarding a chondritic component in howardites; *Proc. Lunar Sci. Conf.* 7th, p. 3501-3518, 1976.

Using neutron activation method, five siderophiles (Ni, Ge, Ru, Ir, Au) and four volatiles (Zn, Ga, Cd, In) were determined in howardites, eucrites and diogenites. Howardites are regolith breccias, and like lunar regolith samples, have high siderophile contents relative to indigenous levels estimated from studies of eucrites and diogenites. The siderophile excess is interpreted as a chondritic component ranging in concentration from 3.3-2.4%. The composition of the chondritic material is similar to that in CM chondrites and mare-type lunar soils. The howardite parent-body and lunar maria appear to have been bombarded by CM-type

interplanetary objects. This study offers data for comparing the compositions of interplanetary materials captured by planetary bodies at widely separated solar-system locations. Concentrations of Ni, Zn, Ga, Ge, Cd, In, Ir and Au were determined in 25 H-group and 10 L-group chondrites. Work is in progress to examine the fractionation of siderophile and volatile elements within and between these two closely-related groups.

274. CHOU, C.-L., Univ. Toronto (Geology):

Geochemistry and origin of Archean volcanic rocks from Wabigoon volcanic-plutonic belt, 1976-79.

### See:

Trace element geochemistry of Archean volcanic rocks; *Proc. 1977 Geotraverse Conf.*, p. 77-79, 1977.

Fourteen samples of metabasalts were collected from the Sturgeon Lake section during the summer of 1976. Using neutron activation these samples are being analyzed for major and trace elements, including rare earths and potassium. In an earlier study D.G. Beggs has shown that volcanic rocks in this area have bimodal distribution: tholeiitic and dacitic rocks. The  $\text{K}_2\text{O}$  contents of tholeiitic basalts are rather low, mostly in the range of 0.02-0.2%, comparable to low-K tholeiites of island arcs. Dacitic rocks will also be studied. These data will be used to compare Archean volcanics with modern analogs, to study petrogenesis of Archean volcanics and the significance of bimodal magmatism, and to make specific tectonic interpretation of greenstone belts.

275. CHOU, C.-L., GOODWIN, A.M., WILLIAMS, J., Univ. Toronto (Geology):

Trace element geochemistry and origin of Archean gneisses and granites, 1975-79.

### See:

Abundances of rare earth and other trace elements in Archean granitic and gneissic rocks from the eastern Lac Seul region of the English River gneiss belt; *Proc. 1976 Geotraverse Conf.*, p. 80-86, 1976.

Geochemistry and origin of the eastern Lac Seul area, English River gneiss belt; *Proc. 1977 Geotraverse Conf.*, p. 80-93, 1977.

Rare earth and other trace elements have been analyzed by neutron activation in twenty samples selected from the Harris collection of the eastern Lac Seul region of the English River gneiss belt. The results indicate: 1) An amphibolitic gneiss has a flat REE pattern and total REE content of 12X chondritic abundance. It resembles Archean basalts, suggesting that its parent rock is basaltic, formed by partial melting of the upper mantle. 2) A 3.04-b.y.-old tonalitic gneiss has a smooth and steep-sloped REE pattern with remarkable enrichment of light REE and depletion of heavy REE. The trace element data may be interpreted by mixing granitic and mafic components. Possibly tonalitic magma formed in the continental crust as a mixture of granitic melt with material derived from host rocks. 3) Data on granites are consistent with their derivation from earlier sedimentary rocks by crustal anatexis. 4) Both granitic pegmatite and pegmatitic leucosome in paragneiss show positive Eu anomaly, but differ in RE and other trace element contents, reflecting compositional difference of their sources. The Miniss Lake area of the English River Gneiss belt consists mainly of metasediments, intruded by later granitic bodies and pegmatite veins. Samples from this area have

been collected during the summer of 1976. We will study the distribution of rare earth and trace elements in metasediments (mainly garnet gneiss and biotite gneiss), granites and pegmatites. These data will be useful for studying classification, chemical fractionation and source materials of these rocks. Samples from the White Otter batholith, Wabigoon volcanic-plutonic belt, have been collected during the summer of 1976. Major and trace elements will be determined for better understanding the origin of granitic rocks.

276. CHOU, C.-L., PEARCE, G.W., STRANGWAY, D.W., Univ. Toronto (Geology):  
Trace element and magnetochemical studies of lunar samples, 1975-79.

**See:**

Relationship between nickel and metallic iron contents of Apollo 16 and 17 soils; Proc. Lunar Sci. Conf. 7th, p. 779-789, 1976.

Element distribution in size fractions of Apollo-16 soils: Evidence for elemental mobility during regolith processes; Earth Planet. Sci. Lett., v. 29, p. 21-23, 1976.

Lithophiles, siderophiles and volatiles in Apollo 16 soils and rocks; Proc. Lunar Sci. Conf. 7th, p. 727-742, 1976.

Lunar regoliths are layers of fragmental debris on the surface of the Moon, produced principally by meteorite impacts. Their thickness ranges from 3.8 m at the Apollo-12 site to 10 m at Apollo-14 and 16 sites. Studies of siderophile distribution (Ni, Ge, Ir and Au) show that the amount of extralunar component in regolith increases with increasing regolith age. The influx of extralunar materials decayed rapidly ( $T_{1/2} \approx 40$  m.y.) between the time of formation of the Imbrium basin and the lava flooding of the Apollo-17 site. Since the onset of regolith formation at the Apollo-11 site the influx has been essentially constant. Leaching and etching experiments demonstrate that Zn, Ge, Cd, In and Au are concentrated in surficial deposits on the Apollo-15 green glass spherules. The surface deposits appear to be condensates from the magmatic gas phase responsible for the pneumatic explosion of the green glass from the lunar interior. Both Ni and metallic Fe in Apollo 16 and 17 soils have been determined by neutron activation and magnetic methods. The results show that the amount of metallic Fe particles in lunar regolith samples may be interpreted by mixing indigenous, meteoritic and subsolidus-reduced components. Work is in progress to study the formation history of Apollo-17 soil breccia 70019.

277. FRYER, B.J., MCLENNAN, S., BARNETT, R.L., Univ. Western Ontario (Geology):  
Geochemistry of Archean and Proterozoic chemical and clastic sediments, 1969-.

**See:**

Rare earth evidence in iron-formations for changing Precambrian oxidation states; Geochim. et Cosmochim. Acta, v. 41, p. 361-367, 1977.

Trace element geochemistry of the Sokoman iron formation; Can. J. Earth Sci., v. 14, no. 7, p. 1598-1610, 1977.

To elucidate the evolving surficial conditions and the crust during the early history of the earth. Considerable emphasis is placed on the geochemistry of the rare earth elements which provide evidence of changing oxidation states and crustal

composition with time. Chemical sediments as typified by iron formations provide the most sensitive indicator of changing oxidation states whereas the clastic sediments provide the best indication of weathering processes. Weathering during the Precambrian appears to have produced high K illites as a very stable phase and this along with rare earth evidence suggests that the pH of surficial waters was high (>8) and not low as sometimes suggested.

278. FYFE, W.S., Univ. Western Ontario (Geology):  
Fluid transport in the crust, 1972-.
279. FYFE, W.S., BROWN, J.R., BRULÉ, D.G., Univ. Western Ontario (Geology):  
Absorption of metals on mineral surfaces - use of ESCA spectroscopy, 1974-78; Ph.D. thesis (Brown), M.Sc. thesis (Brulé).
280. FYFE, W.S., KERRICH, R.W., Univ. Western Ontario (Geology):  
Nature of ore fluids based on stable isotope studies - new methods of prospecting, 1975-80.
281. MORENCY, M., MCDUGALL, D.J., Université du Québec à Montréal (Sciences de la Terre):  
An assessment of the feasibility of using partially serpentinized ultramafic rocks for radioactive waste storage and disposal, 1976-77.

**See:**

storage and disposal of radioactive wastes; Modern Geology, v. 6, p. 59-60, 1976.

Effets des radiations, essais mécaniques, conductibilité thermique, porosité, expansion linéaire thermique, sur les roches ultramafiques.

282. REARDON, E.J., Univ. Waterloo (Earth Sciences):  
Thermodynamic properties of ion pairs and complexes in natural waters, 1975-.

**See:**

Dissociation constants for alkali earth and sodium borate ion pairs from 10 to 50°C; Chemical Geol., v. 18, no. 4, p. 309-325, 1976.

The determination of dissociation constants, enthalpies and standard entropies of carbonate, bicarbonate, sulfate, silicate and borate ion pairs and complexes at low temperatures. The effect of these ion pairs on solution mineral equilibria can be appraised and applied to particular groundwater flow systems.

**GENERAL**

283. APPLEYARD, E.C., Univ. Waterloo (Earth Sciences):  
Studies of metasomatic and altered rocks, 1974-.
- Studies are in progress on mesozonal to katazonal processes termed nephelinization, scapolitization, feldspathization, granitization, skarnification, and on the epizonal phenomenon of magnesium metasomatism. Attention is being devoted to the timing of the event relative to metamorphic and diastrophic events. A major concern is to develop criteria to constrain the types of interpretations which can be made from basic geochemical data of metasomatic and altered rocks.
284. BIRK, D., MCNUTT, R.H., McMaster Univ. (Geology):  
Geochemistry and geochronology of Archean granitoid plutons within the Wabigoon greenstone belt, northwestern Ontario, 1972-77; Ph.D. thesis (Birk).

- See:**  
Rb/Sr isochrons for Archean granitoid plutons within the Wabigoon greenstone belt, northwestern Ontario; Geol. Surv. Can., Paper 77-1A, p. 161-167, 1977.
- The geochemistry, both major and trace element, has been completed on seven stocks, and some survey work carried out on others. Five Rb/Sr whole rock isochrons are now complete and two others will be done spring 1977.
285. BOORMAN, R.S., WILKOMIRSKY, I.A.E., MADELEY, W.D., NEWMAN, D., GILDERS, R., New Brunswick Res. Prod. Council:  
Process development, northeast ores – sulphation-roast-leach, 1975-78.
- See:**  
Bench scale sulphation roast. Demonstration trials on Brunswick-type ore, mill products, 1976.
286. BRISTOW, Q., Geol. Surv. Can.:  
Geochemical technology development, 1976-.
287. BROOKS, C., Univ. Montréal (Geology):  
The evolution of Precambrian Shields (with special reference to Canada) as determined by geochemical, isotopic and geochronological analysis, 1970-.
- See:**  
Ancient lithosphere: Its role in young continental volcanism; Science, v. 193, p. 1086-1094, 1976.
- Rb-Sr mantle isochrons from oceanic regions; Earth and Planetary Sci. Letters, v. 32, p. 51-61, 1976.
- The long term benefits of this research relate to a better understanding of the formation and evolution of the Canadian Shield and by extrapolation crustal/mantle processes. Such understanding has direct application to such diverse fields as the regional localization of metallogenic provinces (e.g. those existing over undepleted sub-continental lithosphere), and the early chemical evolution of the Earth. Based on the previous 3 years results, the following aspects are to be given priority during 1977-80. I—determination of primary trace-element chemistry of Archean basic magmas of Quebec (via pyroxene analysis). II—geochronological search for relics of ancient crustal nuclei. III—Rb/Sr mantle isochron studies of mafic intrusives and anorthosites in order to map the spatial and temporal evolution of Canadian lithosphere, and to delineate specific petrogenetic constraints (e.g. on massif anorthosite origin). IV—comparative isotopic major and trace-element analysis of modern island-arc and sea-floor volcanics in order to better understand the primary nature of shield metavolcanics and their mode of formation. V—alteration studies involving non-mobile elements of modern orogenic submarine volcanics in order to further understand alteration patterns in Archean metavolcanics.
288. BROOKS, C., Univ. Montréal (Geology):  
Isotopic study of ancient lithosphere, 1976-77.
- See:**  
Rb-Sr mantle isochrons; Carnegie Inst. Washington Yearbook-75, p. 176-207, 1976.
- To study the nature of chemical variations of the ancient sub-continental lithosphere underlying the Australian craton. It is to be accomplished by means of Sr-isotopic analysis of Precambrian, Jurassic and Tertiary tholeiites occurring within close proximity in Tasmania, and examination of the data for Rb-Sr mantle isochron.
289. CARD, K.D., INNES, D.G., Ontario Division Mines:  
Geology and geochemistry of the Huronian Espanola Formation and associated base metal deposits, Districts of Sudbury and Algoma, Ontario, 1975-78.
- Regional stratigraphy, sedimentology and geochemistry of the Espanola Formation with emphasis on basemental deposits (iron, zinc, copper) associated with Espanola carbonate rocks and Nipissing Diabase intrusions.
290. CLAGUE, J.J., Geol. Surv. Can.:  
Paleosurfaces and weathering profiles in the Southern Cordillera, 1976-.
291. FAYE, G.H., CANMET (EMR):  
Canadian certified reference materials project (CCRMP), 1970-.
- See:**  
Certified compositional reference materials for the Earth Sciences; Can. Mineral., v. 14, p. 164-171, 1976.
- Zinc-copper ore RU-1: Its characterization and preparation for use as a certified reference material; CANMET Rep. 77-7, 1977.
- Interlaboratory programs have been established for the certification of: an antimony-arsenic ore, a high-grade uranium ore, commercial-grade concentrates of zinc, lead and copper, and four Canadian soil samples. The concentrates and soils will be certified for a number of major, minor and trace constituents.
292. FORESTER, R.W., ORO, F., Univ. Saskatchewan (Geological Sciences):  
Oxygen and hydrogen isotopic studies of igneous and metamorphic rocks, 1976-78; M.Sc. thesis (Oro).
293. FRITZ, P., BARKER, J., Univ. Waterloo (Earth Sciences):  
Methane in groundwater, 1975-77; Ph.D. thesis (Barker).
294. GARRETT, R.G., Geol. Surv. Can.:  
Geochemical data systems, 1975-.
295. GUHA, J., LEROY, J., GUHA, D., Univ. du Québec à Chicoutimi:  
Application de l'étude des inclusions fluides dans les problèmes géologiques reliés à la minéralisation dans le précambrien avec une emphase sur la région de Chibougamau, Québec, 1975-.
- Voir:**  
Phase fluide associée à la remobilisation du gisement de cuivre de Henderson, Chibougamau; Société française de minéralogie et de cristallographie, 1977.
296. JAMES, D., BROOKS, C., Univ. Montréal (Geology):  
The geochemical evolution of the Andes, 1972-78.
- See:**  
Archean Cenozoic volcanism: magma genesis in the light of Sr isotopic composition and trace-element geochemistry; Bull. Geol. Soc. Am., v. 86, p. 592-600, 1976.
- Preliminary Rb/Sr data on the minimum age of the central Andean Precambrian basement complex; Carnegie Inst. Washington Yearbook-75, p. 213-216, 1976.
- To understand the formation of the Andes (and thereby delineate more precisely the petrogenesis of igneous rocks produced over a subducting

- oceanic plate) by means of broad-scale geochemical analysis of Peruvian and Bolivian rocks (includes major, trace-element and Sr and Pb isotopic analysis).
297. KEMP, A.L.W., WILLIAMS, J.D.H., WONG, H., HARPER, N., THOMAS, R.L., Environment Canada (CCIW):  
Geochemical budgets, 1976-77.  
To determine sediment and geochemical inputs to basins of fine-grained sediments in Lakes Erie, Superior and Huron. Cores have been collected from Lakes Erie, Superior and Huron and have been sub-sampled at close intervals for palynological and geochemical analysis. The analyses will be completed by the end of 1976-77. Total sediment and geochemical loadings will be calculated for each of the lakes based on sedimentation rate data, regional sediment distributions and the surface sediment geochemistry. During 1977-78, compilation and evaluation of the data will be carried out and reports written for each of the lakes.
298. LAMBERT, R.St.J., CHAMBERLAIN, V.E., Univ. Alberta (Geology):  
CO<sub>2</sub>-permafrost on Mars, 1976-78.
299. LAMBERT, R.St.J., CHAMBERLAIN, V.E., HOLLAND, J.G., Univ. Alberta (Geology):  
Geochemistry of the Archean Crust, 1975-85.  
**See:**  
The geochemistry of Archean rocks; The Early History of the Earth; p. 377-387, 1976.
300. LAMBERT, R.St.J., HOLLAND, J.G., Univ. Alberta (Geology):  
Geochemistry of the Amitsoq gneiss, 1974-76.  
**See:**  
Amitsoq gneiss analyses: preliminary observations; The Early History of the Earth; ed. B.F. Windley, p. 191-201, 1976.
301. LEHTO, D., ARNOLD, R.G., Saskatchewan Res. Council (Geology):  
Development and application of geochemical exploration methods in Precambrian terrain, 1972-.  
**See:**  
Multi-media geochemical evaluation of the 1974 GSC-DMR lake sediment survey; Saskatchewan Res. Council, Prel. Rep., 1976.
302. LEVINSON, A.A., Univ. Calgary (Geology):  
Geochemistry and mineralogy of kidney stones, 1975-.
303. LEVINSON, A.A., Univ. Calgary (Geology):  
Compilation of second edition of book on exploration geochemistry, 1976-.
304. MUDROCH, A., CHAU, Y.K., CAPOBIANCO, J.A., Environment Canada (CCIW):  
Speciation of heavy metals in lake sediments, 1977-79.  
To investigate the chemical speciation of heavy metals in sediments with reference to potential availability to biota. (1) Bottom sediments will be collected from selected sites, unpolluted sites and sites subjected to heavy metal inputs from man's activities. Potential sites include: Trent/Severn River system, Rideau/Ottawa River, Moire River, Shubenacadie Lakes system, Hamilton Harbour, Welland River, Lake Erie and Georgian Bay. (2) In the field, samples will be analyzed for pH, Eh, and frozen as quickly as possible. (3) In the laboratory, geochemical fractionization (similar to those of Gibbs and Chen and Gupta) will be carried out on sediment samples in order to differentiate geochemical phases such as interstitial water, exchangeable fractions, fractions associated with organic compounds, crystalline rock matrices, oxides, etc. (4) Relevant sediment parameters such as particle size, organic C, N and P and clay mineralogy will also be determined.
305. PAUL, D.K., MCNUTT, R.H., CROCKET, J.H., CLARK, A.H., McMaster Univ. (Geology), Queen's Univ. (Geological Sciences):  
Pb, Sr and rare earth element study of Mesozoic and Cenozoic Andean rocks in Chile and Bolivia, 1972-.  
**See:**  
Initial Sr<sup>87</sup>/Sr<sup>86</sup> ratios of plutonic and volcanic rocks of the Central Andes between Latitude 26° and 29°S; Earth and Planet Sci. Lett., v. 27, p. 305-313, 1975.  
Project concerned with the Sr and Pb isotopic characteristics, and REE patterns of the Mesozoic and Cenozoic Andean rocks. Our field area has concentrated in a transect across Chile from the coast into Argentina. We are also studying a N-S transect in Bolivia, looking at juxtaposed rocks 20 and 200 m.y. old respectively. We are endeavouring to use these geochemical tracers to determine the source of the magma for these rocks.
306. SHEGELSKI, R.J., SCOTT, S.D., Univ. Toronto (Geology):  
Characterization and geochemistry of Archean iron formations in the Savant Lake-Sturgeon Lake greenstone belt, northwestern Ontario, 1972-77; Ph.D. thesis (Shegelski).
307. SONNENFELD, P., HUDEC, P.P., TUREK, A., LEW, M., Univ. Windsor (Geology):  
Geochemistry of a solar pond, 1976-77; M.Sc. thesis (Lew).  
A heliothermally heated, density stratified brine in a pond on the island of Gran Roque, Archipelago of Los Roques, Venezuela, displays rapid concentration of selected cations in both water and bottom sediment. The variability of geochemical conditions in different seasons is being studied.
308. STEGER, H.F., FAYE, G.H., CANMET (EMR):  
Thiosalt formation, 1976-78.  
The formation of thiosalts by the oxidation of monomineralic samples of the more common sulphide minerals in aqueous slurry will be studied with respect to (1) nature of the mineral, (2) temperature, (3) pH of the slurry, (4) particle size and (5) oxygen flow rate or availability. An attempt will be made to relate the results of this study of the pure minerals to those obtained for the New Brunswick ore to improve the understanding of the thiosalt problem associated with the processing of this ore.
309. STEGER, H.F., FAYE, G.H., MARK, E., DESJARDINS, L.E., CANMET (EMR):  
Effect of microwave radiation on moist sulphide-bearing ores and concentrates, 1976-77.  
The use of microwave radiation presents an efficient and rapid method for drying moist ores and concentrates. However, preliminary tests indicate that certain sulphide-bearing materials are susceptible to oxidation when exposed to microwave radiation. A systematic, empirical, study has been undertaken to determine the effect of the moisture content, particle size, and sample size on

the oxidizability of several of the more common sulphide minerals when subjected to microwave radiation. It is possible that this study will provide knowledge about the stability of sulphide ores to drying by this technique or could permit the development of useful methods for selectively oxidizing certain sulphide minerals in the presence of others.

310. TANAKA, R.T., KIMBERLEY, M.M., Univ. Toronto (Geology):

Trace element distributions in Elliot Lake uraniferous conglomerate and associated rocks, Ontario, 1976-78; M.Sc. thesis (Tanaka).

Neutron activation analysis is being employed to determine the abundance and distribution of trace elements in uraniferous conglomerate and associated rocks in the Elliot Lake area.

311. WARREN, H.V., Univ. British Columbia (Geological Sciences):

Minor element variations in plutonic rock: a guide to economic mineralization, 1976-79.

### GEOCHRONOLOGY

313. ARMSTRONG, R.L., MISCH, P., BROWN, E.H., HOLLISTER, V.F., Univ. British Columbia (Geological Sciences), Univ. Washington, Duval Corp.:

Geochronometry of Cascade Mountains, Washington-British Columbia, 1975-.

#### See:

Late Cenozoic porphyry copper deposits of the North American Cordillera; Inst. Mining Metal. London, Trans., v. 85, p. B239-B244, 1976.

Permo-Triassic and Early Cretaceous periods of high-pressure metamorphism in the Vedder Mountain and Shuksan schists have been dated (concordant K/Ar and Rb/Sr on muscovite and whole rock samples). Work is being extended on these rocks and started on Skagit Gneiss and other plutonic rocks of the core of the Cascade Mountains. A suite of Cenozoic porphyry mineralized rocks has been dated by K-Ar and the results published.

314. ARMSTRONG, R.L., MONGER, J.W.H., WOODSWORTH, G.J., PRETO, V., EADIE, T., PANTELEYEV, A., Univ. British Columbia (Geological Sciences), Geol. Surv. Can., British Columbia Dep. Mines Pet.:

Sr isotopic composition - survey of plutons and volcanic rocks in interior (eugeosynclinal) British Columbia, 1974-; B.Sc. thesis (Eadie).

#### See:

Strontium isotope study of the composite batholith between Princeton and Okanagan Lake; Can. J. Earth Sci., vol. 13, no. 11, p. 1577-1583, 1976.

Sr isotopic analyses have been completed on several suites from eugeosynclinal volcanic rocks and several plutons of the Intermontane Belt. Where sufficient spread of Rb/Sr ratio is found isochrons have been obtained. This work will be continued and extended to characterize all major tectono-stratigraphic units and most named larger plutons.

315. ARMSTRONG, R.L., SCOTT, K.L., MULLER, J., Univ. British Columbia (Geological Sciences), Geol. Surv. Can.:

Sr isotopic study, igneous rocks of the Insular Belt, Vancouver Island, British Columbia, 1975-80.

#### See:

Minor element variations in selected but nominally similar rocks; Western Miner, v. 49, no. 7, p. 23-27, 1976.

Preliminary studies have demonstrated that "uniform" plutonic rocks have been found by spectrographic analyses to possess non-uniform distribution of various trace elements. There is some evidence that detailed studies of the areal distribution of these trace elements may be an aid in mineral exploration.

312. WILLEY, J.D., Geol. Surv. Can.:

Formation and equilibrium of authigenic and syngenetic metal deposits in the marine environment, 1974-.

#### See:

Reactions which remove trace metals from seawater: preliminary observations; Geol. Surv. Can., Paper 76-1C, p. 71, 1976.

Rb/Sr isochrons have been obtained for Sicker volcanics, Island intrusions, and Bonanza volcanics. Sr isotopic composition but no isochron obtained for Karmutsen Formation. Additional work in progress on Cenozoic intrusive and volcanic rocks, Sicker Group, Leech River Schists, and West Coast Complex.

316. ARMSTRONG, R.L., SOUTHER, J., GREEN, N., BEVIER, M.L., WATTERS, B., NICHOLLS, J., Univ. British Columbia (Geological Sciences), Geol. Surv. Can.:

K/Ar geochronometry and Sr isotope studies of Late Cenozoic volcanic rocks, 1975-77; M.Sc. thesis (Bevier), Ph.D. thesis (Green).

New K/Ar dates and numerous Sr isotopic analyses have been completed for all major volcanic groups of Late Cenozoic age in the Canadian Cordillera.

317. ARMSTRONG, R.L., WYNNE-EDWARDS, H.R., Univ. British Columbia (Geological Sciences):

Geochronometry of metamorphic rocks in upper plate of major Himalayan thrust sheets near Askot and Almora, India, 1976-77.

A Precambrian (1.6 b.y.) whole-rock Rb/Sr isochron has been obtained for schists and gneisses near Askot. This work will be continued to confirm the initial result and determine the extent of these old rocks (which were contrary to the expectations of some recent syntheses).

318. BAADSGAARD, H., GODFREY, J.G., Univ. Alberta (Geology), Alberta Research Council:

Geochronology of the Precambrian Shield of north-eastern Alberta, 1957-.

The extensive batholithic area of the northeastern Alberta shield has been sampled and some 100 more reconnaissance K-Ar dates obtained. Rb-Sr whole rock and U-Pb zircon dating are underway but at least two years of analytical work remain to be done. The mapping of the northeastern Alberta shield is now complete and it is hoped that the main geochronology can now be planned for completion in two to three years. Reconnaissance investigations in the Canadian shield area to the north in the Northwest Territories are beginning.



319. BAADSGAARD, H., LAMBERT, R., BANKS, C., Univ. Alberta (Geology):  
Isotopic and petrologic study of a relatively undisturbed Archean terrain within the Hudsonian (or Churchill) metamorphic province of the Canadian Shield, 1975-; M.Sc. thesis (Banks).  
The K-Ar reconnaissance is more than half completed and the extent of the Archean body is being delineated. Rb-Sr studies already completed for that portion of the body in northwestern Saskatchewan yield an age of  $\sim 2650$  m.y., while most K-Ar values lie close to 2400 m.y. K-Ar dating of late pegmatites in the area also give  $\sim 2400$  m.y., indicating a late Kenoran thermal pulse. The Hudsonian orogeny (at  $\sim 1700$ -1900 m.y.) has not affected this area as it has other Archean rocks in the white Lake Fold belt in Saskatchewan and in northeastern Alberta. U-Pb dating of zircons and Rb-Sr dating of the Northwest Territories samples with be carried out after the reconnaissance K-Ar dating.
320. BAADSGAARD, H., WINZER, S., Univ. Alberta (Geology):  
Isotopic study of polymetamorphism in a segment of the Kootenay Arc, British Columbia, 1972-78.  
The initial work around Kootenay Bay, British Columbia has now been expanded to include all of the Bayonne Batholith, since only limited radiometric data can be obtained on metasediments. Stable isotope analyses have had to be run on the batholithic and pegmatitic samples since it appears that hydrothermal alteration and metamorphism are far more effective and extensive than previously thought. For example, Rb-Sr whole rock dating of the batholithic rocks has yielded a negative isochron; indicating extensive metamorphic and/or metasomatic activity on a large scale. Detailed systematic mineralogic studies will be necessary to clarify this problem. In addition, U-Pb analyses of the batholithic zircon populations must be made to furnish a realistic reference time of formation. Both K-Ar and Rb-Sr fail to yield a primary date of emplacement.
321. COLLERSON, K., BAADSGAARD, H., Univ. Alberta (Geology), Memorial Univ. (Geology):  
Geochronology of the Early Archean rocks of the Saglek Bay area, Labrador, 1976-.  
Two sample suites have been processed for mineral separation and dating. Some 25 U-Pb zircon analyses and a dozen sphene-apatite U-Pb analyses have been completed. K-Ar and Rb-Sr whole rock dating on some sixty representative samples will follow this summer. The tectonic and metamorphic history of this ancient Archean area should then be reasonably interpretable. Some detailed mineralogic and isotopic studies are also planned. These studies will deal with problems in reconstructing the metamorphic histories of polymetamorphic rocks; in particular that for the Saglek Bay area.
322. CORMIER, R.F., STIRLING, J.S., Saint Francis Xavier Univ. (Geology):  
Rubidium-strontium dating of rocks and minerals from the northern Appalachians, 1965-.  
Nova Scotia: Rb/Sr isochron dating of granitic intrusive bodies in the Cobequid Highlands and the Antigonish-Pictou Highlands - 50% complete. Rb/Sr isochron dating of granitic intrusives in the southwestern portion of the province - just beginning. Detailed whole-rock and mineral isochron dating of the eastern part of the South Mountain batholith - 80% completed. New Brunswick: Rb/Sr whole-rock isochrons for Harvey volcanics and Mount Pleasant volcanics completed. Rb/Sr whole-rock isochrons at western and eastern ends of St. George batholith completed - work will continue. First Rb/Sr whole-rock isochron study on older (D2) granites of north-central New Brunswick completed.
323. DOIG, R., McGill Univ. (Geological Sciences):  
Rb-Sr geochronology and evolution of the Grenville Province, northwestern Québec, 1972-77.  
The regional Rb-Sr geochronological study in LaVérendrye Park has been completed. Reworked Archean rocks have been identified in a probably continuous segment extending from the Grenville Front near Val d'Or to about 125 km southeast of the Front. The southeastern boundary of this Archean segment is marked by a broad zone of migmatites, many of which yield ages of about 1150 m.y., but high  $^{87}\text{Sr}/^{86}\text{Sr}$  initial ratios. This zone also includes a lithologically distinct meta-sedimentary unit which yields an age of granulite facies metamorphism of 1650 m.y. and little indication of an earlier crustal history. In summary there is evidence for three distinct episodes of high grade metamorphism in this northern segment of the Grenville province.
324. FLETCHER, I., FARQUHAR, R.M., Univ. Toronto (Physics):  
Lead isotope studies of lead mineralization in Grenville and related sedimentary rocks, 1973-79; Ph.D. thesis (Fletcher).  
See:  
Lead isotopes in the Grenville and adjacent Palaeozoic formations; Can. J. Earth Sci., v. 14, p. 56-66, 1977.  
The data bank of lead mineral isotopic analyses for samples from the area studied will be enlarged in an effort to more clearly identify the components of the isotopic distribution and their inter-relations. Work on rock leads will be commenced to determine if possible the relation of initial lead isotope ratios to mineral lead ratios in the Grenville.
325. FOWLER, A.D., DOIG, R., McGill Univ. (Geological Sciences):  
Age and origin of uranium deposits associated with granitic rocks, Grenville Province, Québec, 1975-78.
326. FRAREY, M.J., Geol. Surv. Can.:  
Correlation and geochronological studies in the Canadian Shield, 1975-.
327. FRITZ, P., REARDON, E.J., Univ. Waterloo (Earth Sciences):  
Carbon $^{14}$  dating of groundwaters in the Canadian Shield and in fractured crystalline rocks, 1976-79.
328. GOODWIN, A.M., THODE, G.H., Univ. Toronto (Geology), McMaster Univ. (Chemistry):  
Stable isotope abundances in Archean iron-formation, 1971-79.  
Stable isotope investigations provide strong evidence that Archean iron-formations in the Michipicoten and Wanan River areas, Ontario, are products of biogenic activities during precipitation of sulfidic, carbonaceous and probably siliceous phases. Sulfur source is attributed to sea-water sulfate; however, the sulfur in the sea-water have had a direct volcanic source with a short-lived sea-water residence. The iron-formations are being



- tested as a paleo-environmental and paleo-bathymetric indicators in terms of Archean paleoslopes. Detailed systematic isotope and trace element determinations on continuous drill-core intersections (1500 ft.) from the McLead Mine Michipicoten area, are presently underway. Sulfur and carbon isotopes are being determined; oxygen isotope determinations will be brought on-stream. This is part of a multi-national program to investigate biogenic contribution to ore deposition of which the Canadian contribution focuses on Archean banded iron-formation material, especially siliceous parts, is conducted in the search for possible fossil forms.
329. HIGGINS, M., DOIG, R., McGill Univ. (Geological Sciences):  
Rb-Sr chronology and origin of the Sept-Iles anorthosite suite, Québec, 1975-78; Ph.D. thesis (Higgins).  
The Seven Islands anorthosite suite consists of a roughly horizontal sequence of anorthosite, grading upwards into layered gabbro, followed by monzonite and adamellite. A total of two months have been spent in the field, mapping and sampling the various members of the suite. Results from the adamellite and a layered monzonite yield ages of  $552 \pm 12$  and  $538 \pm 17$  m.y. Preliminary results from the pegmatitic patches in the anorthosite confirm this age for the complex as a whole. These rocks have been considered to be typical of the "undeformed" anorthosite of the Grenville Province. We do not suggest that they are all Cambrian in age, but do suggest that anorthosites may have had a more passive role during the orogenic evolution of the Grenville Province. Deformed anorthosites could represent earlier pre-Grenville orogenic events. Considering this suite in the context of the St. Lawrence graben system, the presence of anorthosite within an alkaline rift-related suite may provide insight into the origin of these alkalic rocks. The low initial ratios obtained from the Seven Islands granitic rocks discount the possibility that they are an envelope of melted country rocks. Initial ratios from eight widely separated anorthosite samples average 0.7039 with a single standard deviation of only 0.0005.
330. KEMP, A.L.W., WONG, H., HARPER, N., Environment Canada (CCIW):  
Recent geochronological investigation, 1976-78.  
To determine modern sedimentation rates (last 200 years) in Canadian freshwater environments. Modern sedimentation rates will be measured in a number of freshwater environments: (1) large lake (clay and sandy sediment), (2) small lake (organic sediment), (3) marsh (peat), and (4) river sediments. Areal reproducibility of the rate measurements on the micro (<1 m) and macro (0.5-1.0 km) scales in the above environments will be ascertained. Modern time horizons in sediment cores will be established using independent dating methods (paly-nology, varve counting,  $^{210}\text{Pb}$ ,  $^{14}\text{C}$  and using known pollutant horizons such as PCBs, DDT and Hg). During 1977-78, sedimentation rates will be determined on cores previously collected and sub-sampled in 1976 from Lakes Erie, Lake St. Clair, Chalk River, Sudbury, St. Lawrence River and Kamloops Lake. Sedimentation rates will be determined using two independent methods on the above cores. Geochemical analyses will also be carried out on the cores. Computer programme will be developed for data analysis of the cores during this year. In addition, during 1977-78, sediment cores will be collected from Toronto area marshes, James Bay marshes, St. Clair marshes, Lake Ontario and Kootenay Lake for sedimentation rate and geochemical analysis in 1978. Sediment cores will be sub-sampled, freeze dried and the water contents measured as soon as possible after collection of the cores.
331. KLEMES, V., LENNOX, D.H., Environment Canada (Water Res. Br.):  
Effect of model heterogeneity on the modelling process, 1973-76.  
See:  
Geophysical time series and catastrophism; *Catastrophist Geol.*, v. 1, p. 43-48, 1976.
332. KROGH, T.E., BREAKS, F.W., BOND, W.D., Ontario Division Mines:  
Geochronology, English River Subprovince, Ontario, 1976-.  
To unravel emplacement ages of major granitoid suites, time span of Kenoran migmatization in northern supracrustal domain, maximum and minimum ages of sedimentation in northern domain, age of faulting (Sydney Lake Cataclastic Zone), and age of pre-Kenoran metamorphism.
333. KROGH, T.E., NUNES, P.D., Royal Ontario Mus. (Geology and Mineralogy):  
U-Pb isotopic dating of Precambrian rocks.  
Search for pre-volcanic basement in Archean; detecting and avoiding two stages of zircon growth; the effect of chemical alteration on zircon U-Pb systems; and the effect of regional metamorphism of Rb-Sr and U-Pb dating systems.
334. LAMBERT, R.St.J., BAADSGAARD, H., Univ. Alberta (Geology):  
Archean-Proterozoic transition north of Uranium City, Northwest Territories, 1974-78.
335. MACQUARRIE, R., STAUFFER, M.R., Univ. Saskatchewan (Geological Sciences):  
Uranium/lead dating of igneous events in the Flin Flon region, Manitoba and Saskatchewan, 1972-77; Ph.D. thesis (MacQuarrie).  
The age of emplacement of the Amisk Group of volcanic rocks is approximately 1875 m.a. Intrusion occurred up to about 1800 m.a. just after metamorphism ended.
336. MATHEWS, W.H., Univ. British Columbia (Geological Sciences):  
Anomalous K-Ar dates from gneisses of the Trinity Hills and Enderby areas, North Okanagan, British Columbia, 1974-77.
337. MAXWELL, R., ARMSTRONG, R.L., Univ. British Columbia (Geological Sciences):  
A study of rubidium, strontium, and strontium isotopes in some mafic and sulphide minerals, 1974-77; M.Sc. thesis (Maxwell).  
The mineral sphalerite contains Sr and Rb at the 1 ppm level, or below, and has Rb/Sr ratios favorable for dating. A mid-Mesozoic age was obtained for Pb-Zn mineralization at Pine Point. Study of Rb, Sr, and Sr isotopes in ultramafic nodules from two localities in B.C. showed internal disequilibrium between mineral phases and/or a possible older Precambrian age for some specimens.

338. NUNES, P.D., Ontario Division Mines, Royal Ontario Mus. (Geology and Mineralogy):  
Geochronology of Archean metavolcanic-metasedimentary belts of Ontario, 1976-.
- Initial sampling in the Abitibi, Uchi Lake, and Sturgeon Lake belts was carried out in 1976.
339. PARRISH, R.R., ARMSTRONG, R.L., Univ. British Columbia (Geological Sciences):  
Structure, metamorphism, and geochronology of the northern Wolverine Complex near Chase Mountain, Aiken Lake map-area, British Columbia, 1974-76; M.Sc. thesis (Parrish).
- Mapping and structural studies were completed in an area near Chase Mountain within amphibolite facies rocks of the Wolverine Complex. Rb/Sr and K/Ar dating show major regional metamorphism to be pre-Middle Cretaceous but all minerals are reset in an area near a small Early Cenozoic pluton.
340. RUNKLE, D., HARRISON, M., ARMSTRONG, R.L., CLARK, G.C., LEWIS, T., WOODSWORTH, G., Univ. British Columbia (Geological Sciences), Geol. Surv. Can.:  
Geochronometry of Ecstall, Quottoon and related plutons and surrounding metamorphic complex, 1975-77; M.Sc. thesis (Runkle), B.Sc. thesis (Harrison).
- Rb/Sr whole rock and mineral dates, K/Ar mineral dates, and fission track dates for epidote, sphene, zircon and apatite give emplacement age and cooling history curves for plutons in the Prince Rupert-Terrace portion of the Coast Plutonic Complex. Preliminary results suggest a Precambrian age for enclosing schists and gneisses along the western side of the plutonic complex. The cooling curves for the Quottoon Pluton are being reproduced by cooling models based on measured heat production, conductivity, and uplift rate.
341. RUSSELL, R.D., AHERN, T.K., MELORUM, R.D., SHORE, P., SLAWSON, W.F., Univ. British Columbia (Geophysics and Astronomy):  
Isotopic measurements of lead and oxygen; Rb/Sr geochronology; Ph.D. thesis (Ahern).
- Rb/Sr and K/Ar measurements of the domal structures of the Ominica crystalline complex suggest a complex history with events reaching back to 740 m.yr and perhaps to 1300 m.yr. A concordant age of 56 m.yr is obtained for the Tertiary metamorphism. Major reconstruction of the lead mass spectrometer is now completed. Its work is being confined to the analysis of lead ores. The construction of an automated, high throughput oxygen mass spectrometer for water analysis, based on the design of Dansgard is under way.
342. WANLESS, R.K., Geol. Surv. Can.:  
Isotopic study of mica-bearing rocks yielding anomalous K-Ar ages, 1965-.
- See:  
Geochronology of the Twillingate granite and Herring Neck group, Notre Dame Bay, Newfoundland; Can. J. Earth Sci., v. 13, no. 11, p. 1591-1601, 1976.
343. WANLESS, R.K., Geol. Surv. Can.:  
Geochronological research and control studies, 1973-.
344. WERNER, L., BULTMAN, T., ARMSTRONG, R.L., MONGER, J.W.H., RODGERS, J., Univ. British Columbia (Geological Sciences), Yale Univ., Geol. Surv. Can.:  
Geology-geochronometry of Atlin Lake-Juneau Ice Field region, Coast Mountains, British Columbia, 1973-78; M.Sc. thesis (Werner), Ph.D. thesis (Bultman).
- An area extending from the Atlin Horst across the Laberge Trough into the central crystalline complex of the Coast Mountains is being mapped in detail. Plutons of many ages ranging from Triassic to Early Cenozoic have been dated by K/Ar and Rb/Sr. Preliminary results suggest a Precambrian age for high grade metamorphic rocks in the Coast Mountains.
345. WOLFF, M., CROCKET, J.H., McMaster Univ. (Geology):  
Geochronology of the Stephen Lake pluton and associated felsic volcanics, 1974-77; M.Sc. thesis (Wolff).
- An Rb/Sr isochron of approximately 2.6 billion years was obtained for the Stephen Lake diorite to granodiorite stock from the Kakagi Lake area of northwestern Ontario. Trace element comparison of the stock and its associated felsic (dacite) pyroclastics suggest the two are very closely related geochemically. Although the field relations show the stock intrudes the felsic volcanics, we suggest the stock is a relatively high level subvolcanic pluton representing the magma chamber from which the volcanics were extruded. We are currently attempting to obtain an Rb/Sr date on the volcanics to confirm this hypothesis.

#### GEOLOGICAL COMPUTER APPLICATIONS

346. PORUKS, M., HAMILTON, W.N., Alberta Research Council (Geology Div.):  
Canadian index to geoscience data, 1974-.
- See:  
Index to uranium assessment reports for quartz mineral exploration permits, northeastern Alberta; Alberta Res. Council, Rep. 76-6, 1976.
- Indexing is now complete for assessment reports, with more than 700 documents indexed and entered into the CIGD file, and work has commenced on unpublished initial reports.
347. RUCKLIDGE, J.C., NIELSEN, P.A., Univ. Toronto (Geology):  
Analysis of rocks and minerals by computer controlled instruments, 1975-79.
- The recently acquired PDP-11/05 computer system is being applied intensively in the field of rock and mineral analysis. We are developing interface devices and programmes to perform analyses automatically, and to reduce and plot data. Currently quality quantitative analyses are being obtained from the energy dispersive spectrometer on the microprobe, and attempts are underway to make the sophisticated reduction program EDATA operational in the laboratory computer.
348. SINCLAIR, A.J., Univ. British Columbia (Geological Sciences):  
Geostatistical analysis of the Kutcho chrysotile deposit, northern British Columbia and Carolin Mines gold deposit, southern British Columbia, 1975-77.

349. SINCLAIR, A.J., DITSON, G., Univ. British Columbia (Geological Sciences):

Computer-processible file of mineral deposit information as an aid in evaluating metallogeny in Vancouver and Hope map-areas, southern British Columbia, 1975-77; M.Sc. thesis (Ditson).

A detailed information file has been constructed for more than 300 mineral deposits in Vancouver and Hope map-areas — this added to 200 deposit

detailed file for a contiguous area — the Pemberton-Taseko Lakes area. To date a variety of map output and contingency tables have been extracted from the file for various types of analysis and thesis writing is in preparation. Many deposits were visited in the field as part of this project and a conceptual model of metallogeny based on a classical geological approach is to be refined by use of statistical evaluation of data.

### GEOMATHEMATICS

350. AGTERBERG, F.P., Geol. Surv. Can.:  
Probability models for estimating mineral potential, 1969-.

351. FABBRI, A.G., Geol. Surv. Can.:  
Quantification of geological variables and geomathematical estimation of mineral potential for selected areas in Canada, 1972-.

352. MAY, R.W., SCHWARTZ, F.W., Univ. Alberta (Geology):

Application of geostatistics to geological problems, 1976-78.

As part of a study in applied geostatistics, areal variation in groundwater chemistry in various areas of Alberta is being studied. In particular, conical analysis, cluster analysis, discriminant analysis and factor analysis procedures are being utilized.

### GEOMORPHOLOGY

353. BARENDREGT, R.W., ONGLEY, E.D., RUTHERFORD, G.K., GORMAN, A., YALIN, S., STALKER, A.M., Queen's Univ. (Geography), Geol. Surv. Can.:

A detailed geomorphological survey of the Pakowki-Pinhorn area of southeastern Alberta, 1974-77.

#### See:

Differentiation of tills in the Pakowki-Pinhorn area on the basis of their magnetic susceptibility; Geol. Surv. Can., Paper 76-1C, p. 189, 190, 1976.

Paleomagnetic remanence characteristics of surface tills found in the Pakowki-Pinhorn area of southern Alberta; Geol. Surv. Can., Paper 77-1B, p. 271, 272, 1977.

Primaire in this work was the isochronic correlation of till sheets and meltwater forms with the glacial advances and retreats postulated for this section of the Great Plains region. A descriptive classification of the landforms which are present, was carried out through detailed geomorphological mapping. Glacial tills were differentiated using various techniques. Paleomagnetism and clay mineral properties of tills were found to be useful criteria for differentiation. The preglacial course of the Milk River and its tributaries was defined. Contemporary dryland processes such as piping, badland erosion and glacia formation were outlined.

354. BEATY, C.B., Univ. Lethbridge (Geography):  
The causes of glaciation without tears, 1976-77.

355. BIRD, J.B., McGill Univ. (Geography):  
Late Quaternary events and associated geomorphic processes along the Manitoba escarpment, 1975-78.

Sampling of soil horizons and alluvial sediments in fans at base of Riding Mountain has been completed and laboratory analyses are proceeding.

356. BIRD, J.B., ALGUS, M., McGill Univ. (Geography):  
Periglacial geomorphic processes in eastern Baffin Island, District of Franklin, 1976-80; M.Sc. thesis (Algus).

Initial field studies concentrated on coastal zone and determination of rate of cliff retreat, geomorphic processes operating on cliff face, beach and inshore waters, and role of snow in terrain evolution.

357. BROOKS, I.A., MCANDREWS, J.H., York Univ. (Geography), Royal Ontario Mus.:

Weathering zones and multiple glaciation, Newfoundland, 1976-80.

To establish criteria based on weathering, soils, limnologic, and palynologic phenomena for the delimitation and age determination of surfaces in Newfoundland that were glaciated at different times in the Quaternary. 1976 airphoto and field investigation enable three major weathering zones to be identified in three separate areas of west Newfoundland plateaus. Correlation between them awaits more research. Soils are being analyzed for evidence of age differences.

358. BRYAN, R.B., HODGES, W., SPORN, C., MORGAN, C., YAIR, A., Univ. Toronto (Scarborough College) — Geography):

Soil entrainment by sheetwash under intense rainfall and its contribution to the development of hillslopes, 1978-78; Ph.D. theses (Hodges, Sporn, Morgan).

#### See:

Considerations on soil erodibility indices and sheetwash; Catena, v. 3, p. 99-111, 1976.

Project covers several related areas: 1) critical threshold velocities for soil entrainment by sheetwash — two summers lab work at Uppsala — work will be completed this summer with new experimental flume at Scarborough; 2) relation of sediment concentration to hydrograph for sheetwash and rainsplash-laboratory project, now virtually complete; 3) relative importance of sheetwash, rainsplash and subsurface piping in development of badlands hillslope — field project in Alberta, one field season completed; 4) field observations of soil entrainment under intense rainfall — Ph.D. field project with simulated rainfall in S. Ontario, 2 summer seasons completed; 5) laboratory

- 5) laboratory examination of processes of surface crusting under intense rainfall – Ph.D. project just started; and 6) processes of entrainment under rainfall at Ada Bokes, Negev, Israel.
359. CHATWIN, S.C., RUTTER, N.W., Univ. Alberta (Geology):  
Terrain characterization – thermokarst peat lands, 1976-77; M.Sc. thesis (Chatwin).  
To characterize the surface topography and vegetation of a thermokarsted peat plateau – palsa complex, and hopefully relate the surface features and processes of permafrost aggradation and degradation to sub-surface ice conditions. An initial surface investigation of a representative 1/2 km<sup>2</sup> area, southwest of Fort Simpson, Northwest Territories, was completed, summer, 1976. A detailed topographic survey, at 1/2 m contour intervals, vegetation mapping delineation of active layer depths on a grid basis, and Hoffer probe coring of the frozen peat, was carried out in the field season. A drilling project is planned for April, 1977, to core the frozen peat and mineral soil at selected sites. A detailed resistivity survey to delineate permafrost depths is planned. Anticipated analysis for the frozen cores includes peat stratigraphy, ground ice classification and determination of ice amounts, thaw consolidation tests, and hydrochemical analysis of melted cores.
360. DAVIS, P.T., Univ. Colorado (INSTAAR):  
Holocene glacial, vegetational, and climatic history of southern Cumberland Peninsula, Baffin Island, District of Franklin, 1974-78.
- See:**  
Little ice age permanent snowcover in the eastern Canadian Arctic: Extent mapped from Landsat-1 satellite imagery; Geogr. Ann., v. 58A, p. 71-81, 1976.  
The large number of lake sediment cores and peat samples collected from the southern Cumberland Peninsula of Baffin Island during the summers 1975 and 1976 should provide a palynologic record spanning the last 5000 years. The materials collected will allow for comparisons not only between lacustrine sediments and peats but also for comparisons with modern pollen fallout analogues provided by moss polsters and tauber-like traps. The glacier moraine record now has been extended back to about 4500 years ago by lichenometric field techniques, and a suite of lake sediment cores down valley from a small cirque glacier should offer evidence for glacial meltwater runoff changes over possibly a larger time period. Finally, these two different records will be compared and attempt to determine the time lags involved in their individual responses to climatic change.
361. FRENCH, H.M., Univ. Ottawa (Geography):  
Quaternary and Recent deposits, Banks Island, Northwest Territories, 1972-80.
- See:**  
Pingo investigations, north-central Banks Island; Can. J. Earth Sci., v. 13, no. 17, p. 937-946, 1976.
362. FRENCH, H.M., Univ. Ottawa (Geography):  
Terrain sensitivity mapping, Banks and eastern Melville Islands, Northwest Territories, 1975-76.
363. FRENCH, H.M., Univ. Ottawa (Geography):  
Permafrost studies, Canadian Arctic Islands, 1976-80.
364. GANGLOFF, P.G., Univ. Montréal (Géographie):  
Paleogéographie de la région de Montréal entre 11 000 et 9000 B.P., 1975-78.
- Voir:**  
Indices possibles de pergélisols discoutenius; Buletyn Periglacyalng, p. 223-235, 1976.  
Préciser la paléogéographie (surtout les paléotempératures et l'existence d'un pergélisol) autour de la charnière Tordiglaciaire/Postglaciaire, dans la plaine de Montréal.
365. GANGLOFF, P.G., Univ. Montréal (Géographie):  
Géomorphologie de la côte ouest de la baie d'Ungava, Québec, 1975-78.  
Mise en place des formations glaciaire et littorales; évolution paléogéographique (deglaciation, mer d'Iberville relèvement isostatique) de la région. Changements paléoclimatiques eu rapport avec l'archéologie dorsetienne et thuléenne.
366. JOHNSON, P.G., Univ. Ottawa (Geography):  
A re-evaluation of the glacial history of parts of the St. Elias Mountains, southwestern Yukon, 1971-.  
Evidence from moraines in the Donjek Valley and from rock glaciers in Bighorn Creek, Grizzly Creek and the Duke Valley suggest that there are a number of problems with the current interpretations of glacial history.
367. JOHNSON, P.G., MAXWELL, M., Univ. Ottawa (Geography):  
Mechanics of "Rock Glacier" formation, 1973-79; M.A. thesis (Maxwell).
- See:**  
Mass movement landforms and processes, Grizzly Creek, Yukon Territory; Dep. Geog. Univ. Ottawa, Res. Note 10, p. 89-108, 1976.
368. JOHNSON, P.G., ROSS, A.B., Univ. Ottawa (Geography):  
The formation and degradation of ice cored moraines, 1972-77; M.A. thesis (Ross).
- See:**  
Grizzly Creek glacier ice cored moraine system; Dep. Geog. Univ. Ottawa, Res. Note 10, p. 59-74, 1976.
369. LEVINE, L.D., Royal Ontario Museum (West Asian Studies):  
Holocene alluvial chronology of northwest Iran, 1975-80.  
To establish a sequence of geomorphic events influenced by late Pleistocene and Holocene climatic and anthropogenic events to assist in environmental reconstruction of period of settled agriculture in Kermanshan area of central west Iran. Interpretation of cut-bank alluvial sections and piedmont fans and Bajadas is in progress, assisted by radiocarbon dating of freshwater molluscs.
370. LEWIS, C.P., Geol. Surv. Can.:  
Geomorphology of delta lakes, Mackenzie Delta, District of Mackenzie, 1968-.
371. LUCKMAN, B.H., KING, R.H., CAWKER, K., KEARNEY, M.J., BOWYER, A., HOLLAND, K., Univ. Western Ontario (Geography):  
Holocene environmental change in Jasper National Park, 1975-80; Ph.D. (Kearney), M.Sc. (Bowyer, Holland) theses.

See:

Lichenometric dating of recent moraines at Mount Edith Cavell, Alberta; *Can. J. Earth Sci.*, v. 14, 1977.

Rock glaciers in the southern part of Jasper National Park; *Proc. Can. Assoc. Geog.* Laval, p. 164-167, 1976.

Characteristics and genesis of some subalpine podzols (spodosols), Banff Nat. Park, Alberta; *Arctic and Alpine Res.*, v. 8, no. 1, p. 91-104, 1976.

Reconstruct environmental history during Holocene by examination of relict landforms (moraines, rock glaciers, protalus ramparts etc.), complex soil profile morphologies (paleosols, buried tephra etc.) and the pollen spectra within organic (peat) and inorganic deposits (lacustrine sedimentation etc.). Initial work on rock glaciers (Luckman and Crockett) setting up a lichen growth curve (Luckman, '77) and investigation of soils (King et al.) completed in adjacent areas. Main research areas are Sunwapta Pass, Maligne Valley and Mt. Edith Cavell - Tonquin area.

372. MATHEWS, W.H., RIGLIN, L., Univ. British Columbia (Geological Sciences):

Landslides associated with the 1946 Strait of Georgia earthquake, 1976-77.

373. ONGLEY, E.D., Queen's Univ. (Geography):  
Sediment and nutrient loadings to the Canadian Great Lakes, 1974-77.

See:

Sediment and nutrient yield from Great Lakes tributary drainage, Canada; *Geoscience Can.*, v. 3, p. 164-168, 1976.

Sediment yields and nutrients loadings from Canadian watersheds tributary to Lake Erie: an Overview; *Fisheries Res. Board Can.*, v. 33, p. 471-484, 1976.

Using available historical data, calculate loadings of nutrients, sediment and contaminants to the Canadian side of the Great Lakes. Part of the project involves evaluation of surveillance data (including sediment data). These loadings are being statistically related to nearshore quality attributes and to land use, geology and geomorphological attributes.

374. ONGLEY, E.D., Queen's Univ. (Geography):  
Use of continuous-flow centrifugation in suspended sediment sampling, 1975-.

The project is centred upon the role of suspended solids in the transfer of nutrients and contaminants in fluvial systems. Recognizing the problem of collecting sufficient sample for complete chemical,

physical and mineralogical analysis of suspended solids, continuous-flow centrifugation has been adapted for in-stream, at-stream-velocity sampling of suspended materials. Work to date has included laboratory calibration of two DeLaval MAB102-25 centrifuges under 'worst-possible conditions'. A portable field unit has been built which is self-contained with respect to submersible pumps, centrifuge, aqueous sample splitter etc.. Ongoing work includes the field study of two creeks in the Kingston, Ontario vicinity for the role of suspended solids in nutrient and contaminant transfer under a variety of discharge conditions.

375. PARENT, M., CLÉMENT, P., Univ. Sherbrooke (Géographie):

Geomorphologie Quaternaire de la région de Stoke-Watopeka, Québec, 1974-77.

376. ROBERTSON, R., KUPSCH, W.O., Univ. Saskatchewan (Geological Sciences):

Waterfalls and rapids of the Precambrian Shield in Saskatchewan, 1976-77; M.Sc. thesis (Robertson).

Air photo studies were conducted during the present year following fieldwork. The correlation between the occurrence of waterfalls and rapids and lithological or structural boundaries can be demonstrated in quantitative terms. Conflicting land uses, particularly between recreations use and use of falling water for the generating of hydro-electricity, can be resolved better if the origin and unique position of whitewater is understood.

377. ROGERSON, R.J., DAVIES, J.L., Macquarie Univ., New South Wales (Earth Sciences):

Geomorphology of the Porcupine Stand area, Labrador, Canada, 1974-78; Ph.D. thesis (Rogerson).

Geomorphology/terrain maps have been prepared for 4 areas using a modified version of the technique employed by St. Onge. Grain size analysis of glacial sediments has been interpreted using R-Mode and Q-mode factor analysis and principal components analysis of % weight per 5 phi interval. Delta/raised beach elements are differentiated. Surface texture of sediments is being examined under an SEM with a view to further environmental differentiation.

378. ST-ONGE, D.A., Univ. Ottawa (Géographie):  
Erosion control in the Swan Hills, Alberta, 1976-78.

Comprendre les modalités d'érosion liée au déboisement en vue de définir les types de controls possibles - compilation des données bibliographiques.

## GEOPHYSICS

### ELECTRICAL

379. DAVIS, J.L., *Geol. Surv. Can.*:  
In-situ meter for measuring relative permittivity of earth materials, 1975-.

380. DUCKWORTH, K., Univ. Calgary (Geology):  
The electrical properties of coal and associated sediments as they relate to the use of the induced polarization method of exploring for coal in Alberta, 1976-79.

Induced polarization methods have been used successfully in Alberta in the exploration of coal deposits. The project aims to identify the source

of the I.P. responses which appears to be the coal but may be associated sediments. Laboratory and field tests of the electrical properties of the relevant rock units will be undertaken using the complex resistivity technique. The project will also evaluate the ability of the I.P. technique to provide structural information in coal deposits.

381. EDWARDS, R.N., GARLAND, G.D., BAILEY, R.C., DUNCAN, P.M., Univ. Toronto (Physics):  
Controlled source electromagnetic sounding, 1975-78; Ph.D. thesis (Duncan).

- Using the controlled source electromagnetic deep sounding method previously reported by Edwards et al. (1976) which incorporates the use of a long, grounded wire driven by a pseudo-random binary signal and of cross-correlation signal processing, data consisting of records from 55 stations about Timmins, Ontario have been collected. The stations are roughly located along a north-east line centered at 48°31'N, 82°32'W and extending 50 km in either direction.
382. EDWARDS, R.N., GOMEZ-TREVINO, E., Univ. Toronto (Physics):  
Magnetometric resistivity (MMR) modelling of two dimensional structures with arbitrary cross-section, 1976-78; M.Sc. thesis (Gomez-Trevino).
- See:**  
A field test of the magnetometric resistivity (MMR) method; Geophysics, v. 41, p. 1170-1183, 1976.
- An inexpensive, rapid method has been developed for computing all three components of the magnetic field due to galvanic current flow from a point electrode in the vicinity of a conductive anomaly of infinite strike length and arbitrary cross-section. For any three-dimensional structure, the magnetic field may be written as a sum of surface integrals over boundaries defining changes in conductivity by a direct modification of the Biot-Savart law. The integrand of each surface integral includes the components of the electric field tangential to the boundary which may be evaluated on the boundary using a standard integral equation technique. In the 2D case, a reformulation of the theory, by taking a Fovies transform along strike, results in the reduction of the surface integrals to line integrals in wave numbers domain. We evaluate these integrals numerically for each of about 10 wavenumbers and obtain the magnetic fields in space domain through a concluding one dimensional numerical inverse Fovies transform.
383. EDWARDS, R.N., HWANG, A., URBANSKI, H., Univ. Toronto (Physics):  
The development of a multi-frequency pseudo-time domain ground electromagnetic system, 1976-78; M.Sc. thesis (Hwang).
- A horizontal loop transmitter is fed with a current modulated into pulses of randomly varying width. (Pseudo-random binary sequence). A receiving coil records the magnetic field changes at a distant site. The received signal is integrated and cross-correlated with the transmitted signal. The cross-correlogram is an impulse in lag domain in the absence of any secondary signal. The impulse is modified by the presence of a conductive earth. The modifications are interpretable in terms of IP and conductivity of geologic structures. The device has been built in the laboratory and model experimental data have been obtained. The expected bandwidth of the field apparatus is from 100Hz-10KHz.
384. EDWARDS, R.N., NABIGHIAN, M.N., LEE, H., Univ. Toronto (Physics):  
The theory of the magnetometric resistivity (MMR) method, 1976-77; M.Sc. thesis (Lee).
- The magnetic field due to galvanic current flow in the earth from a point electrode in the vicinity of the following conductive anomalies of simple geometry has been calculated analytically: the contact, the dipping contact, the thick outcropping vertical dike, the thin dike, the dipping thin dike, the hemispherical depression, the semi-cylindrical channel, the two and the three dimensional buried 'alpha' centres. The distortion of the magnetic field due to anisotropic conductivity has been calculated analytically.
385. ELLIOTT, H.M., ROY, K.K., Environment Canada (Water Res. Br.):  
Geophysical survey, Strait of Canso, 1974-78.
386. GENDZWILL, D.J., PANDIT, B., Univ. Saskatchewan (Geological Sciences):  
Electromagnetic sounding to determine roof thickness in a potash mine, 1967-.
- To develop an electromagnetic measurement system to measure thickness of rock salt formation above a potash mine; specifically, the height from the mine opening to the first thick shale unit above the mine. Continuous wave methods or radar reflection techniques may be applicable.
387. KATSUBE, T.J., Geol. Surv. Can.:  
Electrical rock properties, 1963-.
- See:**  
New requirements for electrical exploration methods and for laboratory R and D; Geol. Surv. Can., Paper 76-1B, p. 229-233, 1976.
- Electrical properties of permafrost samples; Geol. Surv. Can., Paper 76-1C, p. 83-90, 1976.
388. NADEAU, A.N., PAURIN, A.F., Québec Min. Richesses Naturelles:  
Levés électromagnétiques aériens dans le Nord-Ouest québécois, 1976-77.
389. ST-AMANT, M., PERRAULT, G., SOQUEM:  
Super P.P.: développement d'un récepteur de polarisation provoquée contrôlé par micro-ordinateur, 1974-77.
- Le récepteur mis au point a donné lieu à deux brevets (Canada:970-039 et U.S.A.:3984759) sa fabrication et sa mise en marché est assurée par Scintrex Ltd., Concord, Ontario. Essentiellement, le récepteur (désigné SWP-1 pour Soft Ware Programmable) permet des relevés de polarisation provoquée plus rapides et surtout plus précis.
390. SCOTT, W.J., Geol. Surv. Can.:  
Electrical mapping techniques, 1967-.
391. STRANGWAY, D.W., KRYZAN, A., REDMAN, J.D., Univ. Toronto (Geology-Physics):  
Crustal sounding by audiofrequency magnetotellurics, 1973-79; M.Sc. theses (Kryzan, Redman).
- Crustal sounding work was continued this year with two major new field studies. A regional study of the electrical structure in the Precambrian of the upper peninsula of Michigan was carried out. This study adds to our previous studies in Nevada, New Mexico and Wisconsin done as part of Project Seafarer for the U.S. Navy. We also completed a major survey in the Geotraverse area of northern Ontario paying special attention to differences between granites, gneisses and greenstone belts. In general, it can be said that the pattern of a highly resistive layer (up to 100 000 ohm-m or more) in the top few kilometers of the crust is typical of shield areas. Beneath this, the resistivity drops sharply, suggesting the presence of moisture in the middle crust. This work was presented at a crustal workshop held in Vail, Colorado. It appears that these low resistivities are correlated with low velocity and low Q portions of the crust.

392. STRANGWAY, D.W., NOWINA, S., WONG, J., ROSSITER, J., Univ. Toronto (Geology-Physics):  
Electrical properties of rocks – terrestrial and lunar, 1973-79; M.Sc. (Nowina), Ph.D. (Wong, Rossiter) theses.
- A continuing program of electrical property studies. We are continuing to examine the implication of the measured electrical properties of lunar samples on the nature of planetary sounding. This work is interpreting the radar returns from the planets and radio-frequency sounding results carried out on the moon. These results are explainable in terms of highly transparent materials which become highly scattering at high frequencies. Using the high vacuum system, Mr. Nowina has made measurements of the intrinsic dielectric anisotropy of a number of Precambrian samples from deformed regions of the shield. Using a simple model of series and parallel paths these properties can be quite readily described and clearly reflect the strain in the rocks. Analogous measurements of the magnetic susceptibility anisotropy give similar results. A new effort to study the electrical properties of interfaces has been initiated. This effort will concentrate on the interface between semi-conducting solids and between semiconductors and fluids.
393. STRANGWAY, D.W., REDMAN, J.D., WONG, J., ROSSITER, J., Univ. Toronto (Geology-Physics):  
Electrical sounding in permafrost and glaciers, 1977-80; Ph.D. thesis (Rossiter).
- Work on permafrost sounding was extended this year to include measurements by audiofrequency magnetotellurics (AMT), radio frequency interferometry and in situ probes to study the electrical structure in winter time. Previous work using AMT in the summer time suggested that the active layer was transparent. The winter time results were essentially unchanged and confirm that AMT sounding is an excellent method for determining permafrost thickness even in the presence of the active layer. The radio frequency sounding data showed also that the active layer had little influence on the results but that attenuation due to the properties of the permafrost itself, reduced the interference to very low values. This means that this method can only be used in high resistivity permafrost ( $10^4$  ohm-m or more). At the same time, the measurement of the dielectric properties in the top meter of the soil showed marked changes between summer and winter due to the presence of moisture and clays. These data could be explained from the previously studied properties of permafrost as a function of temperature.
- EXPLORATION**
394. ANNAN, A.P., Geol. Surv. Can.:  
Radar sounding for geological mapping, 1975-.
- See:**  
Density of ice samples from "involved hills" test site, District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 91-95, 1976.  
Impulse radar experiments on permafrost near Tuktoyaktuk, Northwest Territories; Can. J. Earth Sci., v. 13, no. 11, p. 1584-1590, 1976.
395. BOYLE, R.W., Geol. Surv. Can.:  
Primary halos and metallogenic distribution of the elements, 1973-.
396. BURKE, K.B.S., Univ. New Brunswick (Geology):  
Development of seismic reflection techniques for shallow investigations, 1974-79.
397. BURKE, K.B.S., GUPTA, V.K., NAING, W., Univ. New Brunswick (Geology):  
An integrated interpretation of geophysical data in the Caledonia Highlands area of southeast New Brunswick, 1972-78.
- See:**  
Density and magnetic susceptibility measurements in southeastern New Brunswick; Can. J. Earth Sci., v. 14, no. 1, p. 128-131, 1977.
398. FOLINSBEE, R.A., Geol. Surv. Can.:  
East coast offshore surveys, 1973-.
- See:**  
Geology of the continental shelf off southeastern Labrador; Geol. Surv. Can., Paper 76-1C, p. 61-70, 1976.
399. GRASTY, R.L., Geol. Surv. Can.:  
Gamma ray spectrometry, 1972-.
- See:**  
The circle of investigation of airborne gamma-ray spectrometers; Geol. Surv. Can., Paper 76-1B, p. 77-79, 1976.  
The "field of view" of gamma-ray detectors, a discussion; *ibid.*, p. 81-82, 1976.  
The reduction of statistical noise in airborne radiometric data; Can. J. Earth Sci., v. 13, no. 10, p. 1351-1357, 1976.
400. GREENHOUSE, J.P., Univ. Waterloo (Earth Sciences):  
VLF and inductive resistivity methods in hydrogeology, 1975-77.
- Field work continues in the comparison of galvanic and inductive (VLF, Loop-Loop) resistivity profiling methods for shallow subsurface exploration in southwest Ontario.
401. GREENHOUSE, J.P., ATOBRAH, K., Univ. Waterloo (Earth Sciences):  
Digital well logs in unconsolidated sediments, 1976-77.
- Digitally recorded electric, neutron, gamma and caliper logs have been obtained from several holes in Kitchener's greenbrook well field. The logs are being interpreted in terms of the hydrological parameters of the aquifers; in addition, we are studying the statistical variability of logs run in the same hole at different times, and of logs in holes spaced by one to two metres.
402. PARSLOW, G.R., STOLTZ, H., DWAIRI, A., BULMAN, R., Sask. Geol. Surv., Univ. Regina and Saskatchewan:  
Underwater uranium exploration, 1975-78; M.Sc. thesis (Dwairi, Bulman).
- See:**  
Precision and accuracy of the fluorometric determination of uranium in lake sediment; Sask. Geol. Soc., Sp. Publ. 3, 1977.  
Evaluation of techniques for assessing the uranium potential of lake-covered areas; Sask. Geol. Surv., Summ. Investig. 1976, p. 128-141.  
In 1976 geochemical results were correlated with data obtained using an underwater scintillometer. An improved technique for collecting radon samples in water was developed. Although samples from the Key Lake uranium deposit area did not



yield significant anomalies of radon or uranium, the lake sediments have high uranium values in places, as well as anomalous nickel. The methods will be tried out in other areas of Saskatchewan in 1977.

403. RUSSELL, R.D., MITCHELL, G.J., KUNG, A., Univ. British Columbia (Geophysics and Astronomy): Linearity of induced polarization signals, 1975-78; M.Sc. theses (Mitchell, Kung).

Field and laboratory experiments are looking for non-linearities of IP response. The basic technique is the observation of intermodulation distortion in the output signals. Digital data analysis is now being used. Plans for the application of adaptive filters exist and will be tested 1977-78. If measurable, non-linearities are expected to provide a useful prospecting indicator, and may be useable to distinguish certain rock types.

404. SINHA, A.K., Geol. Surv. Can.: Applied EM problems, 1973-.

**See:**

A technique for obtaining correct ground resistivity from airborne wave tilt measuring systems; Geol. Surv. Can., Paper 76-1B, p. 281-283, 1976.

An interactive graphic system for interpretation of dipole EM sounding data; Geol. Surv. Can., Paper 76-1C, p. 51-53, 1976.

Interpretation of tridem airborne EM data; *ibid.*, p. 221-224.

A field study for sea-ice thickness determination by electromagnetic means; *ibid.*, p. 225-228, 1976.

**GEOMAGNETISM-PALEOMAGNETISM**

405. DEUTSCH, E.R., Memorial Univ. (Physics): Rock magnetism and geological structure in the Newfoundland region, 1965-.

**See:**

Magnetism of basalt cores from the Nazca plate and implications for magnetic anomaly interpretation; J. Geophys. Res., v. 81, p. 4188-4198, 1976.

Inferences on the magnetic domain state of Leg 37 basalts; J. Geophys. Res., v. 81, p. 4199-4206, 1976.

(1) Two studies of material from the Deep Sea Drilling Project were completed: (i) Basalt cores from Leg 34 (Nazca Plate) showed predominant "soft" magnetizations attributed to very fine magnetic grains exhibiting superparamagnetism. (ii) Basalt cores from Leg 37 (near Azores) showed generally stable remanence over a thick section of the deep hole 332B, but directions fluctuated between +ve and -ve shallow inclinations, indicating that the observed surface anomalies required a more deepseated magnetic contribution than is proposed in 'thin-layer' models. (2) Various paleomagnetic studies on Lower Paleozoic rocks in Newfoundland were completed. The results on the St. George's (Lower Ordovician) limestones, the Bradore (Lower Cambrian) sandstones, and the Cloud Mountain (latest Precambrian) basalts, when compared with data from rocks of similar age in interior North America, fail to lend support to Wegener's proposed 30° anticlockwise rotation of Newfoundland. (3) A study of lamprophyre dikes in Central Newfoundland gave a reliable pole position consistent with Jurassic poles reported from other parts of the Appalachians. (4) Late Precambrian diabase dikes from the Long Range Mountains of Western Newfoundland were sampled in detail and paleomagnetic studies are in progress. Work is

continuing on the Swift Current granite pluton (510 m.y.) from the Avalon zone in eastern Newfoundland. (5) Andesites and volcanic tuff beds of presumed early Caradocian age from Waterford County, Eire, were collected; it is hoped that the results will provide evidence regarding a proposed proto-Atlantic Ocean between western and eastern Ireland. (6) In a joint study with the Tata Institute of Fundamental Research, Bombay, it was found that hysteresis properties may be used to distinguish magnetite grain-size effects from a "true" solid solution state in titanomagnetite and that the existence of the latter may be less common in basalts than is generally believed. (7) A previously completed gravity survey of western Notre Dame Bay was interpreted, indicating that much denser than normal crust underlies the whole Notre Dame Bay coastal strip down to 10 km or less. Rezonation of tectono-stratigraphic zones in one area is proposed.

406. FAHRIG, W.F., Geol. Surv. Can.: Paleomagnetism of the dykes of west Greenland, 1972-.

407. FAHRIG, W.F., Geol. Surv. Can.: Paleomagnetism of Proterozoic to Devonian strata across Boothia Arch, 1974-.

**See:**

Paleomagnetism and age of the Schefferville diabase dykes; Geol. Surv. Can., Paper 76-1B, p. 153-155, 1976.

408. FAVINI, G., Univ. Laval: Patrons aéromagnétiques et gravimétriques des dépôts et occurrences de sulfures massifs en Abitibi.

Dans une première phase on a compilé les données géophysiques de 130 occurrences et dépôts cuprifères. Dans la deuxième phase on compte faire une analyse statistique de ces données.

409. FOSTER, J.H., Geol. Surv. Can.: Paleomagnetic reversals in the Paleozoic of the St. Lawrence Platform, 1972-.

410. FOSTER, J.H., Geol. Surv. Can.: Paleomagnetic stratigraphy within the Abitibi Belt, Ontario and Quebec, 1975-.

411. FOSTER, J.H., Geol. Surv. Can.: Paleomagnetism of the Natkusiak volcanics, Victoria Island, District of Franklin, 1975-.

412. GRAVENOR, C.P., STUPAVSKY, M., SYMONS, D.T.A., Univ. Windsor (Geology): Paleomagnetism of the Catfish Creek, Seminary and Meadow Cliff Tills of Southern Ontario, 1973-78.

**See:**

Magnetic, physical and lithologic properties and age of till exposed along the east coast of Lake Huron, Ontario; Can. J. Earth Sci., v. 13, p. 1655-1666, 1976.

For the past five years studies have been made on the paleomagnetic properties of glacial sediments of Wisconsin age in southern Ontario. The current study on the Catfish Creek, Meadow Cliff and Seminary Tills will provide a reasonably complete picture of the shifts of the virtual geomagnetic pole positions during the Wisconsin in Ontario.

413. GUPTA, V.K., WALLACE, H., RAMANI, N., Ontario Division Mines:

Aeromagnetic interpretation of Bamaji-Fry Lakes area and its correlation to the geology, 1977-79.



Various statistical techniques will be applied to the aeromagnetic data obtained from a high resolution survey, flown in 1975, over Bamaji-Fry Lakes area. The magnetic field will be resolved in terms of shallow and deep seated components. This data will be compared with the results of a detailed geologic mapping program (1:15 840) to be completed by 1979. The advantages of having this type of statistically treated aeromagnetic data prior to detailed geological mapping will be evaluated.

414. HALL, D.H., Univ. Manitoba (Earth Sciences):  
Deep crustal magnetization beneath the English River gneiss belt, Ontario, 1976-78.
415. HALL, J.M., CLARK, M.J., PEIRCE, J.W., Dalhousie Univ. (Geology):  
Magnetic studies of basaltic rocks from the Cayman Trough, 1976-77.

The Cayman Trough study will provide information of the history of the area and answers for the following questions: What is the intensity of magnetization of median valley's basalts? Do basalts of reverse magnetic polarity occur in crust beneath anomaly No.1 (some reversed basalts occurred in two areas of the median valley of the MAR (Johnson and Atwater, Bulletin GSA, in press and Ade-Hall et al., 1973, CJES)? Work by the Deep Sea Drilling Project (legs 34 and 37 as well as some other legs) indicates that many magnetic inclinations for basalts are far from dipole values — this leads to the question of how well do the young basalts of the Cayman Trough record the present dipole field inclination. The study of opaque mineralogy and magnetic properties of MAR basalts from the FAMOUS area and elsewhere (Abdel-Aal and Johnson, in preparation and Hall and Fischer, in press) indicates that low temperature oxidation of the magnetic minerals as well as the crystallization state plays an important role in determining the magnetic properties of rocks. The pattern of basalt alteration in the Cayman Trough spreading center will help to show how general this type of alteration is in layer 2 basalts. The variations of oxidation type with the age of the rocks and its effect on the intensity of magnetization, Curie temperature, weak field susceptibility and the stability of the remanence are questions which we would like to look into further using Cayman Trough materials.

416. HALLS, H.C., Univ. Toronto (Geology):  
The paleomagnetic signature of a complex meteorite impact structure, Slate Islands, Lake Superior, 1974-78.

Widespread intrusive breccias, shatter cones, microscopic deformation lamellae in quartz and local lake bathymetry suggest that the Slate Islands form the central uplift of an eroded complex meteorite impact crater. Archean rocks form most of the islands, except in the SW where they are overlain unconformably by Animikie argillite/iron formation (2.0 by old) and Keweenaw mafic volcanics (1.1 by old). Keweenaw diabase feeder dikes are ubiquitous throughout the islands. The shock metamorphic features are found in all rocks, including those of Keweenaw age so that the impact event is younger than 1.1 by. A partial remagnetization is also found in these rocks and is revealed by af cleaning to 1000 oe. The direction of this component could not be obtained by conventional paleomagnetic methods and instead a technique, based on converging circles of remagnetization was used (Halls, 1976). The direction

thus obtained was found to be  $D=81^\circ$ ,  $I=48^\circ$ ,  $k=84$ ,  $\alpha_{95}=8.4^\circ$  and  $N=5$  where  $N$  is the number of rock units from which independent families of converging remagnetization circles were obtained. This direction is virtually identical to that measured from the shock breccias through use of stable end-points ( $D=81.5^\circ$ ,  $I=49^\circ$ ,  $k=191$ ,  $\alpha_{95}=5.6$ ,  $n=5$ ) where  $n$  is the number of sites. Neither shatter cones nor a conspicuous secondary magnetization component have been observed before in Keweenaw igneous rocks around Lake Superior, despite their intensive investigation. This observation, plus the occurrence of the component in isolation within the breccias, suggests that the magnetic overprinting is genetically related to the shock event. These results therefore demonstrate that a paleomagnetic halo may surround other impact sites and may ultimately provide additional evidence on the age and mechanics of crater formation.

417. HALLS, H.C., PALMER, H.C., PESONEN, L.J., Univ. Toronto (Geology):  
Paleomagnetic investigations on Keweenaw conglomerate pebbles, 1975-78.

Detailed af cleaning has been carried out on 160 field-drilled cores taken from mafic volcanic pebbles, at 3 sites along strike within the Keweenaw (1.1 by) Copper Harbor conglomerate, northern Michigan. NRM directions have a marked W bias (which increases on cleaning) indicating the presence of a secondary component with westerly declination. About 50% of the pebbles at each site show clear convergence of their remagnetization circles, while the remainder yield stable directions with random distribution. The local site direction of the secondary component is estimated from the least-squares convergence point of the remagnetization circles (Halls, 1976). After referencing to the paleohorizontal the site secondary directions become virtually coincident ( $N=3$ ,  $D=281^\circ$ ,  $I=17^\circ$ ,  $k=1068$ ,  $\alpha_{95}=3.8^\circ$ ; paleopole 14N, 179E), indicating that the overprinting episode predates tilting but is significantly younger than the time of extrusion of the immediately underlying Portage Lake lavas which yield a paleopole at 27.5N, 178W (Books, 1972). Swinging/stable samples have  $J_0$  values less/greater than  $1 \times 10^{-4}$  emu/cc; since directions of stable samples are random while those for swinging ones have a marked W bias, the secondary component is thought to be a CRM. A similar study on 70 mafic lava pebbles from a Keweenaw conglomerate site at Mamainse Point, Ontario yields comparable results. A major difference is that the secondary component lies, after structural correction, within  $10^\circ$  of that found by Palmer (1970) and Robertson (1973) for the overlying mafic volcanics (mean paleopole 33N, 178W). The combined conglomerate data thus suggest the two remagnetization episodes occurred at different times. The significance of the data in terms of Palmer's (1970) remagnetization hypothesis to explain Keweenaw asymmetric reversals will be discussed.

418. HOOD, P.J., Geol. Surv. Can.:  
Ocean aeromagnetism, 1965-.

See:

VLF navigation in the North Star aircraft of the National Aeronautical Establishment; Geol. Surv. Can., Paper 76-1C, p. 79-82, 1976.

419. HOOD, P.J., Geol. Surv. Can.:  
Queenair high resolution aeromagnetism, 1968-.

See:

The Geological Survey of Canada aeromagnetic gradiometer system: a progress report; Geol. Surv. Can., Paper 76-1B, p. 303-305, 1976.

420. LATHAM, A.G., SCHWARCZ, H.P., FORD, D.C., McMaster Univ. (Geology):  
Paleomagnetic studies of speleothem, 1976-79; Ph.D. thesis (Latham).

Measurement of paleomagnetic record in sequential samples of speleothem which have been dated by U/Th methods. Correlation will be made between coeval samples and with records from other sources. May permit establishing a time record for old speleothem through detection of reversals. May help to refine magnetic record.

421. LERBEKMO, J.F., Univ. Alberta (Geology):  
Magnetostratigraphy of the Late Cretaceous and Cretaceous-Tertiary boundary in Alberta, 1973-78.

Approximately two hundred specimens of latest Cretaceous mudstones from the Red Deer Valley of Alberta have been magnetically analyzed for geomagnetic polarity reversals. Most of the samples come from the uppermost one hundred meters of Cretaceous section from the Ardley (No. 14) coal seam down to slightly below the Carbon (No. 11) seam, and represent essentially the last three million years of the Cretaceous Period, from 67 to 64 m.y. B.P.. The Cretaceous-Tertiary boundary may be approximated by either the Ardley Seam, on the basis of highest occurrence of dinosaur remains, or by the Nevis (No. 13) seam, fifteen meters below, on palynological grounds. This three million year interval was a period of dominantly normal polarity, but was interrupted by at least three shorter intervals of reversed polarity, ranging from about 100 000 years to 300 000 years in duration based upon average rate of sedimentation. In addition, at least two and probably three or more reversed intervals have been found lower in the section down to the No. 9 coal, but have not yet been accurately delimited. Mineral separates from several bentonites in the section are awaiting more accurate K/Ar radiometric age determinations. The dominance of normal polarity in the latest Cretaceous of the Red Deer Valley section appears to favor the geomagnetic reversal time scale for late Cretaceous sea floor magnetic anomalies proposed by Sclater et al. (1974) and adopted by van Hinte (1976) rather than earlier versions by other authors.

422. MCGRATH, P.H., Geol. Surv. Can.:  
Aeromagnetic interpretation - Appalachia, 1968-.

See:

A method for the compilation of high quality calculated first vertical derivative aeromagnetic maps; Geol. Surv. Can., Paper 76-1C, p. 9-17, 1976.

423. NADEAU, A.N., DOMPIERRE, F., LAURIN, A.F., Québec Min. Richesses Naturelles:  
Levés magnetiques aériens au Nouveau Québec, 1972-79.
424. NADEAU, A.N., DOMPIERRE, F., LAURIN, A.F., Québec Min. Richesses Naturelles:  
Levés géophysiques au sol dans la région de Normétal, 1977.

Mieux de finir une zone géologique jugée favorable à la découverte de gisements de sulfures de cuivre-zinc.

425. PEARCE, G.W., POPLAWSKI, S., Univ. Toronto (Geology):

Paleomagnetism of Paleozoic sedimentary cores, 1976-.

This study is just beginning with measurements in progress of pieces of a core drilled into Ordovician sedimentary rock underlying Lake Erie.

426. PEIRCE, J.W., HALL, J.M., CLARKE, M.J., Dalhousie Univ. (Geology):

Do lavas of reversed polarity occur within the central anomaly of the Reykjanes Ridge?, 1977-78.

As our knowledge of plate kinematics increases, it is becoming clear that our concepts of ocean crust formation are grossly oversimplified. One very puzzling result is the frequent occurrence of reversely magnetized lavas within the zone of active spreading (7 of 30 partially oriented samples). According to the Vine-Matthews hypothesis, the youngest reversely magnetized rocks should lie about 15 km away from the present spreading center. How can reversely magnetized material still be within the zone of active spreading? Young reversals are possible, but unlikely in view of the rare evidence for their occurrence on land. The frequent occurrence of these reversed samples in partially oriented dredge samples is telling us that something is lacking in our understanding of sea floor spreading on a fine scale or else there is something fundamentally wrong with our concept of how submarine lavas acquire remanent magnetism. In order to gain insight into this problem and to provide a wider statistical sample base, we are planning a cruise aboard the CSS Hudson in the summer of 1977 to sample the active spreading region of the Reykjanes Ridge using the novel technique of sampling exposed lava with a submarine electric drill developed at the Bedford Institute of Oceanography. In addition, field work is planned on the Reykjanes peninsula on exposed sections of subaqueous basalts to provide a point of comparison for the submarine work.

427. PESONEN, L.J., HALLS, H.C., PEARCE, G.W., Univ. Toronto (Geology):

Keweenawan asymmetric reversal - secondary component or polar wandering?, 1974-77; Ph.D. thesis (Pesonen).

Paleomagnetic studies of Late Precambrian Keweenawan rocks (1200-1000 my) from the Lake Superior region have revealed a well-defined magnetic stratigraphy composed of units with both normal and reversed polarity. A characteristic feature of this reversal is its asymmetry: the reversed magnetization always has a steeper (upward) inclination than the normal (downward) one. Of particular concern in the interpretation of Keweenawan paleomagnetism is whether this asymmetry is caused by a secondary magnetization component or by apparent polar wander. Detailed thermal and a.f. demagnetization studies on both igneous and baked rocks do not reveal any systematic secondary component but rather the difference in inclination between normal and reversed rocks remains throughout the full range of blocking temperatures and coercivities. Moreover, there is an excellent agreement in paleomagnetic and paleointensity data between the igneous and baked contact rocks. A possibility still exists that a 'non-removable' secondary component is present in all Keweenawan rocks. We have performed various rockmagnetic experiments in an order to search for this secondary component. These investigations

suggest that (i) the reversed units exhibit a higher Thellier paleointensity than the normal ones, (ii) the reversed units also have a higher 'relative paleointensity' (NRM/ARM) than the normal ones and (iii) this difference in paleointensity disappears when the data are reduced to the paleoequator. These results are consistent with apparent polar wander and cast doubt on the existence of a widespread regional secondary overprint in Keweenawan igneous rocks.

428. SCHWARZ, E.J., Geol. Surv. Can.:  
Paleomagnetism of the Circum-Ungava Belt, 1973-.

**See:**

Paleomagnetism of the Circum-Ungava Belt: east coast of Hudson Bay; Geol. Surv. Can., Paper 76-1B, p. 37-38, 1976.

Depth of burial from remanent magnetization: the Sudbury irruptive at the time of diabase intrusion (1250 Ma); Can. J. Earth Sci., v. 14, no. 1, p. 82-88, 1977.

429. SEGUIN, M.R., LAURENT, R., LAMBERT, G., LAFOND, D., BEAUDIN, J., Univ. Laval:  
Paléomagnétisme des ophiolites des Cantons de l'Est, Province de Québec, 1974-79.

**See:**

Reconnaissance paleomagnetic investigation of the ophiolitic complex, Thetford Mines, Québec; Tectonophysics, v. 34, p. 231-243, 1976.

Les prochaines études paléomagnétiques de cette région vont être centrées sur les intrusions granitiques dévoniennes et les cornéennes environnantes ainsi que les volcaniques siluriennes plus au Sud de cette région, i.e. près de la frontière américaine.

430. SRIVASTAVA, S., Geol. Surv. Can.:  
Sea floor spreading history of the Labrador Sea, 1974-.

431. STRANGWAY, D.W., GUBINS, A., BAMBRICK, J., Univ. Toronto (Geology):  
Magnetic mapping, 1975-79; M.Sc. (Gubins), Ph.D. (Bambrick) theses.

Two projects are now under way. The first is a study by Mr. Gubins on magnetic gradiometry. He is developing interpretive techniques and has applied these to a number of examples. He takes delivery of a prototype gradiometer in January, 1977, which will be used for a number of studies including mapping of ancient meteorite crater features. The second project is just getting started and involves an attempt to study the magnetic signatures found within a greenstone belt. These signatures will be correlated with a number of geological and geochemical parameters.

432. STRANGWAY, D.W., LANOIX, M., WU, Y.M., SUGIURA, N., Univ. Toronto (Geology):  
Magnetic paleointensities determined from lunar and meteorite samples, M.Sc.-Ph.D. theses (Lanoix).

The focus of this study is to use lunar samples and meteorites to determine the strength of the magnetic field present during the early history of the solar system. We are using the classic Thellier technique for this study but have found it difficult to heat samples to 780°C, the Curie point of iron, without altering the nature of the iron carrying the magnetization. Studies to control these changes using known oxygen fugacities are under way. At the same time, we have discovered that, where there are intergrowths of two magnetic phases,

strong interactions and partial self-reversals take place making it difficult to apply the Thellier method. These interactions occur for example in intergrowths of iron and troilite in lunar samples. At the same time a similar interaction has been found in meteorites. The question of how lunar samples became magnetized is also being examined by a study of micromagnetics. In this study a breccia is being taken apart grain by grain to see if the sample is homogeneously magnetized. The degree of thermal overprinting will then be established in cooperation with Ar<sup>39</sup> isotopic studies. These results were presented at the 7th Lunar Science Conference and at the Western AGU meeting.

433. SYMONS, D.T.A., Univ. Windsor (Geology):  
Paleomagnetism and boundary geotectonics of the Superior Geologic Province, 1975-78.

Studies on several rock units of ≈2.4 b.y. age are in progress.

434. WATANABE, T., RUSSELL, R.D., HORITA, R.E., OGUTI, T., TSURUDA, K., HAYASHI, K., ZAMBRESKY, L.F., Univ. British Columbia (Geophysics and Astronomy), Univ. Victoria, Univ. Tokyo:

Design and calibration of induction magnetometers and observation of magnetic pulsation in central Canada, 1975-81; M.Sc. thesis (Zambresky).

**See:**

Quasi-periodic poleward propagation of on-off switching aurora and associated geomagnetic pulsation in the dawn; J. Atmos. Terr. Phys., v. 38, p. 543-551, 1976.

An induction magnetometer of a high sensitivity and stability has been successfully designed by the UBC research team. It can detect magnetic field changes as small as 30 mV/sec approximately. Frequency response is flat up to about 2 Hz, covering almost the entire frequency range of magnetic pulsations. Concerning the stability, d.c. offset is not more than ±0.1 volt with the highest amplifier gain which is about 200 000. The magnetometer employs a high μ metal core, 50 000 turns of AWG No. 28 copper wire as a head sensor. For calibration of the magnetometer, a bridge method which has been applied to seismometer calibration by R.D. Russell et al., is being investigated. Six 3 component induction magnetometer systems have been built at the UBC Geophysics/Astronomy Dept. These systems were used last summer for observation of magnetic pulsations at five stations in Manitoba; Winnipeg, Island Lake, Thompson, Gillam and Churchill. At Thompson and Churchill, a research team from the Univ. of Tokyo carried out observation of aurorae and natural VLF radio emissions. All these observations were done as part of the programme for the International Magnetospheric Study. The magnetic pulsation data obtained are useful not only for magnetospheric studies but also for investigation of electric conductivities of the subsurface regions of the Earth.

435. WESTGATE, J.A., PEARCE, G.W., ROBERTSON, K., Univ. Toronto (Geology):  
Paleomagnetic characteristics of the Scarborough Formation in the Toronto region, 1976-.

The exact age of the Scarborough Formation is unknown. This formation is older than 40 k.y. — the limit of the C-14 method — but is generally believed to be younger than the last (Sangamon)

interglacial. Paleomagnetic characteristics (secular variation and polarity excursions) are being documented in the hope that they will enable a more precise age estimate to be eventually made.

#### GEOTHERMAL

436. CHURCH, B.N., British Columbia Dep. Mines Pet. Res. (Geological):

An inventory of geothermal resources in British Columbia, 1977-.

Compilation of data: geography and geology of thermal sites; inventory of drill holes in and near thermal areas; heat flow potential; magnetic studies in thermal areas; chemistry of thermal waters; and infra-red photography. Technology research: heat exchange systems; and thermodynamics of aqueous systems.

437. LAMBERT, R.St.J., JONES, F.W., SYDORA, L., Univ. Alberta (Geology):

Thermal studies of the upper mantle, 1975-80.

#### See:

Archean thermal regimes, crustal and upper mantle temperatures and geotectonics; *The Early History of the Earth*, ed. B.F. Windley, p. 363-373, 1976.

#### GRAVITY

438. GUPTA, V.K., Ontario Division Mines:

Gravitational field and its structural implications in the Red Lake and Uchi Subprovinces, Ontario, 1976-78.

During the summers of 1975 and 1976 over 5200 gravity stations were established, covering an area of approximately 21 000 km<sup>2</sup>, in the Red Lake and Uchi belts. The interpretation of the data is now underway. Various statistical techniques will be applied to separate the effects of the shallow and deep gravity features for the purpose of geological interpretation. Three dimensional gravity modelling will also be attempted.

439. GUPTA, V.K., WADGE, D.R., Ontario Division Mines: Gravity and susceptibility survey in Temagami-Marten River area, Ontario, 1977-79.

A gravity-susceptibility survey in the Temagami-Marten River area will be conducted during the summer of 1977. The area includes the Temagami metavolcanic belt and a part of the Grenville Front. The gravity survey will be of use in synthesizing and interpreting the regional geology of this area. An attempt will also be made to determine from the gravity data, the thickness and shape of the metavolcanics and the nature of the Grenville Front.

440. RAMANI, N., GUPTA, V.K., Ontario Division Mines: Statistical analysis of gravity and magnetic data, 1976-77.

To investigate one possibility of the use of two dimensional recursive filters for the interpretation of gravity and magnetic data. Filters will be designed for various interpretation techniques such as continuation methods, use of low pass and high pass filters etc. The new filters will be compared with conventional filters regarding their effectiveness and computation time.

441. SPENCE, G.D., CLOWES, R.M., ELLIS, R.M., Univ. British Columbia (Geophysics and Astronomy):

Gravity and seismic studies in the southern Rocky Mountain Trench, 1974-76.

#### See:

Gravity evidence against a high-angle fault crossing the Rocky Mountain Trench near Radium, British Columbia; *Can. J. Earth Sci.*, v. 14, p. 25-31, 1977.

As one explanation of a 1.7 sec time delay in the 6.5 km/s branch of their seismic refraction survey in the Rocky Mountain Trench, Bennett et al. (1975) suggested a high-angle crustal fault crossing the trench near Radium. This suggests a gravity anomaly of about 18 mgal should be observed. To test this hypothesis, a gravity survey was carried out in the Radium area. The resultant data are not consistent with the proposed fault model. The principal feature of the data is a pronounced low which coincides with the trench throughout the survey area due to Cenozoic fill of thickness about 550 m to the north and 420 m to the south of Radium. To determine maximum and minimum depth limits to the Moho allowed by the seismic data, an extremal analysis was performed on both the P and S wave record sections. From the P wave data, the limits on crustal thickness beneath the Rocky Mountain Trench are 52 km and 60 km; from the S wave data, the limits are 47 km and 59 km. As a result of these studies, the alternative hypotheses of Bennett et al. (1975) to explain the seismic data must be reconsidered. These are: (1) the existence of a crustal low velocity zone, and (2) a major deformation of the basement and overlying rocks due to the trench being an ancient zone of weakness which coincides with the western limit of the continental Precambrian craton. As reflections from the top of the low velocity zone are not observed by Bennett et al. (1975), the second alternative is preferred.

#### SEISMOLOGY AND PHYSICS OF INTERIOR

442. CHAPMAN, C.H., Univ. Toronto (Physics): Seismic body wave theory.

#### See:

Exact and approximate generalized ray theory in vertically inhomogeneous media; *Geophys. J. Roy. Astr. Soc.*, v. 46, p. 201-233, 1976.

A first-motion alternative to geometrical ray theory; *Geophys. Res. Lett.*, v. 3, p. 153-156, 1976.

Several methods for the computation of theoretical seismograms in vertically inhomogeneous media exist: generalized ray theory, quantized ray theory, asymptotic ray theory, reflectivity method, spectral method, equal-phase method, etc. Each technique has its own advantages and disadvantages depending on the approximations and computational efficiency, and all suffer since their use in interpretation is by trial-and-error. The approximations used in the various methods have been studied. A new method of evaluating the frequency-wave number integrals has been developed. It is efficient and easy to evaluate. Currently, the inverse problem is being investigated.

443. CLOWES, R.M., CUMMING, W.B., ELLIS, R.M., Univ. British Columbia (Geophysics and Astronomy): Southern trans-British Columbia seismic profile, 1973-77, M.Sc. thesis (Cumming).

A partially reversed seismic refraction profile, utilizing mine blasts as sources, was recorded across southern British Columbia from Sparwood to the Highland Valley. Amplitude-corrected vertical component record sections were compiled from the data. As well as geometrical techniques, least

squares delay-time methods and disc ray theory synthetic seismograms are used to interpret the data. Where the profile crosses the Rocky Mountain Trench and the Okanagan Valley, the seismic data show arrival time and amplitude anomalies in the 6.0 km/s upper crustal refraction arrivals. An intermediate crustal layer with a velocity of 7.3 km/s is at a depth of about 23 km and has a thickness of 12 km in the west, near Okanagan Lake. To the east, this layer becomes deeper and thinner, probably discontinuously, with a depth of 33 km and a 4 km extent near Kootenay Lake. The  $P_n$  arrival has a velocity of 7.8 km/s based on partially reversed data. The M-discontinuity across the southern sections of the Omineca Crystalline Belt and the Interior Plateau appears to dip gently to the east with an average depth of 37 km.

444. DUBERGER, R., Univ. du Québec à Chicoutimi: Etudes séismiques dans le Haut-Saguenay, Québec, 1971-78.

445. ELLIS, R.M., DRAGERT, H., Univ. British Columbia (Geophysics and Astronomy): Seismic monitoring during loading of Mica Reservoir, 1972-78.

Seismic activity associated with the filling of McNaughton Lake (Mica) has been continued using a telemetered seismic array. Loading was initiated in March, 1973 with full load of  $25 \times 10^9 \text{ m}^3$  and maximum depth 191 m reached for the first time in July 1976. An earthquake swarm of 747 events ( $M_L > 0$ ) with largest event  $M_L = 4.7$  occurred within 17 km of the reservoir just prior to loading. Subsequent to this, three swarms of 194, 292 and 22 events with maximum  $M_L = 4.1$  occurred in the same region; however, no earthquakes have occurred between the reservoir and the swarm area. The level of regional seismic activity is similar to that observed prior to loading. The distribution of this activity, excluding swarm events, exhibits a spatial pattern similar to that recorded earlier by regional seismic stations, except that several events appear to be associated with the fault underlying the Rocky Mountain Trench in which the lake is formed. During a loading-unloading cycle in which the maximum water depth varied from 98 m to 171 m to 131 m, the change of  $v_p$  was less than 2%. This indicates that no significant change in dilatancy or degree of water saturation occurred in the upper crustal layer during this cycle. Observations will continue to at least the summer of 1978.

446. GENDZWILL, D.J., Univ. Saskatchewan (Geological Sciences):

Investigation of solution collapse structures relating to recent subsidence over the Prairie Evaporite, 1970-.

To investigate the origin of some unique, circular depressions in southern Saskatchewan; two of these have been found to be due to peculiar hydrological conditions related to salt collapse structures. Because the two features are glacial or post glacial in age, it is possible that subsidence activity may be occurring at present; instrumentation to monitor ground motion is being developed.

447. GENDZWILL, D.J., Univ. Saskatchewan (Geological Sciences):

Investigations of geological conditions relevant to potash mining using seismic reflection method, 1973-.

Continuing investigations relate to the further delineation of Winnipegosis mounds and the investigation of solution-collapse structures which affect the Prairie Evaporite formation and development and application of high resolution seismic techniques for the purpose of accurately delineating small scale features.

448. GENDZWILL, D.J., POTS, W., Univ. Saskatchewan (Geological Sciences), Sask. Geol. Surv.:

Estimation of ground subsidence over potash mines with seismology, 1976-77.

To determine whether subsidence over a potash mine can be detected by seismic methods; a project of modeling with synthetic seismograms has been started to simulate expected subsidence effects and determine their response on a seismogram.

449. HALL, D.H., INGRAM, R., Univ. Manitoba (Earth Sciences):

Deconvolution of seismic reflection data, 1976-77; M.Sc. thesis (Ingram).

450. HALLS, H.C., STESKY, R.M., Univ. Toronto (Geology): The distribution, orientation and shape of shatter cones from the Slate Islands, northern Lake Superior, 1975-.

The orientation of striations on shatter cone surfaces has been measured from twenty localities on the Slate Islands, in order to obtain the shape and orientation of the cones. A least-squares iterative technique is used to obtain the cross-sectional shape in terms of ellipticity, the orientation of the cone axis and the cone angle. Results to date show that the cones preferentially point inwards and upwards toward the centre of the island group. There is increasing evidence that cones whose axes depart significantly from a radial azimuth have been subsequently rotated into their present position. The anomalous cone orientations are observed in areas where the local geology is conspicuously different from the regional trend and also where there are anomalous orientations in remagnetization circles suggesting rotation of both primary and secondary shock magnetizations. Two of these sites have been analysed in detail and indicate that a single axis rotation increases the conformity of all three observations with the regional picture. The Slate Islands have yielded the first reported occurrences of elliptical shatter cones, and their formation is thought to be due to host rock anisotropy. The most elliptical cones are found in strongly foliated Archean metavolcanics, and the plane containing the cone axis and the maximum dimension of the cross-sectional ellipse is parallel to the foliation. Further studies on the Slate Islands are planned to examine the effect of anisotropy and lateral changes in rock type on the orientation, size, shape and distribution of the shatter cones. Individual cones will be studied in thin section and with the scanning electron microscope to determine the influence of rock types, grain size, and heterogeneities on the development of these curious structures. Furthermore, other deformation features, such as microcracks, kink bands in mica, and deformation lamellae in quartz and feldspar, all of which can be used to determine the shock wave direction, will be studied to supplement the shatter cone orientation data.

451. HAWORTH, R.T., Geol. Surv. Can.:

A geophysical investigation of the extension of geological zonation of Newfoundland, 1974-.

- See:**  
Geology of the continental shelf off southeastern Labrador; Geol. Surv. Can., Paper 76-1C, p. 61-70, 1976.
452. HUNTER, J.A.M., Geol. Surv. Can.:  
Hammer seismic surveys, 1968-.
453. HUNTER, J.A., Geol. Surv. Can.:  
Seismic properties of earth materials in the permafrost environment, 1973-.
- See:**  
Marine geological and geophysical activities in Lancaster Sound and adjacent fiords; Geol. Surv. Can., Paper 77-1A, p. 495-506, 1977.  
Applications and geophysical techniques in permafrost regions; Can. J. Earth Sci., v. 14, no. 1, p. 117-127, 1977.
454. KEEN, C.E., Geol. Surv. Can.:  
Geophysical studies of the continental slope and rise off the Canadian eastern seaboard, 1972-.
455. OVERTON, A., Geol. Surv. Can.:  
Seismic-Precambrian Shield, 1970-.
456. OVERTON, A., Geol. Surv. Can.:  
Seismic, Arctic Continental Shelf and coastal margin, 1975-.
- See:**  
Seismic instrument tests in Kugmallit Bay, District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 25, 1976.  
Seismic techniques for reconnaissance studies in difficult ice-covered offshore areas; *ibid.*, p. 73-74, 1976.
457. ROCHESTER, M.G., MOON, W., CROSSLEY, D.J., Memorial Univ. (Physics):  
Theoretical global geodynamics and planetary physics, 1961-.
- See:**  
The secular decrease of obliquity due to dissipative core-mantle coupling; Geophys. J., v. 46, p. 109-126, 1976.  
Expansion of the Earth due to a secular decrease in G-evidence from Mercury; Can. J. Earth Sci., v. 13, p. 1723-1725, 1976.  
Reply to comments on 'Core undertones with rotation' by M.L. Smith; Geophys. J., v. 44, p. 729-732, 1976.  
Research continues on: 1. theoretical study of free oscillations of the Earth's liquid core, particularly those of long period (core undertones and inertial oscillations modified by buoyancy) which, if detected using sensitive gravimetry, can yield new information about the physical state of the Earth's deep interior; and 2. effect of the presence of the liquid core on the dynamics of the Earth's rotation, especially the free and forced nutations (for which a geophysically satisfactory theory will serve as basis for new fundamental constants of positional astronomy to be adopted by International Astronomical Union in 1980).
458. SEREDA, I.T., HAJNAL, Z., Univ. Saskatchewan (Geological Sciences):  
Reflection seismic investigation of the earth's crust in southern Saskatchewan, 1974-77; M.Sc. thesis (Sereda).  
Data processing and initial interpretation of four crustal expanding spreads has been essentially completed. The expanding spreads are located on the center and flanks of the Nelson River Gravity High extension into southern Manitoba and Saskatchewan at approximately 51°N latitude. Initial interpretation indicates rapidly varying crustal thickness and complicated structure. Relationship of these parameters to Churchill-Superior boundary are now being investigated.
459. STESKY, R.M., Univ. Toronto (Geology):  
Seismic and mechanical properties of fine powders under vacuum - application to the lunar regolith, 1976-.
- To provide basic data on the seismic velocities of lunar soils and soil analogues under conditions of very low vacuum and low loads. These results will aid in the interpretation of measurements of compressional and shear wave velocities on the moon. The particular problems include deducing the layering structure at the Apollo landing sites and understanding the mechanisms of propagation and attenuation of seismic waves in granular media.
460. STEWART, I.C.F., Memorial Univ. (Physics):  
Seismotectonic studies of Newfoundland, 1974-79.
- See:**  
Travel-time residuals of PP waves reflected under Atlantic Canada; Bull. Seismol. Soc. Am., v. 66, p. 1203, 1976.  
A telemetered seismograph station at Corner Brook commenced operation in October, 1976. This provides a good record of quarry blast times in western Newfoundland for proposed long-baseline refraction work across the island, as well as complementing the eastern Canadian network for local seismicity studies. Two portable event detectors are being tested for field use for both refraction and seismicity recording, and should be in almost continuous operation early in 1977. Teleseisms are also monitored for travel-time residuals to determine broad-scale variations in crustal and upper mantle velocity structure. Published data are also being used in the analysis of seismic wave delay times in the vicinity of Newfoundland.
461. TIFFIN, D.L., Geol. Surv. Can.:  
Geological and geophysical studies of the Pacific Continental Margin and in the Beaufort Sea, 1971-.
- See:**  
Summersible operation on the Pacific continental margin; Geol. Surv. Can., Paper 77-1A, p. 301-310, 1977.  
Gravity and magnetic survey off Vancouver Island, 1975; *ibid.*, p. 311-314, 1977.  
Magnetic susceptibility as a diagnostic parameter of Vancouver Island volcanic rocks; Geol. Surv. Can., Paper 76-1B, p. 97-105, 1976.  
Geologic interpretation of magnetic and gravity anomalies in the Strait of Juan de Fuca, U.S.-Canada; Can. J. Earth Sci., v. 14, no. 2, p. 223-238, 1977.
- GENERAL**
462. CHRISTOPHER, J.E., Sask. Geol. Surv.:  
Geophysical investigations over the edge of the Athabasca Sandstone, Saskatchewan, 1976-.
463. HUNTLEY, D.J., Simon Fraser Univ. (Physics):  
Thermoluminescence as a means of: 1. dating siliceous ocean sediments; 2. dating archaeological material; and 3. obsidian source identification, 1975-.



**See:**

Thermoluminescence as a potential means of dating siliceous ocean sediment; *Can. J. Earth Sci.*, v. 13, p. 593-596, 1976.

464. MACAULEY, H.A., *Geol. Surv. Can.*:  
Sub-seabottom permafrost distribution in the southern Beaufort Sea, 1974-.

**See:**

An application of hydraulic jet drilling techniques to mapping of sub-seabottom permafrost; *Geol. Surv. Can.*, Paper 76-1C, p. 75-78, 1976.

465. MCMILLAN, R.K., *Environment Canada (CCIW)*:  
Acoustic images of underwater structures, 1977-78.

To refine and improve methods and techniques of existing acoustic systems in order to develop new application methods to elucidate underwater structures in deep water. It is proposed to carry out the development of the technique and complete the assessment of the method upon structures adjacent to CIW. In addition, there is an ideal opportunity to use the Hamilton and Scourge in western Lake Ontario as targets for this technique. These targets are located in deep water, unaffected by shipping and other local disturbances and are thus time series consistent. There exists a large scaling of objects, from ropes, to masts, to planking, as well as a variation in acoustic reflectivity in these targets. There is no necessity to construct a target or sink it in deep water in order to evaluate the technique. There is reasonable ground truthing accomplished on these wrecks and there is a degree of control on the nature of the materials of construction of the targets. In addition, the archaeological benefits for the Royal Ontario Museum, and for Parks Canada, who have declared the wrecks as a National Historic site, are numerous.

466. ROBIN, P.-Y.F., *Univ. Toronto (Erindale - Geology)*:  
Maintenance of high water pressures in an igneous/metamorphic craton and the high electrical conductivity anomalies in the Precambrian Shield; 1976-78.

Both porosity and permeability of igneous or metamorphic rocks are nonlinear functions of effective pressure  $P_e$  (difference between lithostatic and fluid pressures). Flow of water through rocks leads to variations of  $P_e$  in time and in space. Large scale fluid flow through the crust is therefore regulated by a nonlinear differential equation. The rate at which water is "squeezed" out of a shield is studied by solving this differential equation numerically. The dependency of permeability on  $P_e$  is simulated by several different functions, and several initial distributions of water are assumed. The aim is to establish whether a high water content could be maintained in shield rocks for periods in excess of  $10^8$ - $10^9$  years. If this is not possible, other mechanisms than a high water content must be envisaged to explain the high electrical conductivities often reported for depths between 10 and 25 km in the Precambrian Shield.

467. STRANGWAY, D.W., SHARPE, H.N., *Univ. Toronto (Geology-Physics)*:  
Models of lunar and planetary evolution, 1974-78; Ph.D. thesis (Sharpe).

The new constraints on planetary conditions found as a result of the last few years of space exploration have opened up many new ideas on the evolution of planets. We have proposed a model for the evolution of the Moon that fits with all known observations. This model has been used to establish parameters of the formation condition of planets and the parameters derived have been used to model the evolution of all the terrestrial planets (including earth) and asteroids. These models all involve an early cool interior and warm exterior and then we model the changes with time due to various mechanisms of heat transfer in solid and fluid states and as a function of different radioactive contents. A special attempt has been made to include an explanation for the magnetic fields now found on several planets. These results were presented at the 7th Lunar Science Conference and at a Conference on Comparisons between Moon and Mercury.

## GEOTECHNIQUE

### ENGINEERING GEOLOGY

468. BELANGER, J.R., *Geol. Surv. Can.*:  
Urban geology, Saint John, New Brunswick, 1976-.  
To compile a geotechnical data bank and map of surficial deposits.
469. COATES, D.F., SAGE, R., *CANMET (EMR)*:  
Pit slope project, 1972-78.

**See:**

Pit slope manual, Chapter 1, Summary; *CANMET Rep. 76-22*, 1976.

Estimation of upper bounds to rock slopes by analysis of existing slope data; *CANMET Rep. 76-14*, 1976.

A digest of environmental regulations pertinent to open pit mining; *CANMET, Rep. 76-16*, 1976.

Presently the following chapters are being prepared with appendices and supplements as part of the Pit Slope Manual: structural geology, mechanical properties, ground water, design, mechanical support, perimeter blasting and monitoring.

470. DION, D.J., MARANDA, R., *Québec Min. Richesses Naturelles*:

Carte geotechnique region de Boucherville-Tracy, Québec, 1975-76.

471. DION, D.J., MARANDA, R., *Québec Min. Richesses Naturelles*:

Carte geotechnique region de Rimouski, Québec, 1976-77.

472. DION, D.J., MARANDA, R., *Québec Min. Richesses Naturelles*:

Carte geotechnique Terrebonne - l'Assomption, Québec, 1976-77.

Etablir le rapport et les cartes donnant l'aptitude des sols à la construction, campagne de terrain; forages penetrometers scissometres géophysique, a faire.

473. EGGINTON, P., *Geol. Surv. Can.*:

Hydraulic, morphologic and morphometric studies of selected rivers along the Mackenzie Highway, 1975-.

- See:**  
 River channel instability studies, District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 207-215, 1976.  
 Dendrochronologic investigation of high-water events along Hodgson Creek, District of Mackenzie; Geol. Surv. Can., Paper 77-1A, p. 381-384, 1977.
474. GADD, N.R., Geol. Surv. Can.:  
 Geological variability of marine deposits, 1974-.
- See:**  
 Offlap sedimentary sequence in Champlain Sea, Ontario and Québec; Geol. Surv. Can., Paper 77-1A, p. 379-380, 1977.
475. GRAHAM, T.G., GREENER, P.E., Univ. Calgary (Geology):  
 Significance of the Point Load Test for anisotropic rocks, 1976-77; M.Sc. thesis (Graham).  
 It has been suggested that the Point Load Test is more realistic for aggregate testing than the Los Angeles Wear Test. Information is currently scanty on the effects of anisotropy on this test. It is the intention to find out whether or not this test can provide meaningful results in the case of anisotropic rocks such as schists or gneisses.
476. GWYN, Q.H.J., MARTINI, I.P., Univ. Toronto (Geography), Univ. Guelph (Land Resource Science):  
 Stratigraphic, hydrogeologic, and geotechnical investigations of Quaternary deposits, Southern Ontario, 1976-78.  
 The first area is in eastern Ontario where a preliminary study was made of the variability of the geotechnical properties, clay mineralogy and pore water chemistry of the Champlain Sea clays. Samples were collected and field shear strength measurements made in eight boreholes at sites which were undisturbed by retrogressive landslides. As a result of this study two deficiencies become apparent: (1) that piezometric data would be needed to fully interpret the geotechnical and geochemical data (hydrostatic conditions were assumed), and (2) because only disturbed samples could be obtained with the thin-walled Shelby tubes that were used, the results of the consolidation tests only represent lower bound values. Thus it is proposed that piezometer nests, consisting of 3 or 4 piezometers, be installed at two sites, one in each of the areas already investigated and that further undisturbed samples (using an Osterberg sampler) be obtained. These samples would be collected at the same elevations at which consolidation tests have already been done, as well as any other levels which had unusual strength characteristics. Also while the two holes were being drilled the in situ shear strength (undisturbed and remoulded) would be measured as well as thixotropic effects on the remoulded strength. The field strength measurements would involve no extra cost. The second project area extends along the north shore of Lake Ontario from Bowmanville to Port Hope, Ontario. Up to 40 m of Quaternary deposits are exposed in continuous bluffs along several sections of the lakeshore. The project will consist of two parts: (1) detailed stratigraphic descriptions and (2) monitoring of the ground water regime and slope development at two selected sites.
477. LEBUIS, J., RISSMANN, P., Québec Min. Richesses Naturelles:  
 Mise au point d'une methode de cartographie des zones exposées aux coulées argileuses, 1975-78.  
 Mise au point d'une methode de cartographie des zones exposées aux mouvements de terrain, en particulier, les coulées argileuses. Utilisation de donnees geologiques, geomorphologiques, geotechniques.
478. MARANDA, R., Québec Min. Richesses Naturelles:  
 Carte geotechnique ville de Boischatel, Québec, 1976-77.
479. MOORE, D.P., MATHEWS, W.H., KUCERA, R., Univ. British Columbia (Geological Sciences):  
 The Rubble Creek landslide, Garibaldi, British Columbia, 1974-77.
480. MORIN, F., Geol. Surv. Can.:  
 Geotechnical and environmental study, Riviere-du-Loup, Québec, 1976-.
- See:**  
 Géologie de l'environnement de Rivière-du-loup/Cacouna, Québec; Geol. Surv. Can., Paper 77-1A, p. 333, 1977.
481. OWEN, E.B., Geol. Surv. Can.:  
 Engineering geology in Canada, 1975-.
482. RIGLIN, L., MATHEWS, W.H., Univ. British Columbia (Geological Sciences):  
 The 'Perpetual' landslide, West Summerland, British Columbia, 1974-77; M.Sc. thesis (Riglin).
483. RISSMANN, P., LEBUIS, J., Québec Min. Richesses Naturelles:  
 Cartographie des zones exposées aux coulées argileuses de la region de Charette-Louiseville (311/7W), Québec, 1976-77.
484. WILSON, M.S., GREENER, P.E., Univ. Calgary (Geology):  
 Effectiveness of Los Angeles Wear Test for aggregates, 1976-77; M.Sc. thesis (Wilson).  
 It has been found that the Los Angeles Wear Test gives misleading results for many types of aggregates. This is particularly so for anisotropic rocks such as schists and gneisses. It is the aim of this thesis to define the shortcomings of present test procedures and to suggest new or improved methods for testing.
485. ZEMAN, A.J., RUKAVINA, N.A., Environment Canada (CCIW):  
 Geotechnical study of eroding bluffs near Port Burwell, Ontario, 1975-78.  
**See:**  
 Coastal Research Activities, CCIW Hydraulics Research Division; Workshop on Great Lakes Coastal Erosion and Sedimentation, Can. Centre Inland Waters, p. 19-22, 1976.  
 A 24-km long stretch of rapidly retreating bluffs along the north shore of Lake Erie between Port Burwell and Long Point has been examined to determine the influence of stratigraphy, sediment geotechnical properties and groundwater regime on bluff failures and recession. Two representative failure mechanisms have been investigated at a detailed study site located 5 km east of Port Burwell: cyclic rotational slips and gully erosion caused by piping. The site conditions have been determined by means of seven deep borings and borehole instrumentation with vibrating-wire piezometers and slope indicator casings. Results of triaxial tests on undisturbed borehole samples have been used for computer-assisted slope stability analyses. Annual triangulation surveys at the site provide detailed information on recession rates and their variation along a relatively short stretch of shoreline.



486. ZEMAN, A.J., RUKAVINA, N.A., Environment Canada (CCIW):

Effect of toe protection on bluff recession, Scarborough Bluffs, Ontario, 1976-78.

The long-term objective of the study is to determine the effect of toe protection on future slope evolution at the site of the Bluffers Park landfill project, which is currently under construction at the base of the Scarborough Bluffs. Two profiles, one with toe protection and one without, have been monitored semi-annually since 1976. In 1976, disturbed stratigraphic samples were collected and analysed for particle size and Atterberg limits. The process of bluff recession within the area is well documented by aerial photography taken in 1947, 1959, 1955, 1956, 1961, 1966 and 1976. It is planned to use the photographs for photogrammetric contouring and the establishment of a time scale for slope evolution during last 30 years.

#### MUSKEG

487. JARRETT, P.M., RIDDELL, D.V.B., DAWE, P.N., WATERS, G.F., Royal Military College (Civil Engineering):

Evaluation and stabilization of highly compressible terrain, 1970-78; M.Eng. theses (Riddell, Dawe, Waters).

Summer 1976 field work involved testing compacted earth fills on peat using plate bearing tests. Different fabrics were used beneath sections of the fills. Results showed that fabrics had little effect at small deformations and only a small effect at larger (failure) deformations. These were static, repeated load, plate bearing tests. Summer 1977 it is planned to use rapid load cycling to assess the effect on similar fills of a more dynamic loading system. In addition work is being pursued on the development of a finite element model of the peat stratigraphy at our Kingston test site to assist in analysis of the various tests performed.

#### PERMAFROST

488. BAKER, T.H.W., National Research Council (DBR):  
Strength and deformation of frozen and thawing soil samples, 1971-79.

#### See:

Performance characteristics of the Geotechnical Cold Rooms; DBR/NRC Building Res. Note 109, 1976.

Preparation of artificially frozen sand specimens; DBR Paper No. 682, 1976.

Transportation, preparation and storage of frozen soil samples for laboratory testing; Reprint ASTM Sp. Tech. Publ. 599, p. 88-112, 1976.

A compliant platen has been developed to reduce the influence of end effects in the compression testing of frozen soil and ice specimens. The platen was designed so that other brittle materials can be tested with a very slight modification. In future tests an investigation of machine stiffness will be undertaken to determine its influence on the strength and deformation properties of frozen soil.

489. BROWN, R.J.E., National Research Council (DBR):  
Permafrost distribution in Canada, 1953-.
490. GOODRICH, L.E., JOHNSTON, G.H., PENNER, E., National Research Council (DBR):  
Ground thermal regime, 1970-.

#### See:

A numerical model for assessing the influence of snow cover on the ground thermal regime; unpubl. Ph.D. thesis, McGill University, June 1976.

Work is in progress on field study of thermal effects of road embankment on permafrost, Mackenzie Highway, mile 419.5. Instrumentation to be completed during 1977. Field measurements of soil thermal conductivity are being maintained at Ottawa, Thompson Manitoba, and mile 419.5, Mackenzie Highway.

491. JOHNSTON, G.H., National Research Council (DBR):  
Preparation of manual on permafrost engineering, field observations of performance of foundations of buildings, bridges, roads, airfields, etc., 1950-.

Observations of performance of bridge pile foundations and data collection for evaluating parameters for thermal design of embankments and similar structures erected on permafrost were continued.

492. JOHNSTON, G.H., National Research Council (DBR):  
Insulated embankments on permafrost, 1972-80.

Observations continuing on performance of insulated and uninsulated test sections installed on the Mackenzie Highway south of Inuvik and south of Wrigley, Northwest Territories, to evaluate the thermal behaviour and determine the parameters required for design. Insulated test sections also installed on Dempster Highway in northern Yukon Territory in March 1977.

493. KING, M.S., Univ. Saskatchewan (Geological Sciences):  
Mechanical and electrical properties of rocks and soils at permafrost temperatures, 1974-80.

#### See:

Acoustic velocities and electrical properties of frozen sandstones and shales; Can. J. Earth Sci., v. 14, no. 5, p. 1004-1013, 1977.

Variations in the following parameters are being studied to determine their effects on the mechanical and electrical properties of rocks and soils at permafrost temperatures (i) mineral composition; (ii) pore size and distribution; (iii) pore fluid saturant; (iv) degree of saturation. These laboratory studies are performed on cylindrical rock and soil specimens subjected to triaxial loading conditions in a temperature-controlled chamber capable of maintaining temperatures in the range  $-20^{\circ}\text{C}$  to  $25^{\circ}\text{C}$  with  $\pm 0.05^{\circ}\text{C}$ . Measurements of ultrasonic compressional and shear wave velocities are being made to determine the elastic properties. Measurements of the resistivity and phase-angle relationships are being made to determine the electrical properties.

#### ROCK MECHANICS

494. CRUDEN, D.M., BRUCE, I., MCCANN, A., Univ. Alberta (Civil Engineering, Geology):  
Stability of natural slopes in rock; Ph.D. thesis (Bruce), M.Sc. thesis (McCann).

#### See:

Major rock slides in the Rockies; Can. Geotech. J., v. 13, p. 8-20, 1976.

The study will catalogue known rock slides in the Foothills and Main Ranges of the Canadian Rockies. Detailed mapping will record the topographic structural and stratigraphic characteristics of the slide masses. Photogeological reconnaissance backed up by later field studies will detect unreported slides and provide data for the qualitative evaluation of slide risk in the area.

495. CURRIE, J.B., DAS GUPTA, U., RODRIGUEZ, A., Univ. Toronto (Geology):  
Mechanisms and development of fractures in sedimentary strata, 1971-80.
- See:**  
A method of distinguishing regional directions of jointing and of identifying joint sets associated with individual geologic structures; *Can. J. Earth Sci.*, v. 14, no. 6, p. 1211-1228, 1977.
- Fractures in sedimentary strata can exert an important control on flow of fluids in the subsurface, particularly in fine grained rocks having low primary porosity. The project comprises a field, laboratory and theoretical study, employing principles of rock mechanics, to examine the genesis of joint patterns in sedimentary rocks. The study is particularly pertinent to further understanding of the development of fracture porosity and permeability in subsurface strata of sedimentary basins. Current studies concern analysis of fracture development in Upper Cretaceous sandstone and Mississippian carbonates of the Alberta basin. Laboratory experiments on strength anisotropy and residual stress in rocks point to significant effects that these properties can have when one considers the artificial stimulation of hydrocarbon reservoirs or the disposal and containment of fluid wastes in subsurface rocks that are seemingly homogeneous and isotropic.
496. EDEN, W.J., GRATTAN-BELLEW, P.E., PENNER, E., National Research Council (DBR):  
Expansion of pyritic shale, Ottawa area, 1969-79.
497. EISBACHER, G.H., *Geol. Surv. Can.*:  
Study of large landslides in the western Cordillera, 1976-.
- See:**  
Rockslides in the Mackenzie Mountains, District of Mackenzie; *Geol. Surv. Can.*, Paper 77-1A, p. 235-241, 1977.
498. HAWES, R.J., *Geol. Surv. Can.*:  
Surficial geology and land classification, Mackenzie River Valley Transportation Corridor (southern part), 1971-.
499. HUGHES, O.L., *Geol. Surv. Can.*:  
Surficial geology and land classification, Mackenzie Valley Transportation Corridor, 1971-.
500. KING, M.S., Univ. Saskatchewan (Geological Sciences):  
The measurement of stress in potash mines by microseismic techniques, 1974-76.
- See:**  
Field studies of microseismic energy emission; *Can. Mining Metal. Bull.*, v. 69, no. 770, p. 79-85, 1976.
- Microseismic techniques are being employed to determine the state of stress in potash mine pillars. Apparatus has been designed and constructed for measuring the rate of emission of microseismic events at various positions in a borehole drilled into the mine pillar. The rates of emission of microseismic events are being correlated with measurement of stress made with hydraulic cells in the same pillars.
501. PALMER, J.H.L., National Research Council (DBR):  
Field performance of tunnels under conditions of high in situ horizontal stress, 1976-.
- A continuing project currently being conducted in cooperation with D. Belshaw of Morton, Dodds and Partners, Toronto, and J.A. Franklin of Franklin Trow Associates Ltd., Toronto. Two tunnels have been instrumented and measurements are continuing.
502. PANDIT, B., GENDZWILL, D.J., Univ. Saskatchewan (Geological Sciences):  
Investigation of acoustic properties of rocks with the aid of Fourier analysis, 1976-78.
- Investigation of the absorption of acoustic energy in rocks with low water saturations; one of the tools is a Fourier analyzer useful to evaluate frequency absorption and internal reflections.
503. ROEGIERS, J.C., Univ. Toronto (Civil):  
Development of a 'Universite de Liege' cell, 1975-.
504. ROEGIERS, J.C., CURRAN, J., Univ. Toronto (Civil):  
'Equivalent medium analogy' as applied to fractured rock.
- Flow through fractured media has recently been studied by assuming an equivalent porous model. Although this approach seems reasonable in cases of highly fractured formations, it could give erroneous results when one or two singular discontinuities are present. This study proposes - by use of computer modelling - to delineate the validity of the equivalent porous medium analogy by examining the influence of fracture density on the analysis of typical borehole packer tests.
505. ROEGIERS, J.C., HEYSTEE, R., Univ. Toronto (Civil):  
Influence of the permeability factor in hydraulic fracturing, 1974-.
- Specific areas that will be investigated with respect to their effects on permeability are:  
(i) effective compressive and tensile stresses;  
(ii) hysteresis; (iii) time dependent effects.
506. ROEGIERS, J.C., MCKAY, D.A., Univ. Toronto (Civil):  
Engineering classification of Ontario shales, 1973-.
- SOIL MECHANICS**
507. BOZOZUK, M., EDEN, W.J., LAW, K.T., National Research Council (DBR):  
Geotechnical properties, eastern marine clay, 1951-.
- See:**  
Settlement analysis of the Gloucester test fill; *Can. Geotech. J.*, v. 13, p. 339-354, 1976.
508. PENNER, E., National Research Council (DBR):  
Influence of steel posts on ground temperatures, 1975-80.
509. STAUFFER, M.R., GENDZWILL, D.J., HAJNAL, Z., Univ. Saskatchewan (Geological Sciences):  
Investigation of rhomboid structures on beaches, 1973-78.
- See:**  
Rhomboidal lattice structure: a common feature on sandy beaches; *Can. J. Earth Sci.*, v. 13, no. 12, p. 1667-1677, 1976.
- Further plans for this project are to develop a clear theory concerning the origin of rhomboid lattice structures by making a detailed study of physical processes operating near the surface of a beach: water pressure and flow, porosity, density and variations, etc.
- SNOW AND ICE**
510. FREDERKING, R.M.W., SINHA, N.K., National Research Council (DBR):  
Ice mechanics, 1960-.
- See:**  
The bearing capacity of ice covers under static load; *Can. J. Civil Eng.*, v. 3, p. 288-293, 1976.

## GLACIOLOGY

511. ANDREWS, J.T., TYLER, K., DAVIS, P.T., Univ. Colorado (INSTAAR):  
Establishment of mass-balance stations on two glaciers in Auyuittuq National Park, District of Franklin, 1976.  
During the 1976 summer weather stations were established adjacent to two glaciers in Auyuittuq National Park, Northwest Territories, Canada (glacier inventory numbers 46204J-68 and 46204D-87). On each glacier, a basic glaciological mass balance network was established and the 1975-76 mass-balance was measured. Park wardens were trained in the tasks associated with maintenance of weather stations during the summer months.
512. LUCKMAN, B.H., Univ. Western Ontario (Geography):  
Geomorphic work of snow avalanches in the Canadian Rockies, 1968.  
**See:**  
Geomorphic work of snow avalanches in the Canadian Rockies; *Internat. Geog.*, v. 1, p. 177-180, 1976.  
Measurement of annual debris accumulation patterns by snow avalanches (eight years data available); morphologic activity of snow avalanches; formation and characteristics of available boulder tongues.
513. MATHEWS, W.H., Univ. British Columbia (Geological Sciences):  
Simulated glacial abrasion.
514. PATERSON, W.S.B., KOERNER, R.M., FISHER, D.A., ALT, B., Polar Continental Shelf Project (EMR):  
Devon ice cap project, 1971-76.  
**See:**  
Artificial radioactivity layers in the Devon Island ice cap, Northwest Territories; *Can. J. Earth Sci.*, v. 13, no. 9, p. 1251-1255, 1976.
- Temperatures in the Devon Island ice cap, Arctic Canada; *J. Glaciology*, v. 16, no. 74, p. 277, 1976.  
Vertical strain rate measurements in an Arctic ice cap and deductions from them; *J. Glaciology*, v. 17, no. 75, p. 3-12, 1976.  
A further comparison of glacier velocities measured by radio-echo and survey methods source; *J. Glaciology*, v. 17, no. 75, p. 35-38, 1976.  
Work continues on particulate content, chemistry, stratigraphy and crystallography on 3 cores from Devon Island ice cap providing climatic record for past 120 000 yr. Radio-echo sounding of ice caps on Axel Heiberg, Ellesmere, Devon Islands to select site suitable for new core, and mass balance measurements on Devon and Meighen ice caps continues.
515. RICE, R.J., RUTTER, N.W., Univ. Alberta (Geology):  
Sedimentary processes of the Sunwapta River Valley train, Alberta, 1977-78; M.Sc. thesis (Rice).  
To establish parameters which will contribute to the identification of glacial outwash gravels in the ancient record by: 1. the surveying of the longitudinal and transverse profiles of a selected reach of the river, 2. the monitoring of morphological variations of this portion of the valley train surface via plane tabling and photography, and 3. the hydrodynamic interpretation of the stratification found in the channels and bars of an inactive section of this portion of the valley train. The stratification thus documented will be compared with the stratification of a limited number of exposures of semi-consolidated Pleistocene outwash gravels to arrive at an indication of its preservation potential.

## HYDROGEOLOGY

516. BARNES, R.G., OZORAY, G.F., Alberta Research Council (Groundwater Div.):  
Hydrogeology of the Brazeau-Canoe River area, Alberta, 1976-77.
517. BELAND, A., FARVOLDEN, R.N., Univ. Waterloo (Earth Sciences):  
The management of the Greenbrook pumping station with respect to the hydrogeological properties, 1976-77; M.Sc. thesis (Beland).
518. BERNARD, D.W., BARNES, R.G., Alberta Research Council (Groundwater Div.):  
Hydrogeological map corridors, Jasper National Park, Alberta, 1976-77.  
Hydrogeologic mapping of major highway corridors in Jasper National Park has been completed. A contract report, in the form of mylar maps and short report is almost complete. The maps will present expected well yields as well as hydro-chemistry. The report is the result of a qualitative study; little or no quantitative studies have been carried out.
519. BORNEUF, D.M., Alberta Research Council (Groundwater Div.):  
Springs of Alberta, 1976-77.
520. CEROICI, W.J., Alberta Research Council (Groundwater Div.):  
Hydrogeology of Peerless Lake (NTS 84B), Alberta, 1976-77.
521. CEROICI, W.J., PRASAD, B.S., Alberta Research Council (Groundwater Div.):  
Hydrogeology of the Canmore Corridor, Alberta, 1976-77.  
**See:**  
Hydrogeology of the Canmore Corridor, Alberta; Calgary Reg. Planning Commission, Calgary, Alberta, 1976.
522. CHERRY, J.A., FRIND, E.O., FRITZ, P., GILLHAM, R.W., PICKENS, J.F., VANDOR, H., Univ. Waterloo (Earth Sciences):  
Hydrogeologic and digital simulation studies of the lower Perch Lake Basin, 1976-; Ph.D. (Pickens), M.Sc. (Vandor) theses.  
**See:**  
Field determination of the physical contaminant transport parameters in a sandy aquifer; Proc. IAEA Advisory Group Meeting on "The Use of Nuclear Techniques in Water Pollution Studies", Dec. 1976, Cracow, Poland.

Laboratory and field tracer tests in granular porous media are being conducted to provide an improved understanding of the controlling factors in the transport of solutes or contaminants in subsurface flow systems. This will also lead to the development of a useful methodology for simulating with numerical models the movement of water and solutes in subsurface flow systems.

523. CHERRY, J.A., FRIND, E.O., GILLHAM, R.W., Univ. Waterloo (Earth Sciences):  
Studies of agricultural pollution of groundwater and influence of groundwater pollution on stream water quality in two PLUARG watersheds, 1975-77; M.Sc. theses.
524. CHERRY, J.A., FRITZ, P., GILLHAM, R.W., Univ. Waterloo (Earth Sciences):  
Studies of geochemical retardation of radionuclides in representative unconsolidated Canadian geologic materials, 1974-77.
525. CHERRY, J.A., PICKENS, J.F., Univ. Waterloo (Earth Sciences):  
Contaminant behavior in groundwater flow systems, 1976-80; Ph.D. thesis (Pickens).  
  
To evaluate and improve methods for determination of solute transport parameters in shallow groundwater flow systems in Quaternary deposits with emphasis on "dispersivity" and "partitioning relations" in field situations. The powerful computer simulation models for prediction of contaminant migration in groundwater flow systems will be of little use until reliable methods for determination of the field parameters are available.
526. FARVOLDEN, R.N., FRIND, E.O., Univ. Waterloo (Earth Sciences):  
Hydrogeologic investigations of Ojibway Prairie, Windsor, Ontario, 1976-77.  
  
Hydrogeologic data have been collected for about one year at the Windsor Prairie. A mathematical model will be developed for the purpose of predicting dangers to the hydrogeologic regime (water-table) in the event of future development around the periphery of the preserve.
527. FREEZE, R.A., SMITH, L., Univ. British Columbia (Geological Sciences):  
Mathematical models of subsurface flow in geological engineering, 1975-78; Ph.D. thesis (Smith).  
  
1 dimensional groundwater flow complete; 2 dimensional flow to a well complete; and 1 dimensional consolidation complete. Research in progress on regional groundwater flow with special reference to spatial stochastic structure of hydraulic conductivity distribution.
528. FRIND, E.O., CHORLEY, D.W., Univ. Waterloo (Earth Sciences):  
A finite element model for analysis of multiaquifer systems, 1975-76; M.Sc. thesis (Chorley).
529. FRIND, E.O., GILLHAM, R.W., Univ. Waterloo (Earth Sciences):  
Studies of engineered geologic environments for radioactive work storage facilities, 1976-77.  
  
During the first year of this study it has been shown by mathematical modelling that use of the "Wick Effect" of unsaturated flow in the design of shallow subsurface storage systems for low level radioactive waste is technically feasible. In this type of design, a concrete container is buried in a granular material above the watertable, and covered with gravel. The gravel has a sloping surface and is in turn covered with a fine-grained material which acts as the 'wick'. As long as the pressure in the wick remains negative, infiltrating water will be laterally diverted within the wick and the buried container will remain dry. The next phase of the study will deal with the verification of this concept by means of laboratory experiments.
530. FRIND, E.O., SEPOL, G., Univ. Waterloo (Earth Sciences):  
Three-dimensional finite element model for analysis of contaminant transport in variably saturated porous media, 1975-76.
531. FRITZ, P., MICHEL, I., Univ. Waterloo (Earth Sciences):  
1)  $^{18}\text{O}$ , D and tritium in permafrost as an indicator for hydrogeologic conditions. 2) The slope geochemistry of hot springs in the NWT, 1976-80; M.Sc. thesis (Michel).
532. GABERT, G.M., WITHERS, D.W., Alberta Research Council (Groundwater Div.):  
Alberta groundwater observation well network, 1956-77.  
  
1. Publication of "Alberta Groundwater Observation Well Network": completion date for manuscript April, 1977. Catalogue of hydrographs included. 2. New field work: Acquisition of new data for existing wells and installation of new observation wells. Continued monitoring of water levels.
533. GEVAERT, D., FARVOLDEN, R.N., Univ. Waterloo (Earth Sciences):  
Evaluation of potential for induced infiltration along the Grand River, 1975-77; M.Sc. thesis (Gevaert).
534. HACKBARTH, D.A., Alberta Research Council (Groundwater Div.):  
Water quality monitoring at Grande Cache, Alberta, 1971-.  
  
Monitoring of quality of water discharging from reclaimed coal mining areas.
535. HACKBARTH, D.A., Alberta Research Council (Groundwater Div.):  
Groundwater chemistry in the Grande Prairie-Beaverlodge area, Alberta, 1973-77.  
  
Groundwater chemical information is divided as to whether it was obtained from glacial drift or bedrock which consists of upper Cretaceous Wapiti, Puskwaskau and Kaskapau Formations. The bedrock source is further subdivided into depth intervals of 0 to 150 feet, 150 to 300 feet and 300 to 450 feet. The data did not warrant explicit investigation to greater depths. Maps showing the distribution of total dissolved solids, calcium, magnesium, hardness, sodium, potassium, carbonate, bicarbonate, alkalinity, sulfate, chloride and fluoride are presented for each of the four rock type/depth subdivisions. Maps presenting chemical equivalent as a percent of anions or cations are also presented for pertinent ions in all intervals. Distributions of hydraulic head with depth are shown on various maps up to a depth of 500 feet. A discussion of groundwater yields from 150 to 450 feet below land surface is also included.
536. HACKBARTH, D.A., Alberta Research Council (Groundwater Div.):  
Hydrogeology of the Grande Prairie area, Alberta, 1975-77.

The region is divided into two hydrogeological areas: 1) a southern area in which groundwater is abundant, with 20-year safe yields of 25 igpm (2 l/s) common and water of reasonably good quality and 2) a northern area in which groundwater is not usually available and is of very poor quality. In addition to the 1:250,000 scale groundwater availability map, maps at 1:1,000,000 scale present the hydrochemistry of the surficial deposits and of the bedrock.

537. HACKBARTH, D.A., Alberta Research Council (Groundwater Div.):  
Hydrogeology of Athabasca Oil Sands area, Alberta, 1974-78.

About 80 observation wells, up to 1900 feet deep, were installed for the project and are being monitored.

538. HERR, R.L., LENNOX, D.H., Environment Canada (Water Res. Br.):

Hydrogeology of the National Capital Region, 1974-.

539. HORE, R.C., HUGHES, G., FUNK, G., GOFF, K., VIIRLAND, J., HOLLAND, C., MELLARY, A., SMALL, E., HAMMOND, C., Ontario Ministry Environment (Water Resources Br.):

Groundwater quality protection, 1957-.

540. HORE, R.C., SIBUL, U., VALLERY, D., GOFF, K., VIIRLAND, J., HOLLAND, C., MELLARY, A., SMALL, E., HAMMOND, C., Ontario Ministry Environment (Water Resources Br.):

Groundwater interference investigation program, 1961-.

541. HORE, R.C., SIBUL, U., WANG, K.T., ROY, A., LAMMERS, W., Ontario Ministry Environment (Water Resources Br.):

Northern Ontario studies, 1966-77.

542. HORE, R., WILKINS, D., HUGHES, G., SIBUL, U., GOFF, K., VIIRLAND, J., HOLLAND, C., MELLARY, A., SMALL, E., HAMMOND, C., Ontario Ministry Environment (Water Resources Br.):

Environmental assessment-groundwater, 1961-.

543. JACKSON, R.E., CHAMP, D.R., GULENS, J., INCH, K.J., MERRITT, W.F., Environment Canada (Water Res. Br.):

Hydrogeochemical processes affecting the migration of radiocontaminants in the lower Perch Lake Basin, Chalk River, Ontario, 1975-80.

During 1976 the bias of this project shifted towards an investigation of the redox processes in the ground waters in an attempt to obtain some understanding of their role in contaminant alternation.

544. JEFFS, D., HORE, R., FLEISCHER, F., OSTRY, R., RALSTON, J., WOOD, M., BLACK, S., CHAN, T., KING, D., ONN, D., Ontario Ministry Environment (Water Resources Br.):

IJC PLUARG (pollution from land use activities reference group), 1972-78.

545. JEFFS, D.N., RALSTON, J., OSTRY, R., SABACH, S.E., FLEISCHER, F.C., PEARCE, G., Ontario Ministry Environment (Water Resources Br.):

Grand River basin study, 1974-79.

546. LAWSON, D.W., Environment Canada (Water Res. Br.):

Hydrological modelling, 1976-.

See:

The application of remote sensing to water resources planning, watershed modelling and real-

time flood forecasting; Proc. Remote sensing of Soil Moisture and Groundwater, Can. Aeronautics Space Inst./Can. Advisory Comm. Remote Sensing, 1976.

547. LEBRETON, E.G., British Columbia Dep. Environment (Water Investig. Br.):

A hydrogeological study of the Salmon River Valley, Shuswap Lake, British Columbia, 1974-78.

A study of relationships between groundwater and surface water flow with special emphasis based on classification of groundwater and surface waters and two minor constituents silica and total soluble phosphorus.

548. LIEBSCHER, H.M., SOPER, P.W., Environment Canada (Water Res. Br.):

Hydrogeology of Richmond landfill site - study of a coastal lowland peat bog landfill, southwestern British Columbia, 1975-77.

Large municipal landfills located on coastal Fraser River delta peat bogs in southwestern British Columbia present a unique case study in that most leachates generated from these sites are intercepted by ditch systems and discharged into the Fraser River. Hydrogeologic investigations at Richmond Landfill indicate that this area is underlain with 3 stratigraphic units. These units are (1) 30 to 37 m silty sand overlain with (2) 1 to 7 m silty organic clay which in turn is overlain with (3) 0 to 8 m peat. An estimated 140,000 metric tons of industrial, commercial and domestic refuse are disposed annually. Surface and groundwater chemical analyses, slug tests and hydrographs of 23 piezometers installed in units 1 and 2 and the refuse indicate very little, if any, leachate migration through units 2 and 3 into unit 1. Most significant recharge to the refuse occurs during high tides, high discharge rates of the Fraser River, winter precipitation and during on site dredging operations. The heterogeneous nature of the refuse and diurnal tidal influence of the Fraser River results in a highly varying concentrated toxic leachate being discharged into the receiving environment.

549. LYTVIAK, A.T., BROWN, K.D., Alberta Research Council (Groundwater Div.):

Central data bank.

550. LYTVIAK, A.T., OZORAY, G.F., Alberta Research Council (Groundwater Div.):

Hydrogeology, Fort Chipewyan and Lake Claire, Alberta, 1976-77.

551. MACRAE, C.R., LUCKMAN, B.H., SLAUGHTER, R., Univ. Western Ontario (Geography):

The hydrologic and water quality characteristics of urban runoff in a small downtown basin, London, Ontario, 1975-77; M.Sc. thesis (MacRae).

A small (45.5 acre) urban separate stormwater sewer catchment in London, Ontario has been instrumented to monitor the hydrologic and water quality characteristics of stormwater runoff. Pollutographs and hydrographs have been derived from field measurements and are being compared to predictions generated by the EPA-Storm Water Management Model. Pollutant loads and yields are being estimated from existing data. However, future studies entail the expansion of the present data collection system to a number of key locations within the catchment to isolate the principal pollutant sources and determine their relative contribution to pollutant loads.

552. MENELEY, W.A., PUODZIUNAS, P., MAATHUIS, H., CHRISTIANSEN, E.A., WHITAKER, S.H., Saskatchewan Res. Council (Geology):  
Evaluation of groundwater resources in southern Saskatchewan, 1962-.
- A continuing program involving aquifer evaluation, water quality monitoring, continuous monitoring of groundwater levels, electric analogue modelling of aquifer systems, provision of hydrogeology information to users and for special inventory studies.
553. MUNRO, D.S., Univ. Toronto (Geography):  
Energy exchange and water loss from a swamp, 1976-79.
- Study of atmospheric and surface controls with respect to evaporation. Research directed toward obtaining water loss estimation procedures which are useful to hydrologists.
554. OZORAY, G.F., BORNEUF, D.M., WALLICK, E.I., Alberta Research Council (Groundwater Div.):  
Hydrogeological atlas of Alberta, 1976-82.
555. PRICE, A.G., Univ. Toronto (Scarborough College - Geography):  
Snowmelt in a forest environment.
- To investigate the factors controlling daily and hourly snowmelt rates in a forested environment. Particular attention will be given to the modelling of turbulent exchanges of heat and moisture between the snowpack and the air. The radiative exchanges between air, canopy ground, and snowpack will also be investigated. Results will include prediction of daily snowmelts which will be checked using a runoff plot. The research should yield a general predictive model for snowmelt in a forest.
556. RODRIGUEZ, E., FLIGG, K., Ontario Ministry Environment (Water Resources Br.):  
Groundwater geophysics, 1965-.
557. SCHWARTZ, F.W., Univ. Alberta (Geology):  
Investigation of regional water quality, 1973-78.
- See:
- Some factors controlling the major ion chemistry of small lakes: examples from the prairie parkland of Canada; J. Hydrology, 1976.
- The pattern of migration and chemical evolution of dissolved species in a combined groundwater-surface water system can be described mathematically as a solution to the transient form of the dispersion-convection equation, one equation for each species of interest. A complete description of mass transfer requires the simultaneous evaluation of the natural (physical, chemical, biological) and man-made processes operating within the system. The resulting array of differential equations is solved using the method of characteristics and yields a spatial and temporal description of ion concentrations. A detailed, theoretical evaluation of the model through the development and sensitivity analysis of a series of hypothetical cases can assess the relative influence of the physical and chemical parameters on the behaviour of the system. A practical demonstration of the descriptive and predictive ability of the model is provided by field studies of a combined groundwater and surface water system in East-Central Alberta. Field studies are underway to describe the hydrology and hydrogeochemistry of the Lake Wabamun system and to provide parameters necessary to apply the water quality model. The ability of a properly calibrated model to predict water quality patterns provides a planning tool for assessing future human impact on the system and for evaluating proposed remedial strategies to achieve desired water quality standards.
558. SCHWARTZ, F.W., MCCLYMONT, G.L., Univ. Alberta (Geology):  
Chemical and physical interactions between groundwaters and lakes, 1974-77.
- Groundwater inflow to shallow, recreational lakes in the Edmonton area plays an important role in controlling water quality and water levels. Piezometers and watertable wells to be installed within the watersheds and existing domestic wells will provide the instrumentation required to determine the quantity and location of groundwater inflow and to facilitate the collection of groundwater samples for chemical analysis. The significance of the proposed research lies not only in providing a comprehensive data base to more clearly understand the physical and chemical interactions between groundwaters and lakes, but also in giving quantitative information required to more fully understand problems of nutrient cycling, and to guide the future development and management of Western Canadian lakes.
559. SCHWARTZ, F.W., MILNE-HOME, W.A., MCCLYMONT, G.L., Univ. Alberta (Geology):  
Hydrogeological investigation of the Muskey River basin, 1977-80.
- Over a large area of the Muskey River basin, less than 100 feet of drift overlies thick, oil sand deposits. It is expected that mining and extraction will begin on leases within this basin in the next few years. Comprehensive studies of the physical, chemical and biological setting are essential for the ongoing environmental management of the watershed. The groundwater portion of this system is of particular significance because of the important role that it plays in determining the quantity and quality of surface water. In order to properly assess the environmental impact of proposed development schemes within the watershed and to formulate operating and reclamation strategies, a clearer understanding of groundwater conditions in the watershed must be developed. The proposed study focusses primarily on the groundwater-surface water interface and is designed to study the characteristics of shallow, near-surface groundwater systems.
560. SIBUL, U., HICKINBOTHAM, A., Ontario Ministry Environment (Water Resources Br.):  
Groundwater probability mapping, 1966-.
561. SIBUL, U., HICKINBOTHAM, A., Ontario Ministry Environment (Water Resources Br.):  
Flowing wells in Ontario, 1976-.
- To map reported flowing wells (on 1:50 000 topo sheets) to aid in groundwater resource evaluation, development, and management. The maps are specifically designed to aid water-well drillers in the province in anticipating flowing well conditions prior to drilling so that proper precautionary measures can be taken to avoid uncontrolled flows.
562. SIBUL, U., TURNER, M., Ontario Ministry Environment (Water Resources Br.):  
Aquifer mapping, 1976-79.
- To map major aquifer complexes in the Province of Ontario to aid in groundwater resource evaluation, development, and management.



563. SIBUL, U., WANG, K.T., CHIN, V.I., VALLERY, D.J., Ontario Ministry Environment (Water Resources Br.): Drainage basin studies, 1969-.
564. SKLASH, M., FARVOLDEN, R.N., Univ. Waterloo (Earth Sciences):  
The role of groundwater in storm and snowmelt runoff, 1975-77; Ph.D. thesis (Sklash).
- See:**  
A conceptual model of watershed response to rainfall, developed through the use of oxygen-18 as a natural tracer; *Can. J. Earth Sci.*, v. 13, no. 2, p. 271-283, 1976.  
Storm runoff analyses using environmental isotopes and major ions; in interpretation of environmental isotope and hydrochemical data in groundwater hydrology; I.A.E.A. Vienna, p. 111-130, 1976.  
Project designed to define the role played by groundwater in the generation of storm and snowmelt runoff. Environmental isotope techniques (oxygen-18, tritium, deuterium, and radon) provide the main tools of research while studies of physical hydrogeology and computer simulations of the groundwater system will provide additional information. Well instrumented basins in Alberta, Quebec, and Ontario are being studied. These geographically distant areas provide a variety of hydrogeologic environments which will enable one to ascertain the effects of geology, climate, topography, and land use on groundwater contributions to high stream flows. The implications of the study results to surface water modelling, water budgets, groundwater and surface water pollution will be discussed.
565. STEIN, R., Alberta Research Council (Groundwater Div.):  
Hydrogeology of the Edmonton area (northeast segment), Alberta, 1973-76.
- See:**  
Hydrogeology of the Edmonton area (northeast segment), Alberta; Alberta Res. Council Rep. 76-1, 1976.
566. STEVENSON, D.R., VOGWILL, R.I.J., Alberta Research Council (Groundwater Div.):  
Hydrogeology of Marmot and Streeter basins, Alberta, 1964-77.
567. TERRY, R.D., MILLER, J., MCCLENAGHAN, Wm., Ontario Ministry Environment (Water Resources Br.):  
Groundwater data, 1947-.
- A continuing program to license water-well drillers in the province, to encourage adequate well construction practices, to allow for the collection of hydrogeologic information through water-well record submissions and to allow data manipulation for use for groundwater resource development and groundwater protection throughout the province.
568. TOTH, J., Alberta Research Council (Groundwater Div.):  
Relation between migration and accumulation of hydrocarbons and the movements of formation fluids, 1974-77.
569. VANDENBERG, A., Environment Canada (Water Res. Br.):  
Analysis of drawdown data from a multiple aquifer test in a buried preglacial valley near Esterhazy, Saskatchewan, 1976-77.
- See:**  
Tables and type curves for analysis of pump tests in leaky parallel-channel aquifers; Inland Waters Directorate, Env. Canada, Tech. Bull. 96, 1976.
- A pump test is described in which each of 7 wells was pumped for 20 hrs., while water levels were recorded in all 7 wells; the aquifer in which the wells were drilled is a semi-confined, buried bedrock-channel aquifer, which has been extensively explored in the neighbourhood of the 7 wells. A new and improved procedure has been developed for the determination of conductivity, storativity and leakage of a parallel-strip aquifer.
570. VANDENBERG, A., Environment Canada (Water Res. Br.):  
A digital model of groundwater extraction and salt-water encroachment in the Chatham area, New Brunswick, 1977-78.  
Limited data are available on the aquifers (Carboniferous sandstones) from which users in the Chatham area extract groundwater. A digital model of the historical pumping in the area will be attempted in order to explain and locate salt-water encroachment in some of the existing wells. The model will be updated as new hydrologic data becomes available and will be used as a management tool in the management of the groundwater resource.
571. VAN EVERDINGEN, R.O., Environment Canada (Water Res. Br.):  
Northern groundwater and engineering problems, 1974-.
- See:**  
Geocryological terminology; *Can. J. Earth Sci.*, v. 13, p. 862-867, 1976.  
Airphotos from 1950 and 1974 are being studied to detect active development of karst in the area between Smith Arm (Great Bear Lake) and Mahony Lake; Landsat imagery is used to detect seasonal flooding of sinkhole depressions; water chemistry is studied to relate recharge (sinkholes) to discharge (springs); sulfur-isotope data enable correlation of dissolved sulfate in groundwater with sulfate in the source formations (L. Dev. Bear Rock Fm. and U. Cambrian Saline River Fm.). Annual frostmounds in the Bear Rock area are being studied to elucidate the mechanism(s) involved in their formation and subsequent degradation.
572. VOGWILL, R.I.J., BEERWALD, A.S.R., DALAL, G.P., Alberta Research Council (Groundwater Div.):  
Hydrogeology of the Edson area, NTS 83F, Alberta, 1975-77.
573. VOGWILL, R.I.J., CHORLEY, D., Alberta Research Council (Groundwater Div.):  
Methods and techniques of aquifer evaluation in Alberta, 1976-80.  
To upgrade the quality and quantity of aquifer testing in Alberta; to develop methods and concepts of aquifer evaluation in the clastic, fractured clastic, and biogenic rocks of Alberta.
574. WALLICK, E.I., BALAKRISHNA, T., Alberta Research Council (Groundwater Div.):  
Hydrochemistry of the sodium sulfate/carbonate deposits at Horseshoe Lake, Metiskow, east-central Alberta, 1974-77.  
Groundwater influent to Horseshoe Lake near Metiskow in east-central Alberta is of the  $\text{Na}^+ - \text{HCO}_3^- - \text{SO}_4^{=}$  type, and about 1000 mg/l total dissolved solids. The lake has no surface or seepage outflow, the climate is semi-arid with evaporation exceeding total inflow by 15%, so all of the water evaporates to form an economic salt deposit of mirabilite and trona. The existence of



the salt deposit was anomalous in the area inasmuch as no other lake beds contained anywhere near the  $3 \times 10^6$  tons of  $\text{Na}_2\text{SO}_4$  and  $3 \times 10^5$  tons of  $\text{Na}_2\text{CO}_3$  reported for Horseshoe Lake. Based upon this research investigation the salt deposit is the result of: 1. glacial ice thrusting during the Wisconsin stage, which gouged out a bedrock depression as deep as 60 ft. to provide a trap for salt and mud; 2. glacial erosion and deposition of dead ice moraine, the bulk of the till derived from

local Upper Cretaceous carbonaceous and sulfurous bedrock; 3. chemical weathering in the drift and transport of leached salts to the lake by groundwater flow systems 2 to 3 miles in length; and 4. evaporation concentration in the lake bed.

575. YAKUTCHIK, T.J., MCKENNA, P., Ontario Ministry Environment (Water Resources Br.): Groundwater development, 1957-.

## MARINE GEOSCIENCE

576. CHASE, R.L., YOUNG, I.F., Univ. British Columbia (Geological Sciences/Oceanography): Sandspit fault/J. Tuzo Wilson knolls, 1976-77; M.Sc. thesis (Young).

### See:

Marine geological-geophysical study: southwestern Hecate Strait, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 315-318, 1977.

In five weeks fieldwork and shiptime in 1976 we surveyed sandspit fault, (Queen Charlotte Islands and Hecate Strait) to investigate age and sense of movement, and surveyed and dredged Oshawa Seamount, a volcano on trend of Kodiak-Bowie-Wilson seamount chain. Sandspit fault shows no unequivocal signs of recent movement. K-Ar age of Oshawa seamount is 5 m.y., of Wilson Knolls 0-54,000 years.

577. CLOWES, R.M., KNIZE, S., MALECEK, S.J., LYNCH, S., Univ. British Columbia (Geophysics and Astronomy):

Marine deep seismic sounding off the west coast of Canada, 1971-78; Ph.D. thesis (Knize), M.Sc. thesis (Malecek, Lynch).

### See:

Preliminary interpretation of a marine deep seismic sounding survey in the region of Explorer ridge; Can. J. Earth Sci., v. 13, p. 1545-1555, 1976.

A marine deep seismic sounding system; Can. J. Earth Sci., v. 14, no. 6, p. 1276-1285, 1977.

A two-ship marine seismic system for recording sub-critical incidence reflected waves and refracted waves with penetration to the upper mantle has been developed. For the reflection data, velocity-depth models are based on analyses of correlatable phases and the  $T^2-X^2$  or ray parameter methods; for the refraction data, they are based on travelttime analysis and amplitude studies with the aid of synthetic seismograms. During 1973, DSS profile about 20 km in length were recorded off Queen Charlotte Sound and west of central Vancouver Island. Good resolution of horizons enabled possible correlation of the models with geological processes. The study is complete. During 1974, two reversed 75 km DSS profiles were recorded near Explorer ridge. The interpretation included crustal faulting, velocity gradients in the crustal layers, a thick crust which may be due to recent deformation of Juan de Fuca plate, and an anisotropic upper mantle. The study is complete. In 1975, a DSS survey consisting of three reversed profiles was carried out over Winona basin west of northern Vancouver Island. Interpretation of the 90 km profiles along the basin is nearly complete and shows a sub-bottom crustal thickness of more than 15 km. Interpretation of the two 55 km profiles across the basin is in progress.

578. LOGAN, A., Univ. New Brunswick-St. John (Geology): Ecology and systematics of reef brachiopods (Recent) from the Caribbean, 1975-77.

579. LOGAN, A., NOBLE, J.P.A., Univ. New Brunswick-St. John (Geology): Ecology of Recent Mediterranean brachiopods, 1977-80.

580. MACLEAN, B., Geol. Surv. Can.: Eastern Baffin Island shelf bedrock and surficial geology mapping program, 1976-.

581. PIPER, D.J.W., Dalhousie Univ. (Geology): Deposition by turbidity currents in the oceans, 1976-.

582. PIPER, D.J.W., AKSU, A.E., Dalhousie Univ. (Geology): Quaternary sedimentation and paleogeography of Baffin Bay, 1976-79; Ph.D. thesis (Aksu).

583. PIPER, D.J.W., ALAM, M., Dalhousie Univ. (Geology): Quaternary paleoclimates in the Grand Banks region, 1975-78; Ph.D. thesis (Alam).

584. PIPER, D.J.W., KEEN, M.J., LETSON, J.R.J., KEPKAY, P.E., Dalhousie Univ. (Geology): Geological studies of Atlantic coastal bays in Nova Scotia, 1974-79; Ph.D. thesis (Kepkay), M.Sc. thesis (Letson).

585. PIPER, D.J.W., STOW, D.A.V., Dalhousie Univ. (Geology): Late Quaternary sedimentation on the Laurentian fan and Scotian Margin, 1974-77; Ph.D. thesis (Stow).

586. POMEROY, P.W., HALLS, H.C., HUTCHINSON, D.R., Univ. Toronto (Geology): A marine seismic study of the Clarendon-Linden fault structure under Lake Ontario, 1976-77; M.Sc. thesis (Hutchinson).

A compilation of historic and recent seismic activity in western New York State shows an association of epicenters with portions of the north-south trending Clarendon-Linden fault structure. This research project involved a marine seismic profiling investigation of the Lake Ontario bottom sediments to search for the northward continuation of the fault across the lake. Two high resolution seismic systems (7 kHz and Uniboom), a 1 in<sup>3</sup> (compressed air) Airgun and a proton magnetometer were used to collect over 400 km of data in April 1976. The data will be used with the Canada Center for Inland Water's core data and the Geological Survey of Canada seismic data to compile a seismic stratigraphy for the lake, an inferred Quaternary history of the lake, and an analysis of the suspected fault structure.

587. UMPLEBY, D.C., Geol. Surv. Can.:  
Regional subsurface geology, continental shelf and slope, offshore Labrador, Baffin Island and related areas, 1976-.

588. YORATH, C.J., Geol. Surv. Can.:  
Marine geology, District of Franklin, 1973-77.

#### MINERAL/ENERGY GEOSCIENCE

##### COAL GEOLOGY

589. BELINKO, K., CIAVAGLIA, L., NANDI, B.N., CANMET (EMR):  
Coking characteristics of the various constituents of Athabasca bitumen, 1976-77.  
  
The fractions of the bitumen which contribute the most significantly to coke formation during thermal hydrocracking of bitumen appear to be the asphaltenes and the heavy aromatic oils. These two fractions have differing coking properties which result in distinct coke structures during carbonization. The mechanism of coking of the asphaltenes and the heavy aromatic oils will be investigated in order to ascertain the differences in coke structure. The deposition of coke precursors (e.g., asphaltenes and heavy oils) on coal fragments has been observed during thermal hydrocracking of bitumen. Some preliminary studies have shown that the process appears to be highly sensitive to the type of coal used and possibly to the inorganic composition of the coal. This effect is being investigated using various coals of different ranks.
590. BIRMINGHAM, T.F., Geol. Surv. Can.:  
Petrographic analyses of coal seams in the Kootenay Formation of southeastern British Columbia, 1975-77.
591. BOTHAM, J.C., GARDINER, W., JORGENSEN, J.G., LLOYD, T.A., MONTGOMERY, W.J., CANMET (EMR):  
Evaluation of Canadian coking coals.  
  
**See:**  
Coking coals of Eastern Canada differ from those of the west; Northern Miner, p. A5-A7, 22 April 1976.  
  
Full potential of Canadian coking coals still to be realized growing demand in World and domestic markets; Northern Miner, Ann. Rev., p. C23-C30, 25 Nov. 1976.
592. BROUGHTON, P.L., Cambridge Univ. (Geology):  
Coal seam genesis and sedimentology of the Paleocene Ravenscrag Formation of southern Saskatchewan, 1977-79; Ph.D. thesis.  
  
To evaluate the coal seam genesis within the basin environments of the Paleocene Ravenscrag Formation of southern Saskatchewan and to determine the relationships of the coal seams to the local and regional sedimentological and structural framework.
593. BROUGHTON, P.L., WHITAKER, S.H., IRVINE, J.A., Saskatchewan Geol. Surv.:  
Coal resources of southern Saskatchewan, 1972-77.
594. GUNTHER, P.R., Geol. Surv. Can.:  
Correlation of hydrocarbon occurrences and the nature of dispersed organic material in the Mackenzie Delta area, 1974-.  
  
**See:**  
A study employing optical methods to evaluate organic metamorphism and oil-generating potential of sediments in the Mackenzie Delta area, District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 143-152, 1976.

595. GUNTHER, P.R., Geol. Surv. Can.:  
Optical properties of coals and dispersed organic materials, 1975-.  
  
**See:**  
Devonian coal in the subsurface of Great Slave Plain: a guide to exploration for oil and gas; Geol. Surv. Can., Paper 77-1A, p. 147-150, 1977.
596. GRAHAM, P.S., Geol. Surv. Can.:  
Evaluation of coal deposits in western and northern Canada, 1976-.  
  
To establish a coal resource base from which quantitative, qualitative, mineability and environmental studies can be made.
597. HACQUEBARD, P.A., Geol. Surv. Can.:  
Rank and petrographic studies of coal and organic matter dispersed in sediments, 1968-.
598. HACQUEBARD, P.A., Geol. Surv. Can.:  
Microscopic study of pyrite in main seams of Sydney coalfields, Nova Scotia, 1975-.
599. HOLTER, M.E., CHU, M., Alberta Research Council (Geology Div.):  
Geology and coal resources of southeastern Alberta, 1976-77.  
  
Investigations of relatively deep coal resources of southeastern Alberta show that four Upper Cretaceous coal zones are of interest. Two zones in the Foremost Formation, the McKay and overlying Taber, are widespread throughout the area. Seams are generally thin although coal beds in the Taber are locally thick in the Lake Newell, Medicine Hat and Pakowki Lake areas. The Lethbridge zone, a prominent coal horizon at the top of the Oldman Formation, is present on both east and west flanks of the Sweetgrass Arch. It shows significant development for commercial interest only on the west flank of the structure, in the Lethbridge area. Coal seams associated with the Horseshoe Canyon Formation are thick in a region north of Tp. 17. Cross sections illustrate structural and stratigraphic relationships of the late Cretaceous sediments, emphasizing the character of the included coal zones. Coal seam thickness maps are presented including indications of the best seam thickness and the aggregate footages of all seams 3 feet or more thick, in each testhole.
600. MCLEAN, J.R., Geol. Surv. Can.:  
Lithostratigraphy and sedimentology of the coal-bearing Blairmore Group in the Rocky Mountain Inner Foothills Belt, Alberta, 1976-.  
  
**See:**  
An occurrence of coal in the Blairmore Group on Waiparous Creek, central foothills, Alberta; Geol. Surv. Can., Paper 77-1A, p. 151-154, 1977.
601. NANDI, B.N., BELINKO, K., CIAVAGLIA, L., CANMET (EMR):  
Alkane distribution of eastern and western Canadian coals, 1977.  
  
It has been observed by several European Coal Scientists that certain types of paraffinic and bituminous materials are present in coal. The

bitumen content of coal influences not only the carbonization properties but the behaviour of coal during hydrogenation and partial gasification. A certain type of black materials are present in western Canadian coals. This black substance gave a yellow fluorescence when a combination of mercury lamp and a blue filter was used. European scientists reported that this fluorescence originated from the paraffinic and bituminous materials. The generation and decomposition of petroleum-like substances in coal seams appear to have an important influence upon certain coal properties, i.e. agglomeration. The aim of the new project is to investigate quantitatively the distribution of paraffinic material (alkanes) in both eastern and western Canadian Coals.

602. NANDI, B.N., CIAVAGLIA, L., CANMET (EMR):  
Effect of depth of cover on coking properties of coal, 1977.

In our previous study on the Lingan Seam, it has been observed that the coking properties, fluidity and dilatation increased with the depth of cover. This study was further extended to another 2 seams namely, Devco No. 26 and Phalen Seams. The samples were taken at different depths from the surface to 3000 ft. Anomalous results were obtained with the increase of depth (in these 2 seams). Further studies of the causes of this anomaly are being carried out on freshly acquired samples at different depths (from 2200 to 3000 ft.).

603. SMITH, E.W., GILLIS, K.S., Nova Scotia Dep. Mines:  
Coal inventory survey, 1974-.

Diamond drilling plus compilation of economic information has been done on several coalfields in Nova Scotia.

604. WHITAKER, S.H., Saskatchewan Res. Council (Geology):  
Saskatchewan lignite resources evaluation program, 1971-77.

To determine the geologic framework for the Ravenscrag Formation in which most of the coal occurs; to outline areas of important coal occurrences, to determine the quality and quantity of coal on a seam by seam basis.

605. WILLIAMS, G.D., FLINT, D.W., PROUDFOOT, D.N., Univ. Alberta (Geology):  
Western Canada coal resource data base, 1972-77; M.Sc. thesis (Flint).

Development and application of computer techniques for mapping and estimation of quantities of coal resources in western Canada on the basis of borehole data.

#### INDUSTRIAL MINERALS

606. BARNETT, D.E., BRINSMEAD, R.A., FINAMORE, P., New Brunswick Dep. Nat. Res. (Mineral Res. Br.):  
Granular resources of the Bathurst-Belledune region, New Brunswick, 1976-77.

A granular resource inventory of the Bathurst-Belledune region including parts of NTS sheets 21P/12, 21P/5, 21P/13, 21O/9, 21O/16, showed over 100 million tons of sand and gravel in the region. Projected demand and supply indicate that there should be no shortage in the next ten years. With adequate land-use planning taking into account the location of the deposits most of the resource will be available for use.

607. BELL, K.E., ZEMGALS, L.K., RILEY, G.W., CANMET (EMR):

Ceramic clays and shales of western Canada, 1973-77.

608. BURWASSER, G.J., FRASER, J.Z., COWAN, W.R., Ontario Division Mines:  
Granular resources extractive recommendations, 1976-.

Reports are being produced on a township basis for all townships designated under the Pits and Quarries Control Act (1971) and for additional townships on request that include computed possible tonnages of stone and granular aggregate resources, maps of their distribution (scale 1:50 000), and recommendations to planners regarding priorities of deposits for zoning considerations.

609. CHRISTIE, R.L., Geol. Surv. Can.:  
Geology of bedded phosphate deposits in Canada, 1976-.

610. DEAN, R.S., CANMET (EMR):  
Mineralogy of clays and shales in Canada, 1958-.

#### See:

Clay mineral investigations, Atlantic Provinces, Canada; CANMET Lab. Rep. MRP/MSL 76-22(C), 1976.

(1) Mineralogy of ceramic clays and shales of Prairie Provinces to complement previous work in Ontario, Quebec and the Atlantic Provinces.  
(2) Clay mineralogy investigations of Paleozoic and Mesozoic shales and slates within Nova Scotia and southern New Brunswick. An attempt is being made to determine the factors influencing the occurrence of high-alumina clays within this region as part of a continuing search for non-bauxitic sources of alumina.

611. FOWLER, J.H., DICKIE, G.B., Nova Scotia Dep. Mines:  
Sand and gravel survey, 1974-.

All survey work has been completed on a preliminary level with 1:50 000 maps being prepared to illustrate occurrences and 1:125 000 maps showing extent of sand and gravel deposits.

612. GODFREY, J.D., Alberta Research Council (Geology Div.):

Feasibility study of the Fort Chipewyan granite as a building stone, 1972-.

613. HAMILTON, W.N., BAINEY, S.J., Alberta Research Council (Geology Div.):  
Economic minerals map of Alberta, 1975-77.

#### See:

Industrial minerals: Alberta's uncelebrated endowment; Proc. vol., Eleventh Forum on the Geology of Industrial Minerals, Montana Bur. Mines, Sp. Pub. 74, 1976.

All known deposits or occurrences have been compiled. Map editing is in progress. A system of coding and cross indexing to mineral deposit lists and information sources is in preparation.

614. KRAMERS, J.W., BROWN, R.A.S., Alberta Research Council (Geology Div.):

Survey of heavy minerals in the surface mineable area of the Athabasca oil sand deposit, Alberta, 1974-76.

#### See:

Survey of heavy minerals in the surface mineable area of the Athabasca oil sand deposit; Bull. Can. Mining Metal., v. 69, no. 776, 1976.

Samples from seven test wells distributed throughout the surface-mineable area of the Athabasca Oil Sands have been evaluated to determine the amounts of heavy minerals present at the titanium and zirconium contents. The samples were treated to yield the size distribution of the titanium and zirconium minerals as well as their spatial distribution. The study has shown that heavy minerals are found throughout the surface-mineable area; concentrations range from 0.24 to 2.29 percent (by weight), with a mean of 1.02 percent. Titanium and zirconium contents vary throughout the area, and are found preferentially in the finer size fractions. On the basis of preliminary calculations, the tailings streams from an oil sands plant would provide sufficient feed for a large-scale titanium pigment plant, and the tailings from one plant would provide sufficient zircon feed to satisfy Canadian demand for metallic zirconium. Variability of the heavy mineral content and composition is such that the heavy mineral potential must be evaluated in detail for each mine site.

615. MCLAWS, I.J., Alberta Research Council (Geology Div.):

Silica sand in the Fort McMurray area, Alberta, 1973-77.

Analytical work has been completed on samples of oil sand tailings, unsaturated McMurray Formation sands, alluvial and dune sands. All samples have been washed, screened, examined microscopically and analysed for silica and various impurities. Further beneficiation involving heavy liquid separation, magnetic separation, acid leaching and/or flotation were performed on selected samples.

616. MURRAY, D.A., FELDERHOE, G.W., Nova Scotia Dep. Mines:

Industrial mineral survey, 1974-.

Basic data on industrial minerals has been compiled on mineral occurrence data cards. Field surveys have been completed on barite-celestite-fluorite deposits and compilation of data is proceeding on this and on limestones and dolomites in Nova Scotia.

617. SANFORD, B.V., Geol. Surv. Can.:

Salt basins of Canada, 1975-.

618. SCAFE, D.W., HAMILTON, W.N., Alberta Research Council (Geology Div.):

Potential industrial clays of Alberta, 1973-79.

Little excitement was generated by testing samples from the glaciolacustrine deposits of the Edmonton-Hinton-Manning Triangle. An exception was the samples along Highway 35 in the North Star-Chinook Valley area. These samples show good plasticity, workability, and they dry successfully. Their firing range is longer than for samples collected from other areas and fired color is the moderate reddish-brown typical of other glaciolacustrine clays tested. This material should be of interest to brick makers and local potters. Clays associated with the coals of the Kootenay Formation in the Crownsnest Pass area give PCE values that are in the stoneware range. Samples tested were very hard and developed little plasticity but should be good as grog material in stoneware bodies.

619. TROYER, D.R., GULIOV, P., Saskatchewan Geol. Surv.:

An inventory and classification of the provincial peat reserves for possible future use as an energy source, 1976-.

To complete an inventory of the Province of Saskatchewan's peat reserves, using Radforth's Muskeg Classification and air photo interpretation systems to classify and map the peat localities.

620. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:

A survey of Newfoundland clay deposits, 1974-77.

Initial sampling was carried out in 1974 and firing tests during the fall of 1974. Further field evaluations and re-sampling of sites selected for their potential as a source of clay for commercial ceramic production were carried out during 1975. These latter samples were subjected to particle size analyses and quantitative mineralogical studies. On the basis of the field and laboratory evaluations it has been determined that six sites are satisfactory for commercial clay production (brick or pottery) and an additional six sites have potential for limited production or use. All clays tested, fired to a red or brown color.

621. VOS, M.A., Ontario Division Mines: Building stones of Ontario: Pt. III, Marble (revision), 1976-78.

Analytical work of marble samples partly completed.

622. WHITEHEAD, M.B., RUSSELL, G.A., Univ. Manitoba (Earth sciences), Manitoba Dep. Highways:

Determination of hydrated cement in set cured Portland cement concrete by differential thermal analysis (DTA), 1972-76.

#### MINERAL DEPOSITION EXPLORATION/EVALUATION

623. APPELYARD, E.C., BOWLES, E.G., Univ. Waterloo (Earth Sciences):

Alteration at the West Mine, Pilley's Island, Newfoundland, 1976-77; M.Sc. thesis (Bowles).

624. ARTH, J., Univ. Toronto (Geology):

Rare earth elements in komatiites and tholeiites of Munro Township and a model for their genesis, 1974-77.

Field and major element studies in Munro Township have suggested that komatiites are the result of the melting of a mantle source that has already undergone an earlier stage of melting. Their very magnesian nature, high Ni and Cr and low Ti and Mg/Fe ratio are explicable in this way. This study of REE, Sc, Ba, Sr, and RC is providing confirmatory evidence of this hypothesis.

625. ASSAD, J.R., FAVINI, G., Université Laval:

Analyse critique des stratégies d'exploration pour les sulfures massifs, avec emphase sur le rôle-clef de la fonction décisionnelle, 1974-.

Analyse critique des stratégies d'exploration pour les sulfures massifs au Canada. Cerner et identifier les mythes et les réalités à l'intérieur des stratégies conventionnelles, leurs points forts et leurs lacunes. Souligner le rôle-clef de la "fonction décisionnelle" dans une exploration plus effective basée sur un tamisage à niveaux multiples (gravité, aéromagné., topog. hydrographie et géophysique ponctuelle).

626. AYRES, L.D., Univ. Manitoba (Earth Sciences): Setting Net Lake porphyry molybdenum deposit, Ontario, 1975-79.

The deposit, which consists of molybdenite-pyrite-quartz veins in a tilted granodiorite-quartz monzonite stock, is surrounded by a

- metamorphosed alteration zone. Studies are in progress to better document the nature of the alteration and mineralization.
627. BAADSGAARD, H., CUMMING, G.L., HOEVE, J., SIFFORD, T., Univ. Alberta (Geology), Saskatchewan Res. Council, Sask. Dep. Mineral Res.:  
Geochemical and isotopic study of the uranium deposits of Saskatchewan, 1977-.
- Detailed investigations of the time and mode of origin of the uranium deposits in Saskatchewan are planned. Correlative studies made when future data accumulation warrants such studies should cast light on the genesis of the deposits in the Wooleston Lake Belt, in particular. The initial work will concern the Rabbit Lake deposit, but a look at all major and possibly much minor uranium mineralization will be investigated to give a regional overview.
628. BECK, L.S., ZIEGLER, M.J., Saskatchewan Geol. Surv.:  
Exploration data maps, 1975-77.
- See:**  
Sask. Geol. Surv., Summ. Investig. 1976, p. 149.
- A series of maps at a scale of 1:15 840 is being compiled showing geological and other information of value to uranium exploration in the Uranium City-Beaverlodge mining area, Saskatchewan.
629. BELANGER, J., GUHA, J., WOUSSEN, G., ARCHAMBAULT, G., Univ. du Québec à Chicoutimi:  
Déterminer les caractéristiques géologiques et géochimiques de la minéralisation cu-zu et de la roche encaissante de la mine Cooke, Chapais, Québec, 1975-77; thèse de maîtrise (Belanger).
630. BELL, R.T., Geol. Surv. Can.:  
Geology of uranium resources of Canada, 1975-.
- See:**  
Geology of some uranium occurrences in Yukon Territory; Geol. Surv. Can., Paper 77-1A, p. 33-38, 1977.
631. BREAKS, F.W., BOND, W.D., BARLOW, R.B., Ontario Division Mines:  
Mineral exploration-evaluation, English River Subprovince, Ontario, 1977-.
- Evaluation of geological controls on uranium, and lithium-cesium-beryllium mineralization both within the English River Subprovince and contiguous portions of Uchi and Wabigoon Subprovinces, in order to provide guidance for future mineral exploration.
632. BRISTOL, C.C., CHORNOBY, J., HOLMES, G., SPEAKMAN, D., Brandon Univ. (Geology):  
Geology of the Ruttan Orebody, Manitoba, 1975-77.
- To determine the nature of occurrence, the sulphide mineralization and origin of the orebody (is it a volcanogenic Cu-Zn orebody, what rocks is it associated with, etc?) and establish a model for further exploration.
633. BROWN, A.C., Ecole Polytechnique:  
Stratiform red-bed copper in the Carboniferous of the Maritime Provinces, 1974-77.
634. BROWN, A.C., BARTHOLOMÉ, P., Ecole Polytechnique, Univ. Liège:  
The genesis of non-ferrous stratiform ores, 1970-.
- See:**  
The Long Lake zinc deposit, Frontenac County, Ontario; Mineral Expl. Res. Inst. (Montreal), Case History 77-2.
- A long term evaluation of stratiform base metal and uranium ores with the intent to define the geologic controls of mineralization and hence delineate geologic guides for exploration.
635. CHEVÉ, S., BROWN, A.C., Ecole Polytechnique:  
Metallogeny of massive sulfide deposits, Megantic area, Québec, 1974-77; M.ScA. thesis (Chevé).
- Detailed mapping has led to the definition of the paleogeologic of the volcano-sedimentary pile around the Clinton massive sulfide copper-zinc deposits.
636. CLOSS, L.G., COLVINE, A.C., Ontario Division Mines:  
Geology and geochemistry of pyritic and graphitic volcanogenic sediments and their relationship to massive sulphide deposits, 1975-.
- See:**  
Geology and geochemistry of pyritic and graphitic volcanogenic sediments and their relationship to massive sulphide deposits; Ontario Div. Mines, Misc. Paper 67, p. 165-168, 1976.
637. COAD, P.R., ROBERTSON, J.A., Ontario Division Mines:  
Nickel deposits associated with ultramafic rocks of the Abitibi Belt, Ontario, 1975-77.
- Most nickel sulphide deposits in the Abitibi greenstone belt appear to be of the volcanogenic type, being located in extrusive ultramafic flows forming an intricate part of Archean eugeosynclinal volcanism. Deposits of this association include the Langmuir, Texmont and Hart deposits. The Alexo, Sothman and McWatters deposit represent deposits which occur in thin lenticular lenses of dunite with pyroxene-rich peridotitic margins. The exact mode of emplacement of this type of deposit has not been previously documented, however certain features at the Alexo deposit would suggest an extrusive origin. All the deposits belong to the komatiitic magma suite and all but the Alexo appear to occur at one stratigraphic level near the base of the Tisdale Group. Features observed at these deposits and other nickel sulphide deposits in the various shield areas of the world suggest a magmatic-volcanic-exhalative origin. Various nickel deposits in Australia, Canada and South Africa indicate that both intrusive and extrusive komatiites may host nickel sulphide mineralization however the latter is a more common host. Although layered ultramafic intrusions are generally barren of significant nickel-mineralization, they generally underlie extrusive ultramafics and in this respect may be useful in the exploration for volcanogenic nickel sulphide deposits. In volcanic piles where both layered intrusive and extrusive ultramafics are in close proximity, it is the extrusive environment which generally hosts significant mineralization. It is important to realize that mafic intrusions and layered intrusions representative of the tholeiitic magma suite may host rich concentrations of both copper and nickel mineralization. A number of features may be considered when exploring for volcanogenic nickel sulphide deposits however stratigraphic position, type of ultramafic and geological environment appear to play the most important roles in localizing deposits of this type.

638. COLVINE, A.C., Ontario Division Mines:  
Geology of copper, zinc, lead deposits in Ontario, 1974-.
639. COOLEN, P., Sask. Geol. Surv.:  
Mineral deposits index, northern Saskatchewan, 1976-77.
- See:**  
The Saskatchewan mineral deposits index; Sask. Geol. Surv., Summ. Investig. 1976, p. 150.
- An index is being compiled of all known mineral deposits in northern Saskatchewan. Each mineral deposit is being briefly described, catalogued and plotted on 1:250 000 maps. Upon completion this index will be a key to the location of deposits mentioned in the literature and will be a base for a more descriptive mineral file, similar to that of the National Mineral Inventory.
640. DAWSON, K.R., Geol. Surv. Can.:  
Geology of barium, fluorine and strontium deposits in Canada, 1972-.
641. DUNSMORE, H.E., Geol. Surv. Can.:  
Geology of uranium resources of Canada, 1976-.
642. ECKSTAND, O.R., Geol. Surv. Can.:  
Geology of Canadian nickel and platinum group deposits, 1963-.
643. GAUTHIER, A., WOUSSEN, G., PERRAULT, G., NAGY, A., Univ. du Québec à Chicoutimi, SOQUEM:  
Evaluation du potentiel économique d'une zone de terres rares des complexes ignés de carbonatite de St-Honoré et de St-André, Québec, 1975-77; thèse de maîtrise (Gauthier).
644. GAUTHIER, M., BROWN, A.C., Ecole Polytechnique:  
Metallogeny of zinc mineralization in the Grenville Supergroup of Québec, 1977-79; M.Sc.A. thesis (Gauthier).
- A familiarization study of the Balmat ore, New York is now in progress, and field work in the Maniwaki area of Québec will begin in 1977.
645. GHORASHIZADEH, M., HAYNES, S.J., Brock Univ. (Geological Sciences):  
Relationship of supergene zones to dyke locations, Sar Cheshmeh, Iran, 1976-78.
- To relate supergene zones of leaching, oxidation and enrichment to pre, intra and post Hypogene mineral dyke types. Studies are proceeding of the influence of dyke size, shape and attitude, as well as relative age and composition on the types of supergene alteration assemblages observed. Surface mapping and collection of data from tunnels and drillholes was completed in 1976. Laboratory studies of the mineral assemblages and plotting of all data with reference to the topography are currently underway.
646. GIBBINS, W.A., DIAND (Yellowknife):  
Carbonate hosted lead zinc deposits of the Northwest Territories, 1975-.
647. HAMILTON, W.N., Alberta Research Council (Geology Div.):  
Geology of the Clear Hills iron formation, Alberta, 1974-77.
- All drillhole and outcrop data have been compiled. Detailed correlations have been established. Petrologic studies are planned.
648. HARPER, C.T., Sask. Geol. Surv.:  
Northern iron ore exploration, Saskatchewan, 1975-77.
- See:**  
Sask. Geol. Surv., Summ. Investig. 1976, p. 104-114.
- The fieldwork in 1976 involved amongst other things mapping in detail of associated iron formation/volcanic sequences in the La Ronge belt. No substantial iron deposits have been outlined in the Shield area of Saskatchewan. The fieldwork was completed in 1976 and is being written up during the winter of 1976-77.
649. HARPER, C.T., Sask. Geol. Surv.:  
Uranium metallogenic studies - Cluff Lake, Saskatchewan, 1976-78.
- See:**  
Sask. Geol. Surv., Summ. Investig. 1976, p. 124.
- A study of the geological, geochemical and metallogenic features and regional setting of the uranium ore bodies of Amok Ltd. at Cluff Lake. Drill core, cross sections and nearby outcrops and trenches were examined in the short period available in the field in 1976. Detailed mapping will constitute much of the proposed 1977 work in the field.
650. HEBIL, K., STEVENSON, J.S., McGill Univ. (Geological Sciences):  
Petrography at the granite breccia, Levack Mine, Sudbury, Ontario, 1975-77; M.Sc. thesis (Hebil).
651. HOEVE, J., Saskatchewan Res. Council (Geology):  
Geology, geochemistry and genesis of Saskatchewan uranium occurrences, 1975-80.
- See:**  
Rabbit Lake uranium deposit; Saskatchewan Geol. Soc., Sp. Publ. No. 3, 1977.
- To investigate the genesis of Saskatchewan uranium occurrences by studies of the geology of ore horizons and adjoining areas, geochemistry and mineralogy of the ores and wall rocks, alteration, stable isotope and liquid inclusion geothermometry. Studies have been initiated at the Rabbit Lake deposit. Results to date indicate a complex history of primary ore remobilization with repeated episodes of faulting and alteration.
652. INNES, D.G., ROBERTSON, J.A., Ontario Division Mines:  
Geology of Ontario nickel deposits, 1976-.
- Involves the development of a data bank relating to nickel deposits and associated geological data for Ontario; use of these to classify types of deposits and determine criteria for their recognition; development of concepts on genetic processes that govern the relationships between deposit-types and their geological environments; and development of concepts to determine target areas and geological units favourable for the occurrence of each type of nickel deposit.
653. JEFFERSON, C.W., YOUNG, G.M., HODDER, R.W., LORD, C.C., Univ. Western Ontario (Geology):  
Stratigraphy, sedimentology and copper mineralization in the Little Dal, Redstone River and Coppercap Formations, Mackenzie Mountains, Canada, 1976-79; M.Sc. thesis (Jefferson).
- Field work is planned for the summer of 1977. New exposures of the Redstone River Formation will be examined in detail in order to determine the general and detailed paleogeography of the Redstone River Formation. Geochemical analyses of systematically collected samples will be important in determining the relationship of sedimentology and stratigraphy to the position and grade of copper deposits.

654. KESLER, S.E., MACDONALD, J.A., CUDDY, A., WILSON, J., Univ. Toronto (Geology):  
Metallogenic evolution of Island Arcs with special attention to Island Arc porphyry copper deposits, 1978-78; M.Sc. theses.  
Current research focusses on the gold content of mineralization at Cerro Colorado, Panama, the temperature of formation and fluid inclusion chemistry of the Granisle (B.C.) porphyry copper deposit, the fluid inclusion chemistry of the Naica (Mexico) chimney Pb-Zn-Ag ores and the origin of the Fresnille (Mexico) veins. Research by Kesler is aimed at characterization of early tholeiitic massive sulfide mineralization in the Greater Antilles (with an emphasis on Pueblo Viejo, Dominican Republic) and a cooperative lead isotope study of Central American and Mexican mineralization.
655. KIRKHAM, R.V., Geol. Surv. Can.:  
Geology of copper and molybdenum deposits in Canada, 1970-.
656. KLASSEN, R.A., Geol. Surv. Can.:  
Uranium drift prospecting techniques, lower Kazan River area, District of Keewatin, 1975-.
- See:  
Uranium exploration using till, District of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 471-477, 1977.
657. KWONG, J.Y.T., GREENWOOD, H.J., Univ. British Columbia (Geological Sciences):  
Deposition of copper mineralization in the prehnite-pumpellyite facies rocks of the White River Formation, Yukon Territory, 1976-79; Ph.D. thesis (Kwong).  
An understanding of the deposition of chalcocite and copper with prehnite and pumpellyite in Triassic volcanic rocks of the White River basin, Yukon Territory. Under study at present are the relevant mineral equilibria, mineral-solution interactions, and the distribution of mineralogy in the field. Fluid inclusions are also under study, but so far have proved to be too small to use effectively. Further mapping, sampling, microprobe analysis, and computation of equilibria are planned for the balance of the project.
658. LAIFA, E., BROWN, A.C., Ecole Polytechnique:  
Geologic character of uranium deposits in the Hoggar, Algeria, 1974-77; M.Sc.A thesis (Laifa).  
Study of wall-rock alteration and uranium mineralization in near-surface veins in the Precambrian Hoggar of Algeria is near completion.
659. LAZNICKA, P., ROBIN, E., CRAIG, C., Univ. Manitoba (Earth Sciences):  
Metallogenic studies in the Proterozoic belt of copper mineralization, Ogilvie and Wernecke Mountains, Yukon and adjacent Northwest Territories, 1976-78; M.Sc. thesis (Robin, Craig).  
See:  
Geology and mineralization in the Dolores Creek area, Bonnet Plume Range, Yukon; Geol. Surv. Can., Paper 77-1A, p. 435-439, 1977.  
Dolores Creek is an area of undispersed copper and subordinate cobalt and uranium-thorium mineralization, associated with breccias, diorite and syenite bodies and disturbance/alteration zones in the Helikian? core of northeastern Wernecke Mountains.
660. LEGGETT, S.R., BRISBIN, W.C., Univ. Manitoba (Earth Sciences):  
The geologic setting of Cu-Zn mineralization, Gemex showing, Heninga Lake, Northwest Territories, 1975-77; M.Sc. thesis (Leggett).
661. LUSTIG, G.N., BRISBIN, W.C., Univ. Manitoba (Earth Sciences):  
An analysis of the local stratigraphic and structural setting of the Cu-Zn mineralization at the Fox Mine, Lynn Lake District, Manitoba, 1976-77; M.Sc. thesis (Lustig).
662. MACDONALD, D.E., Alberta Research Council (Geology Div.):  
Alberta marl survey, 1976-77.  
The Alberta marl survey was commissioned by Alberta Agriculture to explore for and evaluate marl deposits in the province. Marl (being a soft, friable mixture of calcium carbonate and/or clay, sand, silt) has been found to be very effective in correcting acid soils located on agriculture land. It is the aim of this project to locate marl deposits, of useable size, in close proximity to these problem areas.
663. MACFARLANE, N.D., MOSSMAN, D.J., Univ. Saskatchewan (Geological Sciences):  
Economic geology of Neimeiben Lake ultrabasic intrusion, Saskatchewan, 1976-78.
664. MACLEAN, W.H., McGill Univ. (Geological Sciences):  
Partitioning of metals between sulfide and silicate liquids, 1970-78.  
See:  
The partition of Co, Ni, Cu and Zn between sulfide and silicate liquids; Econ. Geol., v. 64, p. 1049-1057, 1976.  
An experimental study on the partition of zinc and lead between silicate and sulfide liquids; Mineralium Deposita, v. 11, p. 125-132, 1976.  
Base metals partition between sulfide and silicate liquids, and in this way some metals are concentrated in magmatic sulfide ore deposits in economically recoverable amounts. Base metals, of the first transition metal series, beyond Mn, are preferentially partitioned to sulfide liquid. Those between Sc and Mn are partitioned to silicate liquids. The formation of strong molecular-orbital bands determines the sulfophile character of Fe, Co, Ni and Cu in these magmatic liquids. The partition of these elements is apparently controlled by liquid field stabilization energies which have their maximum effect on Ni and Cu, thus explaining the concentration of the metals in magmatic ores.
665. MACLEAN, W.H., MARTIN, R.F., WEBBER, R.G., MACGEEHAN, P.J., McGill Univ. (Geological Sciences):  
Petrography and geochemistry of the volcanic rocks at Matagami, Québec and their relation to enclosed massive sulfide deposits, 1974-77; Ph.D. thesis (MacGeehan).  
Study of the ore deposits and volcanic rocks on the north side of the Bell River Igneous Complex at Matagami, Quebec. The volcanic rocks have been chemically analysed, as have large gabbroic sills included in the volcanic pile. Both volcanic rocks and sills are tholeiitic in nature and exhibit extreme iron enrichment. Basalts are the most common volcanic rock and they exhibit varying degrees of alteration that ranges from silicification



and the addition of Na<sub>2</sub>O and K<sub>2</sub>O, to the depletion of Mg, Fe, Ca and Ti. These processes are related to the formation of the massive sulfide deposits at the tops of rhyolite formations.

666. MACLEAN, W.H., WEBBER, R.G., DAVIDSON, A., McGill Univ. (Geological Sciences):

Geochemistry and petrology of the Key Tuffite at Bell Allard, Matagami, Québec, 1975-77; M.Sc. thesis (Davidson).

The Key Tuffite was studied on either side of the Bell Allard massive sulfide deposit to determine if it changed petrographically or geochemically out from the orebody. A number of elements, including Cu and Zn were analysed for, and some of these, including Cu, Zn, Ag and Fe (mainly) were anomalous for about 400 feet out from the orebody. The Key Tuffite was divided into three petrographic units based on the material type and texture. Those units are traceable through most drill holes in the Tuffite, and each has its individual geochemical character. Thickness of the Key Tuffite also changes throughout the area. These parameters should assist in determining the proximity of orebodies.

667. MCALLISTER, A.L., OWSIACKE, L., Univ. New Brunswick (Geology):

Structure and stratigraphy Heath-Steele A-C-D-ore zones, New Brunswick, 1976-78; M.Sc. thesis (Owsjacke).

Initially to establish structural-stratigraphic relationships of ore zone, relation to B-zone, and finally complete data on environment of deposition.

668. MCALLISTER, A.L., SAIF, I., Univ. New Brunswick (Geology):

Correlation of Brunswick No. 6 and Key Anacon ore horizons, New Brunswick, 1974-77; Ph.D. thesis (Saif).

669. MILLER, C.K., ZENTILLI, M., Dalhousie Univ. (Geology):

Geological aspects of the Mindamar Mine, Stirling, Cape Breton, Nova Scotia, 1976-78; M.Sc. thesis (Miller).

670. MITCHELL, W.S., ZENTILLI, M., Dalhousie Univ. (Geology):

Distribution of uranium in "porphyry" ore environments, 1976-78; Ph.D. thesis (Mitchell).

Nuclear track techniques of mapping variations in the distribution and concentration of uranium in oceanic rocks have proved extremely sensitive indicators not only of primary magmatic variation but also of secondary hydrothermal and halmyrolytic alteration. Current research involves the application of similar techniques of uranium analysis to hydrothermal "porphyry" ore environments. Preliminary studies of the distribution of the element in the El Salvador porphyry copper deposit in Chile indicate that uranium concentrations may be related to zonal patterns of hydrothermal alteration. Rocks collected from various known porphyry copper ore deposits will be studied to establish uranium concentrations within hydrothermally altered zones of the deposits. This will provide information on the behaviour of uranium in hydrothermal ore systems and may aid exploration for copper, molybdenum or even uranium porphyry ore deposits.

671. MOORE, J.C.G., Mount Allison Univ. (Geology):  
Trace elements around sulphide bodies in New Brunswick, 1963-79.

672. MORTON, R.D., Univ. Alberta (Geology):  
Uranium deposits in western and northern Canada, 1968-.

See:

The western and northern U deposits-exploration guides or exploration deterrents for Saskatchewan?; Uranium in Saskatchewan Symp., November 9-10, 1976.

Magnetite-apatite intrusions and calc-alkaline magmatism, Camsell River, N.W.T.; Can. J. Earth Sci., v. 13, no. 2, p. 348-354, 1976.

673. MOSTAGHEL, M.A., HAYNES, S.J., Brock Univ. (Geological Sciences):

Genesis and distribution of Mississippi Valley-type ore occurrences in Middle Silurian strata, Niagara Peninsula, Ontario, 1976-77.

Studies of non-commercial occurrences of Mississippi Valley-type ore assemblages in Middle Silurian strata of the Niagara Peninsula have indicated that a multi-stage genetic model is more applicable than any particular single-stage model. Initial mineralization took place during the compaction-maturation phase of diagenesis, probably by upward movement of formation waters. During the hypergenesis phase, pre-existing sulphides were probably leached from their host rocks by downward moving groundwaters and precipitated near the water table. This process can be observed today.

674. MUIR, J.E., BUCHAN, R., GRAHAM, A.R., Falconbridge Nickel Mines Ltd.:

The Dundonald Nickel Deposit, Ontario, 1974-77.

Petrologic and rock geochemical studies are continuing on core samples selected from drillholes through the Dundonald Nickel Deposit of Falconbridge Nickel Mines in Dundonald Township near Timmins, Ontario. Petrographic and geological evidence to date suggests that the nickel mineralization is intimately associated with a series of peridotite flows and interflow graphitic sediments.

675. NALDRETT, A.J., FISHER, D., Univ. Toronto (Geology):

The petrology of Mt. Edwards nickel deposit, western Australia, 1973-77; Ph.D. thesis (Fisher).

The Mt. Edwards deposit occurs in partly serpentinized ultramafic rocks in a middle amphibolite facies Archaean terrain in Western Australia. The aim of the study has been to investigate the petrology of the silicate host rocks and the ores, and to establish their pre-metamorphism nature. From this it was hoped to develop a model that explains the origin of the deposits. The research has shown that the host rocks are komatiitic ultramafic flows. The stratigraphy of the pile in the vicinity of the orebodies has been established and the nickel sulphides were found to be depressions at the base of two thick, very magnesian peridotitic flows. It is postulated that the sulphides were extruded as a primary sulphide liquid, intimately mixed with the silicate magma and that the denser sulphide droplets settled to the base of the flow and pooled in depressions on the underlying surface.

676. NALDRETT, A.J., GREEN, A.H., Univ. Toronto (Geology):

Langmuir nickel deposit, Timmins, Ontario, 1974-78.

- Initial studies suggested that the Langmuir nickel deposit formed by the accumulation of nickel sulphides at the base of the first three ultramafic flows of the Tisdale Group. Mining and exploration of this deposit provides an excellent opportunity 1) to study the lowermost units of ultramafic komatiitic piles, whose nature is controversial and 2) to test more thoroughly the magmatic nickel model, which has not satisfactorily explained certain ore compositions, ore textures, footwall rock types and structural relations observed in deposits of this class. At Langmuir very good evidence from ore compositions, spinifex and related textures, ore localisation in paleotopographic lows and fault bound troughs, suggest a magmatic origin for the contact mineralization. However the lower grade hanging wall mineralization lacks these features and its origin is under investigation.
677. NALDRETT, A.J., THOMPSON, J.F.H., Univ. Toronto (Geology):  
Geology of the Vakkerlien nickel deposit, Kuikne, Norway, 1976-78; M.Sc. thesis (Thompson).  
The Vakkerlien nickel deposit is a highly deformed metagabbro resting in quartz-biotite schist. The schists belong to the Gula group of probable Cambrian age, the oldest group of the autochthonous Trondheim nappe. The project involves a detailed study of the metagabbro and surrounding schists with an aim of ascertaining the nature of the original igneous host rock, the relationship of the metagabbro to the Gula schists and the effect of subsequent metamorphism and deformation resulting in the present sulphide form and distribution.
678. RICHARDS, T.A., Geol. Surv. Can.:  
Geology and mineral deposits of McConnell Creek map-area, British Columbia, 1975-.
679. ROBERTS, R.G., HALL, B.V., Univ. Waterloo (Earth Sciences):  
Alteration of pillowed andesite, Amulet A deposit, Noranda, Quebec, 1976-77; M.Sc. thesis (Hall).  
To establish the chemical mass transfer within the host andesite, associated with the emplacement of the Upper Amulet A orebody; to examine the variation of alteration effects with distance from the centre of mineralization, and the alteration gradients within patterns.
680. ROBERTS, R.G., HARRIS, R., Univ. Waterloo (Earth Sciences):  
The volcanic and structural setting of gold vein deposits associated with volcanic and volcanicsedimentary rocks in the Canadian Precambrian Shield, 1975-78; M.Sc. thesis (Harris).  
Using the gold deposits of Timmins as an example, to determine the temporal relationship between the emplacement of the gold-bearing quartz-carbonate veins and the structural history of the area, and to establish the spatial relationship between the vein structures and volcanic lithologies.
681. ROBERTSON, J.A., Ontario Division Mines:  
Mineral potential evaluation in Ontario, 1973-.
682. ROBERTSON, J.A., Ontario Division Mines:  
Uranium and thorium deposits of Ontario, 1974-.
- See:**  
The Blind River uranium deposits: the ores and their setting; Ontario Division of Mines, Misc. Paper 65, 1976.
683. ROSE, E.R., Geol. Surv. Can.:  
Geology of titanium and titaniferous deposits of Canada, 1958-.
684. ROSE, E.R., Geol. Surv. Can.:  
Geology of vanadium deposits in Canada, 1963-.
685. ROSE, E.R., Geol. Surv. Can.:  
Geology of rare earth deposits of Canada, 1967-.
686. RUZICKA, V., Geol. Surv. Can.:  
Geology of uranium and thorium resources of Canada, 1975-.
- See:**  
Evaluation of uranium resources in the Elliot Lake-Blind River area, Ontario; Geol. Surv. Can., Paper 76-1B, p. 127-129, 1976.  
Conceptual models for uranium deposits and areas favourable for uranium mineralization in Canada; Geol. Surv. Can., Paper 77-1A, p. 17-26, 1977.  
Assessment of selected uranium occurrences and areas favourable for uranium mineralization in Canada; *ibid.*, p. 27-30, 1977.
687. SANGSTER, D.F., Geol. Surv. Can.:  
Geology of lead and zinc deposits in Canada, 1965-.
- See:**  
Some grade and tonnage relationships among Canadian volcanogenic massive sulphide deposits; Geol. Surv. Can.; Paper 77-1A, p. 5-12, 1977.  
A preliminary study of iron oxide and manganese oxide units associated with volcanogenic sulphide deposits, Sherbrooke area, Quebec; Geol. Surv. Can., *ibid.*, p. 13-14, 1977.
688. SANGSTER, D.F., Geol. Surv. Can.:  
A study of certain accessory elements in Canadian sulphide assemblages and minerals, 1973-.
689. SIBBALD, T.I.I., Sask. Geol. Surv.:  
Uranium metallogenic studies - Rabbit Lake, Saskatchewan, 1976-78.
- See:**  
Sask. Geol. Surv., Summ. Investig. 1976, p. 115-123.  
Detailed mapping and geochemical sampling was carried out in the mine pit at Rabbit Lake Gulf Minerals Mine and in the near environs. New ideas on the geology of the ore and of the metasediments of the Wollaston belt in this area were enunciated. The project will continue in the summer of 1977. (NOTE: Geochemical sampling and analysis were carried out through J. Hoeve of the Saskatchewan Research Council in 1976.)
690. STEWART, E.B., COLWELL, J.A., MOORE, R.G., Acadia Univ. (Geology):  
A study of the lead-zinc mineralization at Jubilee, Nova Scotia, 1977-78; M.Sc. thesis (Stewart).  
To study the stratigraphic control, paragenesis, and methods by which the ore fluids were introduced into the area, and to draw some conclusions as to the possible origin of the fluids responsible for the lead-zinc mineralization that occurs in the lowest member of the Mississippian (Visean) Windsor Group in Nova Scotia.
691. THORPE, R.I., Geol. Surv. Can.:  
Geology of silver and gold deposits in Canada, 1968-.

692. TREMBLAY, A., GUHA, J., ARCHAMBAULT, G., CHOWN, E.H., Univ. du Québec à Chicoutimi: Etude du contrôle structural de la minéralisation dans le "Hanging Wall Zone" de la mine Copper Rand, Chibougamau, Québec, 1976-78; thèse de maîtrise (Tremblay).
693. TREMBLAY, L.P., Geol. Surv. Can.: Geology of uranium resources of Canada, 1975-.
694. VOKES, F.M., Geol. Surv. Can.: Geology of zinc and lead resources of Canada, 1975-.
695. WAGNER, W., GUHA, J., CHOWN, E.H., ARCHAMBAULT, G., Univ. du Québec à Chicoutimi: Définir les caractères géologiques de la minéralisation aurifère de la mine Chibex, Chibougamau, Québec, 1975-77; thèse de maîtrise (Wagner).
696. WALKER, N.C., Sask. Geol. Surv.: Biogeochemical studies over the Key Lake uranium-nickel ore zone, Saskatchewan, 1976-77; M.Sc. thesis.

**See:**

Sask. Geol. Surv., Summ. Investig. 1976, p. 125-127.

To study the uranium and other trace element constituents of plants and trees associated with the Key Lake uranium deposit, as a possible aid to exploration in other areas. Variation in uranium and other element intake has been found between different species and between different parts of the trees and plants. Uranium concentration appears to be a significant factor in plants.

697. ZENTILLI, M., MITCHELL, W.S., Dalhousie Univ. (Geology):

Distribution of uranium in minerals from selected ore environments, 1976-78.

The distribution of U in minerals in rocks, ores and alteration assemblages from a variety of (predominantly) non-uraniferous ore environments is studied using induced fission-track techniques. Over 350 whole-rock and monomineralic samples have been analyzed and the distribution of U in polished surfaces of several samples has been "mapped". The study provides data on partition coefficients, on the behaviour of U in hydrothermal systems, and if some patterns prove to be consistent, they may be of possible use in exploration. We have studied fluorites from different associations, sulphides and other minerals from Mississippi Valley-type, volcanogenic massive sulphide type, porphyry type, and other environments, and also fresh and altered igneous rock suites.

**PETROLEUM EXPLORATION/EVALUATION**

698. AMAJOR, L.C., LERBEKMO, J.F., Univ. Alberta (Geology):

Correlation of the Viking Formation in central Alberta using bentonite time horizons, 1976-77; M.Sc. thesis (Amajor).

Precise time correlation of the Viking Formation in central Alberta is being undertaken as a basis for interpreting the depositional history and depositional environments. Bentonites are being used as the time correlative horizons by chemical identification, relying largely on X-ray fluorescence analysis.

699. CHESHIRE, S.G., WARDLAW, N.C., Univ. Calgary (Geology):

Geology and reservoir behaviour of the Meekwap Oil Field, Alberta, 1975-78; Ph.D. thesis (Cheshire).

All the available information from core analyses, drill stem tests and depletion studies has been compiled and is presently being used to explain the results of physical tests on cores (mercury injection capillary pressure tests, relative permeability tests and waterflood susceptibility tests) in terms of the pore geometry of specific reservoir facies within the producing zone. Preliminary studies of resin pore casts using a scanning electron microscope and approximately twenty mercury injection capillary pressure tests in our laboratory have been completed. Relative permeability studies are judged to be essential to the project and due to the ambiguous nature of the results of available commercial tests it is planned to undertake some relative permeability studies on critical reservoir facies from the producing zone. It is hoped to explain the results of various fluid tests in terms of pore geometry observed in scanning electron microscope studies and to further relate these results to variability of reservoir behaviour indicated by drill stem tests and field depletion studies.

700. CHI, B.I., BP Exploration Canada Ltd. (Geological): Exploration potential of Paleozoic formations, Peel Plateau area, District of Yukon and Northwest Territories, 1976-77.

The area covered by this project lies between 65° and 68°N latitude and between 132° and 136°W longitude. Detailed facies and depositional environments of Paleozoic strata are discussed. Stratigraphic correlations and nomenclature of the strata also are reviewed.

701. CUTT, B.J., LAVING, J.G., BP Exploration Canada Ltd. (Geological):

Tectonic elements and geologic history of the South Labrador and Newfoundland continental shelf, Eastern Canada, 1976.

Geophysical data and information from limited drilling operations on the Newfoundland and south Labrador Shelf indicate the presence of a thick sedimentary sequence, that ranges in age from presumed Paleozoic to Tertiary. A seismically distinctive unconformity marks the base of a wedge of Mesozoic and Cenozoic sediments typical of a trailing continental margin. The underlying rocks vary in age from Precambrian to Mesozoic. Both flat-lying and tectonically disturbed sediments can be identified beneath the unconformity. In at least one area the deformation can be attributed to halokinesis. Regional uplift, the local formation of horst and graben structures, and erosion were contemporaneous with initial continental rifting. Plate separation and the onset of sea floor spreading resulted in the rapid subsidence of the shelf and its subsequent burial by a continental terrace wedge of sediments.

702. GRANT, A.C., Geol. Surv. Can.: Geological interpretation of all pertinent geophysical data as an aid to basin synthesis and hydrocarbon inventory, 1974-.

703. GUNTHER, P.R., Geol. Surv. Can.: Optical properties of sedimentary organic materials in relation to oil and gas occurrences in the Sverdrup Basin, District of Franklin, 1975-.

704. HESLOP, A., Imperial Oil Ltd.: Wireline log responses in shaly sandstones, 1972-.

**See:**

Porosity in shaly sands: SPWLA, Sixteenth Ann. Logging Symp., June 4-7, 1975.

705. IWUAGWU, J.C., LERBEKMO, J.F., Univ. Alberta (Geology):  
Diagenesis of the Basal Belly River sandstone in Keystone 'B' Pool of the Pembina Field, Alberta, 1976-77; M.Sc. thesis (Iwuagwu).  
Detailed thin section analysis of a small area of the basal Belly River producing zone is being undertaken to assess the cause for seeming discrepancies between reservoir performance and predictions based upon mechanical logs. At the same time, the diagenetic history, particularly clay and carbonate cementation, is being evaluated in the hope of predicting the location of sandstone with good reservoir properties.
706. NANDI, B.N., CANMET (EMR):  
Analysis of organic sediments in oil exploration, 1975-77.  
**See:**  
Report of the "Commission Internationale Petrographique de la Matiere organique des sediments et application Geologiques" 1975-76, Internat. Comm. Coal Petrology, 1977.  
To initiate the study of fossil groups about which there is not yet enough known: algae, chitinozoans, acritarchs, zooplanktonic components, animal remains; to determine also the optical characters of amorphous particle such as vitrinite, secondary and primary bitumen in order to classify these materials in proper groups.
707. POTTER, W., FELDERHOF, H., Nova Scotia Dep. Mines:  
Oil shale survey, 1975-.  
Field investigations of oil shale deposits are basically completed. Thirty occurrences were mapped at 1:1320 and sampled.
708. POWELL, T.G., Geol. Surv. Can.:  
Diagenesis of organic matter and clay minerals in sediments in relation to petroleum generation, 1975-.
709. ROEGIERS, J.C., MCLENNAN, J.D., Univ. Toronto (Civil):  
Fracture-borehole interaction (geothermal energy), 1973-.  
Hydraulic fracturing is the technique which is presently used at Los Alamos Scientific Laboratory to try to extract energy from a hot-dry rock reservoir. Of primary importance is a desire to control the direction of propagation of such fractures as well as developing an awareness of the effects associated with fracture-fracture or fracture-borehole interactions. These phenomena are being examined in terms of computer and analytical models along with laboratory simulations. The results will be critically compared with existing field data.
710. STANTON, M.S., Chevron Standard Ltd. (Exploration):  
Chromatography of crude oils.
711. WARDLAW, N.C., Univ. Calgary (Geology):  
Reservoir properties of sedimentary rocks, 1972-.  
**See:**  
Pore geometry of carbonate rocks as revealed by pore casts and capillary pressure; Am. Assoc. Pet. Geol. Bull., v. 60, p. 245-257, 1976.  
Pore geometry in dolomites and its influence on capillary behaviour; Symp. Advances Pet. Recovery, Am. Chemical Soc., v. 21, no. 2, p. 231-242, 1976.
- Mercury capillary pressure curves and the interpretation of pore structure and capillary behaviour in reservoir rocks; Bull. Can. Pet. Geol., v. 24, no. 2, p. 225-262, 1976.  
The purpose of current research is to describe the three dimensional form of pore systems in selected sedimentary rocks and to relate differences of form to physical measurements of porosity, permeability, capillary pressure and oil-water saturations. Further, it is hoped to explain the origin of different types of pore systems in terms of the environment of formation and subsequent diagenesis and metamorphism of the sedimentary host rock. The components of rocks have been well studied but the three dimensional form of the spaces within rocks have received comparatively little attention and it is these which control the important reservoir properties of aquifers and hydrocarbon accumulations.
- GENERAL**
712. BLUSSON, J.L., Geol. Surv. Can.:  
Metallogeny of Selwyn Basin, 1973-.
713. CHATTERJEE, A.K., O'REILLY, G.A., Nova Scotia Dep. Mines:  
Metallogenesis and mineral deposits studies, 1974-.  
**See:**  
Geological data collection in the Nova Scotia Department of Mines; Nova Scotia Dep. Mines, Paper 76-2, 1977.
714. DAWSON, K.M., Geol. Surv. Can.:  
Metallogeny of the northern Canadian Cordillera, 1974-.  
**See:**  
Regional metallogeny of the northern Cordillera; Geol. Surv. Can., Paper 77-1A, p. 1-4, 1977.
715. FRANKLIN, J.M., Geol. Surv. Can.:  
Metallogeny of the southwestern part of the Canadian Shield, 1975-.
716. GALE, J.E., Geol. Surv. Can.:  
Subsurface containment of solid radioactive wastes, 1974-.  
**See:**  
Subsurface containment of solid radioactive wastes; Geol. Surv. Can., Paper 76-1B, p. 147-150, 1976.  
Preliminary evaluation of structural and groundwater conditions in underground mines and excavations; Geol. Surv. Can., Paper 77-1A, p. 39-43, 1977.  
A reconnaissance survey of several plutonic igneous bodies within Ontario; Geol. Surv. Can., *ibid.*, p. 387-392, 1977.  
Subsurface containment of solid radioactive wastes - A progress report; Geol. Surv. Can., *ibid.*, p. 393-398, 1977.
717. GOVETT, G.J.S., GOVETT, M.H., Univ. New Brunswick (Geology):  
Distribution, supply and demand for world mineral resources, 1970-.  
**See:**  
World mineral supplies - assessment and perspective, Elsevier, Amsterdam, 472 p., 1976.
718. GREGORY, D.J., Nova Scotia Dep. Mines:  
Mineral resource inventory and Canadian index to geoscience data, 1974-.

Compilation of basic data on approx. 700 metallic mineral occurrences is complete on manual data file cards. Preliminary occurrence locations are plotted on 1:250 000 NTS maps. Bibliographic data on unpublished exploration assessment material has been entered into the Canadian index to geoscience data.

719. JONES, B.E., Nova Scotia Dep. Mines:  
Eastern shore mineral resources survey, 1973-.

Examination of stratigraphy of Meguma Group (Ordovician) in relation to gold occurrences.

720. KISSIN, S.A., Lakehead Univ. (Geology):  
The genesis of silver deposits in the Southern Province of northwestern Ontario, 1976-.

a) To establish, by the application of modern analytical techniques, the mode of genesis of silver deposits in the Proterozoic rocks of the Thunder Bay District; b) to provide a modern mineralogical description of the deposits and their relation to the country rock; and c) to investigate possible relationships between these deposits and similar deposits in Proterozoic rocks of other areas.

721. LAZNICKA, P., Univ. Manitoba (Earth Sciences):  
Data on global metallogeny, 1967-.

This research is a result of realization that neither a crash-program supported by computer of a limited population of data, nor an intensive detailed study of a single type category or case of ore deposition in certain location, is able to identify correctly the sequences of conditions responsible for mineralization. Any successful study must be world-wide, embrace all types of ore deposits, and investigate all types of terraces, both ore-bearing and barren. The work is based both on processing of published data, and on our field study.

722. MIRKOVICH, V.V., CANMET (EMR):  
Nuclear waste disposal: Petrography and its relation to thermal properties of site rocks, 1976-79.

**See:**

Petrography of drill cores from the White Lake experimental test site, Ontario; CANMET Lab. Rep. MRP/MSL 76-341 (TR), 1976.

Thermal diffusivity tests on these rocks and others from different potential repositories. Purpose is to build up a log on different rocks in order to predict behaviour of similar rocks from other potential sites.

723. NALDRETT, A.J., CHOU, C.-L., HOFFMAN, E.L., Univ. Toronto (Geology):

The precious metal content of some nickel sulphide ores, 1975-78; Ph.D. thesis (Hoffman).

**See:**

Ultramafic and related mafic rocks: their classification and genesis with special reference to the concentration of nickel sulfides and platinum-group elements; *Econ. Geol.*, v. 71, no. 7, p. 1131-1158, 1976.

The precious metal content (including Pt, Pd, Ru, Os, Ir and Au but excluding Rh because of very short half life) of samples from three of Inco Ltd.'s nickel deposits, chosen because of their association with a variety of host rocks are being studied as part of a Ph.D. project. These deposits include the Little Stobie Mine (gabbroic), Pipe Mine (komatiitic) and Ely nickel deposit (troctolitic to anorthositic). The main objectives of the study are 1) to devise sampling and analytical methods for

determining the PGE content by radiochemical neutron activation techniques which will take into account the extreme variability within an individual sample; 2) to obtain the characteristic PGE content of different ore types within the chosen mines; 3) to relate the characteristic PGE values of the deposit to the host rock of that deposit; 4) to correlate PGE values to chemical composition of the ore and 5) to relate precious metal values to precious metal mineralogy.

724. NALDRETT, A.J., GARLAND, M., Univ. Toronto (Geology):

Study of the Manibridge Mine, Manitoba, 1975-77; M.Sc. thesis (Garland).

This nickel deposit is associated with a lens-like body of ultramafic rock in high grade gneisses. It is possible that the lens was emplaced, either as an intrusion and perhaps as a flow, before folding and metamorphism. There is some suggestion that irregularities in an original basal contact may have localized the sulfides. The purpose of the study is to investigate the lens and surrounding rocks with a view to throwing some light on this hypothesis.

725. NALDRETT, A.J., RAJAMANI, V., Univ. Toronto (Geology):

Partitioning of Ni, Cu, Co, Fe, and PGE between silicate and sulfide melts and sulfides and silicates at sub-solidus temperature, 1974-77.

The partitioning behaviour of transition metals such as Fe, Co, Ni, Cu and PGE's between sulfide liquid and silicate melts have been studied experimentally by Dr. Rajamani. He observed that all the four elements have strong affinities for the sulfide liquid relative to basaltic melt even at temperature above 1255°C and their relative sulfophile character is Fe < Co < Cu < Ni. His results also indicated that relative sulfophile character of Ni and Cu depends on the composition of silicate magmas - Cu < Ni for magmas less basic than a basalt and Cu > Ni for magmas more basic than a basalt. On the basis of these experimental results and extrapolating to ultramafic magma, he has proposed to model for the composition of Ni-Cu sulfide deposits. Using the same experimental techniques, he is investigating the partitioning of Pt-group metals between sulfide liquid and silicate melts. Also, Dr. Rajamani is studying the distribution of Fe, Ni and Co between olivine and (Fe-FeS) entatic liquid and between olivine and sulfide at subsolidus temperature.

726. NALDRETT, A.J., SCRIBBINS, R., Univ. Toronto (Geology):

Petrology of ultramafic and mafic inclusions in the sublayer of the Sudbury Nickel Irruptive, 1975-77; M.Sc. thesis (Scribbins).

The thesis involves study of mafic and ultramafic inclusions within the sublayer of the South Range of the Sudbury Irruptive. Textural and chemical characteristics will hopefully indicate whether the xenoliths are disrupted fragments of a layered intrusion or represent mantle nodules.

727. PERVEZ, U., STEVENSON, J.S., McGill Univ. (Geological Sciences):

Resource potential, Noranda area, Quebec, 1977-77; Ph.D. thesis (Pervez).

728. RIDLER, R.H., *Geol. Surv. Can.:*

Regional metallogeny and volcanic stratigraphy of the Superior Province, Ontario and Quebec, 1974-.

**See:**

Regional metallogeny and volcanic stratigraphy of the Superior Province; Geol. Surv. Can., Paper 77-1A, p. 197-198, 1977.

729. ROEGIERS, J.C., WILES, T., Univ. Toronto (Civil):  
Underground storage of radioactive waste.

The storage rather than the disposal of radioactive wastes involves fundamental different approaches in designing potential underground cavities. The long term stability at elevated temperatures requires the knowledge of the rock behaviour under those conditions. An attempt will be made to determine the thermal stress gradients generated by the waste containers. Finally, the influence of the stress gradient on the failure criterion will be determined from various laboratory experiments.

730. SAGE, R.P., Ontario Division Mines:  
Alkalic rocks and carbonatites of Ontario, 1974-79.

Maps and reports under preparation for the Poohbah Lake complex, Sturgen Narrows and Squaw Lake complexes, Wapikopa Lake complex, Schryburt Lake complex, Big Beaverhouse complex, Carb Lake complex, Nemogosenda Lake complex, Lackner Lake complex, Seabrook Lake complex, Shonango Lake complex, and Cargill complex.

731. SINCLAIR, A.J., CAMPBELL, S., Univ. British Columbia (Geological Sciences):  
Metallogeny in Kluane Ranges, Yukon, 1974-78; Ph.D. thesis (Campbell).

We are evolving a conceptual model for copper metallogeny in Permo-Triassic rocks of the Kluane Ranges. Detailed work has been concentrated on the White River native copper deposit, the Conalash Cu-Ni deposit and the Wellgreen Cu-Ni deposit. These are being studied with particular reference to ultramafic and mafic intrusions and Triassic volcanic rocks.

732. SOUTHER, J.G., Geol. Surv. Can.:  
Geothermal energy resources in Canada, 1973-.

**See:**

Geochemistry of thermal waters in the Mount Meager hot springs area, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 283-285, 1977.

### MINERALOGY/CRYSTALLOGRAPHY

737. BAYLISS, P., PRATT, L., Univ. Calgary (Geology):  
Crystal structure analysis of pyrite-type minerals, 1976-79; M.Sc. thesis (Pratt).

**See:**

Crystal structure refinement of arsenian ullmannite-Ni (As,Sb)S; Am. Mineralogist, v. 62, 1977.

To study the order-disorder effect of the non-metal atoms and the distortion effect of the metal atoms.

738. CABRI, L.J., CANMET (EMR):  
Mineralogical studies on new, poorly known, or unusual variants of platinum group elements and their deposits, 1971-78.

**See:**

Mineralogy and concentration of Au and Pt-bearing placers from the Tulameen River area in British Columbia; Bull. Can. Inst. Mining Metall., v. 62, no. 770, p. 111-119, 1976.

Two new palladium-arsenic-bismuth minerals from the Stillwater Complex, Montana; Can. Mineral., v. 14, p. 410-413, 1976.

733. SPRINGER, J.S., Ontario Division Mines:  
Ontario mineral potential, 4-mile series, 1975-78.

734. STEGER, H.F., FAYE, G.H., DESJARDINS, L.E., CANMET (EMR):

Oxidation of sulphide ores and minerals, 1973-77.

An analytical method has been developed to determine the sulphate and thiosulphate in oxidized samples of sulphide minerals and ores. Samples of pyrrhotite, pyrite, chalcopyrite, galena, sphalerite and chalcocite which were subjected to 52°C and 68% Rel. Humid. for up to 5 weeks are currently being analyzed for the various oxidized metal and sulphur-bearing components of the oxidation products to derive knowledge on the nature of the reaction(s), mechanism(s) and kinetic(s) of the oxidation of these sulphide minerals.

735. TIHOR, L.A., CROCKET, J.H., McMaster Univ. (Geology):

Gold in Archean greenstone belts: a genetic study by neutron activation analysis, 1973-80; Ph.D. thesis (Tihor).

Geochemical studies on the Kirkland-Larder Lake gold bearing carbonates suggest strong ultramafic affinities. Whole rock major element compositions are very similar to the bulk, chemical composition of peridotite. Certain trace elements characteristically high in ultramafics such as Co and Cr are high in these carbonates. Textures remarkably similar to spinafex are sometimes observed in the carbonates, one locality being the Kerr-Addison Mine. Drillcore logging shows a significant section of carbonate in the Larder Lake area to be conformably underlain by talc-chlorite schist which we interpret as an extrusive ultramafic. Rare earth element analysis and XRF determinations are in progress to further characterize the carbonate horizon.

736. WYNNE-EDWARDS, H.R., SINCLAIR, A.J., Univ. British Columbia (Geological Sciences):

Mineral commodity maps in British Columbia, 1975-77.

Ultramafic and related rocks: their classification and genesis with special reference to the concentration of nickel sulfides and platinum-group elements; Econ. Geol., v. 71, p. 1131-1158, 1976.

Glossary of platinum-group minerals; Econ. Geol., v. 71, p. 1476-1480, 1976.

The mineralogy of the platinum-group elements from some copper-nickel deposits of the Sudbury area, Ontario; Econ. Geol., v. 71, p. 1159-1195, 1976.

Arsenopalladinite from Itabira, Brazil, and from the Stillwater Complex, Montana; Can. Mineral., v. 15, p. 70-73, 1977.

739. CERNY, P., Univ. Manitoba (Earth Sciences):  
Mineralogy and petrology of pegmatites, 1971-.

Continuing study of the Tanco pegmatite was aimed at finalizing the investigation of beryl and pollucite. Accessory sulphidic mineralization, feldspars, zircon-hafnon, and the geochemistry of Tl and Ga are being studied. Crystal chemistry of beryl, pollucite, monazite group from southeastern



Manitoba, and petalite are examined. Feldspar studies concentrate on the petrology of feldspar crystallization in different paragenetic and geochemical types of pegmatites. Continuing study of the Greer Lake pegmatite group in southeastern Manitoba deals recently with feldspars, micas, and garnets.

740. CHEN, T.T., CANMET (EMR):

Mineralogy, geochemistry and distribution of silver and other trace elements in the Caribou deposit, New Brunswick, 1976-78.

To study the mineralogy, textures, and distributions of silver and other trace elements, with potential economic values, in the Caribou ores. These data would provide valuable informations on ore minerals for evaluating possible physical or chemical separation methods to maximize the metal recovery of the Caribou ores. Substantial studies on the mineralogy and textures of sulfides, and element distributions in tetrahedrite, sphalerite, and galena in ore samples have been made. Current studies are emphasized on the systematic variations of these features in the orebodies.

741. CLUFF, R.G., MOSSMAN, D.J., Univ. Saskatchewan (Geological Sciences):

Geology of Mt. Washington porphyry copper occurrence, Vancouver Island, British Columbia, 1974-77; M.Sc. thesis (Cluff).

742. DELL, C.I., CHEAM, V., Environment Canada (CCIW):  
Fibre content of Lake Superior sediments, 1976-78.

To determine the distribution, nature and origin of both anthropogenic and naturally-occurring asbestos fibres in Lake Superior sediments. Work is now underway to establish by electron microscopy and electron microprobe examination the distribution, concentration and mineralogy of asbestos fibres in Lake Superior sediments. Particular emphasis is being placed on distinguishing between contamination as a result of man's activities (i.e. The Reserve Mining Company) and the natural background levels.

743. DUKE, J.M., Geol. Surv. Can.:

Mineralogy of nickel deposits in serpentinized ultramafic rocks, 1975-.

See:

Mineralogy of serpentinized ultramafic rocks and associated nickel deposits; Geol. Surv. Can., Paper 77-1A, p. 15, 1977.

New occurrences of the hybrid sulphide Tochilinite; Geol. Surv. Can., Paper 76-1B, p. 65-69, 1976.

744. FERGUSON, R.B., Univ. Manitoba (Earth Sciences):

Detailed crystallography and chemistry of coexisting alkali and plagioclase feldspars from Manitoba granitic rocks, 1976-79.

To analyze coexisting alkali and plagioclase feldspars in plutonic and metamorphic granitic rocks from the Moak-Thompson and Bird River areas of Manitoba using X-ray diffraction powder and single-crystal methods, and microprobe and conventional chemical methods to attempt to correlate the orthoclase-microcline character of the K-feldspar and the low-high temperature character of the plagioclase with the compositions of the minerals themselves and of the whole rock.

745. FERGUSON, R.B., GRICE, J.D., HAWTHORNE, F.C., Univ. Manitoba (Earth Sciences):

The crystal structures of Tantalite, Ixiolite and Wodginite from Bernic Lake, Manitoba, 1970-76; Ph.D. thesis (Grice).

See:

The crystal structures of Tantalite, Ixiolite and Wodginite from Bernic Lake, Manitoba. I. Tantalite and Ixiolite; Can. Mineral., v. 14, p. 540-549, 1976.

The crystal structures of Tantalite, Ixiolite and Wodginite from Bernic Lake, Manitoba. II. Wodginite; *ibid.*, p. 550-560, 1976.

746. HAWTHORNE, F.C., FERGUSON, R.B., CERNY, P., GRUNDY, H.D., ITO, J., Univ. Manitoba (Earth Sciences):

Structure and chemistry of minerals, 1973-.

See:

The crystal chemistry of the amphiboles. IV. X-ray and neutron refinements of the crystal structure of tremolite; Can. Mineral., v. 14, p. 334-345, 1976.

Structure refinements of most of the major clinopyroxene types have been completed; various aspects of clinopyroxene stereochemistry are under investigation and several papers are in preparation. The structure of  $\text{Li}_2\text{Si}_2\text{O}_6$  has been completed together with an examination of structural variations in the alkali clinopyroxenes. Work is underway on the structures of several transition metal orthopyroxenes. Work continues on the arsenates and the structures of adamite, berzeliite, scorodite and roselite have been completed, and the structure of olivenite is currently being examined. The structure of a Li-Cs beryl has been refined to characterize the role of the alkali metals in the structure, a preliminary examination of refractive index variation in pegmatitic beryls has been completed, and a general study on the crystal chemistry and paragenesis of beryl is in progress. Similar studies on milarite have just been started.

747. HEFFERNAN, K.J., MOSSMAN, D.J., Univ. Saskatchewan (Geological Sciences):

Mineralogy of metalliferous sediments from the Atlantis II geothermal deep and the experimental recrystallization of these sediments under subgreenschist facies of metamorphism, 1974-77; M.Sc. thesis (Heffernan).

748. KAIMAN, S., CANMET (EMR):

Mineralogical investigations of uranium ores and process products.

749. KISSIN, S.A., Lakehead Univ. (Geology):

Crystal chemistry and stabilities of sulphide minerals, 1976-.

1) The refinement of an apparatus for the measurement of solid state electrochemical cells mountable on the x-ray precession camera.  
2) Mineralogical and stability studies on tin-bearing sulphide systems. a. The stannite ( $\text{Cu}_2\text{FeSnS}_4$ ) - ketterite ( $\text{Cu}_2\text{ZnSnS}_4$ ) pseudobinary system. b. The Cu-Fe-Sn-S system and the Cu-Zn-Sn-S systems.  
3) The crystal chemistry of the pyrrhotite group.

750. LAMBERT, R.St.J., BAADSGAARD, H., HOLLAND, J.G., CHAMBERLAIN, V.E., Univ. Alberta (Geology):  
The Malton gneiss complex, British Columbia, 1975-80.

751. LAMBERT, R.St.J., BRAME, S., Univ. Alberta (Geology):

Geology of the north-eastern border of the Nelson batholith, British Columbia, 1976-78; M.Sc. thesis (Brame).



752. LAMBERT, R.St.J., COX, J., Univ. Alberta (Geology):  
Geology of the north-western border of the Nelson batholith, British Columbia, 1976-78; M.Sc. thesis (Cox).
753. LAMBERT, R.St.J., HALL-BEYER, M., Univ. Alberta (Geology):  
Chemical petrology of some northern Saskatchewan granulites, 1975-76; M.Sc. thesis (Hall-Beyer).
754. LAMBERT, R.St.J., HALL-BEYER, B., HOLLAND, J.G., Univ. Alberta (Geology):  
Geochemistry of some ocean-floor basalts from central British Columbia, 1975-76.
755. LAMBERT, R.St.J., MARTINEAU, M.P., Univ. Alberta (Geology):  
The Big Spruce Lake nepheline syenite-carbonatite complex, Northwest Territories, 1966-80.
756. LAMBERT, R.St.J., NIELSEN, P.A., Univ. Alberta (Geology):  
Regional metamorphism in the Arseno Lake area, Northwest Territories, 1972-77; Ph.D. thesis (Nielsen).
757. LEPPARD, G.G., MUDROCH, A., ZEMAN, A., Environment Canada (CCIW):  
Comprehensive investigation of clay-sized sediment particles, 1977-78.
- To determine the details of true physical form of naturally moist sediment particles and morphologic changes during freeze-drying, air-drying and oven-drying; to determine morphology and chemical composition of cementing agents occurring within Lake Erie postglacial cohesive sediments. (a) Investigation of the suitability of the freeze-etch method for the determination of true physical form of clay-sized particles and interparticle cementing agents. (b) Investigation of changes in particle morphology during several drying methods (freeze-drying, critical point drying, air-drying, oven drying). (c) Biological analyses of preserved plankton and/or plant tissues in apparently cemented, CaCO<sub>3</sub> rich zones. (d) Geochemical, mineralogical and textural analyses of representative sediment samples from "cemented" and "uncemented zones". (e) Determination of compressibility and stress strain behavior of representative sediment samples by means of consolidation and triaxial tests.
758. MACEK, J.J., FERGUSON, R.B., SCOATES, R.F.J., AMBACH, H., Univ. Manitoba (Earth Sciences):  
New optical curves for the determination of composition and structural state of albite-twinned plagioclase crystals, 1971-77; Ph.D. thesis (Macek).
- Migration curves have been calculated and constructed that enable one to derive by classical U-stage methods the composition and structural state of two contiguous albite-twinned plagioclase lamellae where the two individuals are of different composition and/or structural state. Existing migration curves, one for low-temperature and the other for high-temperature plagioclases, are based on the assumption that contiguous albite-twinned lamellae are identical, and this has resulted in the widely observed optical crystallographic scatter. The new curves permit one to interpret this "scatter" in terms of the (different) chemical/structural character of each of the individuals in pairs of such lamellae.
759. MYSYK, W.K., FERGUSON, R.B., HAWTHORNE, F.C., RAMLAL, K., Univ. Manitoba (Earth Sciences):  
The chemistry and mineralogy of the Homewood (Manitoba) meteorite, 1974-77; M.Sc. thesis (Mysyk).
- See:**  
Discovery of the Homewood, Manitoba, stony meteorite; *Meteoritics*, v. 11, p. 75-76, 1976.
- Principal minerals: olivine (Fa 25.4 mol. %), orthopyroxene, kamacite/taenite, maskelynite, troilite, chromite, chlorapatite/whitlockite. Bulk chemical analysis yields total Fe 21.58%, Fe/SiO<sub>2</sub> 0.55, SiO<sub>2</sub>/MgO 1.53, FeO/Fe 0.36. The chemistry and mineralogy indicate that the Homewood is a typical L6 (hypersthene) chondrite.
760. NUFFIELD, E.W., BARNES, A., Univ. Toronto (Geology):  
X-ray diffraction methods, 1960-.
- See:**  
X-ray diffraction methods; John Wiley and Sons, New York, 1966.
- Two studies are underway to evaluate the quality of certain measurements made with an unmodified powder x-ray diffractometer. 1. Testing the precision of two-theta measurements at various combinations of scan speed, chart speed and time constant in order to define the range of instrumental settings that will lead to the most accurate results the diffractometer will allow in the shortest possible operating time. 2. Determining the maximum grain size of powder samples that will yield consistent intensities. The aim is to test the value of the instrument for the quantitative measurement of mixtures. Because grain shape may have an influence, the tests are being performed on quartz (irregular grains) and calcite (all grains bounded by cleavage surfaces).
761. NUFFIELD, E.W., JANNAWAY, G., HICKS, W., Univ. Toronto (Geology):  
Crystal chemistry of the ore minerals, 1945-.
1. Boulangerite, Pb<sub>5</sub>Sb<sub>4</sub>S<sub>11</sub>, exhibits a type of disorder that is common in many sulpho-salts. The disorder manifests itself on rotation x-ray photographs about the 4-Angstrom cell edge, as weak smeared layer lines alternating with strong layer lines that are composed of sharp reflections. Boulangerite crystals from a few localities, however, have the weak layer lines composed of distinct spots and, therefore, these crystals are an ordered variety. We are making a systematic search for such crystals with the object of resolving the weak layers on Weissenberg photographs. This should settle the question of the symmetry of the mineral, which is in dispute. It is hoped that a microprobe study will point up some differences between ordered and disordered varieties and suggest the reason for the disorder. 2. Meneghinite, CuPb<sub>13</sub>Sb<sub>7</sub>S<sub>24</sub>, shows extra, non-periodic reciprocal levels on rotation x-ray photographs. The current hypothesis explains the levels as random manifestations of a very large supercell. Meneghinite is generally massive and the unsatisfactory explanation for the non-periodic levels is based on crystals from only one locality. We are systematically searching for crystals from other localities to test the validity of the hypothesis. In view of the complex composition and the extra levels, it is reasonable to suspect that meneghinite from the type locality is actually a two-phase crystal.

762. PAUL, B.J., CERNY, P., Univ. Manitoba (Earth Sciences):  
The Huron claim pegmatite, southeastern Manitoba, 1976-78; M.Sc. thesis (Paul).  
Huron claim pegmatite is the largest and best developed member of the Stratford Lake pegmatite group which carries moderate Nb, REE, U, Th, and possibly economic Be mineralization. Although frequently quoted in literature, this pegmatite has never been systematically studied. Mineralogy, geochemistry, and paragenetic relations will be studied with subsequent petrogenetic evaluation. The results of this study, combined with data on other related localities, will serve as representative for the Stratford Lake pegmatite group in comparing it with other pegmatite types in the area. Most of the field work is finished, and geochemical studies are in progress.
763. PETRUK, W., CANMET (EMR):  
Mineralogy applied to ore dressing of Zn-Pb-Cu ores from northeastern New Brunswick, 1976-78.  
To define the mineralogical characteristics that affect ore dressing of these fine-grained ores; involves determining the size distributions of minerals to evaluate grind required for liberating the minerals, and definition of the proportion of mineral that will be recovered by ore dressing techniques.
764. PLANT, A.G., Geol. Surv. Can.:  
Electron probe microanalysis, 1962-.  
**See:**  
A hydrated neodymium-lanthanum carbonate from Curitiba, Parana, Brazil; Geol. Surv. Can., Paper 76-1B, p. 353-355, 1976.
765. POULIOT, G., FOSCAL-MELLA, G., Ecole Polytechnique:  
Analyse minéralogique des argiles glaciaires, 1974-76; M.Sc.A. thesis (Foscal-Mella).  
Développement d'une méthode permettant l'analyse quantitative des argiles glaciaires.
766. RAJAMANI, V., RUCKLIDGE, J.C., Univ. Toronto (Geology):  
Crystal chemistry of olivine from komatiites.  
Recent studies on the crystal chemistry of olivine have shown that there is slight antiordering of  $Fe^{2+}$  and  $Mg^{2+}$  in the two nonequivalent octahedral sites in the structure. This antiordering (preference of a larger cation for the smaller octahedral site in the structure) was observed to be more pronounced in olivines from rapidly cooled volcanic rocks. In order to better understand the intracrystalline distribution of cations in natural olivines, olivines from komatiitic rocks of Munro Township were studied using single crystal x-ray diffraction techniques. Structural refinement of an olivine using 800 x-ray-intensity data indicated little ordering or antiordering of  $Fe^{2+}$  and Mg in these olivines. We suggest that cooling rate of these komatiitic "flows" especially the B-2 zone was not very rapid but slow enough to eliminate the high temperature intracrystalline distribution of Fe and Mg.
767. RIMSAITE, J.Y.H., Geol. Surv. Can.:  
Mineralogical research on the Rabbit Lake uranium deposits, Saskatchewan, 1975-.
768. RUCKLIDGE, J.C., BROOKS, C.K., Univ. Toronto (Geology):  
Mineralogical studies on Tertiary volcanic rocks from east Greenland, 1973-78.  
Electron microprobe and x-ray fluorescence methods are being used to acquire high quality chemical analyses of the rocks and minerals. High pressure nodules and xenocrysts are often encountered.
769. STEVENSON, L.S., STEVENSON, J.S., Redpath Mus., McGill Univ. (Geological Sciences):  
Dawsonite-fluorite relationships at Montreal area localities, 1974-77.  
**See:**  
Dawsonite-fluorite relationships at Montreal area localities; Can. Mineral., v. 15, pt. 1, 1977.  
Dawsonite and fluorite, crystallized together, were collected from three localities in the Montreal area where they were found in particular dykes or sills which were only briefly exposed by quarrying and excavation. It was found that the intergrowth of the dawsonite and fluorite crystals and their frequent association with vein quartz gave definite evidence of hydrothermal origin. The fine-needle dawsonite in the assemblages was seen to be similar to the dawsonite that occurs in fluid inclusions in gold-quartz veins. Field relationships supported the conclusion that the Montreal-area dawsonite and fluorite are indeed low-temperature hydrothermal minerals related in origin to the alkaline rocks of the area.
770. TIHOR, S., CROCKET, J.H., GRUNDY, H.D., McMaster Univ. (Geology):  
Mineralogy of carbonate rocks in the Kirkland-Larder Lake area, 1975-78; M.Sc. thesis (Tihor).  
A distinctive carbonate rock which occurs as a laterally persistent horizon, generally of conformable character, is host to economic gold mineralization in the Archean of the Larder Lake-Kirkland Lake area, northeastern Ontario. The mineralogy of this rock was determined by XRD on about 50 samples. It is quartz-dolomite-magnesite with minor Cr-rich mica. Pyrite is a common sulfide and a nickel sulfarsenide, probably gersdorffite has also been identified by SEM. The rock has strong ultramafic affinities.
771. TRAILL, R.J., Geol. Surv. Can.:  
Studies of meteorites and other extra-terrestrial materials, 1957-.
772. TRAILL, R.J., Geol. Surv. Can.:  
X-ray diffraction analyses and mineralogical studies, 1968-.  
**See:**  
A hydrated neodymium-lanthanum carbonate from Curitiba, Parana, Brazil; Geol. Surv. Can., Paper 76-1B, p. 353-355, 1976.

## INVERTEBRATE

773. ADAMS, K.D., MOORE, R.G., COLWELL, J.A., Acadia Univ. (Geology):  
The *Gigantoproductidae* of the Musquodoboit Limestone (Mississippian), Nova Scotia, 1975-77; M.Sc. thesis (Adams).  
Two late Visean productids are present in the Windsor Series of Nova Scotia. A study of the external morphology and internal features suggests that the local genera belong to two genera present in strata of similar age in the British Isles, Western Europe and U.S.S.R. The smaller genus (up to 6 cm. parallel to hingeline) is *Semiplanus latissimus* (Sawerley) and the larger (up to 11 cm parallel to hingeline) appears to belong to *Gigantoprodiatus giganteus* (Sawerley, 1822).
774. BAMBER, E.W., Geol. Surv. Can.:  
Carboniferous and Permian biostratigraphy and coral faunas, western and northern Canada, 1971-.
- See:  
Occurrence of *Palaeoaplysina* (Hydrozoan?) in Upper Carboniferous (Lower Moscovian) carbonate rocks, northeastern British Columbia; Geol. Surv. Can., Paper 77-1A, p. 145-146, 1977.
775. BARNES, C.R., BERGSTROM, S.M., FORTEY, R.A., Univ. Waterloo (Earth Sciences), Ohio State Univ.:  
Ordovician conodont biostratigraphy of Spitzbergen, 1972-80.
776. BARNES, C.R., KENNEDY, D.J., Univ. Waterloo (Earth Sciences):  
Ordovician conodont biostratigraphy of the southern Canadian Rocky Mountains, 1970-79.
- See:  
Correlation between Canadian Ordovician zonations based on graptolites, conodonts and benthic macrofossils from key successions; Ordovician System Symp., Pal. Assoc., p. 209-226, 1976.
777. BARNES, C.R., MCCRACKEN, A.D., NOWLAN, G.S., UYENO, T.T., FAHRAEUS, L.E., Univ. Waterloo (Earth Sciences), Geol. Surv. Can., Memorial Univ.:  
Ordovician and Silurian conodont biostratigraphy and paleoecology, Anticosti Island, Quebec, 1975-80; M.Sc. thesis (McCracken).
778. BARNES, C.R., NOWLAN, G.S., MIRZA, K., Univ. Waterloo (Earth Sciences):  
Lower Paleozoic conodont biostratigraphy of the Canadian and Greenland Arctic, 1973-78; M.Sc. thesis (Mirza), Ph.D. thesis (Nowlan).
- See:  
Ordovician geology of Akpatok Island, Ungava Bay, District of Franklin; Can. J. Earth Sci., v. 13, no. 1, p. 157-178, 1976.
779. BARNES, C.R., SASS, D.B., NORD, G.L., Univ. Waterloo (Earth Sciences):  
Conodont ultrastructure, 1965-.
780. BARNES, C.R., TARRANT, G.A., Univ. Waterloo (Earth Sciences):  
Upper Ordovician conodont biostratigraphy and paleoecology of southern Ontario, 1975-78; M.Sc. thesis (Tarrant).  
Over 75 000 conodonts from ten sections on Manitoulin Island and the Collingwood area are being studied.
781. BARNES, C.R., UYENO, T.T., LEFÉVRE, J., Univ. Waterloo (Earth Sciences), Geol. Surv. Can.:  
Ordovician and Silurian conodont biostratigraphy and paleoecology, Hudson Bay, 1970-80.
- See:  
Paleoecology of Late Ordovician and Early Silurian conodontophorids, Hudson Bay Basin; Geol. Assoc. Can., Sp. Paper 15, p. 69-89, 1976.
782. BRAUN, W.K., BROOKE, M.M., JOHNSTON, P., Univ. Saskatchewan (Geological Sciences):  
Jurassic microfaunas and biostratigraphy of western Canada, 1968-78; Ph.D. thesis (Johnston).  
Continuation and completion of a study of the Jurassic microfaunas of the Arctic Islands and northern Canada - about 2000 samples have been analyzed to date, and more than 3000 additional ones will be studied shortly. Continuation and completion of the Jurassic microfaunas of the Fernie Basin of southeastern British Columbia and adjoining parts of Alberta and Montana. To date, 474 species of Jurassic Foraminifera and 120 species of ostracodes have been recognized.
783. BRAUN, W.K., FEATHERSTONE, R.P., MATHISON, J.E., YAYCHUK, D., Univ. Saskatchewan (Geological sciences):  
Devonian microfaunas and biostratigraphy of western Canada, 1964-; M.Sc. theses (Featherstone, Mathison, Yaychuk).  
Work is continuing on several fronts: Middle and Upper Devonian ostracode faunas of the Northwest Territories mainly (547 species of Devonian ostracodes have been discovered so far), Late Givetian ostracodes of the Slave Point Formation of central and northern Alberta (Featherstone); Late Givetian to Frasnian ostracode faunas of Saskatchewan (Mathison); Upper Devonian ostracode faunal provincialism in Western Canada (Yaychuk).
784. CALDWELL, W.G.E., NORTH, B.R., MCNEIL, D.H., MCKELLAR, R.L., WATKINS, R.H., WRIGHT, E.C., Univ. Saskatchewan (Geological sciences):  
Biostratigraphy of the Cretaceous System in the western interior of Canada, 1961-.  
To analyse biostratigraphically the Cretaceous System within the southern Interior Plains (but with emphasis on that portion lying within Manitoba and Saskatchewan) with a view to establishing a series of foraminiferal zones that can be used to date and to correlate the sedimentary sequences. Sixteen zones have been recognized in Saskatchewan; twenty-seven zones and subzones across the plains as a whole. The Saskatchewan sequence is broken by numerous disconformities. Foraminiferal zones are particularly important in the Interior Plains because most of the Cretaceous deposits are buried beneath a veneer of surficial deposits and are known from boreholes; the boreholes generally yield poor molluscan faunas but rich foraminiferal faunas. The foraminiferal zones are being tied as closely as possible to existing molluscan zones. Areas under study at the present time include the North Saskatchewan and Qu'Appelle River valleys, the Cypress Hills and environs, and the Manitoba escarpment.
785. CAMERON, B.E.B., Geol. Surv. Can.:  
Tertiary foraminiferal succession of western Cordillera and Pacific Margin, 1969-.

786. CHATTERTON, B.D.E., Univ. Alberta (Geology):  
Trilobite and conodont systematics and biostratigraphy from western and northern Canada, 1971-.
- See:  
Silicified Middle Ordovician trilobites from the South Nahanni River area, District of Mackenzie, Canada; *Palaeontographica A*, v. 154, p. 1-106, 1976.  
Silurian (Wenlockian) trilobites from Baillie-Hamilton Island, Canadian Arctic Archipelago; *Can. J. Earth Sci.*, v. 14, no. 2, p. 285-317, 1977.  
Phacops and other trilobites from Emsian age beds of the Delorme Formation, Mackenzie Mountains, NWT; *Can. J. Earth Sci.*, v. 13, p. 1466-1478, 1976.
787. COLLINS, D.H., Royal Ontario Mus. (Invert. Palaeo.):  
Origin of Actinocerida (Cephalopoda), 1968-77.
788. COPELAND, M.J., Geol. Surv. Can.:  
Paleozoic ostracodes in Canada, 1972-.
- See:  
Leperditicopid ostracodes as Silurian biostratigraphic indices; *Geol. Surv. Can.*, Paper 76-1B, p. 83-88, 1976.
789. COPPER, P., HORST, R., GRANBARGER, D., MORRISON, R., Laurentian Univ. (Geology):  
Paleoecology of Ordovician-Silurian benthic marine communities, 1975-78.
790. DEAN, W.T., Geol. Surv. Can.:  
Lower and Middle Paleozoic biostratigraphy of Gaspé, Maritime region and Newfoundland, 1969-.
- See:  
Some aspects of Ordovician correlation and trilobite distribution in the Canadian Appalachians; *Ordovician System Symp.*, *Pal. Assoc.*, p. 227-250, 1976.
791. DELORME, L.D., ALLAN, R., KALAS, L.L., HANSON, V.W., Environment Canada (CCIW):  
Limnological changes during the last 150 years in selected Qu'Appelle Lakes, Saskatchewan, 1977-78.  
(1) Three cores (each 1 meter in length) were collected during the 1973 field season from Echo Lake. The cores have been disintegrated and the shelled invertebrates identified and counted for computer processing. (2) One core from Pasqua Lake and another from Mission Lake will be supplied ready for shelled invertebrate extraction. (3) Paleolimnological interpretations will be obtained for the Echo Lake cores from the paleoenvironmental interpretive model and written up. (4) Because of the lack of suitable organics in the sediments, palynology and Pb<sup>210</sup> will have to provide the time framework for the chronology. Approximately 15 samples per core will have palynological work done on them. If Pb<sup>210</sup> is available, then about 10 samples per core will be submitted for dating.
792. DELORME, L.D., KALAS, L.L., HANSON, V.W., SHARAWI, A., Environment Canada (CCIW):  
Consistency and predictive capability of the paleoenvironmental interpretive model, 1977-78.  
The results, obtained from quantitative paleoenvironmental interpretive models, need to be tested statistically for consistency and predictive capabilities. 1) To collect 9 short cores (0.5 meters) in an area around Kapuskasing, Ontario. To prepare 450 samples for the extraction of shelled invertebrates, identification, coding, chronology and interpretation of various limnological parameters. 2) To test, statistically, the interpreted results for consistency by detecting inequality among the population means by measuring the between-sample variations.
793. DIXON, O.A., Univ. Ottawa (Geology):  
Ordovician and Silurian heliolitid corals of Anticosti Island, Québec, and Somerset Island, Northwest Territories, 1968-.
- Late Ordovician heliolitid corals on Anticosti have been studied (Dixon, 1975) and this is now being extended to include heliolitid faunas throughout the Ordovician-Silurian sequence there. Their systematics, environmental variability, associated sedimentary environments and evolutionary succession are being examined. A similar study is being conducted on heliolitids from the Late Silurian Read Bay Formation on Somerset Island and on scattered material from other islands. The fauna contains taxa not previously recognised in North America.
794. ELLEN, M., MCGUGAN, A., Univ. Calgary (Geology):  
Santonian/Campanian boundary, 1977-79; M.Sc. thesis (Ellen).
795. FAHRAEUS, L.E., Memorial Univ. (Geology):  
Studies of conodonts and Lower and Middle Paleozoic bio- and chronostratigraphy, 1969-.
- See:  
Conodontophorid ecology and evolution related to global tectonics; *Geol. Assoc. Can.*, Sp. Paper 15, p. 11-26, 1976.
796. FERGUSON, L., Mount Allison Univ. (Geology):  
Permo-Pennsylvanian stratigraphy and faunas of North-Central Ellesmere Island, Northwest Territories, 1961-80.
797. FERGUSON, L., Mount Allison Univ. (Geology):  
A biometrical study of the Scottish Lower Carboniferous ostracod genera *Bairdia* and *Paraparchites*, 1969-78.  
The study is now being directed towards topotype material of the genotypes and of the type specimens of those species recovered from the principal locality.
798. FRITZ, M.A., Royal Ontario Mus. (Invert. Palaeo.):  
Redescriptions of type specimens of species of the Bryozoa from Upper Ordovician of Toronto region, 1968-77.
- See:  
Redescription of type specimens of species of the Bryozoa genera *Monticulipora*, *Mesotrypa*, *Peronopora* and *Prasopora*, from the Upper Ordovician rocks of Toronto and vicinity, Ontario, Canada; *ROM Life Sci. Contrib.*, no. 107, 1976.  
Final entry for this series will be a redescription of type specimens of species of the Bryozoan genera *Atactoporella*, *Homotrypa*, and *Homotrypella* from the Upper Ordovician rocks of the Credit River Valley, Ontario, Canada.
799. FRITZ, M.A., Royal Ontario Mus. (Invert. Palaeo.):  
Restudy of the Bryozoan genus *Stigmatella* from the Upper Ordovician of Workman's Creek (Meaford Creek), Ontario, 1977.
800. GALLAGHER, M., MCGUGAN, A., Univ. Calgary (Geology):  
Ecology Recent Foraminifera, Vancouver Island area, British Columbia, 1976-78; Ph.D. thesis (Gallagher).

801. GISHLER, C.D., LENZ, A.C., Univ. Western Ontario (Geology):  
Chitinozoa of Llandovery and Wenlock of Cape Phillips Formation, central Arctic Archipelago, 1976-78.
802. GRADSTEIN, F.M., Geol. Surv. Can.:  
Biostratigraphic history of the Mesozoic and Cenozoic sediments of the Grand Banks, Northeast Newfoundland and Labrador shelves, 1974-.
803. GREINER, H.R., Univ. New Brunswick (Geology):  
Biostratigraphy and faunal relationships during the late Devonian in the Atlantic realm, 1976-77.
- See:  
Crossopterygian fauna from the Albert Formation, New Brunswick, Canada, and its stratigraphic-paleoecologic significance; *J. Paleont.*, v. 51, no. 1, p. 44-56, 1977.
- Biostratigraphy, paleoecology and paleogeography of the Upper Devonian spiriferid brachiopods and ichthyofauna of the Atlantic realm.
804. HAUGH, B.N., Univ. Toronto, Erindale College (Earth and Planetary Science):  
Paleobiology of Paleozoic camerate crinoids, 1976-79.
1. A number of collections of disarticulated crinoid ossicles are being made from Middle to Upper Paleozoic strata from Kansas, Indiana, and Southern Ontario. Laboratory analysis is currently at the stage of breaking down the shale samples to extract the loose ossicles, prior to scanning electron microscopy. This paleobiologic investigation will involve examination of the skeletal microstructure of crinoid brachial ossicles in an attempt to elucidate the biomechanics of food-gathering appendages. 2. Collection and analysis of well-preserved, and unusual specimens of primitive camerate crinoids, either archaeocrinids or rhodocrinids, from the Late Ordovician, Georgian Bay Formation (Dundas) indicate that this group of camerates had already begun to establish a rheocarbonate habitat preference—an ecology that is well documented for many Late Paleozoic camerate crinoids. The specimens were found in what is interpreted to be a former submarine, level-bottom, channel (silt-carbonate filled) that cuts into the surrounding shale-sandstone facies.
805. HILL, J.M., LENZ, A.C., Univ. Western Ontario (Geology):  
Ludlovian Chitinozoa of Stonehouse Formation, Nova Scotia, and Cape Phillips Formation, Baillie Hamilton Island, Arctic Archipelago, 1976-77; M.Sc. thesis (Hill).
- A comparison of taxonomy, diversity and variation of Chitinozoa of Ludlovian rocks from two regions and different facies.
806. HODGKINSON, K.A., Imperial Oil Ltd.:  
Mesozoic and Cenozoic Foraminifera of the Beaufort area, Arctic Islands and Atlantic Coast, 1974-77.
807. HOFFMAN, H.J., Univ. Montreal (Geology):  
Precambrian and lower Paleozoic paleontology and stratigraphy, 1970-.
- See:  
Precambrian microflora, Belcher Islands, Canada: significance and systematics; *J. Paleont.*, v. 50, no. 6, p. 1040-1074, 1976.
- Comparison of Holocene and mid-Precambrian Entophysalidaceae (Cyanophyta) in stromatolitic algal rests; *ibid.*, p. 1075-1083, 1976.
- Stromatoid morphometrics; *Developments in Sedimentology*, v. 20, p. 45-54, 1976.
- Stromatolite attributes are treated quantitatively and statistically, using image-analysing computers. Morphologic analysis of lamina shape, cross sections, longitudinal sections, and microstructure is feasible. A 2 B.Y. old microbiota from the Belcher islands represents an integrated intertidal algal community. Diagenetic and plasmolytic degradational effects in cells are shown to be comparable to those found in modern intertidal algal mats in subtropical marine embayments. A new microbiota was discovered in the Late Precambrian Vinta Mountain group of Utah.
808. HUNTER, D., FAHRAEUS, L.E., Memorial Univ. (Geology):  
Conodonts of the Cobbs Arm Formation (Middle Ordovician), north-central Newfoundland, 1975-77; M.Sc. thesis (Hunter).
809. JELETZKY, J.A., Geol. Surv. Can.:  
Monograph of the Canadian belemnites, 1959-.
810. JENKINS, W.A.M., Geol. Surv. Can.:  
Stratigraphic distribution of Lower Paleozoic organic-walled microfossils in eastern Canada, 1975-.
811. JOHNSTON, P.F., BRAUN, W.K., Chevron Standard Ltd. (Exploration), Univ. Saskatchewan (Geological Sciences):  
Jurassic microfaunas and biostratigraphy of the Sverdrup Basin in Canada's Arctic Islands, 1974-77; Ph.D. thesis (Johnston).
- Photography of +1200 specimens (350 spp.) complete; taxonomy (systematics) 80% complete; typing of systematics manuscript 50% complete, in 2nd draft form.
812. JULL, R.K., Univ. Windsor (Geology):  
Upper Devonian corals from the Ancient Wall reef complex, Jasper National Park, Alberta, 1973-78.
- See:  
The distribution of corals near the margin of an Upper Devonian carbonate complex in Western Canada; *Mém. Bur. Rech. Géol. et Minières*, 1977.
- The taxonomy and paleoecology of corals at the margin of Upper Devonian reef complexes in the Rocky Mountains of Alberta are being studied in detail. Efforts are initially directed towards the phillipsastroid and disphyllid corals, but other groups will be studied as well. Most of the data to date originates from the southeast margin of the Ancient Wall reef complex, Jasper National Park, with future field work intended on other reef complexes exposed in the Rocky Mountains.
813. JULL, R.K., Univ. Windsor (Geology):  
Distribution and development of bioherms in the Middle Devonian Detroit River Group near Formosa, Ontario, 1976-78; M.Sc. thesis (Klein).
- A series of small bioherms in the Middle Devonian Detroit River Group occur in the vicinity of Formosa, Ontario. Field mapping to determine the shape, orientation and distribution of the bioherms will be made. Sampling through exposures of the bioherms will establish the succession of faunas and lithologies and thereby permit an interpretation of biohermal development from the time of their foundation to cessation of development.

814. JULL, R.K., JOHNSON, M., Univ. Windsor (Geology):  
Paleoecology of the Middle Silurian Fossil Hill Formation, on the Bruce Peninsula and Manitoulin Island, Ontario, 1976-77; M.Sc. thesis (Johnson).  
Both pentamerid brachiopod banks and coral/stromatoporoid biostromes are well developed in the Middle Silurian Fossil Hill Formation. Detailed field and lab examination of sections and large bedding planes exposed on the Bruce Peninsula and Manitoulin Island will endeavour to determine environmental conditions and diagenetic alterations of the biostromal units and brachiopod banks of the Fossil Hill.
815. LEGGAULT, S.A., THUSU, B., Univ. Waterloo (Earth Sciences):  
Chitinozoa of the Ilion shale (Silurian) of New York State, 1977-78.
816. LENZ, A.C., Univ. Western Ontario (Geology):  
Lower Paleozoic paleontology, biostratigraphy, paleoecology or geologic history, northern Cordillera and Arctic Canada, 1975-79.
- See:**  
Late Ordovician-Early Silurian glaciation and the Ordovician-Silurian boundary in the northern Canadian Cordillera; *Geology*, v. 4, p. 313-318, 1976 (Replies, *ibid.*, p. 795, 979).  
Northern Cordillera: study of taxonomy and community paleoecology of Silurian brachiopods of the Whittaker and Road River Formations. Good shelly faunas have been recovered from basin or slope facies of Llandoveryan and Wenlockian beds. This represents the first documentation of shelly faunas of this age and biofacies in the northern Cordillera. A monographic study of Ashgillian to Wenlockian graptolite faunas of the northern Cordillera is underway. Aims for the continuation of the project are for further examination of faunas of the shelf carbonate-basinal shale and carbonate and facies transition.
817. LEWIS, W.J., OWER, J.R., Chevron Standard Ltd. (Exploration):  
Mesozoic-Tertiary Foraminifera, 1971-.
818. LUDVIGSEN, R., Univ. Toronto (Geology):  
Systematics, biostratigraphy, and biofacies of Ordovician trilobites, northern Canada, 1972-.
- See:**  
New cheirurid trilobites from the lower Whittaker Formation (Ordovician), southern Mackenzie Mountains; *Can. J. Earth Sci.*, v. 13, p. 947-959, 1976.  
Silicified Middle Ordovician trilobites from the South Nahanni River area, District of Mackenzie; *Palaeontographica*, Abt. A, v. 154, p. 1-106, 1976.
819. LUDVIGSEN, R., Univ. Toronto (Geology):  
Trilobites of Ontario, 1975-.
- Ordovician, Silurian, and Devonian strata in southern Ontario (a triangle with apices at Kingston, Tobermory, and Windsor) have yielded species of about sixty genera of trilobites. With few exceptions, these trilobites are insufficiently known, in a taxonomic sense, as well as in a distributional and an ecologic sense. A long-range program of investigation of these trilobites has been initiated. A series of taxonomic revisionary works constitutes the initial stage of this program. To this end, treatment of *Bathyurus* and *Ceraurus* has been completed, *Pseudogygites* is near completion, and work has started on *Hemiarges*, "*Encrinurus*", *Triarthrus*, "*Calyptaulax*", and *Terataspis*.
820. LUDVIGSEN, R., MILLER, A.V., Univ. Toronto (Geology):  
Early Ordovician trilobites of the Broken Skull Formation, District of Mackenzie, 1975-; Ph.D. thesis (Miller).  
The upper part of the Broken Skull Formation in the Natla River area contains an apparently complete silicified trilobite record through the Canadian (Tremadocian to Arenigian). The faunas from a single 300 m measured section are currently being studied; further field work in 1977 will add another two or three sections.
821. MATTHEWS, J.V., Jr., Geol. Surv. Can.:  
Quaternary fossil insects and paleoecology, 1973-.
- See:**  
Insect fossils from the Beaufort Formation: geological and biological significance; *Geol. Surv. Can.*, Paper 76-1B, p. 217-227, 1976.
822. MCGUGAN, A., Univ. Calgary (Geology):  
Upper Cretaceous Foraminifera, Vancouver Island area, British Columbia.
823. MITCHELL, C., LENZ, A.C., Univ. Western Ontario (Geology):  
Paleoecology and phylogeny of Ordovician brachiopods of the Whittaker Formation, Mackenzie Mountains, Northwest Territories, 1975-77; M.Sc. thesis (Mitchell).
824. MORGAN, A.V., MORGAN, A., Univ. Waterloo (Earth Sciences):  
Paleoentomology – an analysis of climatic change in southwestern Ontario and parts of the adjacent United States, 1974-.
- See:**  
Climatic interpretations from the fossil faunas of the Don and Scarborough Formations; *Geol. Soc. Am.*, Abstracts with programs, v. 8, no. 6, p. 1020, 1976.  
We have now completed the collection, sorting and most of the analysis of four sites which have been examined for fossil Coleoptera. These include the Don Formation, at Don Valley Brickpit, Toronto (a Sangamon site), the Early Wisconsin Scarborough Formation from the Scarborough Bluffs, Toronto, a ?Early-Middle Wisconsin site at Collingwood, Ontario and the classical type section at Two Creeks, Wisconsin (11 800-12 000 years B.P.).
825. NASSICHUK, W.W., HODGKINSON, K.A., Geol. Surv. Can., Imperial Oil Ltd.:  
Permian scaphopods, Arctic Islands, 1975-76.
- See:**  
Scaphopods from the Permian Assistance Formation, Canadian Arctic Archipelago; *J. Paleontol.*, v. 50, no. 6, p. 1150-1156, 1976.
826. PEDDER, A.E.H., Geol. Surv. Can.:  
Stratigraphically important cystimorph corals from the Lower Devonian of western Canada, 1975-.
827. PERRY, D.G., CHATTERTON, B.D.E., Univ. Calgary (Geology):  
Silurian conodont biostratigraphy of Delorme and Road River Formations, Northwest Territories, 1971-78.  
Many taxa characteristic of the European late Llandovery through Pridoli have been recovered.
828. PERRY, D.G., CHATTERTON, B.D.E., Univ. Calgary (Geology):  
(A) Lower Devonian conodonts of Delorme Formation, Mackenzie Mountains, Northwest Territories (b) Middle Devonian conodonts, northern Yukon, 1971-78.



- The Lower Devonian conodont faunas of the Delorme Formation serve to document and refine the original zonation set forth by Klapper (1969) for northwestern Canada. Rather complete Lochkovian-Zlichovian conodont faunas have been recovered. The study of the Upper Lower Devonian and Middle Devonian conodont faunas from Northern Yukon is in the processing stage. Most widely represented in collections from the Hare, Ogilvie, Headless, Prongs Creek Formations are Emsian through early Givetian conodont faunas.
829. PERRY, D.G., LENZ, A.C., CHATTERTON, B.D.E., Univ. Calgary (Geology), Univ. Western Ontario (Geology):  
 (A) Silurian trilobites of Road River Formation, Avalanche Lake area, Northwest Territories.  
 (B) Silurian trilobites of Delorme Formation, eastern Mackenzie Mountains, 1975-78.
- Diverse, well preserved trilobite faunas of Road River and Delorme Formation show the high diversity of shelf-basin margin faunas and their marked European aspect.
830. PERRY, D.G., LENZ, A.C., CHATTERTON, B.D.E., Univ. Calgary (Geology), Univ. Western Ontario (Geology):  
 Biostratigraphy of Wenlock and Ludlow brachiopods, trilobites and conodonts, Cape Phillips Formation, Baillie-Hamilton and Cornwallis Islands, District of Franklin, 1976-.
- See:  
 Silurian (Wenlockian) trilobites from Baillie-Hamilton Island, Canadian Arctic Archipelago; Can. J. Earth Sci., v. 14, no. 2, p. 285-317, 1977.
- Large collection of silicified faunas have been made from Baillie Hamilton and Cornwallis Islands. Dissolution of limestones is largely completed indicating extensive brachiopod faunas, moderate trilobite fauna, fair conodont fauna.
831. PETRYK, A.A., Quebec Dep. Nat. Res. (Energy):  
 Carboniferous Foraminifera and algae: biostratigraphy and taxonomy.
- See:  
 Upper Carboniferous (Late Pennsylvanian) microfossils from the Wandel Sea basin, eastern Peary Land, eastern North Greenland; Geol. Surv. Greenland, Rep. Activities, 1977.
- An assemblage of about twenty taxa of larger and smaller foraminiferids and six taxa of algae is present in samples from the basal, limestone-shale unit in the Hellefiskefjord area of the Wandel Sea Sedimentary Basin of eastern Peary Land Greenland. Of the larger foraminiferids, the Schwagerininae, *Triticites* spp. predominate whereas the Fusulininae, *Pseudofusulinella* spp. and others, are less common. This alone is indicative of the zone of *Triticites* which is of Missourian-Virgilian (Upper Pennsylvanian) age in terms of the southwestern North America standard, and Gzhel'ian-Orenburgian (Upper Carboniferous) in terms of the Ural and Perm sections of eastern Europe. The considerable degree of septal folding and conspicuous chomata in the Hellefiskefjord *Triticites* is believed to be an evolutionary phase common to Upper Pennsylvanian members of the American *Triticites* group. Furthermore, the presence of *Pseudofusulinella* and *Schuchertella* suggests a Late Pennsylvanian, possibly Late Virgilian age. The fusulinid assemblage from Hellefiskefjord is younger than that reported from Ward Hunt Island, off the northern tip of Ellesmere Island in the Canadian Arctic, which was assigned a Middle Pennsylvanian (Middle Desmoinesian) age. It is older than the Lower Permian (Artinskian) assemblage from the Belcher Channel Formation of Grinnell Peninsula, Devon Island (about 800 km southwest of Ward Hunt Island). The assemblage of larger and smaller foraminiferids and algae is rather similar to that of the Virgilian Leavenworth Limestone of the Midcontinent region of the United States, but it apparently lacks some of the endothyrids and algae. All the Fusulinidae are cosmopolitan and are equated with the Midcontinent-Andean Realm, except for *Pseudofusulinella* which is apparently of the Eurasian-Arctic Realm.
832. PICKERILL, R.K., Univ. New Brunswick (Geology):  
 Sedimentology, paleontology, chronology and stratigraphy of selected Paleozoic sequences in eastern Canada, 1975-.
- See:  
 Trace fossils from the Silurian Chaleurs Group of southeastern Gaspé Peninsula, Quebec; Can. J. Earth Sci., v. 14, no. 2, p. 239-249, 1977.
- Significance of a new fossil locality containing a *Salopina* community in the Waweig Formation (Silurian-uppermost Ludlow/Pridoli) of southwest New Brunswick; Can. J. Earth Sci., v. 13, no. 9, p. 1328-1331, 1976.
- Includes: taxonomy and paleoecology of eastern Canadian ichnofossils, stratigraphy, sedimentology and paleontology of Siluro-Devonian rocks of southern New Brunswick, paleoecology of the Trenton Limestone in Quebec, and sedimentology of the Gander-Davidsville groups in northern Newfoundland.
833. POULTON, T.P., Geol. Surv. Can.:  
 Jurassic Trigoniidae of western British Columbia, 1971-.
- See:  
 Some Lower Jurassic trigoniid bivalves from southwestern British Columbia; Geol. Surv. Can., Bull. 256, 1976.
834. RIVA, J., Univ. Laval (Geology):  
 Study of Middle and Late Ordovician graptolites, 1967-.
- See:  
*Climacograptus bicornis bicornis* (Hall), its ancestor and likely descendants; Ordovician System Symp., Pal. Assoc., p. 589-621, 1976.
- It is hoped to be gradually able to restudy the most important Middle to Late Ordovician species, run down the problems of synonymies on a global scale (a recent trip to the U.S.S.R. was undertaken for this purpose) and to simplify or render more understandable the number of species actually occurring in this part of the geologic time scale. A great deal of attention is also given to faunal and zonal content in order to arrive at a biostratigraphic scale based on actual or real, and not imaginary, faunas of the Ordovician Period.
835. RYAN, R.J., MOORE, R.G., GILES, P.S., Acadia Univ. (Geology):  
 Paleontology and paleoecology of the Gays River Formation, 1976-78; M.Sc. thesis (Ryan).
836. SCHAFER, C.T., Geol. Surv. Can.:  
 In-situ environmental responses of estuarine benthonic Foraminifera, 1975-.



- See:**  
In situ environmental responses of benthonic Foraminifera; Geol. Surv. Can., Paper 76-1C, p. 27-32, 1976.
837. SCHWERT, D.W., MORGAN, A.V., Univ. Waterloo (Earth Sciences):  
A paleoecological reconstruction of two late glacial sites at Kitchener, Ontario and Winter Gulf, New York, 1974-78.  
  
Two sites, one at Winter Gulf (south of Buffalo, N.Y.) and a second site in Kitchener, Ontario are currently being analysed for insect assemblages. The Winter Gulf site has been <sup>14</sup>C dated at 12 750 years B.P. and represents a small ponded deposit ca. 1.5-2.0 m thick. The Kitchener site is undated (as yet) but probably is ca. 11 000 - ca. 8000? years old. The Gate St. site (Kitchener) is part of a series of small flora marl filled depressions with thicknesses in excess of 5 m. A large insect fauna has been recovered from both sites, probably with a total of over 25 000 insect fragments represented. The specimens are currently being identified.
838. SKEVINGTON, D., Memorial Univ. (Geology):  
Ordovician graptolite faunas and biostratigraphy of the Trondheim Region, Norway, 1974-77.  
  
Description of graptolite faunas and establishment of biostratigraphical classification of the Ordovician sequence in the Løkken district, Trondheim region, Norway. Field mapping completed; Lower and Middle Ordovician graptolite faunas collected and reviewed.
839. SKEVINGTON, D., Memorial Univ (Geology):  
Ordovician and Silurian graptolite faunas of the Massif Armoricaïn, France, 1975-78.  
  
A revision of the Ordovician and Silurian graptolite faunas of the Massif Armoricaïn - their morphology, taxonomy and age. Completed: 1) graptolites of the Saint-Germain-sur-Ille Formation; 2) graptolite fauna of the *G. teretiusculus* Zone; and 3) Lower Silurian graptolite faunas of the Menez-Belair syncline.
840. SMITH, R.E., Geol. Surv. Can.:  
Lower Devonian (Gedinnian) biostratigraphy and brachiopod faunas, Prince of Wales and Bathurst Island, District of Franklin, 1973-.
- See:**  
Biostratigraphy and paleoecology of the *Atrypella* community, Upper Silurian Douro Formation, Devon Island, District of Franklin; Geol. Surv. Can., Bull. 256, 1976.
841. SOUAYA, F.J., BAILLIE, A.D., Gulf Oil Canada Ltd. (Geological):  
Biostratigraphic studies of wells from the Arctic Islands and offshore Eastern Canada and Western Greenland.  
  
**See:**  
Foraminifera of Sun-Gulf-Global Linckens Island Well P-46, Arctic Archipelago, Canada; Micro-paleontology, v. 22, no. 3, p. 249-306, 1976.  
  
To establish biostratigraphic frameworks in and to describe the paleoenvironmental conditions of the above mentioned frontier areas.
842. STEARN, C.W., McGill Univ. (Geological sciences):  
Studies in Canadian stromatoporoids: micro-structure, preservation, classification, biostratigraphy.
843. STOUGE, S., FAHRAEUS, L.E., Memorial Univ (Geology):  
Conodonts of the Table Head Formation (Middle Ordovician), western Newfoundland, 1975-78; Ph.D. thesis (Stouge).
844. SULEK, J.A., Imperial Oil Ltd.:  
Tertiary and Cretaceous Foraminifera of the Beaufort area, 1975-.
845. TELFORD, P.G., Ontario Division Mines:  
Silurian conodonts of the Niagara Escarpment, southern Ontario, 1975-78.  
  
Conodonts have been obtained from a number of the rock units making up the Niagara Escarpment and are proving to be useful in local correlation. The Niagaran sequences have been used previously as the North American reference section for the Silurian. Definition of a conodont biostratigraphic scheme for this sequence may help to re-establish it as the premier Silurian section for North America.
846. TELFORD, P.G., VON BITTER, P.H., TARRANT, G.A., Ontario Division Mines, Royal Ontario Mus. (Invert. Palaeo.):  
Lower-Middle Devonian conodont biostratigraphy and palaeoecology, Niagara Peninsula, Ontario, 1973-77.
847. TOZER, E.T., Geol. Surv. Can.:  
Canadian Triassic Ammonoidea and Bivalvia, 1967-.
848. TOY, B.R., MARTSOLF, R.H., TROLLOPE, F.H., Mobil Oil Canada Ltd.:  
Mesozoic-Tertiary invertebrate paleontology, eastern and northern Canada, 1971.  
  
Foram and nannoplankton biostratigraphy and deposition of environments of wells drilled on the Scotian Shelf, Grand Banks, Mackenzie Delta and in the Beaufort Sea.
849. UYENO, T.T., Geol. Surv. Can.:  
Conodont biostratigraphy of Middle and Upper Devonian strata of southern and central Manitoba, 1967-77.
850. UYENO, T.T., Geol. Surv. Can.:  
Conodont biostratigraphy of Upper Ordovician to Devonian rocks of the Arctic Islands, 1968-.
851. VERMA, H.M., WESTERMANN, G.E.G., McMaster Univ. (Geology), Royal Ontario Mus. (Invert. Palaeo.):  
New Upper Jurassic (Lower Tithonian) ammonites of the neighbourhood of Mombasa, Kenya and their paleobiogeographic significance, 1977.  
  
New collections from the classic Upper Jurassic Changamwe shales of the neighbourhood of Mombasa, Kenya have confirmed the earlier doubtful existence of *Gravesia* and *Hybonoticeras hybonotum* both zonal indices of the Lower Tithonian and yielded new *Nothostephanus* previously known only from Northern Iraq and Turkey. The domain of the sub-boreal genus *Gravesia* is thus extended south to Kenya. The fauna shows close similarities with Lower Tithonian faunas of Tanzania, Kutchh and Spiri indicating closer shelf connections among these areas.
852. VICENCIO, R., COLLINS, D.H., Royal Ontario Mus. (Invert. Palaeo.):  
Development of techniques for standardized description of fossils, 1972-77.
853. VILKS, G., Geol. Surv. Can.:  
Foraminiferal, molluscan and lithologic study in surface sediments and cores from the Beaufort Sea and Northwest Passage, 1973-.

854. VILKS, G., Geol. Surv. Can.:  
Micropaleontology of unconsolidated sediments on the Labrador continental shelf and slope, 1973-.
855. VON BITTER, P.H., Royal Ontario Mus. (Invert. Palaeo.):  
Palaeoecology and biostratigraphy of Lower Carboniferous (Windsor and Codroy groups) conodonts, Atlantic Provinces, Canada, 1971-80.
- See:  
Palaeoecology and distribution of Windsor Group (Viséan-? Early Namurian) conodonts, Port Hood Island, Nova Scotia, Canada; Geol. Assoc. Can., Sp. Paper 15, p. 225-241, 1976.
856. VON BITTER, P.H., LUDVIGSEN, R., Royal Ontario Mus. (Invert. Palaeo.):  
A new species of *Opsiconidion*, a Devonian acrotretid brachiopod with unique protegular ultrastructure, from Ontario, Canada, 1977.
857. VON BITTER, P.H., MERRILL, G.K., Royal Ontario Mus. (Invert. Palaeo.), Charleston College:  
Conodont distributions in the Pennsylvanian of North America - their taxonomic and palaeoecologic implications, 1968-.
- See:  
Revision of conodont biofacies nomenclature and interpretations of environmental controls in Pennsylvanian rocks of eastern and central North America; ROM Life Sci., Contrib., no. 108, p. 1-46, 1976.
- The apparatus of *Gondolella sublanceolata* Gunnell (Conodontophorida, Upper Pennsylvanian) and its relationship to *Illinella typica* Rhodes; ROM Life Sci., Contrib., no. 109, p. 1-44, 1976.
858. WALKER, D.A., Geol. Surv. Can.:  
Application of scanning electron microscope to micropaleontology, 1975-.
859. WALL, J.H., Geol. Surv. Can.:  
Reconnaissance of Mesozoic Foraminifera of Arctic Islands, 1972-.
860. WIGINGTON, R., LENZ, A.C., Univ. Western Ontario (Geology):  
Taxonomy and biostratigraphy of some brachiopods of the Whittaker Formation of Mackenzie Mountain, Northwest Territories, 1975-77; M.Sc. thesis (Wigington).
- A detailed biostratigraphic and taxonomic study of orthid and rhynchonellid brachiopods of the Whittaker Formation.
861. WILLIAMS, N., MORGAN, A.V., Univ. Waterloo (Biology):  
Analysis of fossil Trichoptera, 1974-.
- While the Don Valley Birchpit site was being examined for fossil beetle material, large numbers of fossil caddisflies were found in the organic debris. These consisted of the remains of larval segments of hundreds of individuals consisting of many different species. It was possible to identify many of the specimens to genus or species level, and from this data attempt a reconstruction of the paleoenvironment during deposition of the stratum. The prognosis for this type of reconstruction is believed to be exceptionally good. Further work will be conducted on other sites in the future, but this work is regarded as being secondary to the fossil beetle research.
862. WILSON, M.R., KUPSCH, W.O., Univ. Saskatchewan (Geological Sciences):  
A study of the climatic and vegetational history of some Quaternary sediments from north-central Saskatchewan, 1977-80; Ph.D. thesis (Wilson).
- The Precambrian shield of northern Saskatchewan is in part overlain by glacial and postglacial deposits. These comprise organic deposits, peat and gyttja, as well as lacustrine, glaciofluvial, and glacial deposits. Microfossils are well preserved in the organic and lacustrine deposits. A systematic study of the microfossils recovered from already available samples and further coring to be done during the summer field seasons, will be followed by an interpretation of the climatic and vegetational history of the area.
863. WILSON, M.V.H., Univ. Alberta (Zoology):  
Paleogene insect faunas of North America, 1975-.
- See:  
New records of insect families from the freshwater Middle Eocene of British Columbia; Can. J. Earth Sci., v. 14, no. 5, p. 1139-1155, 1977.
- Present research includes continuing collection of fossil insects from the freshwater Middle Eocene of British Columbia and Washington, and compilation of a bibliography and family index to insects known from the British Columbia Eocene, the Green River Eocene, and the Florissant Oligocene, with a study of the evolutionary and paleoenvironmental significance of similarities and differences among the faunas.

#### VERTEBRATE

864. BÉLAND, P., RUSSELL, D.A., National Mus. Nat. Sci.:  
Comparison de deux communautés de vertébrés: les dinosaures de la formation Judith River (Crétacé, Alberta) et les mammifères de la Luangwa (récent, Zambie), 1976-77.
- Les données relatives à la communauté de dinosaures sont compilées et analysées. Une recherche bibliographique a permis d'obtenir une partie de l'information pertinente sur les mammifères africains. Les données finales résulteront d'une expédition à la vallée de la Luangwa en juin et juillet 1977.
865. ELLIOTT, D.K., DINELEY, D.L., Univ. Bristol (Geology):  
New Heterostracans from the Siluro-Devonian of Arctic Canada, 1974-77.
- A group of pteraspids of the genus *Protopteraspis* have been described from the lower member of the Peel Sound Formation, Prince of Wales and Somerset Islands and the Boothia Peninsula and a number of new species have been identified. A revision of the genus will be proposed based on information from the new forms. New information on the age of the fauna suggests that the protopteraspids, occur earlier in Arctic Canada than in Europe and that this area was an evolutionary centre for the group. Pteraspids of probable upper Lower Devonian age from Prince of Wales and Cornwallis Islands have been described and four new genera identified. These are unlike any European forms but their occurrence at a number of localities in the Arctic will aid correlation. Work is continuing on a group of advanced cyathaspids of the genus *Listraspis* firstly to enable a fuller diagnosis of the group to be made and also to reinforce evidence of an evolutionary connection between the Cyathaspidae and the Pteraspidae.

866. DINELEY, D.L., Univ. Bristol (Geology):  
Vertebrates from the Siluro-Devonian of Arctic  
Canada, 1965-.
- See:**  
Ostracoderm faunas of the Delorme and associated  
Siluro-Devonian formations, Northwest Territories,  
Canada; Sp. Papers, Palaeontology 18, p. 1-214,  
1976.
- A new species of **Corvaspis** (Agnatha, Hetero-  
strachi) from the Upper Silurian to Lower or Middle  
Devonian of the North-West Territories, Canada;  
Palaeontology, v. 19, pt. 4, p. 757-766, 1976.
- Ctenaspis** from the Devonian of Arctic Canada;  
Athlon, Roy. Ontario Mus., p. 26-44, 1976.
- The recognition of greater diversity of faunal  
composition within the Siluro-Devonian formations  
of Arctic and Western Canada continues. Problems  
of heterostracan ontogeny and palaeoecology are  
under scrutiny.
867. HARRINGTON, C.R., FITZGERALD, G.R., THOMAS, C.,  
National Mus. Nat. Sci. (Paleobiology Div.):  
Pleistocene vertebrates of the Yukon Territory,  
1966-.
- To collect Pleistocene vertebrate material from  
the Yukon and to curate and describe it, in an  
attempt to reconstruct the vertebrate history of  
that region during the Pleistocene.
868. HILLS, L.V., SHACKLETON, D.M., Univ. Calgary  
(Geology):  
Quaternary ungulates, 1972-.
- See:**  
Post-glacial ungulates (**Cervus** and **Bison**) from  
Three Hills, Alberta; Can. J. Earth Sci., v. 14,  
no. 5, p. 963-986, 1977.
- To document morphologic variation and strati-  
graphic position of fossil and subfossil ungulate in  
Canada.
869. LOEFFLER, E.J., Univ. Bristol (Geology):  
Vertebrates from the Late Silurian-Early Devonian,  
Districts of Mackenzie and Franklin.
- See:**  
A new species of **Corvaspis** (Agnatha, Hetero-  
strachi) from the Upper Silurian to Lower or Middle  
Devonian of North-West Territories, Canada;  
Palaeontology, v. 19, pt. 4, p. 757-766, 1976.
- An ostracoderm fauna from the Leopold Formation  
(Silurian to Devonian) of Somerset Island,  
Northwest Territories, Canada; Palaeontology,  
v. 19, pt. 1, p. 1-15, 1976.
- Ostracoderm faunas of the Delorme and associated  
Siluro-Devonian formations, District of Mackenzie,  
Northwest Territories, Canada; Sp. Papers  
Palaeontology, v. 18, 1976.
- Preparation of ostracoderm material collected in  
1973 from transitional beds between the Allen Bay  
and Read Bay formations on Somerset Island is  
continuing. The fauna includes a number of  
interesting new cyathaspidids and traquairaspidids.
870. PAGEAU, Y.N., Université du Québec à Montréal  
(Sciences de la Terre):  
Paleo-ichthyologie, Gaspé, Québec, 1976-78.
- Voir:**  
Interpretation de la paléontologie et de la sédi-  
mentologie d'une coupe géologique dans la forma-  
tion de Battery Point (Dévonien moyen), Grés de  
Gaspé; Nat. Canadien, v. 103, p. 111-118, 1976.
871. RUSSELL, D.A., BÉLAND, P., JARZEN, D.M.,  
National Mus. Nat. Sci. (Paleobiology Div.):  
Cretaceous-Tertiary extinction, dinosaurian  
paleoecology.
- Emphasis will continue on paleoecologic implica-  
tions of terminal Cretaceous extinctions, and their  
chronostratigraphic duration using paleomagnetic  
data; the structure of dinosaurian communities also  
will be investigated.
872. RUSSELL, L.S., Univ. Toronto (Geology):  
The Cretaceous-Tertiary transition in central  
Alberta, 1976-78.
- A sequence of strata in central Alberta lying above  
the highest dated Cretaceous rocks (Scollard beds)  
and below the lowest dated Tertiary rocks  
(Paskapoo Formation) is of uncertain geological age  
and correlation. These strata are being searched  
for diagnostic fossils and the stratigraphic relation-  
ships with strata above and below are being  
examined. Palaeontological dating of these strata  
is needed for a more precise delimitation of the  
Cretaceous-Tertiary boundary in this region, and to  
determine whether or not there was a considerable  
interval of non-deposition here during the  
Mesozoic-Cenozoic transition. During the field  
season of 1976 a fossil bed was discovered just  
above the Ardley coal seam, and tentatively dated  
as Paleocene. During 1977 the examination will be  
extended to other localities and to the beds  
immediately below the Ardley coal seam.
873. SARJEANT, W.A.S., MOSSMAN, D.J., CURRIE, P.,  
Univ. Saskatchewan (Geological Sciences), Alberta  
Prov. Mus.:
- Vertebrate footprints in the Carboniferous and  
Triassic rocks of the Maritime Provinces, 1976-78.
- Examination of newly discovered specimens of  
vertebrate footprints from the Upper  
Carboniferous of Nova Scotia and description of  
some vertebrate footprints recently discovered in  
the Triassic rocks of New Brunswick.
874. VEILLEUX, P., WILSON, M.V.H., Univ. Alberta  
(Zoology):  
Osteology and classification of fossil and Recent  
Umbridae, 1975-77; M.Sc. thesis (Veilleux).
875. WILSON, M.V.H., Univ. Alberta (Zoology):  
Eocene freshwater fishes of British Columbia and  
Washington, U.S.A., 1969-.
- Current work centres on detailed studies of the  
variation in the catostomid species **Amyzon**  
**brevipinne** from the Princeton area of British  
Columbia, and collection and description of the fish  
fauna from the Klondike Mountain Formation, near  
Republic, Washington, U.S.A.
876. WILSON, M.V.H., Univ. Alberta (Zoology):  
Paleoecology of Eocene lacustrine sediments in  
British Columbia, 1975-.
- See:**  
Paleoecology of Eocene lacustrine varves at  
Horsefly, British Columbia; Can. J. Earth Sci.,  
v. 14, no. 5, p. 953-962, 1977.
- Present studies include use of fossil fishes and  
insects as paleoenvironmental predictors, with  
special reference to Eocene shales of the Allenby  
Formation, Princeton Group, British Columbia.
877. WILSON, M.V.H., Univ. Alberta (Zoology):  
Upper Cretaceous marine fishes from the Kanguk  
Formation, Banks Island, District of Franklin, 1975-  
78.

878. WILSON, M.V.H., Univ. Alberta (Zoology):  
Paleocene fishes from the Paskapoo Formation, Alberta, 1976-.
- Search for fossil fish localities in the Paleocene Paskapoo Formation of Alberta, and additional collecting and study of collections from a small number of known localities, for the purpose of studying the systematics, evolution, and distribution of freshwater fishes during the Paleocene.
879. WOOLF, T., KUPSCH, W.O., Univ. Saskatchewan (Geological Sciences):  
Quaternary chronostratigraphy of the Interior Plains, Canada, 1976-80; Ph.D. thesis (Woolf).
- The 1976 summer field work concentrated on 3 sites of Quaternary deposits near Saskatoon, Saskatchewan, consisting of water-laid sands and gravels that were known to contain vertebrate remains. All 3 sites are late Wisconsinan in age. The remains of larger vertebrates tentatively identified in the field include mammoth, bison, antelope, and others. The study of micro-vertebrate fossil remains, mainly rodents, is presently underway.
- PALEOBOTANY/PALYNOLOGY**
880. ACHAB, A., INRS-Pétrole, Univ. Québec:  
Etude palynologique du Paléozoïque inférieur de l'Est du Canada, 1975-78.
- Voir:**  
Les chitinozoaires de la zone à *Dicellograptus complanatus*, Formation de Vauréal (Ordovicien supérieur), Ile d'Anticosti, Québec; Can. J. Earth Sci., v. 14, no. 3, p. 413-425, 1977.
- Etude des chitinozoaires des Formations de Macasty, Vauréal et d'Ellis Bay de l'île d'Anticosti; essai de zonation de ces formations.
881. BARSS, M.S., Geol. Surv. Can.:  
Palynological zonation of the Carboniferous and Permian rocks of Atlantic Provinces, Gulf of St. Lawrence and northern Canada, 1968-.
- See:**  
A mounting medium for palynological residues; Geol. Surv. Can., Paper 76-1B, p. 131-132, 1976.
882. BRIDEAUX, W.W., Geol. Surv. Can.:  
Taxonomy, biostratigraphy, and paleoecology of Mesozoic miospore and microplankton assemblages from the District of Mackenzie, northwestern Canada, 1971-.
- See:**  
Lithostratigraphy and dinoflagellate cyst succession in the Gulf Mobil Parsons N-10 well, District of Mackenzie; Geol. Surv. Can., Paper 76-1B, p. 235-249, 1976.
- Taxonomic notes and illustrations of selected dinoflagellate cyst species from the Gulf Mobil Parsons N-10 well; *ibid.*, p. 251-257, 1976.
- Berriasian dinoflagellate assemblage, Martin Creek, northwestern District of Mackenzie; Geol. Surv. Can., Paper 76-1C, p. 115-130, 1976.
- Upper Jurassic-Lower Cretaceous dinoflagellate assemblages from Arctic Canada; Geol. Surv. Can., Bull. 259, 1976.
883. BUJAK, J., Geol. Surv. Can.:  
Biostratigraphy and paleoecology (palynology) of Mesozoic and Cenozoic of the Atlantic Shelf, 1976-.
884. CHI, B.I., BP Exploration Canada Ltd. (Geological):  
Devonian-Mississippian spores of Yukon and Northwest Territories, 1976-.
- See:**  
Biostratigraphy and taxonomy of Devonian megaspores, Arctic Canada; Bull. Can. Pet. Geol., v. 24, no. 4, 1976, p. 640-818, 1977.
- Morphologic variation and stratigraphic significance of *Triangulatisporites rootsii* Chabner; Can. J. Earth Sci., v. 13, no. 6, p. 847-861, 1976.
885. CWCYNAR, L., RITCHIE, J.C., Univ. Toronto (Scarborough College-Botany):  
The modern and Late-Pleistocene vegetation and flora of the northern Yukon, particularly in the region of the Old Crow Flats, 1975-78; Ph.D. thesis (Cwynar).
886. FEDEROVICH, S.L., Geol. Surv. Can.:  
Diatom analyses of Quaternary sediments, 1972-.
- See:**  
A preliminary list of diatoms from sea floor sediments in Croker Bay, Devon Island, District of Franklin; Geol. Surv. Can., Paper 76-1B, p. 133-136, 1976.
887. GUILBAULT, J.P., MAMET, B.L., Univ. Montréal (Géologie):  
Algues ordoviciennes des Basses-Terres du Saint-Laurent, 1974-76; thèse de maîtrise (Guilbault).
- Voir:**  
Codiacées ordoviciennes des Basses-Terres du St-Laurent; Can. J. Earth Sci., v. 13, no. 5, p. 636-660, 1976.
888. HILLS, L.V., Univ. Calgary (Geology):  
The Beaufort Formation, Arctic Canada, 1967-.
- To describe the stratigraphy, sedimentation, paleobotany, palynology and paleoclimatology of the Beaufort Formation Arctic Canada. This will be used to date the Beaufort and to gain better insight into late Tertiary climates. Evolutionary change within the macroflora will be evaluated.
889. HILLS, L.V., Univ. Calgary (Geology):  
Devonian megaspores, 1971-.
- See:**  
Biostratigraphy and taxonomy of Devonian megaspores, Arctic Canada; Bull. Can. Pet. Geol., v. 24, no. 4, p. 639-816, 1976.
- Morphologic variation and stratigraphic significance of *Triangulatisporites rootsii* Chaloner; Can. J. Earth Sci., v. 13, no. 6, p. 847-861, 1976.
- Prior studies have emphasized the zonation and distribution of megaspores in Devonian strata on the Arctic Islands. The youngest Devonian exposed on the Arctic Islands is within the Fammenian. Therefore work is being done on the Imperial Formation in order to examine the Devonian-Mississippian boundary. Attempts will also be made to examine the Frasnian-Fammenian boundary throughout the area.
890. HILLS, L.V., Univ. Calgary (Geology):  
Carboniferous palynology, 1974-.
- Identify, document and determine the stratigraphic and geographic distribution of Carboniferous miospores in Western Canada.
891. HILLS, L.V., Univ. Calgary (Geology):  
Carboniferous megaspore palynology, 1976-80.

Carboniferous megaspores from Canadian strata are virtually unknown. Preliminary investigations of samples from the Mattson Formation, Jackfish Gap, N.W.T. and the Pictou Group, Point Aconi, Nova Scotia indicate that megaspores are locally abundant in Carboniferous strata. Therefore, this project will undertake extensive sampling in order to evaluate their stratigraphic and paleoecologic significance.

892. HOPKINS, W.S., Jr., Geol. Surv. Can.:  
Mesozoic palynology and biostratigraphy, Arctic Islands, 1968-.

**See:**

Cretaceous stratigraphy, Hoodoo Dome, Ellef Ringnes Island, District of Franklin; Geol. Surv. Can., Paper 76-1B, p. 329-334, 1976.

893. HOPKINS, W.S., Jr., Geol. Surv. Can.:  
A palynological study of the Shell Harlequin D-86 and Shell Murrelet L-15 wells, British Columbia, 1974-.

894. JANSONIUS, J., Imperial Oil Ltd.:  
Tertiary fungal spores, 1973-.

895. JANSONIUS, J., HILLS, L.V., Imperial Oil Ltd., Univ. Calgary (Geology):  
Catalogue of fossil spore and pollen genera, 1973-.

**See:**

Genera card file of fossil spores; Dept. Geology, Univ. Calgary, Sp. Publ., 1976.

To provide practicing palynologists an up-to-date listing of genera of fossil spores and pollen in English. Each entry contains a full generic diagnosis, usually given as a direct quotation from the original publication (or 'protologue'). Relevant emendations by subsequent authors are presented in a similar manner. A description of the type species, its measurements, as well as its geographic and stratigraphic occurrence are given in abbreviated, generalized form. Additional nomenclatural remarks may be included. (Subjective opinions of the authors are identified by their initials. JJ) Each card is headed by the generic name and the original or validating author and year of publication. The second line gives an abbreviated bibliographic reference to the book or periodical and page number where the genus was first described. Next is given the name of the type species, with author and date. For new combinations, the basionym is given, with a bibliographic reference including the figure number of the holotype. Each valid and legitimate genus has a line drawing of this holotype. If not otherwise indicated, designation of the type species and its holotype are by the original author.

896. JARZEN, D.M., RUSSELL, D.A., WHALEN, G.J., National Mus. Nat. Sci. (Paleobiology Div.):  
Angiosperm evolution, paleoecology and paleobiogeography during the Mesozoic-Cenozoic transition, 1973-.

The botanical affinities of several angiosperm pollen types from Cretaceous and Tertiary sediments from several localities around the world are providing valuable information as to the paleoclimatology and paleobiogeography during the Mesozoic-Cenozoic transition period. The eventual description of the floras from several localities within the Western Interior basin will allow for valid deductions as to the nature and extent of plant extinctions and/or migrations at the close of the Cretaceous period.

897. LEGAULT, J.A., Univ. Waterloo (Earth Sciences):  
Fungal spores from the Boissevain and Turtle Mountain formations, southern Manitoba, 1974-77.

898. LEGAULT, J.A., Univ. Waterloo (Earth Sciences):  
Spores of the Hamilton Formation, southwestern Ontario, 1977-.

899. MAY, R.W., MCCOURT, R., Univ. Alberta (Geology):  
Palynology of Quaternary sediments in northeastern British Columbia, 1977-78; M.Sc. thesis (McCourt).

Preclassical Wisconsin sediments in northeastern British Columbia have been sampled and initial processing is nearing completion.

900. MCANDREWS, J.H., BURDEN, E., NORRIS, G., Univ. Toronto (Geology):

Pollen and dinoflagellate successions in recent lacustrine sediments, Simcoe County, Ontario; M.Sc. thesis (Burden).

Eight short sediment cores from Second Lake and Gignac Lake, Simcoe County, Ontario are being analysed for pollen and dinoflagellates. Sedimentological and geochemical studies are also being conducted to determine if there is a relationship between the upland and lacustrine vegetation and the sediment deposited in these lakes. The nature and chronology of upland vegetation successions is established by palynologically investigating each core at 1 to 5 cm intervals. The ragweed rise, about 100 years ago, and the white pine rise, about 350 years ago are believed to represent events related to major forest disturbances initiated by human activity and accentuated by climatic change. Dinoflagellate cyst successions during these intervals will be compared to upland vegetation changes and trace element changes as determined from neutron activation analysis. An attempt will be made to determine if any ecologically significant variables are represented here. The ecology of freshwater dinoflagellates is virtually unknown, though preliminary studies indicate that water chemistry and temperature may control long term successions.

901. MCGREGOR, D.C., Geol. Surv. Can.:  
Silurian and Devonian spores of Canada, 1975-.

**See:**

Upper Silurian? to Middle Devonian spores of the Moose River basin, Ontario; Geol. Surv. Can., Bull. 263, 1976.

902. MOTT, R.J., Geol. Surv. Can.:  
Quaternary palynology, 1969-.

903. NORRIS, G., ARTZNER, D., FASOLA, A., Univ. Toronto (Geology):

Evaluation of the North American mid-continent palynofloras and their stratigraphic applications; Ph.D. theses.

The palynological content of the Senonian sedimentary sequences in the Manitoba Escarpment area is being studied in order to establish a stratigraphic zonation and determine the influence of the western and eastern floral provinces over the late Cretaceous floras of the Mid-Continent (Manitoba). The objectives of the Utah study, besides a detailed description of pollen, spores and dinoflagellate assemblages, will be to establish the variation in distribution of palynomorphs deposited within different sedimentary environments. Correlation of marine sections will be made between both areas by using marine dinoflagellates.

904. NORRIS, G., DAVIES, G.H., Univ. Toronto (Geology):  
Ultrastructural analysis of exine and apertures of angiospermous colpoid pollen.  
Scanning electron microscopic examination of *Stephanocolpites fredericksburgensis* Hedlund and Norris and *Asteropollis asteroides* Hedlund and Norris from the Albian of Oklahoma, supports the theory of derivation of equatorial apertures of pollen through migration of the radial arms of a distally-centered polychotomosulcate aperture to the equator, and subsequent reduction of the polar portion. These species have ultrastructures somewhat similar to the coniferalean genera *Classopollis* and *Dichieropollis*, yet unlike that of tricolpate types of the same assemblage. *Penetrarpites mollis* Hedlund and Norris also appears to have close affinities to coniferalean grains in ultrastructure and in possessing a distal pore. A polyphyletic origin of angiospermous pollen is suggested based on the ultrastructural correlations. Ultrastructural analysis of other possible angiosperm ancestral pollen types are needed to confirm these evolutions.
905. NORRIS, G., DAVIES, E.H., Univ. Toronto (Geology):  
Jurassic-Cretaceous stratigraphic palynology of the Sverdrup Basin, Arctic Canada; Ph.D. thesis (Davies).  
Surface and subsurface sections of the thick clastic sequences comprising the Jurassic and Lower Cretaceous of the western and central Sverdrup Basin are being analyzed in detail for marine and terrestrial palynofloras. Rich assemblages indicate that a biostratigraphic zonation using miospores and dinoflagellates will be possible. Problems currently being investigated are techniques for evaluating the effect of cavings on subsurface sections, and the age determination of certain Lower Cretaceous intervals by correlation to European stratotypes.
906. NORRIS, G., DÖRHÖFER, G., Univ. Toronto (Geology):  
Correlation of palynofloras from the Jurassic-Cretaceous boundary beds of Europe, 1973-78.
907. NORRIS, G., DÖRHÖFER, G., Univ. Toronto (Geology):  
Provincialism and correlation of upper Lower Cretaceous (Aptian-Albian), palynofloras in the north-Atlantic Realm.  
In Europe, only outcrops from southern England are being investigated on a relatively large scale; however, further investigations are being conducted on more terrestrially-influenced northwest German strata. These data will ultimately be used to determine changing provincialism in the North Atlantic realm. This provincialism is thought to be related, in part, to opening of the North Atlantic Ocean during this period.
908. NORRIS, G., HOYER, P.W., Univ. Toronto (Geology):  
Dinoflagellates from the Barremian stratotype near Angles, France; M.Sc. thesis (Hoyer).  
The rich dinoflagellate assemblages obtained indicate that few, if any, species are restricted to the Barremian and the majority of species extend into both higher and lower strata with the result that the Barremian is not palynologically distinctive.
909. NORRIS, G., TELFORD, P., VOSS, M., Univ. Toronto (Geology):  
Palynologic investigations of the Moose River basin, James Bay Lowlands.
- See:**  
Palynofloral evidence for terrestrial Middle Jurassic in the Moose River Basin, Ontario; Can.J. Earth Sci., v. 14, no. 2, p. 153-158, 1977.  
The Mattagami Formation has been investigated in five boreholes in the south-west part of the Moose River Basin, James Bay Lowlands. A tripartite palynologic zonation has allowed subsurface correlations between boreholes and has identified horizons correlative with the economically important Onakawana Lignite in the eastern part of the basin. The entire Mattagami Formation is Albian in age, except for the presence of Middle Jurassic on the north-west edge of the basin. Palynologic correlations between the Moose River Basin and Middle Cretaceous continental and marine strata in western Canada have been established.
910. PIROZYNSKI, K.A., National Mus. Nat. Sci. (Paleobiology Div.):  
Fossil fungi and phylogeny: A preliminary assessment, 1975-80.  
**See:**  
Fossil Fungi; Ann. Rev. Phytopath., v. 14, p. 237-246, 1976.  
Fungal spores in fossil record; Biol. Mem. 1, 1977.  
To bring together scattered paleomycological data and to interpret the history of Fungi using morphology and distribution of present day forms as the key to the past. To bring to the attention of micropaleontologists the abundance of fossilized remains of Fungi and their relevance in environmental geoscience, especially paleoecology.
911. POCKOCK, S.A.J., Imperial Oil Ltd.:  
Jurassic and Cretaceous palynology, 1957-.
912. RITCHIE, J.C., Univ. Toronto (Scarborough College-Botany):  
Late-Pleistocene vegetation history of western interior of Canada, 1970-80.
913. ROUX, A., MAMET, B.L., Univ. Montréal (Géologie):  
Algues et microfacies du Paléozoïque Supérieur de l'Arctique canadien (Innuitiennes), 1976-79.
914. SARJEANT, W.A.S., HARKER, S.D., FENSOME, R.A., WILSON, M.A., BRADFORD, M.R., Univ. Saskatchewan (Geological Sciences):  
Dinoflagellates and acritarchs in the Mesozoic; stratigraphical application in Western and Arctic Canada and use in intercontinental correlation, 1962-; Ph.D. theses (Harker, Bradford), M.Sc. theses (Fensome, Wilson).  
Work is continuing on several fronts: on the British type-sections of the Jurassic, on a sequence of samples from Algeria and Iran, dinoflagellate cysts from the Jurassic of Jameson Land, east Greenland (Fensome); assemblages of pollen, spores and dinoflagellate cysts from three sections across the Cretaceous-Tertiary boundary in Yukon and Mackenzie (Wilson); dinoflagellate cysts from the Campanian of the Prairie Provinces of Canada and from Wyoming and the Gulf Coast, U.S.A. (Harker), and assemblages from fully known Recent sedimentary environments in the Persian Gulf and Arabian Sea (Bradford).
915. SHALABY, H., MAMET, R.L., Univ. Montréal (Géologie):  
Algues ordoviciennes de la Plate-Forme du Saint-Laurent, 1977-79; thèse de doctorat (Shalaby).

916. SINGH, C., Alberta Research Council (Geology Div.): Cenomanian microfloras of the Peace River District, Alberta, 1969-78.
- To describe, illustrate and record the stratigraphic distributions of the microfioral species present in the upper Shaftesbury, Dunvegan and lower Kaskapau Formations in northwestern Alberta. A diverse and well preserved microfioral assemblage has been recovered. Most of the photographic work and compilation of data on age and distribution of the microfioral species have been completed, and a report on an exclusively Cenomanian microfioral assemblage consisting of about 150 species of microspores, pollen, megaspores and microplankton is being currently compiled.
917. SINGH, C., Alberta Research Council (Geology Div.): Late Cretaceous-Tertiary microfioras, west-central Alberta, 1970-78.
918. SINGH, C., Alberta Research Council (Geology Div.): Palynological study of the coal-bearing late Cretaceous strata in the Red Deer River valley, Alberta, 1973-84.
- To determine the distinguishing qualitative and quantitative microfioral characteristics of the prominent coal seams in the Edmonton Group and Scollard Member of the Paskapoo Formation, which will facilitate their recognition and correlation in the subsurface. A diverse and well preserved microfioral assemblage has been recovered. The distribution of megaspore genera is currently being recorded. A microfioral break has been located at the Nevis Seams (in the Scollard Member), which corresponds with the regional and synchronous floral changes that occur at the Maestrichtian-Paleocene boundary in the western interior of the United States and Canada.
919. STAPLIN, F.L., Imperial Oil Ltd.: Triassic microplankton, Arctic Islands, 1974-.
920. SWEET, A.R., Geol. Surv. Can.: Palynological studies of Upper Jurassic and Cretaceous coal measures in western Canada, 1971-.
- See:**  
A microfiora from a short section of the Paleogene Kishenehn Formation, southeastern British Columbia; Geol. Surv. Can., Paper 76-1B, p. 307-309, 1976.
921. SWEET, A.R., Geol. Surv. Can.: Palynological study of the Tertiary coal and associated clastic rocks of the Ravenscrag and Frenchman formations, Saskatchewan, 1973-.
922. SWEET, A.R., Geol. Surv. Can.: Reconnaissance survey to determine the biostratigraphic value of megaspores in Mesozoic and Tertiary strata of northern Canada, 1973-.
923. TAN, T., HILLS, L.V., Univ. Calgary (Geology): Late Triassic to Lower Cretaceous dinoflagellates from the Sverdrup Basin, Arctic Canada, 1971-; Ph.D. thesis (Tan).
- Determine the stratigraphic distribution of dinoflagellates in Late Triassic to Lower Cretaceous strata of the Western Sverdrup Basin. Attempts will be made to correlate the dinoflagellates with invertebrate faunas (principally ammonites) and with the European section. It is hoped that this data will: (a) refine correlations within this time interval; and (b) provide a basis of correlating surface and subsurface sections within the area.
924. UTTING, J., INRS-Pétrole, Univ. Québec: Palynological investigation of the Windsor Group (Mississippian) of Nova Scotia, 1975-77.
- See:**  
Preliminary palynological investigation of the Windsor Group (Mississippian) of Nova Scotia; Geol. Surv. Can., Paper 77-1A, p. 347-349, 1977.
- Further work is in progress concerning the section on Port Hood Island and on samples from sub-zone A of Cape Breton.
925. UTTING, J., INRS-Pétrole, Univ. Québec: Palynostratigraphic investigation of Upper Palaeozoic and Triassic rocks of Arctic Canada, 1976-79.
- The investigation has been concerned so far with Permian rocks from the northern Yukon and the Permo-Carboniferous and Triassic of Ellesmere and Axel Heiberg Islands.
926. VAN HELDEN, B.G.T., OWER, J.R., Chevron Standard Ltd. (Exploration): Mesozoic-Tertiary palynology.
- See:**  
Correlation of microplankton assemblages with ammonite faunas from the Jurassic Wilkie Point Formation, Prince Patrick Island, District of Franklin; Geol. Surv. Can., Paper 77-1B, p. 163-171, 1977.
927. WALTON, H.S., Chevron Standard Ltd. (Exploration): Proterozoic and Paleozoic palynology, Northwest Territories, Canada, 1975-78.
928. WALTON, H.S., BERTI, A.A., OWER, J.R., Chevron Standard Ltd. (Exploration): Palynology of Grand Banks area, Newfoundland, 1975-77.
- See:**  
Upper Triassic and Lower Jurassic palynology of the Grand Banks area, Eastern Canada; Abstract AASP/CIMP Joint Meeting, Halifax, Nova Scotia, 1976.
929. WILLIAMS, G.L., Geol. Surv. Can.: Classification of dinocysts, 1973-.
- See:**  
Dinoflagellate cyst terminology; Geol. Surv. Can., Paper 76-24, 1977.
930. WINN, C.E., TERASMAE, J., Brock Univ. (Geological Sciences): Vegetational history and geochronology of southwestern Ontario, and mastodon extinction in this region, 1974-77; M.Sc. thesis (Winn).
- Detailed palynological analyses were carried out on samples from four lakes, two bogs, two buried peat sections and three mastodon sites in southwestern Ontario. A total of thirty-two radiocarbon dates were obtained from material collected from these sites in an attempt to establish a detailed chronology to be used in the development of a preliminary detailed vegetational history for the study area. Published and unpublished palynological and radiocarbon data from several sources were used to further establish a chronologically controlled vegetational history for southern southwestern Ontario.



EXPERIMENTAL

931. EDGAR, A.D., CONDLIFFE, E., Univ. Western Ontario (Geology):

Experimental petrology of highly potassic ultramafic rocks with mixed volatiles (H<sub>2</sub>O and CO<sub>2</sub>), 1976-78.

See:

Experimental petrology of a highly potassic magma; J. Petrology, v. 17, p. 339-356, 1976.

932. FAWCETT, J.J., Univ. Toronto (Geology):

The stability of chlorite with PH<sub>2</sub>O < P total, 1977-79.

See:

Upper stability of chlorite + quartz in the system MgO-FeO-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub>-H<sub>2</sub>O at 2 kbar; Amer. Mineralogist, v. 61, p. 1175-1193, 1976.

The stability and phase relations of iron chlorite below 8.5 Kb PH<sub>2</sub>O; Contrib. Mineral. Petrology, v. 56, p. 1-25, 1976.

Reduction of the upper thermal stability of hydrous minerals under conditions of PH<sub>2</sub>O < P<sub>total</sub> is well known but experimental studies under such conditions have not yet been conducted on the chlorite mineral group. As the most common chlorite occurrences (greenschist facies) are usually associated with carbonates, including PH<sub>2</sub>O below P fluid, we have begun investigations of Mg chlorite stability using H<sub>2</sub>O-CO<sub>2</sub> buffers developed by Holloway et al. (1968). Preliminary experiments have been carried out on the clinocllore composition at P<sub>total</sub> = 2Kb. The dehydration reaction has been traced to temperatures as low as 640°C (cf. 710° ± 15°C for PH<sub>2</sub>O = P<sub>total</sub>).

933. GITTINS, J., Univ. Toronto (Geology):

Phase equilibrium studies applied to the petrogenesis of carbonatite complexes, 1971-.

The system Na<sub>2</sub>CO<sub>3</sub>-K<sub>2</sub>CO<sub>3</sub>-CaCO<sub>3</sub> was investigated at a total pressure of 1 Kb in order to elucidate the development of extrusive carbonatite lavas at the Tanzanian volcano Oldoinyo Lengai. From this study the idea developed that alkalic carbonatite magmas may in fact be common in deep-seated carbonatites of the type found in the Canadian Shield, whereas it has been customary to think of the Tanzanian example as a rare petrological curiosity. It is proposed that calcitic and dolomitic carbonatites are the residues remaining after alkalis are removed from alkalic carbonatite magmas in aqueous solution or alkali halides forming part of the fenitizing fluids associated with carbonatite complexes. To test the hypothesis, the system Na<sub>2</sub>CO<sub>3</sub>-CaCO<sub>3</sub>-CaMg(CO<sub>3</sub>)<sub>2</sub> is being investigated at PT = 1 Kb and PH<sub>2</sub>O = 1 Kb. The effect of the alkalis on the solubility of phosphorus and niobium in carbonate liquids is being tested in the hope that this can be related to the type of fenitization and developed into an exploration guide in the search for niobium and phosphate deposits.

934. GREENWOOD, H.J., Univ. British Columbia (Geological Sciences):

Equilibrium relations and solution models in the orthorhombic Fe-Mg amphiboles. Thermodynamics of the grossular-hydrogrossular series, 1976-78.

Anthophyllite: Exchange equilibria between Fe-Mg chloride solutions and solid phases will be used to extract thermodynamic mixing models of the solid

solutions. Fluids analysed by atomic absorption, solids by x-ray and microprobe. Hydro-grossular: Displacement of the equilibrium Gross+quartz = An + woll by means of hydrogrossular substitution will be used to estimate the free energy of substituting protons for Si in the garnet structure.

935. GREENWOOD, H.J., Univ. British Columbia (Geological Sciences):

Thermodynamic properties and stability of edenite, 1976-78.

To determine equilibrium stability relations of the amphibole edenite, and to use these data for the estimation of the thermodynamic properties of this end-member of the amphibole series.

936. SCARFE, C.M., Univ. Alberta (Geology):

Viscosity and related properties of silicate melts and magmas, 1976-79.

See:

Physics and chemistry of silicate melt and magmas; EOS, Trans. Am. Geophys. Union, March, 1977.

937. TURNOCK, A.C., Univ. Manitoba (Earth Sciences):

Melting relations of Ca-Mg-Fe pyroxenes, 1970-77.

Phase relations showing solidus and liquidus surfaces, and compositions of pyroxenes, bustamites, and liquids, in the pyroxene quadrilateral CaMgSi<sub>2</sub>O<sub>6</sub>-CaFeSi<sub>2</sub>O<sub>6</sub>-FeSiO<sub>3</sub>-MgSiO<sub>3</sub>, have been determined experimentally for P = 1 atm. For the liquidus surface, the field boundaries Augite-Pigeonite, Augite-Bustamite, and Bustamite-Tridymite are now satisfactorily determined, but Pigeonite-Orthopyroxene, Pigeonite-Tridymite and Pigeonite-Forsterite are poorly known. The positions of the piercing points Pig-Trid-Aug-Liq and Aug-Bust-Trid-Liq have been determined. Reaction rate slowness impedes determination of solidus, and only the Augite and Bustamite portions of the solidus are well determined.

IGNEOUS

938. ALLARD, G.O., Québec Min. Richesses Naturelles:

Etude du contact nord du complexe de Lac Doré, 1966-77.

939. APPELYARD, E.C., STOTT, G.M., Univ. Waterloo (Earth Sciences):

Migmatite gneisses in the Madawaska Valley, eastern Ontario, 1974-77; M.Sc. thesis (Stott).

Migmatite gneisses in part of the Madawaska area of eastern Ontario are being studied to decipher the structural and intrusive events. The tectonic sequence can be correlated with that preserved within the super-incumbent Grenville Supergroup. The sequence of events recorded in the migmatites appear to reflect only the effects of the Grenville orogeny; pre-orogenic "basement" has not been recognized.

940. BAKER, D., WILLIAMS, H., Memorial Univ. (Geology): Petrology and structural setting of Skinner Cove volcanics, western Newfoundland, 1976-77; M.Sc. thesis (Baker).

941. BARAGAR, W.R.A., Geol. Surv. Can.:

Studies of Coppermine River volcanic rocks, District of Mackenzie, 1966-.

942. BARAGAR, W.R.A., Geol. Surv. Can.:

Volcanic stratigraphy and geochemistry of the Cape Smith belt, New Quebec, 1973-.

943. BARAGAR, W.R.A., Geol. Surv. Can.:  
Stratigraphy and petrology of the Natkusiak basalts, Victoria Island, District of Franklin, 1975-.
944. BARR, S.M., MACDONALD, A.S., NAKPIN, T., Acadia Univ. (Geology):  
Carboniferous-Triassic mafic and ultramafic rocks in Thailand: their petrology, geochemistry and tectonic significance, 1975-78.  
To define the true nature of two "ophiolite" belts with a view to understanding the tectonic history of Thailand and southeast Asia, and thereby to specify the expected types of economic mineral deposits such as are found with similar convergent plate margins elsewhere in the world. Field mapping indicates that the eastern "ophiolite" belt includes alpine-type ultramafic bodies (dunite, peridotite, serpentinite, pyroxenite) with associated chromite, talc and asbestos. The western "ophiolite" belt is not an ophiolite complex, but may be an andesitic volcanic arc association. Studies of petrology and geochemistry of these rocks are in progress.
945. BARR, S.M., MACDONALD, A.S., REYNOLDS, P.H., HAILE, N.S., Acadia Univ. (Geology):  
Petrography, geochemistry, age and tectonic significance of gem-bearing alkaline basalts of Southeast Asia, 1974-78.  
To characterize gem-bearing basalts as compared to non-gem-bearing basalts in Thailand, using petrology, geochemistry, age, and palaeomagnetism, and thus to outline possible new gem sources. To compare Thai basalts to the better known Indo-Chinese basalts, and hopefully to discover the tectonic significance of the volcanic province as a whole. To improve understanding of the origin of gems in gem-bearing basalts. Over 200 samples have been collected for studies of petrography, geochemistry, and/or palaeomagnetism. Dating of zircons by the fission track method is in progress. Attempts at dating by the K-Ar method proved unsuccessful due to weathering. Initial geochemical data indicate that the basalts range in composition from basanite through mugearite, and that it is possible to discriminate between gem-bearing and non-gem-bearing basalts and thus provide an exploration tool for defining new gem prospects.
946. BELANGER, J., CATY, J-L., CHOWN, E.H., WOUSSEN, G., Univ. du Québec à Chicoutimi:  
Etude de la transition entre les roches acides de la Formation de Waconichi et les roches basiques de la Formation de Gilman, au Sud du lac Waconichi, 1976-77; thèse de maîtrise (Belanger).
947. BOSTOCK, H.H., Geol. Surv. Can.:  
Volcanic rocks of the Appalachian region, 1973-.
948. BOUDREAU, A.P., CATY, J-L., CHOWN, E.H., WOUSSEN, G., Univ. du Québec à Chicoutimi:  
Etude pétrographique et géochimique des laves et filons-couches mafiques du canton de Richardson, Québec, 1975-77; thèse de maîtrise (Boudreau).
949. BRYAN, M.P.D., SCARFE, C.M., Univ. Alberta (Geology):  
Petrology of a portion of the Hackett River greenstone belt, District of Mackenzie, Northwest Territories, 1975-77; M.Sc. thesis (Bryan).
950. BUCKLEY, D.W., COLWELL, J.A., STEVENS, G.R., MAX, M.D., BARR, S.M., Acadia Univ. (Geology):  
The petrology of Ordovician igneous rocks, East Mweelrea syncline, west of Eire, 1976-77; M.Sc. thesis (Buckley).
- Following three months field studies in Ireland, routine geochemical analyses of 43 samples of ignimbrites were carried out by atomic absorption. Approximately 60 thin sections also were examined. The three ignimbrite bands showed a differentiation sequence from rhyolite to alkalic rhyolite. Examination of the spilites suggests a basaltic/andesitic parentage.
951. BUREAU, S., GUHA, J., CIMON, J., CHOWN, E.H., Univ. du Québec à Chicoutimi, Québec Min. Rich. Nat.:  
Etude pétrographique et géochimique des brèches du Canton de Queylus de la région de Chibougamau, Québec, 1976-78; thèse de maîtrise (Bureau).
952. CASEY, J.J., SCARFE, C.M., Univ. Alberta (Geology):  
Petrology of the Heart Peaks volcanic centre, northwestern British Columbia, 1976-78; M.Sc. thesis (Casey).
953. CERNY, P., TRUEMAN, D.L., GOAD, B.E., PAUL, B.J., Univ. Manitoba (Earth Sciences):  
Pegmatite mineral evaluation project, 1976-79.  
The project is aimed at documenting the character of pegmatites and their geological setting in the two major pegmatite districts of Manitoba, the Cat Lake-Winnipeg River and Herb Lake areas, and providing a scientific basis for directing further exploration activities in most promising areas. These objectives will be achieved through the following studies: the distribution, structural setting, mineralogy and geochemistry of the pegmatites; the distribution, mineralogy, and geochemistry of the granitic bodies; and the spatial, temporal and genetic relationships between the granitic bodies, the pegmatites and their host structures. First field season concentrated on structural studies, with subordinate sampling of plutonic rocks and pegmatites complementing earlier studies conducted under other programs. Geochemical studies are in progress.
954. CHUTE, M.E., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Missi Island volcanic centre, Saskatchewan, 1974-80; Ph.D. thesis (Chute).  
On Missi Island of Amisk Lake, extensive subvolcanic, felsic to intermediate dikes were injected into a basaltic shield volcano. Alteration and pyrite-chalcopyrite mineralization associated with the dikes are suggestive of a porphyry-type environment. Field and laboratory work are in progress to determine the relationship between mineralization, alteration, plutonism, and volcanism, and the nature of the plutonism.
955. COCKER, J.D., Univ. Alberta (Geology):  
Petrogenesis of the Nipple Stock, British Columbia, 1976-78.  
This study is directed towards the petrogenesis of the biotite-, hornblende- and garnet-bearing Nipple Quartz Diorite, which is part of the Coast Plutonic Complex in the Fraser Valley, British Columbia. It is hoped that the zoning profiles of the mafic minerals and plagioclase will provide evidence for the paragenesis of the quartz diorite. Comparison of the paragenesis with experimentally crystallized sequences will be used to determine the P-T history and fH<sub>2</sub>O of the melt.
956. CURRIE, K.L., Geol. Surv. Can.:  
Alkaline rocks in Canada, 1968-.
957. CURRIE, K.L., Geol. Surv. Can.:  
Granite studies in the Appalachians, 1973-.

**See:**

Igneous metamorphic rocks between Rocky Bay and Ragged Harbour, northeastern Newfoundland; Geol. Surv. Can., Paper 77-1A, p. 341-345, 1977.

On the position of the Variscan Front in southern New Brunswick and its relation to Precambrian basement: reply; Can. J. Earth Sci., v. 13, no. 9, p. 1345-1346, 1976.

958. DAVIDSON, A., Geol. Surv. Can.:  
Granite studies in the Ennadai-Rankin Inlet region, District of Keewatin, 1966-.

959. DAVIDSON, A., Geol. Surv. Can.:  
Granite studies in the Slave Province, District of Mackenzie, 1971-.

960. DUROCHER, M.E., HOGARTH, D.D., Univ. Ottawa (Geology):  
Petrology of the Gracefield pluton, 1972-77; M.Sc. thesis (Durocher).

961. EMSLIE, R.F., Geol. Surv. Can.:  
Anorthosite study, Newfoundland, 1967-.

**See:**

Further paleomagnetic results from the Michikamau Intrusion, Labrador; Can. J. Earth Sci., v. 13, no. 8, p. 1052-1057, 1976.

962. FAWCETT, J.J., GITTINS, J., BROOKS, C.K., NIELSEN, P.A., RUCKLIDGE, J.C., Univ. Toronto (Geology):  
Petrological studies in East Greenland - The Batbjerg Intrusion, 1975-78.

**See:**

Caledonian magmatic activity in southeastern Greenland; Nature, v. 260, p. 694-695, 1976.

Laboratory study has begun on the alkalic ultramafic Batbjerg intrusion which was mapped in 1975. The most remarkable result of these studies so far has been the discovery of a Caledonian age (440 m.y.). It had previously been assumed that the Batbjerg intrusion was part of the Tertiary igneous province of the Kangerdlugssuaq Fjord region composed of such intrusions as the Skaergaard, Kangerdlugssuaq, Kap Edward Holm, Lilloise and Gardiner intrusions (~52 m.y.). The importance of the 440 m.y. age by both K/Ar and Rb/Sr determination is that it requires that the Caledonian front in East Greenland be moved some 200 km south of its previously presumed position. It also establishes the Kangerdlugssuaq alkalic province as not only extremely large but one that has been active over a long period of the earth's history and not merely to be related to Tertiary plate tectonic episodes. A very similar intrusion (Loch Borolan) of the same age in Scotland invites comparison; further detailed work will be required to establish if the two intrusions were emplaced simultaneously and from related magma sources.

963. FINDLAY, D.J., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Lang Lake porphyry copper deposit, Ontario, 1975-78; M.Sc. thesis (Findlay).

**See:**

Precambrian porphyry copper and molybdenum deposits in Ontario and Saskatchewan; Geol. Surv. Can., Paper 76-1B, p. 39-41, 1976.

At the Lang Lake porphyry copper deposit of Bochawna copper mines Ltd., low-grade copper mineralization and associated alteration occurs in both a felsic to intermediate dike suite and adjacent metasedimentary and metavolcanic

country rocks. Current research is focused on the relationship of mineralization, alteration, and plutonism, and the nature of the alteration and plutonism.

964. FRANCIS, D.M., McGill Univ. (Geological Sciences):  
Spinel lherzolite xenoliths and the nature of the upper mantle, 1972-77.

**See:**

Amphibole pyroxenite xenoliths: cumulate or replacement phenomena from the upper mantle; Contrib. Mineral. Petrol., v. 58, p. 51-61, 1976.

Corona-bearing pyroxene granulite xenoliths and the lower crust beneath Nunivak Island, Alaska; Can. Mineral., v. 14, p. 291-298, 1976.

The origin of amphibole in lherzolite xenoliths from Nunivak Island, Alaska; J. Petrol., v. 17, p. 357-378, 1976.

A detail study of a suite of ultramafic xenoliths from Nunivak Island, Alaska, concludes that spinel lherzolite xenoliths can not be simply regarded as the residue of partial melting of the upper mantle. They have undergone various degrees of deformation associated with a metasomatic introduction of Na, Ti, Al, and Fe. Following this deformation, the infiltration of an alkali-bearing fluid has developed secondary amphibole. These observations point out the perils of choosing the least refractory spinel lherzolites as models for the chemistry of primitive upper mantle material.

965. FRANCIS, D.M., McGill Univ. (Geological Sciences):  
Peridotite-gabbro intrusions in the root zones of orogenic belts, 1975-.

Part of the past two summers were spent examining such bodies in the Kluane Ranges of the Yukon Territory. These ultramafic bodies apparently were emplaced as magmas, but differ from komatiitic magmas in the presence of abundant poikilitic orthopyroxene. This project will be incorporated into a new joint project with Professor Hynes to study the Cape Smith Fold belt. Similar peridotite gabbro complexes with associated nickel mineralization are found in this Proterozoic orogenic fold belt. These will be studied and compared to their Permian equivalents in the Yukon Territory.

966. FYFE, W.S., MARZOUKI, F.M., Univ. Western Ontario (Geology):  
Petrology-chemistry of the Taif igneous complex, Saudi Arabia, 1974-78; Ph.D. thesis (Marzouki).

967. FYFE, W.S., RADAIN, A., Univ. Western Ontario (Geology):  
Geochemistry and tectonic setting peralkaline granites, Saudi Arabia, 1974-78; Ph.D. thesis (Radain).

968. GAUTHIER, J., GUHA, J., ALLARD, G.O., CATY, J.-L., Univ. du Québec à Chicoutimi, Univ. Georgia:  
Etude de la zone de contact entre le complexe du Lac Doré et les roches volcaniques de la formation de Gilman, Chibougamau, Québec, 1976-78; thèse de maîtrise (Gauthier).

969. GITTINS, J., Univ. Toronto (Geology):  
Miscellaneous problems in the mineralogy and petrology of alkalic rocks and carbonatites.

These studies concern diverse aspects of the petrology of alkalic rocks and carbonatite complexes such as magnetite-orthopyroxene relations, olivine-clinopyroxene relations in carbonatites and nepheline syenites, the evolution of the Obidjiwan

- nepheline rocks, the stability fields of certain new minerals, studies of amphibole-biotite-clinohumite relations in carbonatites, alkali amphiboles in per-alkaline granites, and studies of Tanzanian carbonatite lavas.
970. GOAD, B.E., CERNY, P., Univ. Manitoba (Earth Sciences):  
Mineralogy, geochemistry, and petrology of the pegmatitic granites in the Winnipeg River area, southeastern Manitoba, 1976-78; M.Sc. thesis (Goad).  
Pegmatitic granites in the Winnipeg River area contain local mineralized facies resembling some economically significant pegmatite bodies in their vicinity. They represent a member in the differentiation or anatectic sequence of pegmatite-generating processes, probably the immediate precursors of mineralized pegmatites. Their study is aimed at the mineralogy, geochemistry, and petrology of four major bodies, and their linking with plutonic rocks as well as different pegmatite types in the area.
971. GOFF, S.P., SCARFE, C.M., Univ. Alberta (Geology):  
Magmatic and metamorphic history of the East Arm of the Great Slave Lake, Northwest Territories, 1974-78; Ph.D. thesis (Goff).
972. GOODWIN, A.M., CHOW, C-L., Univ. Toronto (Geology):  
Trace metal content in Archean volcanic rocks, 1976-78.  
Cu, Zn, Pb and Ag determinations in volcanic rocks of the Timmins-Kirkland Lake-Noranda region demonstrate that the heavily mineralized zones lie in metal-depleted country rocks thereby suggesting a metal leaching process of ore formation. The mass of metal in the known ore bodies is the same order of magnitude as that represented by the metal-depleted zones. However, the indicated drop in metal content in the metal depleted zone is sufficiently small e.g. Cu - 6 ppm, that additional neutron activation determinations are run to establish the reliability and significance of the results.
973. GOODWIN, A.M., SMITH, I.E.M., FISHER, D.F., JACKSON, M., Univ. Toronto (Geology):  
The study of Archean volcanic piles, 1970-80.  
Detailed field studies define the presence of numerous Archean volcanic piles with mafic to felsic compositional progressions characterized by uppermost, commonly mineralized felsic to volcanic accumulations. Those rhyolite accumulations are typically associated with cauldron or subsidence structures representing the surface tectonic response to periodic igneous discharge from underlying source magma chambers. Emplacement of ore deposits is apparently a direct function of this extrusive-tectonic relationship.
974. GORMAN, B.E., EDGAR, A.D., Univ. Western Ontario (Geology):  
Petrology and geochemistry of the Fiskaeneset anorthosite, Greenland, 1976-79; Ph.D. thesis (Gorman).
975. HAMILTON, T.S., SCARFE, C.M., Univ. Alberta (Geology):  
The geology and petrology of the Level Mountain volcanic centre, northwest British Columbia, 1974-78; Ph.D. thesis (Hamilton).
- See:  
Preliminary report on the petrology of the Level Mountain volcanic centre, northwest British Columbia; Geol. Surv. Can., Paper 77-1A, p. 429-434, 1977.
976. HILL, J., EDGAR, A.D., Univ. Western Ontario (Geology):  
Petrology and geochemistry of some granitic plutons of the Western Slave Province, Northwest Territories, 1974-77; Ph.D. thesis (Hill).
977. HOGARTH, D.D., GRIFFIN, W.L., Univ. Ottawa (Geology):  
Origin of Lapis Lazuli, 1974-78.  
See:  
New data on lazurite; Lithos, v. 9, p. 39-54, 1976.  
Detailed petrology of lapis lazuli from all known occurrences. Microprobe analysis of coexisting phases. Field examination of Italian Mountain (Colorado) occurrences in September 1976.
978. JOLLY, W.T., Brock Univ. (Geological Sciences):  
Igneous and metamorphic history of the Abitibi belt, Québec, 1974-77.
979. KRUPICKA, J.G., Univ. Alberta (Geology):  
Petrology of reworked crystalline rocks, 1975-78.  
See:  
Mineral isotopic age relationships in the polymetamorphic Amitsoq gneiss, Godthaab District, West Greenland; Geochim. et Cosmochim. Acta, v. 40, p. 513-527, 1976.  
In 1976 the work on the project was concentrated mainly on the largest known Precambrian mobile belt, the Mozambique Belt in East Africa. Field study and extensive sampling of reworked and polymetamorphic rocks were carried out in Kenya and Tanzania to a lesser degree in the Sudan.
980. LAFONTAINE, M., HOGARTH, D.D., Univ. Ottawa (Geology):  
Uranium-thorium mineralization at the Yates Mine, Huddersfield Township, Quebec, 1974-78; M.Sc. thesis (Lafontaine).
981. LAMBERT, M.B., Geol. Surv. Can.:  
Archean volcanic studies in the Slave-Bear Province, District of Mackenzie, 1973-.
982. LAMBERT, M.B., Geol. Surv. Can.:  
Archean felsic volcanic complex near Regan Lake, District of Mackenzie, 1974-.
- See:  
The southwestern margin of the Back River volcanic complex, District of Mackenzie; Geol. Surv. Can., Paper 77-1A, p. 179-180, 1977.
983. LAMBERT, R.St.J., HOLLAND, J.G., Univ. Alberta (Geology):  
Chemical petrology of DSDP 37 basalts, 1974-78.  
See:  
Trace elements and petrogenesis of DSDP 37 basalts; Can. J. Earth Sci., v. 14, no. 4, pt. 2, p. 809-836, 1977.
984. MAILLET, J., GUHA, J., WOUSSEN, G., CHOWN, E.H., Univ. du Québec à Chicoutimi:  
Etude pétrologique et géochimique des dykes dans le flanc nord du complexe du Lac Doré, Chibougamau, Québec, 1975-77; thèse de maîtrise (Maillet).

985. MILLER, R., GITTINS, J., Univ. Toronto (Geology):  
The mineralogy and petrology of highly evolved nepheline syenites in Monmouth and Glamorgan Township, county of Haliburton, Ontario; M.Sc. thesis (Miller).  
This is a re-study of rocks previously studied twenty years ago before the advent of the electron microprobe. It is now hoped by means of whole rock chemical analysis and mineral analysis to follow the late stages of the evolution of nepheline syenite magmas, the trends of iron-rich alkalic pyroxenes, and the olivine-clinopyroxene relationship.
986. MITCHELL, R.H., PLATT, R.G., Lakehead Univ. (Geol.):  
1. Petrology and mineralogy of kimberlite and associated ultrabasic inclusions. 2. Petrology and geochemistry of alkaline rocks and carbonates, 1972-.
- See:  
Oxide and sulphide mineralogy of the Peuyuk kimberlite, Somerset Island, Northwest Territories; Contrib. Mineral. Petrol., v. 56, p. 157-172, 1976.  
Ultramafic xenoliths from the Elwin Bay kimberlite: the first Canadian paleogeotherm; Can. J. Earth Sci., v. 14, no. 6, p. 1202-1210, 1977.  
1. Kimberlites: (a) investigation of the mineralogy of the Elwin Bay, Tunraq and Jos kimberlites, Somerset Island; and (b) petrology of mantle derived ultramafic xenoliths in the Elwin Bay, Nanorluk, and Amayersuk kimberlites. 2. Alkaline rocks: (a) petrology of the Poohbah Lake complex, Ontario; (b) petrology of ferroaugite syenites, Coldwell Complex, Ontario; (c) chemistry of minor intrusions associated with the Coldwell Complex, Ontario; and (d) petrology and geochemistry of undersaturated volcanic rocks from Bathurst Island, Northwest Territories.
987. MURPHY, J.B., STEVENS, G.R., COLWELL, J.A., Acadia Univ. (Geology):  
The stratigraphy and geology of Forchu Group, Louisbourg, Cape Breton, Nova Scotia, 1976-77; M.Sc. thesis (Murphy).  
The Forchu (Precambrian) volcanics in Cape Breton are a group of mildly metamorphosed igneous rocks that have suffered one major tectonic deformation producing a penetrative axial plane of foliation. A second tectonic foliation is evidenced only in the more schistose units. These volcanics have been divided into five informal members based on lithological, structural and stratigraphic criteria. The predominant extrusion is tuffaceous and the sequence reflects increasing viscosity in the felsic magma chamber. There have been three periods of pre-tectonic mafic intrusion.
988. NALDRETT, A.J., Univ. Toronto (Geology):  
Study of komatiitic and tholeiitic rocks in Dundonald Township, Ontario.  
A sequence of intrusive and extrusive komatiitic flows are cut and brecciated by extrusive tholeiitic picritic rocks near the Alexo mine. The tholeiites themselves are covered by late komatiitic flows. Field relations here demonstrate ultramafic to mafic magmatic activity of two kinds within a very short time interval.
989. NALDRETT, A.J., SCOTT, R., Univ. Toronto (Geology):  
Petrology of a portion of the Bell River Complex in Bourbaux Township, Quebec, 1976-78; M.Sc. thesis (Scott).  
The Bell River Complex is a layered gabbro-anorthosite complex located near Matagami, Quebec approximately 350 miles northwest of Montreal. It lies within the Abitibi orogenic belt which forms part of the Superior structural province. The complex consists of an eastern and a western lobe separated by granitic intrusions. The eastern lobe (about 8 miles by 8 miles in area and located approximately 30 miles southeast of Matagami) was mapped geologically on a scale of 1"=1000', and part of this area (about 1.5 miles by 4.0 miles) was also mapped on a scale of 1"=400'. Initial work suggests that the complex is one of a number of large gabbro-anorthosite complexes characteristic of a certain type of intrusive magmatism within the Abitibi belt. For this study, the petrology and geology of the eastern lobe of the Bell River Complex will be studied and compared with other complexes of the same type such as the Dore Lake Complex near Chibougamau, Quebec and the Kamiskotia Complex near Timmins, Ontario.
990. NICHOLLS, J., STOUT, M.Z., PROFETT, E., Univ. Calgary (Geology):  
Petrology and geochemistry of peralkaline and related rocks, Itcha Mountains, British Columbia, 1973-80; M.Sc. thesis (Profett).  
Six weeks of field work on the older peralkaline phosolites in the Itcha Mountains, British Columbia has been completed.
991. PETO, P., Univ. Windsor (Geology-Geological Engineering):  
Trace element petrochemistry of Similkameen Batholith, British Columbia, 1976-77.  
Application of multivariate statistical techniques to XRF rock data for the purpose of ascertaining the magmatic history of the "Similkameen" or "Okanagan" Batholith.
992. RIDLER, R.H., Geol. Surv. Can.:  
Volcanic study in the Ennadai Belt, District of Keewatin, 1970-.
993. SCARFE, C.M., Univ. Alberta (Geology):  
Secondary minerals in some basalts from DSDP legs 3, 11, 26 and 27, 1976-77.
994. SCHAU, M., Geol. Surv. Can.:  
Volcanic rocks of the Prince Albert belt, 1972-.
995. SCHAU, M., Geol. Surv. Can.:  
Geology of southeast Baker Lake, District of Keewatin, 1976-.
- See:  
Granulites, anorthosites and cover rocks northeast of Baker Lake, District of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 399-407, 1977.  
To provide information on the origin and relationships of a heterogeneous group of plutonic and metamorphic rocks.
996. SHAW, D.M., McMaster Univ. (Geology):  
Tallan Lake metagabbro.  
Trace element and other geochemical information suggest a history of intrusion, gravitational differentiation, metamorphism and structural inversion. This hypothesis is being tested.
997. SOUTHER, J.G., Geol. Surv. Can.:  
Geology of the Edziza volcano, British Columbia, 1965-.
998. SPRINGER, R.K., Brandon Univ. (Geology):  
Ultramafic rocks in southeastern Manitoba, 1974-77.

Mineralogical descriptions and electron microprobe analyses completed. XRF work to be completed.

999. STEVENSON, J.S., McGill Univ. (Geological Sciences): Thompson nickel deposits, and their environment, 1969-79.
1000. STEVENSON, J.S., McGill Univ. (Geological Sciences): The Onaping ash-flow field, Sudbury, Ontario, 1970-78.
1001. STEVENSON, L.S., STEVENSON, J.S., Redpath Mus., McGill Univ. (Geological Sciences): Feldspar replacement in dawsonite-bearing rock, Mount Royal and Mount St. Hilaire, Québec, 1976-78.
- Replacement of euhedral feldspar phenocrysts in dawsonite-bearing dyke rocks by an aggregate of bladed dawsonite, fluorite, quartz and calcite is being studied from Mount Royal and Mount St. Hilaire, Québec, locations.
1002. VALENCA, J., EDGAR, A.D., Univ. Western Ontario (Geology): Petrology of some alkaline rocks of the Rio de Janeiro province, Brazil, 1975-79; Ph.D. thesis (Valenca).

#### METAMORPHIC

1003. APPLEYARD, E.C., WOOLLEY, A.R., Univ. Waterloo (Earth Sciences): Geochemistry of fenites — an assessment of metasomatic gains and losses, 1976-77.
- Analyses of fenites are commonly recalculated to a constant cell of 100 anions, predominantly oxygen, as a basis for assessing gains and losses of material during the metasomatic event. The fundamental validity of this procedure has never been clearly demonstrated. Analyses of fenites from Sokli, Finland and other localities are being reexamined using other criteria for geochemical comparison in a pragmatic attempt to improve the methods of investigating metasomatic phenomena.
1004. BARAGAR, W.R.A., Geol. Surv. Can.: Studies in the Seal Lake volcanic province, Newfoundland, 1968-.
1005. BREAKS, F.W., BOND, W.D., Ontario Division Mines: Petrology-metamorphism, English River Subprovince, Ontario, 1976-.
- Regional delineation of isograds in migmatized wacke + pelitic metasediments of northern supracrustal domain, petrographic evaluation of critical metamorphic assemblages and relevant petrochemistry. Facies zones and isograds will ultimately be recorded on a Metamorphic Map of English River Subprovince.
1006. CAPE, D.F., BURWASH, R.A., Univ. Alberta (Geology): Uranium-thorium distribution in a gneissic complex, Fort Smith map-area, Northwest Territories, 1974-77; M.Sc. thesis (Cape).
1007. CARD, K.D., Ontario Division Mines: Contribution to metamorphic map of the Canadian Shield, 1976-77.
- Includes the Proterozoic rocks of the Southern Province and the Archean rocks of part of the Superior Province in Ontario.
1008. CHU, P.H.T., STEVENS, G.R., COLWELL, J.A., Acadia Univ. (Geology): Metamorphism and tectonic development of Early Paleozoic rocks near Shelburne, Nova Scotia, 1976-77; M.Sc. thesis (Chu).

Petrographic study of the medium to high grade metamorphic minerals in order to define metamorphic facies, and petrogenic details. Geochemistry of the Goldville formation near Shelburne, Nova Scotia. Major elements distribution between the whole rock, garnet, biotite, staurolite, and cordierite metacrysts. Relation of structural elements (folds, faults, joints, schistosity, lineation) to metamorphism.

1009. CRAW, D., GHENT, E.D., SIMONY, P.S., Univ. Calgary (Geology): Metamorphic and structural evolution of a portion of the Southern Canol River area, British Columbia, 1975-77; M.Sc. thesis (Craw).
1010. CURTIS, L.W., GITTINS, J., Univ. Toronto (Geology): Regional metamorphism of alkalic igneous rocks; Ph.D. thesis (Curtis).

Regional metamorphism of alkalic igneous rocks under amphibolite facies conditions is being studied in the Red Wine complexes, Labrador; the Kipawa complex, Quebec; and in parts of the Haliburton-Bancroft area, Ontario. Particular emphasis has been on pyroxene development. Chemical analytical studies and theoretical thermodynamic considerations have shown that titanian aegirines, aegirine-jadeites, and titanian ferro-omphacites do not indicate conditions more severe than amphibolite facies. New ranges of pyroxene compositions have been established and shown to exist in many alkalic complexes where the pyroxenes have previously been erroneously described as augites or aegirine-augites.

1011. DE VRIES, C.D.S., GHENT, E.D., SIMONY, P.S., KERR, J.W., Univ. Calgary (Geology), Geol. Surv. Can.: Petrology, Somerset Island, District of Franklin, 1975-79; Ph.D. thesis (De Vries).

#### See:

Structural geology of Somerset Island and Boothia Peninsula, District of Franklin; Geol. Surv. Can., Paper 77-1A, p. 107-111, 1977.

To investigate some aspects of the granulite facies metamorphism of the Precambrian shield in Somerset Island; the main objective is to study element distribution patterns between coexisting phases in suitable rock types with a large areal distribution. Systematic changes in distribution coefficients will be interpreted in terms of variation in pressure, temperature or fluid composition during metamorphism. Agmatitic lenses and sheets of metabasalts are the most suitable rock type for this purpose on account of their widespread areal distribution, and the occurrence of coexisting clinopyroxene, ortho-pyroxene, hornblende and plagioclase. Data from mineral assemblages in rock types of limited areal extent, such as sillimanite-garnet gneiss and calc-silicates will serve as a comparison with the metabasalt results. A second objective concerns the analysis of petrofabric data in order to establish the timing of high grade metamorphism relative to a sequence of deformational events recorded in the structures of Somerset Island.

1012. DONAGHY, T.J., BURWASH, R.A., Univ. Alberta (Geology): Petrology of the Thekulthili Lake area, Northwest Territories, 1974-77; M.Sc. thesis (Donaghy).



1013. DUNCAN, I.J., GREENWOOD, H.J., Univ. British Columbia (Geological Sciences):  
Thermodynamic role of H<sub>2</sub>O in cordierite: a laboratory and field study based on Thor-Odin Gneiss Dome, British Columbia, 1974-78; Ph.D. thesis (Duncan).  
The project has two aims: 1. Determine in the laboratory the effect on the thermodynamic properties of Mg-cordierite of adding water to the intra-crystal channels. This work is in progress and enough data have been collected to give the following preliminary estimates of thermodynamic properties of Mg-cordierite Mg<sub>2</sub>Al<sub>4</sub>Si<sub>5</sub>O<sub>18</sub>H<sub>2</sub>O.  $\Delta G_{E,298}^{\circ} = 57.78 \pm 2$  kcal, from the elements.  $\Delta S_{E,298}^{\circ} = 41.6 \pm 4.5$  e.u. (from the elements), third-law entropy of H<sub>2</sub>O in cordierite = 13.7 e.u. 2. Determine in the field the equilibria involving cordierite and the role played in these equilibria by H<sub>2</sub>O. The area chosen for this part of the study is the south end of the Thor-Oden Gneiss Dome at the eastern margin of the Shuswap Complex. In addition to the mineralogic study progress is being made on the tectonic and deformational history of the Dome. The final field season will be in 1977.
1014. EINARSON, G.R., WILLIAMS, H., Memorial Univ. (Geology):  
Burial metamorphism of Bay of Islands ophiolite complex, 1975-77; Ph.D. thesis (Einarson).
1015. FAWCETT, J.J., NIELSEN, P.A., Univ. Toronto (Geology):  
Metamorphism in the Kashabamie area, northwestern Ontario, 1973-77.  
As part of the Geotraverse Project, we are investigating the distribution of isograds near the boundary of the Shebandowan metavolcanic belt and the Quetico gneiss belt. Textural relations in the metamorphic mineral assemblages of the meta-greywackes suggest at least three distinct stages in the complex metamorphic history. The critical saturoilite-bearing assemblages are rare in the study area but are more common in its east and west extensions. This assemblage represents an apparent climax in regional metamorphic conditions but has largely been replaced by cordierite-bearing assemblages, presumably in response to a reduction in pressure. Chlorite laths, growing at a high angle to the regional schistosity, represent the latest stage of metamorphism. Electron microprobe analyses of coexisting minerals are being carried out to determine the position of isograds and their relationship to the major lithological boundaries. Zeolite-bearing assemblages have been observed in metavolcanic rocks from the SE part of the study area but no consistent pattern of zeolite facies metamorphism has yet been detected.
1016. FRASER, J.A., Geol. Surv. Can.:  
Metamorphism in the Canadian shield, 1974-.
1017. FRISCH, T., Geol. Surv. Can.:  
Gneisses of the Prince Albert belt, 1972-.
1018. FROESE, E., Geol. Surv. Can.:  
Petrological studies in the vicinity of the Kisseynew Front, Manitoba, 1970-.
1019. FROESE, E., Geol. Surv. Can.:  
Petrological studies in the Sherridon area, Manitoba, 1974-.
1020. FROESE, E., Geol. Surv. Can.:  
Metamorphic map of Manitoba south of 56 degrees, 1974-.
1021. GHENT, E.D., DUDLEY, J., Univ. Calgary (Geology):  
Alteration of Jurassic volcanic rocks and sediments, 1976-80; Ph.D. thesis (Dudley).  
See:  
Zeolitization of the Telkwa volcanics, Smithers, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 249-250, 1977.  
To continue mapping and laboratory work on the subgreenschist facies (zeolite and prehnite-pumpellyite facies) metamorphism of the Telkwa Formation (Jurassic) south of Smithers, British Columbia, with work concentrated on the Howson subaerial facies of the Telkwa Formation. Laboratory work will include identification and characterization of minerals by x-ray diffraction and electron probe microanalysis. The following areas of research will be emphasized: (1) determination of the geochemical budget during alteration; (2) description and correlation of selected stratigraphic sections; (3) attempt to correlate subgreenschist facies alteration with economic copper mineralization; and (4) estimation of P<sub>load</sub>, T activities of volatile and aqueous species accompanying alteration.
1022. GHENT, E.D., KNITTER, C., Univ. Calgary (Geology):  
Petrologic and geochemical studies in the Cordillera and electron microprobe analysis of minerals, 1977-79; M.Sc. thesis (Knitter).  
The kyanite-sillimanite isograd in the Mica Creek area, British Columbia, will be studied in detail to: (1) accurately map the isograd; (2) study the mineral reactions in pelitic rocks at the isograd; (3) study phase equilibria in metabasites at the isograd; (4) estimate P<sub>load</sub>-P<sub>fluid</sub>-T conditions of metamorphism using mineral compositions obtained by electron microprobe analysis and experimental and computed phase equilibria; and (5) study chemical zoning in garnet and associated minerals and to attempt to use this zoning to infer a sequence of mineral reactions in the metamorphic rocks.
1023. GHENT, E.D., STOUT, M.Z., Univ. Calgary (Geology):  
Petrologic and geochemical studies in the Cordillera and electron microprobe analysis of minerals, 1976-79.  
See:  
Plagioclase-garnet-Al<sub>2</sub>SiO<sub>5</sub>-quartz: a potential geobarometer-geothermometer; Am. Mineral., v. 61, p. 710-714, 1976.  
To study phase equilibria in metamorphosed siliceous carbonate rocks from the Late Precambrian Windermere series of southeastern British Columbia. Mineral chemistry will be determined by electron microprobe analysis. We will attempt to correlate P<sub>load</sub>-T estimates obtained from a study of pelitic mineral assemblages with those obtained from a study of the metacarbonate rocks and to apply a number of 'geothermometers' and 'geobarometers' in this study; for example, calcite-dolomite, alkali feldspar-plagioclase. Fluid compositions which could have been in equilibrium with these mineral assemblages will be estimated from a comparison of these assemblages with computed and experimental phase equilibria involving mixed volatiles. From these data we hope to obtain data on the magnitude of possible activity gradients between pelitic and carbonate assemblages which equilibrated under similar P<sub>load</sub>-T conditions.



1024. GITTINS, J., NIELSEN, P.A., Univ. Toronto (Geology):  
The petrology of Sapphirine granulites in the Wilson Lake area, Labrador, 1975-.
1025. GOODWIN, A.M., WILLIAMS, J.G., CHOW, C-L., Univ. Toronto (Geology):  
Study of Archean gneiss, 1973-78.
- See:**  
Archean rocks from the eastern Lac Seul region of the English River gneiss belt, northwestern Ontario, part 1. Petrology, chemistry, and metamorphism, part 2. Geochronology; Can. J. Earth Sci., v. 13, no. 9, p. 1201-1215, 1976.
- English River gneisses are divided into a southern domain of mainly older predominantly orthogneiss at least 3080 m.y. old and a southern domain featuring younger paragneiss, migmatized at least 2650 m.y. ago, with occasional massive plutons and pegmatites dated at 2560 m.y. Thus the gneiss collectively represents a long and complex history of development involving numerous plutonic and supracrustal phases. The gneiss is probably mainly older than adjoining volcanic belts and thereby represents sialic crust existing at the time of volcanic accumulation. Boundary relations between gneiss belts and adjoining volcanic belts are variable along strike from a state of structural discordance to one of transition. Trace element studies are underway to test the relative sources of plutonic, gneissic and volcanic components of the English River and adjoining belts. Major and minor element data are used to investigate source problems. These constitute integral parts of the Superior Geotraverse Project.
1026. HILLARY, E.M., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Pre-volcanism, trondhjemitic crust, Favourable Lake, Ontario, 1976-78; M.Sc. thesis (Hillary).
- The North Trout Lake batholith, on the north side of the Favourable Lake greenstone belt contains remnants of trondhjemitic crustal material dated at 2.95 B.Y. (zircons). Although not in contact with the greenstone belt, the strong deformation of the trondjemite and other parameters indicates that the trondjemite pre-dates volcanism. Petrologic and geochemical studies are in progress.
1027. LAMBERT, R.St.J., CHAMBERLAIN, V.E., Univ. Alberta (Geology):  
The metamorphic rocks north of Mount Everest, 1976-80.
1028. LAPOINTE, P., HOGARTH, D.D., Univ. Ottawa (Geology):  
Fenitization of gneisses in Hull and Templeton townships, Québec, 1973-77; M.Sc. thesis (Lapointe).
1029. MACKASEY, W.O., PIRIE, J., BLACKBURN, C.E., TROWELL, N.F., Ontario Division Mines, Geol. Surv. Can.:  
Metamorphic map of the Canadian Shield - Contribution, North Central Ontario, 1976-77.
1030. PIGAGE, L.C., GREENWOOD, H.J., Univ. British Columbia (Geological Sciences):  
Metamorphism and structure of Proterozoic rocks of Wells Gray Park, British Columbia, 1973-77; Ph.D. thesis (Pigage).
- Part of the Wells Gray Park has been mapped at a scale of 1"=1000 feet between Hobson Lake and the east end of Azure Lake. A Barrovian sequence of isograds has been found to be disturbed by syn-metamorphic faults. Staurolite, kyanite, chloritoid, garnet, sillimanite, and calc-silicates take part in the mineral reactions, which permit estimates of pressure and temperature to be made. Microprobe analysis of the minerals is in progress. One of the major changes in metamorphic grade is due to tectonic movement rather than to steep isograds.
1031. PIRIE, J., Ontario Division Mines:  
Progressive metamorphism in Crooked Pine Lake area, northwestern Ontario, 1976-.
- Study of progressive metamorphism of Quetico Belt turbidite sequence from virtually unmetamorphosed wacke-mudstone units near Quetico Fault to high grade paragneisses and related diatexites some 4 miles to the south.
1032. SCOATES, R.F.J., CORKERY, M.T., MACEK, J.J., Manitoba Geol. Surv. Br.:  
Fox River greenstone belt, northeastern Manitoba, 1972-77.
- Mafic volcanic rocks of the Fox River area occur as two cycles interlayered with sedimentary rocks and differentiated intrusions. The rocks have undergone a period of low grade metamorphism and are considered younger than the more strongly metamorphosed gneisses of the adjacent Churchill Province. The lower portions of both volcanic cycles contain composite massive flows. These flows have a lower zone of cumulus minerals (olivine ± clinopyroxene) in a groundmass of altered glass and skeletal crystals (clinopyroxene ± plagioclase), and an upper polygonal, columnar jointed zone of altered glass, unsettled crystals and skeletal crystals (olivine ± clinopyroxene ± plagioclase). Composite flows range in average composition from ultramafic to mafic and individual flows can vary in composition from base to top.
1033. SCOATES, R.F.J., MACEK, J.J., Manitoba Geol. Surv. Br.:  
Thompson nickel belt, Manitoba, 1977-80.
- To establish the relationship of the intermediate and high grade gneissic rocks in the nickel belt with the intermediate and high grade gneisses of the Pikwitonei Province to the east and the Kesseynew gneiss terrain to the west, to establish the stratigraphy and structure of the younger metasedimentary and metavolcanic suite of rocks and determine the nature of their relationship with the gneissic rocks, to determine the nature and relative age of the ultramafic rock suite of the belt, to determine the relative age and extent of the felsic plutonism in the belt, and to identify the number of periods of major cataclastic deformation within the belt. The examination of areas necessary for establishing criteria by which the problems noted above can be solved will allow a critical evaluation of the nature of the Thompson Nickel Belt and its nickel sulphide ore deposits and the nature of the Churchill-Superior boundary in this part of the Shield to be made.
1034. SHARPE, R.J., FAWCETT, J.J., Univ. Toronto (Geology):  
Metamorphic studies in the Miminiska Lake area, northwestern Ontario, 1974-77; M.Sc. thesis (Sharpe).
- Metamorphic rocks from the Miminiska Lake area of the Uchi volcanic-plutonic belt of northwestern Ontario are being studied. Two summers (1974, 1975) have been spent in field mapping and sample collecting, and laboratory work is now in progress. The objectives include: i) determination of the

nature of metamorphism (i.e. regional, contact, and polymetamorphic events) in this particular section of greenstone belt, ii) obtaining detailed information with respect to the mineralogical and chemical changes associated with the transition from lower greenschist(?) facies to lower amphibolite facies in pelitic and mafic rocks of the area, and iii) relating metamorphism to the overall structural and tectonic framework of the area. Field mapping (completed), detailed petrographic study, microprobe analyses, and chemical analyses (XRF and AA) are being employed in meeting these objectives.

1035. THURSTON, P.C., BREAKS, F.W., BOND, W.D., Ontario Division Mines, Geol. Surv. Can.:  
Metamorphic map of the Canadian Shield – contribution northwestern Ontario, 1976-77.

#### SEDIMENTARY

1036. BUSTIN, R.M., LEROND, M.M., Gulf Oil Canada Ltd. (Geological):  
Petrology and sedimentology of the Parsons Lake Gas Field, Northwest Territories, 1976-.

To derive reservoir properties that will enhance production and secondary recovery.

1037. DAVIS, M.W., FERM, J.C., Univ. Windsor (Geology), Univ. South Carolina (Carolina Coal Group):  
Relationship between megascopic and microscopic properties, and depositional environment, of some Carboniferous sandstones, 1976-77.

A standardized sandstone classifications which can be used by test hole drillers in coal exploration, has been developed. The present study attempts to discover what properties – such as composition and grain size variation – are correlatable to the descriptive megascopic classification. A secondary aim is to provide more data about the relation between grain size and quartz content, and the control of depositional environment on this relation.

1038. HESSE, R.F., CHOUGH, S.K., VELDHUYZEN, S.K., OGUNYOMI, O., McGill Univ. (Geological Sciences):  
Labrador Sea sediments, 1973-80; Ph.D. theses (Chough, Ogunyomi), M.Sc. thesis (Veldhuyzen).

#### See:

Submarine meandering talweg and turbidity currents flowing for 4000 km in the Northwest Atlantic Mid-Ocean Channel, Labrador Sea; Geol., v. 4, no. 9, p. 529-533, 1976.

In 1976-77 work concentrated on the laboratory study and interpretation of core materials, interpretation of echo-soundings and seismic lines collected in 1975 (Hudson cruise 75-009-IV). The facies pattern of the surface sediments of the Labrador Sea, like that of some other small ocean basins, is opposite from normal ocean basins: hemipelagic and pelagic deposits (mixed with ice-rafted materials) fringe the marginal parts of the deep basin, whereas the center of the basin is occupied (along its NNW-SSE running long axis) by terrigenous sediments. These are the channel-fill and spill-over deposits associated with the NAMOC which constitute areally and, it seems, also volumetrically, a significant portion of the basin fill. Channel-fill and spill-over deposits are clearly distinguishable from each other on the basis of sedimentary structures (full-scale X-radiography coverage of most cores) and textures. Spill-over deposits are mostly finely laminated very fine

sands and silts with some coarser turbidites intercalated. Significant differences seem also to exist between the right (higher) and the left (lower) levee sediments. A major effort was made to characterize the interpret the fine horizontal laminations of the levee sediments. A distinction between head and body-spill turbidites seems to be possible in a number of cores. Layers and laminae can be traced between several cores up to 70 km apart. A comparison with core material from Eiric Ridge south of Greenland, which is a depositional feature, provides criteria for the distinction between fine-grained sediments deposited by turbidity currents (levee sediments of the NAMOC) and contour-current deposited material. At present, weak bottom currents occur also in the NAMOC, but seem to affect mostly the redistribution of modern pelagic sediment. A number of radiocarbon dates has been obtained. Together with additional age determinations still underway, these will permit determination of the initiation of ice-rafting in the Labrador Sea during and at the end of the last glaciation. Ice-rafted tephra layers (of Icelandic origin) are expected to provide marker horizons for stratigraphic correlation once these age-determinations will have been completed.

1039. HEESE, R.F., TASSÉ, N., PREDA, M., BUTT, A., McGill Univ. (Geological Sciences):  
Clastic sedimentary sequences, 1970-; Ph.D. thesis (Tassé), M.Sc. thesis (Preda).

#### See:

Paleobathymetry of Cretaceous turbidite basins of the East Alps relative to the calcite compensation level; J. Geol., v. 84, no. 4, p. 505-533, 1976.

Unusual secondary sedimentary structures in the lacustrine Mississippian of Nova Scotia, Canada (In German); *Eclogae Geologicae Helvetiae*, v. 69, no. 1, p. 196-201, 1976.

(1) Turbidity currents and paleobathymetry: Methods for the distinction of turbiditic and (hemi-) pelagic mudstones in Mesozoic-Cenozoic flysch sequences were developed and applied to Alpine flysch basins. For the first time the concept of calcite compensation levels has been applied in detail to Cretaceous flysch basins and led to a distinction between relatively shallow (slope) basins and very deep (trench-floor) basins. (2) Depositional environments and tectonic setting of flysch basins: Emphasis was placed on the tectonic interpretation of lateral and vertical associations of depositional environments of Alpine turbidites in terms of basin development and plate tectonics. (3) New project: Partly based on the results in the Alps an attempt will be made to determine the tectonic setting (foundered shelf basins, slope basins, continental rise sequences, deep-sea trench fills) of Cambrian and Ordovician flysch sequences in Quebec and New Brunswick on the basis of detailed sedimentological studies. (4) Diagenesis and lithification: The origin and tectonic significance of secondary sedimentary structures in lacustrine Carboniferous deposits of Nova Scotia has been revealed. Work on the diagenesis of ooids started earlier was continued. A study on the diagenesis of chert, chalk and clay in Deep-Sea Drilling cores from the West Pacific has been completed. (5) Modern deep-sea sediments: Modern deep-sea trench sediments were studied during a cruise to the Japan and Kurile trenches (sabbatical leave at the Geological Survey of Japan). This study is a direct continuation of previous work on ancient deep-sea trench sediments and West Pacific pelagic sediments.

1040. KIMBERLEY, M.M., Univ. Toronto (Erindale-Earth and Planetary Science):  
Origin of Archean Outerring Iran Formation, Upper Back River area, Northwest Territories, 1975-77.  
An exceptionally well preserved Archean siderite-chert iron formation is being studied petrographically and geochemically.
1041. KIMBERLEY, M.M., Univ. Toronto (Erindale-Earth and Planetary Science):  
Diagenesis and the origins of sedimentary ores, 1975-78.  
**See:**  
Basic similarity of Archean to subsequent atmospheric and hydrospheric compositions, as evidenced in the distributions of sedimentary C, S, U, and Fe; Earth History of the Earth, Wiley, London, 1976.  
Precambrian atmospheric oxygen: evidence in the sedimentary distributions of carbon, sulfur, uranium, and iron; Can. J. Earth Sci., v. 13, p. 1161-1185, 1976.
1042. LANTOS, J.A., DAVIS, M.W., SONNENFELD, P.A., SIBLEY, D., Univ. Windsor (Geology):  
Cementation and diagenesis of Middle Ordovician carbonates, southwest Ontario, 1976-77; M.Sc. thesis (Lantos).  
150 stained acetate peels have been prepared from samples taken from cores through Middle Ordovician carbonates in Essex and Kent counties, Ontario. These are being examined in order to determine the history of cementation, diagenesis, and dolomitization, and its relation to original lithology and depositional environment.
1043. RODRIGUEZ, A., CURRIE, J.B., Univ. Toronto (Geology):  
Petrographic study of relations between cementation and fracture porosity in fine-grained sandstone, 1975-77; M.Sc. thesis (Rodriguez).  
Studies of change in sandstone porosity with depth of burial point to a gradual increase in the degree of quartz cementation under increasing overburden load. There is need to know whether cementation in fine-grained sandstone occurs dominantly near maximum depths of burial and whether cementation occurs almost entirely prior to the earliest stages of fracture-porosity development and to subsequent filling of those fractures by quartz. Petrographic and cathodoluminescence studies are being carried out on fine-grained sandstones from the surface and subsurface of the Alberta and Uinta Basins. Results indicate that progressive cementation by overgrowth of authigenic quartz upon detrital grains is a dominant mechanism. "Pressure-welding" may be relatively insignificant. Overgrowth cementation precedes fracture development. Overgrowth development seems to occur mainly with increasing burial; therefore fracturing and subsequent filling of fractures must occur during the later unloading of sedimentary strata.
- GENERAL**
1044. DUKE, J.M., NALDRETT, A.J., Univ. Toronto (Geology):  
Activity coefficients of transition metal oxides in silicate melts, 1974-77.  
The activity-composition relation of NiO in silicate has been studied; it has been observed that activity coefficient of NiO in silicate magmas is a strong function of the composition of the magma. A combination of the experimental work with observations on komatiitic flows suggests that NiO increase from 2 in peridotite to 10 in basalt.
1045. FOX, J.S., Saskatchewan Research Council (Geology):  
Geology and geochemistry of Precambrian areas and their base metal potential, 1974-77.  
**See:**  
Rapid pyroclastic mapping in base metal exploration; CIM Bull., March, 1977.  
Field mapping and geochemical studies in the Amisk Lake area east of Flin Flon have delineated several interesting zones of volcanic rocks with better than average base metal potential. An up-to-date bedrock stratigraphic map of the area, geochemical data for the volcanic and intrusive rocks, and a silica normalization technique for bedrock geochemical data now are available.
1046. LAMBERT, R.St.J., HOLLAND, J.G., Univ. Alberta (Geology):  
Geochemistry of the Lewisian of the Scottish mainland, 1963-80.
1047. LAMBERT, R.St.J., HOLLAND, J.G., WINCHESTER, J.A., Univ. Alberta (Geology):  
Chemistratigraphic studies in the Grampians of Scotland, 1970-78.
1048. ROBIN, P.-Y.F., Univ. Toronto (Erindale-Geology):  
Effects of nonhydrostatic stresses on phase transitions and chemical reactions in rocks and minerals, 1974-78.  
**See:**  
Angular relationships between host and exsolution lamellae and the use of the Mohr circle; American Mineral., v. 62, p. 127-131, 1977.  
A continuing theoretical and experimental study of reactions in stressed rocks and minerals, including: (a) direct measurements of lattice strains associated with the calcite I-II transition under a pressure of 1.65 GPa. Influence of the transition on acoustic velocity and absorption in rocks containing calcite; (b) pressure solution in rocks and supersaturation of aqueous solutions during diagenesis; (c) theory of melting of rocks under stress. Possible incidence of stresses on localization of magma generation in the Earth's crust and upper mantle; and (d) the influence of shear stresses on the formation of coherent exsolution lamellae in minerals, with particular reference to the pyroxene quadrilateral.
1049. SORBARA, J.P., KIMBERLEY, M.M., Univ. Toronto (Erindale-Earth and Planetary Science):  
Sedimentology and geochemistry of the Archean Innerring Formation, Upper Back River area, Northwest Territories, 1976-78; M.Sc. thesis (Sorbara).  
A period of weathering and sedimentation which affected a large felsic volcanic platform is being studied petrographically and geochemically.
1050. TRZCIENSKI, W.E., Jr., BIRKETT, T., Ecole Polytechnique:  
Petrology and tectonics of the Cambro-Ordovician sequence in the Quebec Appalachians, 1976-79; Ph.D. thesis (Birkett).  
To relate the igneous and metamorphic petrology of Cambro-Ordovician age to the tectonics found in this area of Quebec.

1051. TRZCIENSKI, W.E., Jr., BIRKETT, T., CHEVÉ, S., Ecole Polytechnique:  
Mineralogical and petrological problems in the Canadian Appalachians, 1973-; Ph.D. thesis (Chevé).

**See:**

Crossitic amphibole and its possible tectonic significance in the Richmond area, southeastern Quebec; *Can. J. Earth Sci.*, v. 13, no. 5, p. 711-714, 1976.

**QUATERNARY GEOLOGY**

1052. AALTONEN, R.A., DREIMANIS, A., Univ. Western Ontario (Geology):  
Geology of the City of London, Ontario, 1970-77; Ph.D. thesis (Aaltonen).

1053. ANDERSON, T.W., *Geol. Surv. Can.*:  
Quaternary geology, Great Lakes, 1968-.

**See:**

Late Quaternary paleomagnetic stratigraphy from east-central Lake Ontario; *Geol. Surv. Can.*, Paper 76-1C, p. 203-206, 1976.

1054. ANDRIASHEK, L.D., FENTON, M.M., Alberta Research Council (Geology Div.):  
Surficial geology, Wabamun map sheet 83G, Alberta, 1973-77.

1055. ANDRIASHEK, L.D., FENTON, M.M., RUTTER, N.W., Alberta Research Council (Geology):  
Surficial geology and Quaternary stratigraphy Sand River map sheet NTS 73-L, Alberta, 1976-78; M.Sc. thesis (Andriashek).

1056. ARMSTRONG, J.E., *Geol. Surv. Can.*:  
Surficial geology of Fraser Lowland, British Columbia, 1973-.

**See:**

Quaternary multiple valley development of the lower Coquitlam valley, Coquitlam, British Columbia (92G/7c); *Geol. Surv. Can.*, Paper 76-1B, p. 197-200, 1977.

1057. BARNETT, D.M., *Geol. Surv. Can.*:  
Surficial geology, geomorphology and terrain performance of Melville Island, District of Franklin, 1971-.

1058. BARNETT, D.M., *Geol. Surv. Can.*:  
Surface geology, terrain inventory, Bathurst, Cornwallis and adjacent islands, District of Franklin, 1974-.

**See:**

Soils of bathurst, Cornwallis, and adjacent islands, District of Franklin; *Geol. Surv. Can.*, Paper 76-1B, p. 137-141, 1976.

1059. BARNETT, P.J., Ontario Division Mines:  
Quaternary geology of the Tillsonburg map-area, Ontario, 1976-77.

**See:**

Quaternary geology of the Tillsonburg (401/15) area, Brant, Oxford, Elgin, Middlesex and Norfolk Counties; Ontario Div. Mines, MP 67, p. 148, 149, 1976.

Quaternary geology of the Tillsonburg area, southern Ontario; Ontario Div. Mines, Prel. Map P1214, 1976.

To determine the areal extent and distribution of the various geological materials which occur at or near the surface. Observations of natural and man-made sections plus the utilization of water well and

Petrology and tectonics of the Cambro-Ordovician sequence in the Quebec Appalachians; *Geol. Surv. Can.*, Paper 77-1B, p. 77-79, 1977.

To understand and describe the geologic evolution of various parts of the Appalachian chain.

gas well information aid in determining the relationships of the various materials, in respect to their distribution at depth and their time of deposition. Physical characteristics of the materials observed during field examination are augmented through laboratory investigations.

1060. BLAKE, W.Jr., *Geol. Surv. Can.*:  
Quaternary geochronology, Arctic Islands, 1975-.

**See:**

Sea and land relations during the last 15 000 years in the Queen Elizabeth Islands, Arctic Archipelago; *Geol. Surv. Can.*, Paper 76-1B, p. 201-207, 1976.

Postglacial marine submergence at Lac Ford, northern Ungava, Quebec; *Geol. Surv. Can.*, Paper 76-1C, p. 171-174, 1976.

Radiocarbon age determinations from the Carey Islands, Northwest Greenland; *Geol. Surv. Can.*, Paper 77-1A, p. 445-454, 1977.

1061. BLASCO, S.M., *Geol. Surv. Can.*:  
Surficial geology and geomorphology, Mackenzie Bay-Continental Shelf, 1970-.

**See:**

Estimation of bulk density and water content of Beaufort Sea sediment cores using X-radiographs; *Geol. Surv. Can.*, Paper 77-1A, p. 465-470, 1977.

1062. BORNHOLD, B.D., *Geol. Surv. Can.*:  
Offshore Quaternary geology, Arctic island channels, District of Franklin, 1973-.

**See:**

Marine geological and geophysical activities in Lancaster Sound and adjacent fiords; *Geol. Surv. Can.*, Paper 77-1A, p. 495-506, 1977.

1063. BROSTER, B.E., DREIMANIS, A., Univ. Western Ontario (Geology):  
Huron lobe tills west of Wyoming moraine, Ontario, 1976-78; M.Sc. thesis (Broster).

1064. BURWASSER, G.J., Ontario Division Mines:  
Quaternary geology of the Nottawasaga Bay area, Ontario, 1973-78.

1065. BURWASSER, G.J., FERGUSON, A.J., Ontario Division Mines:  
Quaternary geology of the Onion Lake-Sunshine area, Ontario, 1976-78.

1066. CHRISTIANSEN, E.A., Saskatchewan Research Council (Geology):  
Compilation of the Quaternary geology of Saskatchewan, 1972-77.

A summary of the history of deglaciation in central and southern Saskatchewan at 1:1 million scale is nearing completion. Data for this study were obtained by rotary drilling, augering and surface geological examination.

1067. CLAGUE, J.J., Geol. Surv. Can.:  
Quaternary geology, northern Strait of Georgia, British Columbia, 1974-.
- See:**  
Pleistocene sediments in the northern Strait of Georgia, British Columbia; Geol. Surv. Can., Paper 76-1B, p. 157-160, 1976.  
Some problems in the use of grain size statistics; Geol. Surv. Can., Paper 76-1C, p. 273-275, 1976.  
Holocene sediments in northern Strait of Georgia, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 51-58, 1977.
1068. CLAGUE, J.J., Geol. Surv. Can.:  
Quaternary geology, terrain inventory, Prince Rupert-Terrace area, British Columbia, 1975-.
1069. COOPER, A.J., Ontario Division Mines:  
Quaternary geology of the Grand Bend-Parkhill area, Ontario, 1973-77.  
Geologic mapping of Paleozoic, Quaternary and Recent materials in the Grand Bend-Parkhill NTS sheets at a scale of 1:50 000, with associated stratigraphic, geomorphic, engineering and granular resource studies, and bedrock topography and drift thickness compilations.
1070. COOPER, A.J., Ontario Division Mines:  
Quaternary geology of the Goderich-Seaforth area, Ontario, 1975-77.
1071. COOPER, A.J., Ontario Division Mines:  
Quaternary geology of the Strathroy-Bothwell-Ridgetown area, Ontario, 1976-77.
1072. COWAN, W.R., Ontario Division Mines:  
Quaternary geology of the Sault Ste. Marie area, Ontario, 1976-78.
- See:**  
Quaternary geology of the Sault Ste. Marie area; Ontario Div. Mines, M.P. 67, p. 134-136, 1976.
1073. COWAN, W.R., Ontario Division Mines:  
Quaternary geology of the Walkerton-Kincardine area, Ontario, 1976-78.
- See:**  
Quaternary geology of the Walkerton area, Bruce and Grey Counties; Ontario Div. Mines, M.P. 63, p. 111-112, 1976.
1074. CRAFT, J.L., DREIMANIS, A., Univ. Western Ontario (Geology):  
Pleistocene local glaciation in the Adirondack Mountains, New York, USA, 1965-76; Ph.D. thesis (Craft).  
During the Wisconsin glaciation, the Adirondacks first became a local ice centre. After an interstadial a major Laurentide ice advance completely overrode the area. After melting of ice from the High Peaks region, possibly during the Erie Interstade, local mountain glaciations re-occupied the mountains during the Post Bruce Stadial. Deglaciation occurred during the Two Creeks Interstadial.
1075. DE BOUTRAY, B., Université du Québec à Montreal (Sciences de la Terre):  
Cartographie des dépôts meubles sur la cote ouest de la Baie d'Ungave, Québec, 1976-79.  
Travaux sur le terrain dans la région de Payne Bay effectués pendant l'été 1976; restitution cartographique et synthèse des résultats interrompus pendant la grève de l'Université du Québec à Montreal et repris depuis peu de temps.
1076. DESMARAIS, G., DUBOIS, J.M.M., Univ. Sherbrooke (Géographie):  
Géomorphologie quaternaire du bassin de la rivière Matamek, Québec, 1975-77; thèse de maîtrise (Desmarais).  
**Voir:**  
Morpho-sédimentologie du bassin de la rivière Matamek; Woods Hole Oceanographic Inst., Ann. Rept. 1976.  
La cartographie géomorphologique préliminaire au 1:25 000 est terminée et environ 80 échantillons font l'objet d'analyse. L'analyse de l'évolution paléogéographique du bassin est en cours d'interprétation.
1077. DILABIO, R.N.W., DREIMANIS, A., Univ. Western Ontario (Geology):  
Glacial dispersal of rocks and minerals in the Lac Mistassini-Lac Waconichi area, Quebec, with special reference to the Icon dispersal train, 1972-76; Ph.D. thesis (DiLabio).  
Three till units were investigated, and glacial dispersal trains were found in the basal till of the latest readvance. Chalcopyrite and malachite were main ore minerals, and mapping the abundance of chalcopyrite-bearing pebbles were found to be the most efficient guide in the Icon indicator train.
1078. DREDGE, L.A., Geol. Surv. Can.:  
Surficial geology, Sept-Îles Cap Chat, Quebec, 1971-.
- See:**  
The Goldthwait Sea and its sediments: Godbout-Sept Isles region, Quebec north shore; Geol. Surv. Can., Paper 76-1C, p. 179-181, 1976.  
Moraines in the Godbout-Sept Isles area, Quebec north shore; *ibid.*, p. 183-184, 1976.  
Development of a gully-flow near Sept-Îles, Quebec; Can. J. Earth Sci., v. 13, no. 8, p. 1145-1151, 1976.
1079. DREDGE, L.A., Geol. Surv. Can.:  
Quaternary geology, terrain inventory, northeastern Manitoba, 1975-.
- See:**  
Terrain reconnaissance, Lake Agassiz Margin, Northern Manitoba; Geol. Surv. Can., Paper 77-1A, p. 45-50, 1977.
1080. DREIMANIS, A., EVENSON, E.B., FENTON, M.M., MAY, R.W., NEWSOME, J.W., STANKOWSKY, W., Univ. Western Ontario (Geology):  
Tills, their genesis and classification, 1970-81.  
**See:**  
Tills, their origin and properties; Roy. Soc. Can., Sp. Publ. 12, p. 11-49, 1976.  
Methods of stratigraphic correlation of tills in central and western Canada; *ibid.*, p. 67-82, 1976.  
Compositional variability in tills; *ibid.*, p. 99-119, 1976.  
The various genetic types of tills, and methods of investigation applied mainly to investigation of basal till, as well as the variability of basal till have been reviewed. A genetic classification is proposed that considers various classifications used in North America and Europe.
1081. DREIMANIS, A., EVENSON, E.B., GRANT, D.R., RAUKAS, A., TERASMAE, J., Univ. Western Ontario (Geology), Brock Univ. (Geological Sciences):  
Last glaciation in the eastern North America, 1958-.

- See:**  
 Progress report on Late Pleistocene stratigraphy of southeastern Canada; IGCP Project 73-1-24, Rep. 3, p. 240-249, 1976.  
 Late glacial (14 000-10 000 y.B.P.) history of the Great Lakes region and possible correlations; IGCP Project 73-1-24, Rep. 3, p. 217-239, 1976.  
 Quaternary stratigraphy of southern Ontario; in Quaternary stratigraphy of North America, p. 51-63, 1976.  
 The stratigraphy of the Wisconsin Glaciation has been reviewed and some of its parts revised according to new findings, and by correlations with the ocean records for that part which is beyond the range of the radiocarbon dating method.
1082. DUBOIS, J.M.M., Univ. Ottawa (Géologie):  
 Géologie quaternaire de la Côte Nord de l'estuaire maritime du Saint-Laurent, 1974-78; thèse de doctorat.
- Voir:**  
 Le quaternaire de la côte Nord de l'estuaire maritime du St-Laurent: secteurs de Rivière-aux-Graines, Sheldrake et Mingan; Geol. Surv. Can., Paper 76-1A, p. 33-36, 1976.  
 Levé préliminaire du complexe morainique de Manitou-Matamek sur la Côte Nord de l'estuaire maritime du St-Laurent; Geol. Surv. Can., Paper 76-1B, p. 89-93, 1976.  
 La cartographie préliminaire des formations meubles est terminée entre les rivières Moisie et Mingan au 1:25 000. Les analyses de 200 échantillons sont en cours afin de préciser cette cartographie et les caractéristiques des ensembles sédimentaires. La découverte des complexes morainiques et les données d'autres chercheurs ont permis l'élaboration d'une hypothèse de chronologie des systèmes morainiques de la Côte Nord.
1083. EDWARDS, D.A.D., DREIMANIS, A., Univ. Western Ontario (Geology):  
 Lithologic variations in some eskers of southern Ontario, 1974-77; M.Sc. thesis (Edwards).
1084. EDWARDS, W.A.D., SHETSEN, I., Alberta Research Council (Geology Div.):  
 The sand and gravel inventory of Alberta, 1976-81.  
 Present and possible areas of aggregate occurrence will be outlined and their potential as a resource will be assessed. Areas of heavy aggregate demand will be examined to define the situation and an overall data base created to allow for future planning of the resource.
1085. EMERSON, D., RUTTER, N.W., SCHWEGER, C.S., WESTGATE, J.A., Univ. Alberta (Geology):  
 The surficial geology of the Cooking Lake moraine, east-central Alberta, Canada, 1975-77; M.Sc. thesis (Emerson).
1086. FEENSTRA, B.H., Ontario Division Mines:  
 Quaternary geology of the Grimsby-Dunnville area, southern Ontario, 1973-77.
1087. FEENSTRA, B.H., Ontario Division Mines:  
 Quaternary geology of the Markdale-Owen Sound and north Keppel area, southern Ontario, 1975-.
1088. FENTON, M.M., ANDRIASHEK, L.D., Alberta Research Council (Geology Div.):  
 Quaternary stratigraphy and surficial geology, Sand River map sheet 73L, Alberta, 1976-78; M.Sc. thesis (Andriashek).
- To map the distribution of surface sediments and study the Quaternary deposits to a depth of 50 metres for the purpose of: (1) outlining deposits of economic importance, (2) determining the simple engineering properties of the sediments, (3) defining and tracing lithostratigraphic units, and (4) understanding the Quaternary history of the area. First field season completed and about half of the area examined.
1089. FILLON, R.H., Geol. Surv. Can.:  
 Late Cenozoic paleo-oceanography of the Labrador Sea, 1975-.
1090. FORBES, D.L., Geol. Surv. Can.:  
 Sedimentary processes and sediments, Babbage River delta, Yukon coast, 1974-.
- See:**  
 Sedimentary processes and sediments, Babbage River delta, Yukon coast: a progress report; Geol. Surv. Can., Paper 76-1C, p. 165-168, 1976.
1091. FULTON, R.J., Geol. Surv. Can.:  
 Quaternary geology inventory, southern Labrador, 1969-.
1092. FULTON, R.J., Geol. Surv. Can.:  
 Quaternary geology of the Canadian Cordillera, 1975-.
1093. GADD, N.R., Geol. Surv. Can.:  
 Quaternary geology, Chaudiere River region, Quebec, 1962-.
1094. GASCOYNE, M., SCHWARCZ, H.P., FORD, D.C., McMaster Univ. (Geology):  
 Geochronology and paleotemperature studies of speleothem, Vancouver, Jamaica, England, 1974-78; Ph.D. thesis (Gascoyne).  
 Analysis of O-18 and C-13 abundance of speleothems allows determination of temperature of formation in some instances. Speleothems are dated by  $^{230}\text{Th}/^{234}\text{U}$  method.  $^{231}\text{Pa}/^{235}\text{U}$  dating is found to be possible for high-U speleothems. Some deposits with equilibrium profiles (of  $^{18}\text{O}$ ) have been measured from caves on Vancouver Island, British Columbia.
1095. GAUTHIER, R.C., Geol. Surv. Can.:  
 Quaternary geology of the Bathurst area, New Brunswick, 1976-.
- See:**  
 Cartographie des dépôts superficiels, péninsule nord-est du Nouveau-Brunswick; Geol. Surv. Can., Paper 77-1A, p. 371-378, 1977.
1096. GEDDES, R.S., DREIMANIS, A., Univ. Western Ontario (Geology):  
 Mineral exploration by stratigraphic investigations of Pleistocene deposits in the Kidd Creek Mine area, Timmins, Ontario, 1975-78; M.Sc. thesis (Geddes).
1097. GRANT, D.R., Geol. Surv. Can.:  
 Quaternary geology St. Anthony-Blanc Sabbon, Newfoundland, 1969-.
1098. GRANT, D.R., Geol. Surv. Can.:  
 Surficial geology, southern Cape Breton Island, Nova Scotia, 1970-.
- See:**  
 Reconnaissance of early and middle Wisconsinan deposits along the Yarmouth-Digby coast of Nova Scotia; Geol. Surv. Can., Paper 76-1B, p. 363-369, 1976.

- Late Wisconsinian ice limits in the Atlantic Provinces of Canada with particular reference to Cape Breton Island, Nova Scotia; *Geol. Surv. Can., Paper 76-1C*, p. 289-292, 1976.
1099. GRANT, D.R., *Geol. Surv. Can.:*  
Surficial geology of Newfoundland, 1974-.
- See:**  
Altitudinal weathering zones and glacial limits in western Newfoundland, with particular reference to Gros Morne National Park; *Geol. Surv. Can., Paper 77-1A*, p. 455-463, 1977.
1100. HICOCK, S.R., DREIMANIS, A., *Univ. Western Ontario (Geology):*  
Pre-Fraser Pleistocene stratigraphy, geochronology and paleoecology of the Georgia Depression, British Columbia, 1976-80; Ph.D. thesis (Hicock).
1101. HODGSON, D.A., *Geol. Surv. Can.:*  
Surficial geology and geomorphology of central Ellesmere Island, 1972-.
1102. HUGHES, O.L., *Geol. Surv. Can.:*  
Quaternary stratigraphy of Old Crow Basin and Porcupine River Valley, Yukon, 1968-.
1103. JACKSON, L.E., *Geol. Surv. Can.:*  
Quaternary geology, terrain inventory, Kananaskis Lakes, Alberta, 1974-.
1104. KARROW, P.F., BADA, J.L., STALKER, A.M., CHURCHER, C.S., *Univ. Waterloo (Earth Sciences):*  
Amino-acid dating of Quaternary bones and shells from Canadian and U.S. sites, 1976-78.  
  
To attempt to date vertebrate bones from Canadian Prairies and Toronto Interglacial, and raised marine terraces of California.
1105. KARROW, P.F., BAKER, C., *Univ. Waterloo (Earth Sciences):*  
Microfabrics of clay tills in Waterloo County, Ontario, 1975-77; M.Sc. thesis (Baker).
1106. KARROW, P.F., FREY, E., *Univ. Waterloo (Earth Sciences):*  
Precambrian clasts in tills in southwestern Ontario, 1972-78; M.Sc. thesis (Frey).
1107. KARROW, P.F., FRITZ, P., MORGAN, A.V., SCHWERT, D.P., KALAS, L., ANDERSON, T.W., DELORME, L.D., *Univ. Waterloo (Earth Sciences):*  
Paleoenvironmental analysis of a bog in Kitchener, Ontario, 1974-80.  
  
Study underway of beetles (Schwert-Morgan), molluscs (Kalas), ostracods (Delorme), pollen (Anderson), carbon and oxygen isotopes (Fritz), on a set of samples collected from a 4.5 m test pit.
1108. KARROW, P.F., MILLER, B.B., KALAS, L., ANDERSON, T.W., *Univ. Waterloo (Earth Sciences):*  
Paleontology and geomorphology of lake and stream terraces near Lake Huron, Ontario, 1968-88.  
  
Studies of molluscs generally completed, palynology in progress, surveys of terrace elevations and relationships in progress.
1109. KARROW, P.F., MORGAN, A., HAHN, B., KALAS, L., SREENIVASA, B.A., *Univ. Waterloo (Earth Sciences):*  
Paleontology of the Toronto interglacial, 1963-.  
  
Manuscripts completed on molluscs (Kalas), beetles (Morgan), midges (Sreenivasa), ostracods (Poplawski) and caddisflies (Williams); cladocera under study (Hahn).
1110. KARROW, P.F., WHITE, O.L., *Univ. Waterloo (Earth Sciences-Civil):*  
Urban geology of Kitchener-Waterloo, 1959-.
1111. KLASSEN, R.W., *Geol. Surv. Can.:*  
Quaternary geology, Duck Mountain, Riding Mountain, Manitoba, Saskatchewan, 1964-.
1112. KLASSEN, R.W., *Geol. Surv. Can.:*  
Quaternary geology inventory, lower Nelson River basin, Manitoba, 1971-.
1113. LAMOTHE, M., PRICHONNET, G., GADD, N., HILLAIRE-MARCEL, Cl., *Université du Québec à Montréal (Sciences de la Terre), Geol. Surv. Can.:*  
Les dépôts meubles de la région de St-Faustin - St-Jovite (Québec): cartographie, stratigraphie, sédimentologie, 1975-77; These de maîtrise en Sciences (Lamothe).  
  
A partir d'une cartographie de détail (1/20 000), établir la succession lithostratigraphique régionale et reconstituer les événements paléogéographiques successifs: déglaciation; invasion marine. Analyse sédimentologique des unités lithostratigraphiques. Essai de corrélation géochronologique.
1114. LOCKE, W.III, LOCKE, C., *Univ. Colorado (INSTAAR):*  
Quaternary history of the Cape Dyer area, Baffin Island, District of Franklin, 1974-78; Ph.D. theses.  
  
To determine the maximum vertical extent of glaciation in the area, and to develop a glacial, sea-level, and climatic chronology for the area. Examination of the Tertiary basalts which are found at elevations of 300-800 m.a.s.l. reveal no evidence, such as molded forms, striae, or erratics, of active glaciation of the high plateau. The Cape Dyer area is thus interpreted as a refugium during at least the Wisconsin maxima. The Late Quaternary chronology of Cape Dyer includes one or more pre-Wisconsin glaciations of major extent. The major advances during the Wisconsin were an early(?) Wisconsin and a nearly equivalent middle Wisconsin (60 000 yr. BP) advance. The latter was associated with a warm marine fauna and a relative sea level of +15 m. Few local glaciers show evidence of a late Wisconsin extent greater than at present, and the relative sea level is interpreted as -70 m. Several minor fluctuations of climate have been identified within the Neoglacial, however the dating of these events must await the determination of lichen growth rates (*Alectoria min.*) for the area.
1115. MARTINEAU, G., CHAUVIN, L., LASALLE, P., MAURICE, O.D., *Québec Min. Richesses Naturelles:*  
Géologie des dépôts meubles de la région de St-Jean-Port-Joli, Québec, 1976-77.
1116. MAY, R.W., *Univ. Alberta (Geology):*  
Sedimentology and geomorphology of Quaternary deposits, 1976-78.  
  
Studies of proglacial lacustrine sediments will be continued. In particular, sequences resembling turbidites will be studied.
1117. MAY, R.W., *Univ. Alberta (Geology):*  
Scanning electron microscope (SEM) study of Quaternary sediments, 1976-78.  
  
To assess the utility of scanning electron microscopy in the study of microtextural aspects of Quaternary sediments, with particular emphasis being placed on the study of bulk specimen.



1118. MAYR, F.C., Université du Québec à Montréal (Sciences de la Terre):  
Rapport entre les oscillations du champs magnétique et les fluctuations climatiques, 1974-78.
- Voir:**  
The Oelberg paleomagnetic events and the problem of radiocarbon dates around 28 000 BP; Internat. Geol. Correlation Prog., Project 24, Proc. Symp. 1975, Bellingham, Wash., Praha, 1976.
- Rapport entre les oscillations du champs magnétique et les fluctuations climatiques; 3<sup>ème</sup> Colloque sur le Quaternaire du Québec, 14-17 Octobre 1976 (Trois-Rivières), p. 62-65, 1976.
1119. MCATEE, C., TERASMAE, J., Brock Univ. (Geological Sciences):  
Palynology of Holocene sediments in Georgian Bay, Ontario, as related to the Great Lakes history, 1975-77; M.Sc. thesis (McAtee).
- In this study modern pollen, spore, and other palynomorph transport to and within Georgian Bay has been investigated, as well as their distribution in the bottom sediments. Modern pollen and spore assemblages in Georgian Bay sediments do reflect the surrounding vegetation when preservation and pollen production are accounted for. In a 13 metre core, this information is used in the palynologic interpretation of late- and postglacial vegetation changes, lake level changes, sedimentation rates, and climatic changes. Rivers flowing into Georgian Bay are shown to be a major source of pollen and spores deposited in Georgian Bay, and as such, provide a 'label' for sediments that cannot otherwise be identified as to their origin. Pollen and spores caught in traps in the Moon and Muskoka Rivers are shown to be somewhat 'locally' derived (most of which are washed in by runoff), and to reflect the vegetation of the watershed. Nottawasaga River alluvium shows 'regional' pollen and spore assemblages, and as such palynomorphs in alluvium can possibly be used in the interpretation of (1) the river's geologic history, (2) past climatic change, and (3) vegetational history. Pollen preservation in the rivers, Georgian Bay surface sediments, and sediment core, has been investigated and related to certain environmental conditions and events.
1120. MILLER, G.H., Univ. Colorado (INSTAAR):  
Glacial and glacio-isostatic history of northern Hall Peninsula, Baffin Island, District of Franklin, 1976-77.
- A reconnaissance field study and air photo interpretation revealed a major moraine system along the northern fiords of Hall Peninsula. Mollusks in ice-contact marine features associated with the moraine system are being dated by <sup>14</sup>C. Preliminary amino acid ratios indicate the mollusks are of post glacial age. A well-controlled fix on the marine limit along a transect perpendicular to the regional isobases will allow reconstruction of the strandline tilt in the area. The lowest marine limits were determined by echo-sounding.
1121. MORGAN, A.V., HAMILL, P., Univ. Waterloo (Earth Sciences):  
The analysis of the distribution of polygonal ground networks in southern Ontario, 1972-77; B.Sc. thesis (Hamill).
- The distribution of polygonal patterned ground in southwestern Ontario is more widespread than formerly believed. It is suggested that the polygons are the result of the surface expression of former ice-wedge structures created during a periglacial episode following a retreat in the region. The continuation of this project is an attempt to see whether these structures are preferentially linked to lithology of the surficial materials in which they are found. It is also hoped that by plotting the full areal extent the age of the structures can be determined.
1122. MUDIE, P.J., PIPER, D.J.W., Dalhousie Univ. (Geology):  
Palynological studies of Quaternary marine sediments in the Maritimes, 1976-79; Ph.D. thesis (Mudie).
1123. NELSON, A., MAYBE, S., Univ. Colorado (INSTAAR):  
Quaternary stratigraphy of Kivituiba'k Forelands, Baffin Island, District of Franklin, 1975-78.
- In order to better understand the critical early history of the last glaciation a Wisconsin and pre-Wisconsin chronology for a representative area of the northeastern margin of the Laurentide Ice Sheet is being developed through a detailed stratigraphic and morphologic study of the Kivituiba'k Foreland. The stratigraphy of the foreland is being deciphered using detailed techniques of stratigraphic and lithologic analysis which have been used extensively in studies along the southern margin of the Laurentide Ice Sheet. Relative weathering and soil data is being collected from landforms and all exposures are being examined with the emphasis on interpreting the dynamics of the depositional environments. Dating methods which are providing an absolute time framework for the chronology include enriched C<sup>14</sup>, U-series, amino acid diagenesis, paleomagnetism, biostratigraphy (mollusc and Foraminifera assemblages and palynology). Multiple dating of the same units will provide badly needed crosschecks on all dating methods.
1124. NETTERVILLE, J.A., Geol. Surv. Can.:  
Quaternary geology, terrain inventory, Boothia Peninsula, northeast Keewatin, Somerset and Prince of Wales Islands, 1975-.
- See:**  
Soils and vegetation of Somerset and Prince of Wales Island, District of Franklin; Geol. Surv. Can., Paper 76-1B, p. 143-145, 1976.
- Tors and associated weathering phenomena, Somerset Island, District of Franklin; *ibid.*, p. 209-216, 1976.
1125. OCCHIETTI, S., ST-ONGE, D., Univ. Ottawa (Géographie):  
Dépôts et faits quaternaires du Bas-St-Maurice; thèse de doctorat (Occhietti).
1126. OSBORN, G.D., Univ. Calgary (Geology):  
Holocene glacial fluctuations in the Canadian Rockies, 1974-78.
- Volcanic ash, lichens, and C<sup>14</sup> dating have been used to date Holocene glacial deposits in Banff, Jasper, Yoho, and Mt. Robson Parks. Mazama ash has been found on 13 terminal moraines or rock glaciers that are situated slightly downvalley from recent moraines deposited in the last few centuries. The old moraines represent a very minor advance that occurred between roughly 7000 and roughly 9000 B.P. A possible intermediate advance by a rock glacier in Lost Horse Valley (Banff Park) which is overriding a Mazama-bearing rock glacier, and which is being overridden by a young, still-active rock glacier. The deposits indicate that the

- minor advances of the last few centuries were in most cases the most extensive advances of the last 9000 or so years.
1127. PAGE, P., PRICHONNET, G., LASALLE, P., HILLAIRE-MARCEL, Cl., Université du Québec à Montréal (Sciences de la Terre):  
Les dépôts meubles de la région de St-Jean de Matha, St-Émélie de l'Énergie (Québec): cartographie, sédimentologie, stratigraphie, 1975-77; Thèse de maîtrise en Sciences (Page).  
A partir d'une cartographie de détail (1/20 000), établir la succession lithostratigraphique régionale et reconstituer les événements paléogéographiques successifs: déglaciation; invasion marine. Analyse sédimentologique des unités lithostratigraphiques. Essai de corrélation géochronologique.
1128. PREST, V.K., Geol. Surv. Can.:  
Quaternary geology, Montreal Island, Quebec, 1951-.
- See:**  
Geology and engineering characteristics of surficial deposits, Montreal Island and vicinity, Quebec; Geol. Surv. Can., Paper 75-27, 1977.
1129. PREST, V.K., Geol. Surv. Can.:  
Quaternary research in Canada, 1974-.
1130. PRICHONNET, G.P., Université du Québec à Montréal (Sciences de la Terre):  
Preuves géologiques et géomorphologiques du retient glaciaire wisconsinien, au nord de la région montréalaise, 1974-77.
- Voir:**  
Déglaciation de la vallée du St-Laurent dans la région de Montréal et invasion marine contemporaine (Québec) (-12 500 à -10 500 BP); 3<sup>e</sup> Colloque sur le Quaternaire du Québec - Trois Rivières, Octobre, 1976.
1131. PRICHONNET, G.P., Université du Québec à Montréal (Sciences de la Terre):  
Déglaciation des premières chaînes appalachiennes au Sud-Est des Basses Terres du St-Laurent, Québec, 1977-80.  
Mettre en évidence les mouvements glaciaires successifs sur les premiers reliefs appalachiens du SE du Québec. Établir les relations entre ces mouvements, les accumulations morainiques et les dépôts des plans d'eau postglaciaires régionaux (lacs proglaciaires, mer de Champlain).
1132. PROUDFOOT, D.N., RUTTER, N.W., Univ. Alberta (Geology):  
The stratigraphy of the Pleistocene deposits of the E-1/2 Priddis and W-1/2 Dalemead map sheets, Alberta, 1976-79; Ph.D. thesis (Proudfoot).  
Determination and correlation of the Pleistocene stratigraphy from an analysis of field relationships observed in exposed sections, auger holes and air photos.
1133. RAMPTON, V., Geol. Surv. Can.:  
Quaternary geology, Beaufort-Mackenzie, 1969-.
1134. RICHARD, S.H., Geol. Surv. Can.:  
Surficial geology, Tawatinaw area, Alberta, 1968-.
1135. RICHARD, S.H., Geol. Surv. Can.:  
Surficial geology, Ottawa Valley lowlands, 1974-.
- See:**  
Surficial geology mapping: Valleyfield-Huntingdon area, Quebec; Geol. Surv. Can., Paper 77-1A, p. 507-512, 1977.
1136. ROBERTSON, W., FARVOLDEN, R.N., MORGAN, A.V., Univ. Waterloo (Earth Sciences):  
Subsurface correlation of Pleistocene and Holocene lithic units in part of the Grand River watershed, 1976-77; M.Sc. thesis (Robertson).
1137. RUTTER, N.W., Univ. Alberta (Geology):  
Quaternary history of parts of Alberta, British Columbia and Yukon, 1976-.
1138. RUTTER, N.W., Univ. Alberta (Geology):  
Paleosols of the Prairie Provinces, 1976-.
1139. RUTTER, N.W., CRAWFORD, R.J., Univ. Alberta (Geology):  
Development of amino acid racemization dating techniques, 1976-.
1140. SCHREINER, B.T., ALLEY, D.W., CHRISTIANSEN, E.A., Saskatchewan Res. Council (Geology):  
Quaternary geology in the Precambrian terrain of Saskatchewan, 1974-78.
- See:**  
Quaternary geology of NTS areas 64D, 73O, 74C, 74B, 74H; Saskatchewan Res. Council, Summ. Investig. 1976.  
Field studies carried out during the year included reconnaissance aircraft mapping and sampling at an average density of one site per 100 km<sup>2</sup>. To date approx. 100 000 km<sup>2</sup> have been investigated between the southern boundary of Precambrian exposure and 58° north latitude. Auger holes have been drilled along roads and a seismic survey was conducted to measure drift thickness. Preliminary 1:250 000 Quaternary geology maps have been published.
1141. SCHREINER, B.T., ALLEY, D.W., CHRISTIANSEN, E.A., Sask. Geol. Surv., Saskatchewan Res. Council (Geology):  
Quaternary geology - 64D, 64E, 73O, 74C, 74B, 74H areas, Saskatchewan, 1976-77; Ph.D. thesis (Alley).
- See:**  
Sask. Geol. Surv., Summ. Investig. 1976.
1142. SCHWARCZ, H.P., McMaster Univ. (Geology):  
Dating of fossil human sites in Israel, Greece and Hungary by <sup>230</sup>Th/<sup>234</sup>U method, 1975-78.  
To obtain absolute ages of travertines found in close stratigraphic relation to archaeological deposits including fossil human remains or tools produced by early man.
1143. SHARPE, D.R., WHITE, O.L., COWAN, W.R., Ontario Division Mines:  
Quaternary geology of Durham and Chesley-Tiverton areas, Ontario, 1975-78.
1144. SHILTS, W.W., Geol. Surv. Can.:  
Quaternary geology, Sherbrooke, Quebec, 1966-.
1145. SHILTS, W.W., Geol. Surv. Can.:  
Properties and provenance of till, 1969-.
1146. SHILTS, W.W., Geol. Surv. Can.:  
Quaternary geology inventory - geomorphic process studies, Maguse River, District of Keewatin, 1973-.
- See:**  
Heavy metal content of tundra plant species; Geol. Surv. Can., Paper 76-1B, p. 273-279, 1976.
1147. STALKER, A.M., Geol. Surv. Can.:  
Quaternary of southern Alberta, 1965-.

- See:**  
Paleomagnetic stratigraphy of the Wellsch Valley site, Saskatchewan; Geol. Surv. Can., Paper 76-1C, p. 191-193, 1976.
- Differentiation of tills in the Pakowki-Pinborn area of southeastern Alberta on the basis of their magnetic susceptibility; *ibid.*, p. 189-190, 1976.
1148. STALKER, A.M., Geol. Surv. Can.:  
Glacially displaced intertill bedrock blocks, Canadian Prairies, 1974-.
1149. STALKER, A.M., Geol. Surv. Can.:  
Syntheses of Quaternary geology, Great Plains of Canada, 1975-.
1150. TERASMAE, J., Brock Univ. (Geological Sciences):  
Late-Quaternary paleoecology and history of Belcher Islands, Northwest Territories, 1975-77.
- Collections of marine shells from a series of raised beaches have been made and the samples have been radiocarbon dated. A number of surface samples (peat and lake sediment) has been collected for palynological study to establish modern pollen deposition on the islands and aid in the interpretation of fossil pollen assemblages. Several short cores of peat have been analysed for fossil pollen. The radiocarbon dates will be used to construct an uplift curve for the Belcher Islands during the last 5000 years.
1151. TERASMAE, J., PREST, V.K., Brock Univ. (Geological Sciences), Geol. Surv. Can.:  
Late-Quaternary history of Magdalen Islands, Quebec, 1974-78.
- See:**  
Late-Quaternary history of Magdalen Islands, Quebec; *Maritime Sediments*, v. 12, no. 2, 1976, p. 39-60, 1977.
- Reconnaissance of Quaternary geology has been completed on all islands of this group. Several pollen diagrams covering postglacial time (the last 10 000 years) have been compiled. One pollen diagram of interglacial deposits (dated at more than 35 000 radiocarbon years), including information on diatoms, insects, seeds, leaves, etc. has been prepared. The studies made so far have included: past sea level changes, permafrost features, general geomorphology, characteristics of Pleistocene and Recent deposits, climatic changes. Available data indicate that the islands were not "over-ridden" by ice during the last (Wisconsin) glaciation.
1152. TREMBLAY, G., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Géologie des dépôts meubles des bassins des rivières du Nord et de l'Assomption, Québec, 1976-77.
1153. UNKAUF, J.C., RUTTER, N.W., Univ. Alberta (Geology):  
The surficial geology and Quaternary stratigraphy of the Grande Prairie area, Northwest Alberta, 1976-78; Ph.D. thesis (Undauf).
1154. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:  
Surficial and glacial geology-gravel resources of the Wesleyville-Carmanville area of Newfoundland, 1975-77.
- See:**  
Surficial and glacial mapping-gravel resource inventory; Nfld. Dept. Mines Energy, Rept. 77-1, 1977.
- Surficial and glacial geological mapping was carried out on an area covering three 1:50 000 map sheets in the Wesleyville-Carmanville area of eastern Newfoundland during July of 1975. The mapping was based on a landform classification as interpreted from 1:53 500 airphotos. Sieve analyses were conducted on 51 samples of sand, gravel and for glacial till materials. Compilation of the field data and laboratory investigations should be complete by June, 1977.
1155. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:  
Surficial and glacial geology-gravel resource inventory of west-central Newfoundland, 1975-77.
- Surficial and glacial mapping was carried out during August, 1975 on an area covering three 1:50 000 map sheets in the Deer Lake to Harry's River area of West-Central Newfoundland. The mapping is based on a landform classification as interpreted from 1:53 500 airphotos. Sieve analyses were conducted on 87 samples of sand, gravel and for glacial till materials collected from various geomorphological units in the study area. Compilation of the field and laboratory data should be completed by June, 1977.
1156. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:  
Surficial and glacial geology-gravel resource inventory, Avalon Isthmus area of Newfoundland, 1975-77.
- Surficial and glacial mapping was conducted on five 1:50 000 map sheets in the northwestern part of the Avalon Peninsula, Newfoundland. A landform classification was conducted using airphotos scale approximately 1:53 500, glacial flow features were plotted and ground truthing carried out during the summer of 1975. The area was affected during the last glaciation by three glacial flow regimes: (a) an island based ice cap that extended only into the northern half of the Avalon Isthmus at its maximum extent, (b) an ice cap situated on the Avalon Peninsula that covered the southern part of study area, and (c) a small ice center situated on the southern part of the Avalon Isthmus that shed ice to the NE into Trinity Bay and SW into Placentia Bay and may have been confluent with the other two ice masses at its maximum extent. Drift thickness is varied from moderately thick at the north and south ends of the study area to shallow in the central or Isthmus area. Gravel resources are likewise restricted to the northern and southern portions of the area. Grain-size analyses were conducted on 51 samples of gravel and glacial tills.
1157. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:  
Gravel resource inventory of the Goose Bay-Gull Island area of Labrador, 1976-78.
- A total of 250 clay, silt and/or sand, gravel and till samples were collected, and sieved in the field and laboratory. Notes on the surficial geology, glacial geology and Quaternary stratigraphy were also made during the course of investigations. The glacial tills of the area generally have a sandy-silty matrix lacking in clay and show evidence of deposition in an ice contact - melt walls - water position. Buried tree fragments were found and sampled at a number of localities buried midway up a section of glaciofluvial sands and silts in the Happy Valley-Mud Lake area. The area has an abundance of sand and gravel for most construction purposes and the clay material may have potential for ceramic production.

1158. VANDERVEER, D.G., Newfoundland Dep. Mines Energy:

Surficial and glacial geology-gravel resource inventory of the St. John's area, Newfoundland, 1975-78.

The original open file release in 1975 consisted of a landform classification of the surficial geology (as interpreted from airphotography) of an area within a thirty mile radius of St. John's and covering approximately 2.5 1:50 000 map sheet. During the 1976 field season ground truthing and sieve analyses of selected sand, gravel and/or glacial till materials was conducted over 75% of this area. The remainder of the area will be surveyed during the 1977 field season. The project is designed to provide information on: (a) the distribution of the various surficial materials, (b) the glacial flow features of the area, and (c) the geotechnical properties of the different surficial materials in the study area.

1159. VILKS, G., Geol. Surv. Can.:

Pleistocene-Holocene basin sedimentation, 1975-.

**See:**

Post-glacial paleo-oceanography of Emerald Basin, Scotian Shelf; Can. J. Earth Sci., v. 13, no. 9, p. 1256-1267, 1976.

1160. VINCENT, J-S., Geol. Surv. Can.:

Terrain studies, James Bay power development area, Quebec, 1973-.

1161. VINCENT, J-S., Geol. Surv. Can.:

Surficial geology inventory, Banks Island, District of Franklin, 1974-.

1162. WARREN, B., BOUCHARD, M., LASALLE, P., MAURICE, O.D., Québec Min. Richesses Naturelles:

Géologie des dépôts meubles de la région de Drummondville, Québec, 1976-77.

**Voir:**

Géologie des dépôts meubles de la région de Drummondville; Min. Rich. Nat., DPX-437, 1977.

1163. WATERS, P.L., RUTTER, N.W., Univ. Alberta (Geology):

Quaternary stratigraphy and glacial history of the St. Paul region, Alberta, Canada, 1976-78; M.Sc. thesis (Waters).

1164. WESTGATE, J.A., BRIGGS, N.D., PEARCE, G.W., HUGHES, O., CHRISTIANSEN, E.A., FULTON, R.J., Univ. Toronto (Geology):

Quaternary tephrochronological studies in western Canada, Yukon Territory and Alaska, 1967-.

**See:**

Wascana Creek Ash (Middle Pleistocene) in southern Saskatchewan: characterization, source, fission track age, paleomagnetism, and stratigraphic significance; Can. J. Earth Sci., v. 14, no. 3, p. 357-374, 1977.

#### REMOTE SENSING

1166. ANDERSON, D.T., Univ. Manitoba (Earth Sciences):

Photogeology and remote sensing interpretation of northern Manitoba and northwestern Ontario, 1975-78.

Examination of all available aerial photography, compilation of field geology and aeromagnetic data, and an interpretation of these data with ERTS and Landsat imagery.

1167. DUBOIS, J.M.M., Woods Hole Oceanographic Inst.:

Hydromorphologie des Rivières à Saumon, 1975-77.

Widespread and distinctive pyroclastic deposits constitute important time-parallel stratigraphic markers, and their potential contribution to the solution of Quaternary stratigraphic problems in western Canada is great. Several investigations are presently being conducted. Documentation of the discriminating characteristics, age and extent of tephras in late Quaternary sediments of southwestern Canada is continuing in an effort to refine the tephrostratigraphical record and identify source volcanoes (Westgate). Fission-track dating, mineralogical and chemical studies of sub-till tephras in southern Saskatchewan have resulted in the recognition of the 0.6 m.y. old Pearlette "O" tephra, a widespread deposit derived from vents in Yellowstone Park (Westgate, Christiansen and Boellstorff) but the source and age of other tephras in this region have yet to be determined — a situation that is also true for the thin rhyolitic tephras in interglacial sediments of southern British Columbia (Westgate, Fulton). A new programme on the late Cenozoic tephrochronology of the Yukon Territory and adjacent areas of Alaska is now underway; fission-track (Briggs, Westgate) and palaeomagnetic (Westgate, Pearce) studies provide the chronological control. This project forms part of an interdisciplinary effort aimed at reconstruction of Quaternary environments in the northern Yukon, where several Early Man sites have recently been found. Tephras here will undoubtedly play a significant role in resolving problems of correlation and geochronology (Westgate, Hughes, Ritchie).

1165. WESTGATE, J.A., KALAS, L., EVANS, M.E., RAMSDEN, J., Univ. Toronto (Geology):

Quaternary geological studies in central and southern Alberta, 1965-.

Investigations in the Edmonton region are directed towards elucidation of the Quaternary geological history (Westgate, Ramsden). At present, particular attention is being given to the nature of environments immediately prior to glaciation, as evidenced by physical and biological criteria (Westgate, Kalas) and to the palaeogeography and palaeoecology of extensive late Wisconsin stagnant ice masses. A comprehensive palaeoecological study of fossiliferous Mid-Wisconsin interstadial sediments of the Peace River region is near completion (Westgate and others) as is a synthesis of the Quaternary lithostratigraphy of southeastern Alberta (Westgate). Palaeomagnetic characteristics of late Quaternary lacustrine sediments associated with Glacier Peak tephra in Alberta and Montana are being documented to see whether they are of use in stratigraphic correlation (Evans, Westgate).

**Voir:**

Hydromorphologie du bassin de la rivière Matamek et de la Basse Moisie; Woods Hole Oceanographic Inst., Ann. Rept. 1976.

Une méthode d'inventaire et de cartographie de la géomorphologie et des sédiments de cours d'eau été mise au point avec l'aide de techniques de télédétection. Cet inventaire est axé sur la détermination des caractéristiques des rivières à Saumon et sur leur potentiel de frayères.

1168. HARDY, N.E., Univ. Toronto (Geography):  
Effectiveness of synthetic aperture SLAR in monitoring forest regrowth in central Oregon, 1977-78.

This project has been developed to make use of a fairly complete existing data base in the establishment of a predictive model. The project will make use of several flights of radar imagery covering the Umatilla and Malheur National Forests of Oregon, plus data derived from the U.S. Forest Service and several of the lumber firms in the area. Thus sufficient information is available to develop a

predictive model which ought to be capable of yielding the relationship between forest regrowth stage, and return signal strength for a given depression angle or range of depression angles.

1169. KUGLER-GAGNON, M., Univ. Ottawa (Geography):  
Environmental studies, Mirabel airport, Montreal region, Québec, 1976-.

Etude de la dynamique de l'impact de l'aéroport international de Mirabel du moyen des images des satellites LANDSAT A et B.

## SEDIMENTOLOGY

### ANCIENT SEDIMENTS

1170. BAILES, A.H., BRISBIN, W.C., AYRES, L., FROESE, E., MCRITCHIE, W.D., Univ. Manitoba (Earth Sciences); Geol. Surv. Can., Manitoba Geol. Serv. Br.:

Stratigraphic setting, sedimentology and regional metamorphism of turbidites of the File Lake Formation, near Snow Lake, Manitoba and their relationship to the Aphebian age Kiseynew sedimentary gneiss belt, 1972-78; Ph.D. thesis (Bailes).

The File Lake Formation of the Flin Flon volcanic belt comprises a sequence of classic proximal turbidites of greywacke and shale composition. They are composed of volcanic detritus, largely felsic in composition, and trace directly into highly metamorphosed migmatitic paragneisses of the Kiseynew sedimentary gneiss belt. The implication is that the Kiseynew sedimentary gneiss belt comprises, at least in part, epiclastic volcanic detritus from the Flin Flon volcanic belt deposited by turbidity currents.

1171. BERTRAND, R., HUMBERT, L., HÉROUX, Y., CHAGNON, A., RENAUD, J., ACHAB, A., INRS-Pétrole, Univ. Québec:

Diagenèse des carbonates des Basses-Terres du Saint-Laurent du Québec, 1976-78.

Comparer l'évolution diagénétique des carbonates des Basses-Terres du Saint-Laurent avec l'évolution diagénétique des minéraux argileux et de la matière organique.

1172. BERTRAND, R., RENAUD, J., INRS-Pétrole, Univ. Québec:

Application du programme Microfaciès et Ordinateur à la sédimentologie et à la stratigraphie des bassins de l'île Anticosti et des Basses-Terres du Saint-Laurent, 1974-78.

Etude sédimentologique et stratigraphique des carbonates des Basses-Terres et du bassin de l'île Anticosti, grâce au traitement par ordinateur, des descriptions pétrographiques de microfaciès observés en lames minces, faites à partir de sondages et de sections de rivières.

1173. BOUCHARD, M., LAJOIE, J., GÉLINAS, L., Univ. Montréal (Géologie):

Volcanoclastiques, Rouyn-Noranda, Québec, 1976-78; thèse de maîtrise (Bouchard).

Une stratigraphie détaillée des rhyolites de Dou mettent en doute le caractère effusif des rhyolites. Plusieurs indices impliquent une mode d'emplacement par écoulement de masse de type sédimentaire. Une paleotopographie de type dôme rhyolitique-bassin sédimentaire (type Kuroko) qui associe les sulfures massifs au pyroclastiques est suggéré.

1174. BUDREVICS, V., MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
Upper Devonian reef dolomitization, 1975-78; Ph.D. thesis (Budrevics).

Document sedimentary facies distribution, diagenetic and dolomitization fabrics and type and distribution of porosity. From this it is hoped to determine the diagenetic and dolomitization sequences and place limits on the causes and mechanisms of diagenesis and dolomitization.

1175. BURROWES, R.A., MOUNTJOY, E.W., McGill Univ. (Geological Sciences):

Upper Devonian reef diagenesis - sedimentation and diagenesis of back reef deposits Miette and Golden Spike buildups, Alberta, 1974-77; M.Sc. thesis (Burrowes).

1176. CAMPBELL, R.H.A., Geol. Surv. Can.:  
Sedimentary rocks of the Prince Albert Belt, Northwest Territories, 1972-.

1177. CHANDLER, F.W., Geol. Surv. Can.:  
Redbed sequence in Canada, 1976-.

1178. DAVIES, G.R., Geol. Surv. Can.:  
Sedimentology of selected Upper Paleozoic carbonates and evaporites, Queen Elizabeth Islands, Arctic Archipelago, 1972-.

#### See:

"Bitumen" in post-burial diagenetic calcite; Geol. Surv. Can., Paper 76-1C, p. 107-114, 1976.

1179. FLACH, P.D., MOSSOP, G.D., LERBEKMO, J., Univ. Alberta (Geology), Alberta Research Council (Geology Div.):

Facies analysis of McMurray Formation Oil Sands, Steepbank River area, Athabasca, 1976-77; M.Sc. thesis (Flach).

Project encompasses detailed facies analysis of McMurray Formation oil sands in closely-spaced exposures along the lower Steepbank River, Athabasca mineable area. Field data synthesized, standard textural and petrographic data on limited numbers of samples now complete.

1180. FOSCOLOS, A.E., Geol. Surv. Can.:  
Mineralogy of fine grained clastic rocks in central Sverdrup Basin, 1973-.

1181. FUZESY, L.M., Sask. Geol. Surv.:  
The geology and hydrocarbon potential of the Winnipegosis Formation in southern Saskatchewan, 1974-78.

1182. GLAISTER, R.P., NELSON, H.W., Imperial Oil Ltd.:  
Environmental facies and reservoir characteristics of Cretaceous heavy oil sands, Alberta, 1974-.

1183. GLAISTER, R.P., NELSON, H.W., Imperial Oil Ltd.:  
Environmental interpretations from grain-size distributions (total spectrum), 1973-.

1184. GORDANIER, W.D., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Sedimentology of formation K, Favourable Lake volcanic complex, Ontario, 1976-78; M.Sc. thesis (Gordanier).  
Formation K comprises a lower conglomerate member and an upper greywacke member and has an aggregate thickness of 1 km. The conglomerate is an alluvial fan deposit formed on the northwest flank of a volcanic island. The greywacke is a turbidite and reflects downsinking of the island. Both units are derived from a combined volcanic-plutonic provenance.
1185. HARRIS, I.M., Geol. Surv. Can.:  
Sedimentologic study and basin analysis of the eugeoclinal sedimentary rocks (Cambrian to early Devonian) of southern Nova Scotia, 1976-.
1186. HENDRY, H.E., Univ. Saskatchewan (Geological Sciences):  
Study of resedimented conglomerates and sandstones, Cambro-Ordovician, Quebec, 1970-.
1187. HENDRY, H.E., STAUFFER, M.R., Univ. Saskatchewan (Geological Sciences):  
Folded cross-bedding, 1972-.  
Cross-bedding formed in a fluvial environment can be folded by current drag. Liquefaction and earthquakes have little, if any, control on the origin of deformed cross-bedding.
1188. JAMES, D.R., OLIVER, T.A., Univ. Calgary (Geology):  
Sedimentology of McMurray Formation, east Athabasca, 1975-77; M.Sc. thesis (James).  
Detailed sedimentologic studies of the McMurray Formation on the northeast edge of the oil sands have been carried out. Data from work done on palynology, petrology, scanning electron microscope, clay mineralogy, and grain size analysis were used along with core examination and log data led to these conclusions: 1. sands are predominantly quartzose, with minor muscovite and microcline; 2. kaolinite and illite are the most important clay minerals; 3. clay fabric and authigenesis are important controls on porosity-permeability; and 4. overall trend of fluvial to marine environments is re-affirmed and several subenvironments can be recognized and mapped.
1189. JEFFERSON, C.W., YOUNG, G.M., Univ. Western Ontario (Geology):  
Stromatolites, sedimentology and stratigraphy of parts of the Amundsen Basin, Northwest Territories, 1973-77.  
**See:**  
Stromatolites and basin analysis: an example from the Upper Proterozoic of northwestern Canada; *Palaeogeog., Palaeoclimat., Palaeoecol.*, v. 19, p. 303-318, 1976.  
The Amundsen Basin includes Upper Proterozoic ("Hadrynian") strata of Victoria Island, Banks Island, Brock River area, and Coppermine area, Northwest Territories. The Glenelg and Reynolds Point Formations of the Shaler Group on Victoria and Banks Islands are each divisible into at least four units, each being of possible formational status. Equivalents of several of the Glenelg and Reynolds Point subdivisions occur in most parts of the Amundsen Basin, permitting detailed intrabasinal lithologic correlation. Stromatolites of the Glenelg and Reynolds Point Formations and their correlatives consistently occur in a unique form succession. These forms appear to correspond in detail to the rock types in which they occur and strengthen the lithostratigraphic intrabasinal correlation. The forms, in ascending stratigraphic order, have been compared to: **Basisphaera**, **Inzeria** and **Conophyton** (middle cherty dolostone of the Glenelg Formation); **Inzeria** (upper, orange-weathering stromatolite of the Glenelg Formation); **Gymnosolen** and **Baicalia** (middle oolitic carbonates of the Reynolds Point Formation); **Acaciella** and **Jurusania** (upper carbonates of the Reynolds Point Formation). Systematic study and description of the Amundsen Basin stromatolites has indicated that a binomial classification system is useful. However, there are many inconsistencies in the rules for definition of groups and forms, and in the methods of description. These inconsistencies preclude conclusive identification except where type samples are available for examination. The Amundsen stromatolites show evidence of environmental control, the extent of which is incompletely understood. Hence, stromatolites of the Amundsen Basin are compared to other forms rather than being definitely named. The age suggested by the stromatolites (in the order of 950 m.y.) is within the range of ages that have been given by conventional K-Ar and Rb-Sr techniques (1200 to 640 m.y.). It is less than the age of the "Helikian" basins that are indicated to be older than the Amundsen Basin on the basis of stratigraphic relationships. Detailed correlation, based on both lithostratigraphy and stromatolites, is possible between the lower part of the Proterozoic Mackenzie Mountain succession and the Amundsen Basin succession.
1190. KENDALL, A.C., Sask. Geol. Surv.:  
Diagenesis and geochemistry of evaporites and pre-evaporite carbonates in Dawson Bay and lower Souris River formations (Devonian), southern Saskatchewan, 1976-.  
**See:**  
Bedded halites in the Souris River Formation (Devonian), Potash Mining District around Saskatoon; *Sask. Geol. Surv., Summ. Rep. Investig.* 1976, 1977.  
Investigation into the effects of early-diagenetic halite cementation upon carbonate (including organic-rich carbonate) and evaporite diagenesis. Significance with respect to formation, modification and destruction of porosity and hydrocarbon generation.
1191. KRAMERS, J.W., Alberta Research Council (Geology Div.):  
Wabasca "A" oil sand deposit, Grand Rapids Formation study, northeastern Alberta, 1972-80.
1192. LAJOIE, J., GELINAS, L., BOUCHARD, M., SIMARD, A., Univ. Montréal (Géologie):  
Sédimentologie de dépôts volcanoclastiques de la région de Noranda, Québec, 1975-80; thèse de maîtrise (Bouchard, Simard).  
Établir un modèle de dépôt des volcanoclastiques, semblable au modèle plus récent.
1193. LAJOIE, J., HUBERT, C., DUCHARME, D., Univ. Montréal (Géologie):  
Sédimentologie du flysch cambro-ordovicien des Appalaches du Québec, 1968-; thèse de maîtrise (Ducharme).
1194. LAKE, J., MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
Sedimentology and paleoecology of Upper Ordovician mounds of Anticosti Island, Quebec, 1975-77; M.Sc. thesis (Lake).



1195. LANTOS, E.A., DAVIS, M.W., SIMPSON, F.S., GUNNING, R., TRUDELL, M., Univ. Windsor (Geology):  
 Depositional history of the Matinenda Formation, Elliot Lake, Ontario, 1976-77; B.Sc. thesis (Trudell), M.Sc. thesis (Lantos).  
 Detailed "outcrop" sections and lithologic descriptions were made in fresh headings at Denison Mines, Ltd., Elliot Lake. A facies model is being constructed from this data, and a reconstruction of the detailed depositional system will be attempted. Variations in uranium ore occurrence will be related to lithofacies variation. Samples have also been obtained from Denison Mines workings and from drill cores above and below the main ore zone. Thin sections have been prepared and are being examined to delineate vertical trends in compositional variation and grain size.
1196. LENNOX, T.R., Gulf Oil Canada Ltd. (Geological):  
 Reservoir studies of heavy oil sands at Cold Lake, Alberta, 1976-.
1197. LERAND, M.M., LENNOX, T.R., Gulf Oil Canada Ltd. (Geological):  
 Sedimentology and petrology of Lower Cretaceous oil sands reservoirs in the Wabasca, Cold Lake and Athabasca areas, Alberta, 1976-78.
1198. LUTERNAUER, J.L., Geol. Surv. Can.:  
 Fraser Delta sedimentation, 1974-.
- See:**  
 Fraser Delta sedimentation, Vancouver, British Columbia; Geol. Surv. Can., Paper 76-1B, p. 169-171, 1976.  
 Geofisheries research off the west coast of Canada; Geol. Surv. Can., Paper 76-1C, p. 157-159, 1976.  
 Use of aerial photographs to map sediment distribution and to identify historical changes on a tidal flat; *ibid.*, p. 293-304, 1976.  
 Fraser delta sedimentation, Vancouver, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 65-72, 1977.
1199. MACQUEEN, R.W., BAMBER, E.W., MAMET, B.L., Univ. Waterloo (Earth Sciences), Geol. Surv. Can., Univ. Montreal (Geology):  
 Carboniferous and Permian stratigraphy and sedimentology, Rocky Mountains of Alberta and British Columbia, 1965-80.  
 Project is aimed at outlining the stratigraphic, lithologic, and biostratigraphic framework of Carboniferous and Permian rocks of the southern and central Canadian Rocky Mountains and Foothills. Field work is complete. Current emphasis is on Lower Carboniferous stratigraphy, sedimentology and biostratigraphy of the Monkman Pass-Pine Pass areas; and lower Carboniferous stratigraphy, sedimentology and biostratigraphy of the Banff-Jasper area.
1200. MACQUEEN, R.W., LEGAULT, J.A., FRITZ, P., WILLIAMS, G.K., POWELL, T.G., FOSCOLOS, A.E., Univ. Waterloo (Earth Sciences), Geol. Surv. Can.:  
 Nature, origin, and lateral relationships of Paleozoic basinal shale suites, western Canada, 1976-80.
- See:**  
 Sediments, zinc and lead, Rocky Mountain belt, Canadian Cordillera; Geoscience Canada, v. 3, no. 2, p. 71-81, 1976.
- To understand: a) the conditions of deposition, subsequent diagenesis, and role of basinal shales particularly organic-rich black shales, in basin evolution; b) the significance of organic-rich basinal shales to zinc-lead mineralization at Pine Point and in the Rocky Mountains of northeastern British Columbia; and c) details of the microfauna and microflora of at least parts of the Road River and Besa River Formations (little or nothing is presently known) and of the relative time relations and accumulation rates between platform carbonates and basinal shales, for both Road River and Besa River suites.
1201. MATTES, B., MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
 Upper Devonian Miette reef dolomitization and late diagenesis, 1976-78; M.Sc. thesis (Mattes).  
 To determine the distribution and extent of dolomitization, stages and timing, relationships to primary and secondary porosity in an attempt to delimit probable source fluids and possible dolomitizing mechanisms.
1202. MCDONALD, D.A., TROLLOPE, F.H., Mobil Oil Canada, Ltd.:  
 Petrology and porosity of the Scotian Shelf sandstones, 1975-77.  
 To study factors controlling porosity loss with depth in sandstones of the Scotian Shelf, including mineralogy of sandstones, geothermal gradient, eogenetic and mesogenetic cements, and mechanical and chemical compaction processes. Below the level of complete quartz diagenesis all porosity consists of secondary (decementation) porosity.
1203. MCILREATH, I.A., Geol. Surv. Can.:  
 Stratigraphic relationships at the western edge of the Middle Cambrian facies carbonate belt, Field, British Columbia, 1972-.
1204. MIALL, A.D., Geol. Surv. Can.:  
 Northern basin analysis program: Thomsen River map-area, 1972-.
1205. MOSSOP, G.D., Alberta Research Council (Geology Div.):  
 Sedimentology and petrology of Athabasca Oil Sands, 1975-.  
 Facies distribution, depositional environments, paleocurrent patterns, paleohydrology, basin development, provenance, paleogeography. Oil migration and maturation, and diagenesis of McMurray Formation under continued investigation. Petrographic and mineralogic characterization of all constituents, plus SEM microtextural analysis now underway.
1206. MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
 Carbonate sedimentation and diagenesis in Devonian reefs, 1972-.
- See:**  
 Nubrigyn algal reefs (Devonian), eastern Australia, allochthonous blocks and megabreccias; Bull. Geol. Soc. Amer., v. 87, no. 4, p. 515-530, 1976.  
 A continuing study of carbonate buildup stratigraphy, sedimentation and diagenesis in Ancient Wall, Miette, Golden Spike and other buildups in Alberta and elsewhere. Detailed study of diagenesis and dolomitization continuing with graduate students Budrevics, Burrowes, Mattes and Walls.



1207. NELSON, H.W., GLAISTER, R.P., Imperial Oil Ltd.: Controls on diagenetic pore fillers in sandstones, 1974-.
1208. OLDERSHAW, A.E., KRAUSE, F.F., Univ. Calgary (Geology): Stratigraphy and sedimentology of the Sekwi Formation, Mackenzie Mountains, Northeast Territories, 1975-78; Ph.D. thesis (Krause).
1209. OLDERSHAW, A.E., OLIVER, T.A., HIGGS, R., Univ. Calgary (Geology): A comparison of Cretaceous and Tertiary clastic depositional environments, Labrador and Greenland coasts, 1976-77; M.Sc. thesis (Higgs).
1210. OLDERSHAW, A.E., STOAKES, F., Univ. Calgary (Geology): Stratigraphic relationships, origin and development of the Camrose Tongue, southern Alberta, 1976-79; Ph.D. thesis (Stoakes).
1211. OLDERSHAW, A.E., WONG, P., Univ. Calgary (Geology): Sedimentology and diagenesis of the Kaybob Reef Complex, Alberta, 1975-77; M.Sc. thesis (Wong).
1212. OLLERENSHAW, N.C., Geol. Surv. Can.: Cretaceous and Tertiary conglomerates and sandstones of the eastern Cordillera, 1969-.
1213. ROTTENFUSSER, B.A., Alberta Research Council (Geology Div.): Peace River oil sands study, 1975-80.  
Cores have been logged throughout the heavy oil sands deposit and data on grain size, heavy oil saturation and mineralogy are being generated. Petrographic and scanning electron microscopic studies have found minor authigenic dawsonite and kaolinite plugging porosity in small areas of the deposit. A plot of formation pressures reveals several anomalies.
1214. RUST, B.R., CASS, J., Univ. Ottawa (Geology): Depositional environments of Lower Paleozoic clastic deposits (Nepean, March Formations) of eastern Ontario, 1976-78; M.Sc. thesis (Cass).
1215. RUST, B.R., GIBLING, M.R., Univ. Ottawa (Geology): Sedimentation in alluvial, transitional, and shallow marine environments, eastern Gaspé and Somerset Island, Northwest Territories, 1973-78; Ph.D. thesis (Gibling).  
**See:**  
Stratigraphic relationships of the Malbaie Formation (Devonian), Gaspé, Quebec; Can. J. Earth Sci., v. 13, p. 1556-1559, 1976.
1216. SVELLE, J.M., DIXON, O.A., Univ. Ottawa (Geology): Sedimentary and faunal studies of the Silurian Read Bay Formation near Creswell Bay, Somerset Island, Northwest Territories, 1973-77; M.Sc. thesis (Savelle).  
The Silurian Read Bay Formation and immediately underlying rocks north and south of Creswell Bay comprise a succession of fossiliferous carbonate rocks broadly reflecting a transgressive-regressive depositional cycle. Successional changes are expressed in the petrology, macro- and microfaunas, and geochemical aspects of these rocks. Asymmetry in the cycle may be an expression of facies developed in response to the existence of, or renewed uplift on, the adjacent Boothia Arch in the late Silurian.
1217. SCHMIDT, V., MCDONALD, D.A., PLATT, R.L., Petro-Canada, Mobil Oil Canada, Ltd.: The burial diagenesis and porosity of sandstones, 1974-78.
1218. SONNENFELD, P., Univ. Windsor (Geology): Tethys - Ure Ancestral Mediterranean, 1976-77.  
Eurasian ophiolites in linear patterns, whereby Paleozoic ones are to the north and west of Mesozoic/Cenozoic ones. Their sequential appearance along each trend is related to pre-orogenic distension in shallow epeiric seas. Field evidence speaks against their being interpreted as ancient oceanic expanse now subducted.
1219. STEVENS, G.R., COLWELL, J.A., Acadia Univ. (Geology): Burial diagenesis and origin of clay minerals in Mesozoic-Tertiary strata of Labrador-Newfoundland continental shelf, 1976-77.  
To identify and relate the burial diagenetic sequence of clay minerals in drill hole samples to burial temperatures and depth and to potential hydro-carbon source rocks; to utilize clay minerals as stratigraphic markers and indicators of sediment provenance and depositional environment. Progress: 126 samples of cuttings taken from 5 offshore Labrador boreholes have been washed, disaggregated, dispersed, and chemically processed, to produce smears for X-ray diffraction of the <2 m fraction of each sample. Standard x-ray diffractograms of the 0°-30° 2θ range were made for each sample at 10°2θ/minute, covering the range in which the significant peaks of the various clay minerals occur. Both glycolated and non-glycolated samples were diffracted. High resolution scans were made in the 16°-26° range to apportion combined peak areas between chlorite and kaolinite. These data have been reduced to yield percentages of chlorite, montmorillonite, kaolinite, and illite present in the < 2 m fraction of each sample, and these percentage values have been plotted against depth and stratigraphy for each of the five wells (Karlsefni, Snorri, Bjarni, Gudrid and Freydis). Half of the samples were taken from one well (Bjarni) between 4000 feet and 8000 feet, resulting in close monitoring of diagenetic changes and crystallinity index. Samples in other wells cover intervals between 1500 feet and 10 400 feet.
1220. THOMAS, M., OLIVER, T.A., Univ. Calgary (Geology): Relation of porosity changes to depth in Viking and Cardium Formations, Alberta, 1975-77; M.Sc. thesis (Thomas).  
Samples from cores in a number of reservoirs in the Viking and Cardium Formations have been selected. The depth range of these reservoirs ranges from about 3000 to 9000 feet. Diagenetic changes related to increasing depth have been documented in both reservoirs, mainly by the use of the scanning electron microprobe.
1221. TRETTIN, H.P., Geol. Surv. Can.: Stratigraphy and sedimentology of Silurian and Devonian clastic formations, central Ellesmere Island, 1972-.
1222. VECSEY, G.E., Gulf Oil Canada Ltd. (Exploration): Carbonate depositional environment and porosity development of Middle Devonian in Pem Creek area, Alberta, 1976-77.

1223. WALLS, R.A., MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
Upper Devonian reef margin diagenesis – cementation history and porosity development, Golden Spike (Devonian), reef complex, Alberta, 1973-77; Ph.D. thesis.
1224. WRITT, R., DAVIS, M.W., SIMPSON, F.S., Univ. Windsor (Geology):  
Sedimentology and depositional environment of the Grimsby Formation, central Lake Erie, 1976-77; M.Sc. thesis (Writt).  
  
About 30 cores through Lower Silurian sediments (Thorold, Grimsby and Cabot Head) have been examined and logged in detail, with particular attention to small-scale sedimentary structures and their use in interpreting depositional environments. Cross-sections using this data have also been constructed, with a view to delineating regional patterns of variation in depositional regime. Further aims of this project include relating reservoir flow characteristics (in the Grimsby gas reservoirs) to variations in lithology and small-scale structures.
1225. YOUNG, G.M., MCLENNAN, S.M., Univ. Western Ontario (Geology):  
Sedimentology and stratigraphy of the Huronian Pecors, Espanola and Upper Gowganda formations, 1976-79; M.Sc. thesis (McLennan).  
  
Considerable attention has been given to the mixtite-rich formations of the Huronian succession, because of their glaciogenic nature. The thick quartzitic formations have also engendered much controversy regarding their origin (i.e. fluvial/deltaic vs. marine). The finer grained formations such as the Pecors and Espanola Formations, and the upper part of the Gowganda Formation have received little attention. The Pecors and Upper Gowganda Formations have many of the attributes of deltaic sequences, whereas the Espanola Formation is much more complex. Detailed section measurement, paleocurrent analysis and petrographic studies will be carried out in an attempt to decipher the provenance and depositional environments of these units.
- RECENT AND UNCONSOLIDATED SEDIMENTS**
1226. ADSHEAD, J.D., Geol. Surv. Can.:  
Mineralogy and geochemistry of the unconsolidated cover, central Arctic, 1976-.
1227. AMOS, C.L., Geol. Surv. Can.:  
Dynamics of coastal zones, Minas Basin, Nova Scotia, 1974-.
- See:**  
Suspended sediment analysis of seawater using LANDSAT imagery, Minas Basin, Nova Scotia; Geol. Surv. Can., Paper 76-1C, p. 55-60, 1976.  
  
Estuarine sedimentary dynamics in the Minas Basin, Bay of Fundy, Nova Scotia; Geol. Surv. Can., Paper 76-1B, p. 25-29, 1976.
1228. ASHLEY, G., MATHEWS, W.H., Univ. British Columbia (Geological Sciences):  
Sedimentology of Pitt River and Pitt Lake, British Columbia, 1974-77; Ph.D. thesis (Ashley).
1229. BOUCHER, D., STEARN, C.W., McGill Univ. (Geological Sciences):  
The submarine diagenesis of corals on the Bellairs Reef, Barbados, 1973-77; M.Sc. thesis (Boucher).
1230. BUCKLEY, D.E., Geol. Surv. Can.:  
Multidisciplinary environmental marine geological analyses of a coastal area, 1975-79.  
**See:**  
Surficial sediment distribution in the Miramichi estuary, New Brunswick; Geol. Surv. Can., Paper 76-1C, p. 41-44, 1976.  
  
Seasonal variations in the oceanography and sediment geochemistry in the Miramichi estuary, New Brunswick: a preliminary report; *ibid.*, p. 47-50, 1976.  
  
Multidisciplinary environmental marine geological analysis of a coastal area; Geol. Surv. Can., *ibid.*, p. 1-3, 1976.  
  
Mollusc distributions, Miramichi estuary, New Brunswick; Geol. Surv. Can., Paper 76-1C, p. 45, 1976.
1231. COAKLEY, J.P., Environment Canada (CCIW):  
Sediment dynamics, Point Pelee, Ontario, 1974-77.  
**See:**  
The formation and evolution of Point Pelee, western Lake Erie; Can. J. Earth Sci., v. 13, no. 1, p. 136-144, 1976.
1232. COLBERT, H.S., GILBERT, R., Queen's Univ. (Geography):  
Beach dynamics – Big Sandy Bay, Wolfe Island, Ontario, 1976-77.  
  
Research at Big Sandy Bay, Wolfe Island began in detail in May, 1976 and continued in the field until October, 1976. Aspects of the beach and nearshore environment studied included morphometry, sand and pebble textural characteristics, wind and wave climates, current directions and magnitudes, volumes of erosion and deposition, and water level changes to relate form and process in the lacustrine environment. Wave refraction analysis proved to be the most useful tool in this study revealing complex energy variations along the length of the embayed shoreline due to the irregularities in the offshore topography. Major changes in the beach and nearshore zone can be attributed primarily to the variations in the longshore component of wave energy and associated current directions derived from the refraction analysis.
1233. DAY, T.J., Geol. Surv. Can.:  
Gravel stream beds, 1975-.
- Fluvial and mass wasting processes, Banks Island, District of Franklin, 1975-.
- Dispersion in natural channels, 1975-.
- See:**  
Geomorphology of some Arctic gullies, Banks Island, District of Franklin; Geol. Surv. Can., Paper 76-1B, p. 173-185, 1976.  
  
Observations on river ice, Thomsen River, Banks Island, District of Franklin; *ibid.*, p. 187-196, 1976.  
  
Preliminary results of flume studies into the armouring of a coarse sediment mixture; Geol. Surv. Can., Paper 76-1C, p. 277-287, 1976.  
  
Similarity analyses of a tracer mass dispersing along a meandering channel: Lesser Slave River, Alberta; *ibid.*, p. 305-324, 1976.  
  
Reconnaissance studies of Big River, Banks Island, District of Franklin; *ibid.*, p. 75-86, 1977.

1234. DUNCAN, G.A., ST. JACQUES, D.A., LAHAIE, G.G., RUKAVINA, N.A., Environment Canada (CCIW):  
Manual of physical sedimentology, 1975-.
- To assemble, standardize, and document methods used in sedimentologic studies in order to ensure consistent use at C.C.I.W. and to encourage adoption by other agencies involved in similar studies.
1235. FILLON, R.H., Geol. Surv. Can.:  
Surficial geology and paleoglaciology of Saglek Bank, Labrador Shelf, 1976-.
1236. FRYDL, P., STEARN, C.W., McGill Univ. (Geological Sciences):  
The geological effect of grazing by parrot-fish on Barbados coral reef, 1975-77; M.Sc. thesis (Frydl).
1237. GILBERT, R., CHURCH, M., Queen's Univ. (Geography), Univ. British Columbia (Geography):  
Holocene lacustrine sediments in Cumberland Peninsula, Baffin Island, Northwest Territories, 1976-77.
- In July of 1976 reconnaissance studies were made of two nearby chains of lakes north of Pangnirtung, Baffin Island, one proglacial and one in a basin not glaciated during the Wisconsin(?). Bathymetry was determined and samples of water and sediment collected from seven lakes. Proglacial lacustrine sediments consist of a series of micro turbidites of silt and fine sand interspaced by laminae of fine silt and clay. Varves cannot be distinguished readily, and there is no evidence of ice rafting of sediment. Nonglacial lacustrine sediments are very fine (largely clay size) and have substantially higher organic content. Layers of iron oxidation with associated formation of manganese nodules are common to most locations. Rates of sedimentation are estimated to be less than one millimetre per year. Laboratory analysis continues, and further reconnaissance is planned of lakes east of Pangnirtung in the spring of 1977.
1238. HARDY, I.A., Geol. Surv. Can.:  
Stratigraphy and sedimentology of the sedimentary sequences, Atlantic offshore basins, 1973-.
- See:  
Lithostratigraphy of the Labrador Shelf; Geol. Surv. Can., Paper 76-1B, p. 31-36, 1976.
1239. HUNTER, I., STEARN, C.W., McGill Univ. (Geological Sciences):  
Sediment production and dispersal associated with a fringing reef, Barbados, 1974-77; M.Sc. thesis (Hunter).
1240. JANSA, L.F., Geol. Surv. Can.:  
Stratigraphy and sedimentology of the Mesozoic and Tertiary rocks of the Atlantic Shelf, 1971-.
- See:  
Lower Paleozoic Radiolaria-bearing limestones from the Baffin Island shelf; Geol. Surv. Can., Paper 76-1B, p. 99-105, 1976.
1241. JOPLING, A.V., WEIRICH, F., Univ. Toronto (Geography):  
Continuous monitoring of density underflows in a lacustrine environment, 1975-79; Ph.D. thesis (Weirich).
- A small alpine lake at an elevation of 7000 feet in the Purcell Ranges, British Columbia, was selected for study, and the first detailed field season was completed in 1976. A field camp was established, data were collected on the bathymetry of the lake, lake-bottom cores were taken, and hydrological-climatological data were collected for the glacial stream inflow into the lake. Some preliminary palynological investigations were also made. Trial runs were also made for the continuous monitoring temperature, sediment concentration and current velocity for the density underflows moving along the lake bottom.
1242. KING, R.H., Univ. Western Ontario (Geography):  
Recent biophysical environmental changes in the landscape of Rondeau Provincial Park, Ontario, 1974-77.
- Involves the use of the physical and chemical properties of soils and surficial sediments as paleo-environmental indicators. A series of sediment cores have been obtained from Rondeau Bay in order to examine the sedimentary evidence of environmental change and a number of soil profiles have been investigated within the catchment area. The pedological record indicates that considerable environmental change has taken place within the area especially in response to the human modification of the landscape. Vegetational changes, which can be attributed to specific cultural activities, are reflected in the development of complex soil profiles. The sedimentological record of environmental impact in the Bay is more difficult to evaluate. The mineralogical and geochemical evidence provided by the cores suggest that seasonal rhythms are masked by wave generated turbulence. The investigation of the sediments within the Bay is continuing with emphasis being placed on the pollen spectra.
1243. LAWSON, D.E., Univ. Waterloo (Earth Sciences):  
River sedimentation in response to land use in southern Ontario, 1972-.
1244. LEWIS, C.P., Geol. Surv. Can.:  
Sedimentary and geomorphic processes, southern Canadian Beaufort Sea coast, 1972-.
1245. MACGEACHY, J.K., STEARN, C.W., McGill Univ. (Geological Sciences):  
Macroboring organisms in corals of the Bellairs reef, Barbados, 1973-77; Ph.D. thesis (MacGeachy).
- See:  
Boring macro-organisms in the coral *Montashea annularis* on Barbados Reefs; Int. Rev. ges. Hydrobiology, v. 61, p. 715-745, 1976.
1246. MANNING, P., LEAN, D.R.S., Environment Canada (CCIW):  
Internal loading - use of Mossbauer technique to predict potential for phosphate loading from sediments, 1975-77.
- Following on preliminary and apparently successful Mossbauer effect studies of amorphous Fe compounds in Bay of Quinte sediments, the extension of the study to the more complicated Lake St. George sediments is envisaged. Sediment samples will be collected from different depths of core, in corals operated on a seasonal basis and on occasions determined by observed limnological events, for example, the massive release of nutrient (phosphate usually) to the overlying waters. Correlation of such events with the nature of the iron compounds will be attempted. Additional experiments will be performed to test the theory that reduction of sediment-bound ferric ions causes release of phosphate. These include the doping of a corral with a chelating agent such as EDTA and the doping of another with aluminum ion. The former study will aid in further characterizing Fe-phosphate complexes, and the latter, which mimics country-wide and world-wide large-scale alum

treatment of lakes, will define  $Al^{3+}$ - $Fe^{3+}$ -phosphate interactions in sediments: aluminum-phosphate are not reducible. (The latter point has direct relevance to the problems of excess algae in prairie sloughs.)

1247. MCLAREN, P., Geol. Surv. Can.:  
Coastal erosion-sedimentation, southeast Melville Island, District of Franklin, 1973-.

1248. MCLAREN, P., Geol. Surv. Can.:  
Geological zonation of central Arctic coast, 1976-.

**See:**

Marine geological and geophysical activities in Lancaster Sound and adjacent fiords; Geol. Surv. Can., Paper 77-1A, p. 495-506, 1977.

1249. PELLETIER, B.R., Geol. Surv. Can.:  
Bottom studies of the Beaufort Sea, 1972-.

1250. PRATT, B., STEARN, C.W., McGill Univ. (Geological Sciences):  
Geological effects of boring by micro-organisms on a Barbados reef, 1977-79; M.Sc. thesis (Pratt).

1251. RASHID, M.A., Geol. Surv. Can.:  
Geochemical transformations and reactions of organic compounds in recent marine sediments, 1975-.

1252. REINSON, G.E., Geol. Surv. Can.:  
Nearshore sediment dynamics in the Miramichi Embayment, New Brunswick, 1975-77.

**See:**

Channel and shoal morphology in the entrance to the Miramichi estuary, New Brunswick; Geol. Surv. Can., Paper 76-1C, p. 33-35, 1976.

The effects of storms on nearshore morphology, Neguac Island, New Brunswick; *ibid.*, p. 37-39, 1976.

1253. REINSON, G.E., Geol. Surv. Can.:  
Sedimentological and geomorphological analysis of the Atlantic coast of Nova Scotia, with emphasis on Halifax County, 1976-.

### SOIL SCIENCE

1259. ACTON, D.F., ANDERSON, D.W., STONEHOUSE, H.B., CHRISTIANSEN, E.A., EILERS, W., Univ. Saskatchewan (Inst. Pedology):  
Relation of till stratigraphy to soils and landforms, 1975-.

1260. BANTING, D., KING, R.H., Univ. Western Ontario (Geography):  
Pedogenesis and environmental change in north-central Keewatin, Northwest Territories, 1977-80; Ph.D. thesis (Banting).

To investigate the physico-chemical characteristics of a sequence of soils formed under freely drained conditions to the north of the Forest-Tundra ecotone in the vicinity of Baker and Pelly Lakes, Northwest Territories. The ecotone is a tensional vegetational zone between the Boreal Forest to the south and the tree-less Tundra to the north. Climatic changes during the past 10 000 years have had a considerable influence on both the extent and nature of this ecotone. Superimposed upon the history of vegetational change is the fact that the area has experienced, and continues to experience isostatic rebound subsequent to deglaciation. As a result much of the area has progressively emerged from Hudson Bay. Much of this history of environmental change since deglaciation is recorded in complex soil profiles. The

1254. SCHAFER, C.T., Geol. Surv. Can.:  
Marine geology of the nearshore and estuaries of Chaleur Bay, Gulf of St. Lawrence, 1973-.

**See:**

Distribution of Foraminifera in Chaleur Bay, New Brunswick-Quebec; Geol. Surv. Can., Paper 76-1C, p. 19-23, 1976.

Distribution and depositional history of sediments in Baie des Chaleurs, Gulf of St. Lawrence; Can. J. Earth Sci., v. 14, no. 4, pt. 1, p. 593-605, 1977.

1255. SHILTS, W.W., Geol. Surv. Can.:  
Mineral indicator tracing, southern Keewatin, 1970-.

**See:**

Detailed drift prospecting in the southern District of Keewatin; Geol. Surv. Can., Paper 77-1A, p. 479-483, 1977.

1256. STAUFFER, M.R., HAJNAL, Z., GENDZWILL, D., Univ. Saskatchewan (Geological Sciences):  
Study of rhomboidal patterns on beaches, 1973-.

Rhomboidal lattice structure is caused by interesting grooves that trend diagonally down beach faces. These form just as the last backwash water has drained off the beach and their formation appears to be controlled by the hydrologic condition of the beach.

1257. TAYLOR, R.B., Geol. Surv. Can.:  
Coastal erosion-sedimentation, Barrow Strait region, District of Franklin, 1973-.

**See:**

Nearshore observations along the east coast of Melville Island, District of Franklin; Geol. Surv. Can., Paper 76-1B, p. 43-58, 1976.

1258. UMPLEBY, D.C., Geol. Surv. Can.:  
West Greenland Cretaceous and Tertiary, 1976-.

investigation of this environmental record is expected to provide details of the nature of environmental change since deglaciation and give insights into the nature of the pedological response to such changes.

1261. BEKE, G.J., Agriculture Canada (Atlantic Soil Survey Unit):  
Soil survey of Colchester County, Nova Scotia, 1971-79.

1262. BREWSTER, G.R., KING, R.H., Univ. Western Ontario (Geography):  
Influence of recent volcanic ash on podsolisation within complex parent materials in the Canadian Cordillera, 1974-77; Ph.D. thesis (Brewster).

**See:**

Characteristics and genesis of some subalpine podsoles (spodosols), Banff National Park, Alberta; J. Arctic Alp. Res., v. 8, no. 1, p. 91-104, 1976.

The influence of Recent volcanic ash on alpine and subalpine pedogenesis in the Canadian Cordillera; Am. Quaternary Assoc., Abstracts 4th Biennial Mtg., Tempe, p. 105, 1976.

Concerned with a specific inquiry into the role which Recent volcanic ash is playing as a determinant on high altitude pedogenesis within the Cordillera. Research completed to-date has

demonstrated that the presence of volcanic ash within the surficial deposits has influenced not only the kind but also the degree of soil development. In particular, the mobilization and translocation of volcanic ash degradation products has resulted in the development of Podzols above the tree line and under environmental conditions where they would not normally be expected. The research is presently concentrating on the unique weathering characteristics of the ash and its influence on clay mineralogy.

1263. BRYAN, R.B., Univ. Toronto (Geography):  
Study of processes of soil entrainment by sheet-wash and splash under simulated rainfall in the laboratory and in Albertan badlands, 1975-78.

1264. CAMERON, D.R., TOPP, G.C., KOWALENKO, C.G., IVARSON, K.C., Agriculture Canada (Soil Research Institute):

Plant nutrient and water transport in partially saturated soil, 1974-79.

**See:**

Modelling nitrogen processes in soil: mathematical development and relationships; *Can. J. Soil Sci.*, v. 56, p. 71-78, 1976.

Nitrogen transformations in an incubated soil as affected by combinations of moisture content and temperature and adsorption-fixation of ammonium; *ibid.*, p. 63-70, 1976.

Measurement of hydraulic conductivity with a modified air entry permeameter; *ibid.*, p. 139-147, 1976.

To inter-relate water storage and transport processes with nitrogen transformation processes in order to develop a computer model for loss of nitrates to groundwater systems. The development of in situ procedures for determining soil hydraulic conductivity, and electromagnetic methods for measurement of time variations of soil-water content are under study. Both field and laboratory research are involved in quantifying nitrification and denitrification rates and conditions. These physical and chemical properties and processes are introduced into a two-phase transport equation which is solved by computer to give simulations of the nutrient and water movement.

1265. CHANG, C., VANDENBERG, A., VAN SCHAIK, J., OOSTERVALD, M., DAVISON, C., GRISAK, G., Environment Canada (Water Res. Br.):

Water quality of irrigation return flow, 1977-80.

The study is concerned with monitoring of changes in the water quality of irrigation return flow, studying the mechanisms of transport and transformation of various chemical constituents in the saturated and unsaturated soil, finally developing a computer model or models to estimate or predict the levels of various chemical-constituent loadings to the surface and subsurface water supply from existing or future irrigation projects.

1266. EVANS, L.J., Univ. Guelph (Land Resource Sci.):  
Quantitative studies in pedogenesis on northern soils, 1976-78.

The chemical and mineralogical changes during soil development of Arctic Brown and Polar Desert soils in the eastern Arctic has received little attention to date. In August 1976 investigations were initiated on pre-Wisconsin, Wisconsin and Neoglacial age moraines in Kangetokluk Fjord, east Baffin Island, Northwest Territories. The pedogenetic development of a chronosequence of

five soils, ranging in age from approximately 1000 to 5000 yrs. in the fjord was contrasted with similar soils approximately 35 000 yr. old on nearby Broughton Island. The soils studied raise a number of interesting points concerning the proposed criteria for differentiating Cryosolic soils in the Canadian Soil Classification System. The presence of permafrost within 1 m of the mineral surface was found to be inadequate as a diagnostic characteristic for this order and similarly the presence or absence of cryoturbation inadequate at the great group level. Morphological features such as the presence of a lag gravel surface may prove more useful.

1267. FARNS, D.M., KING, R.H., Univ. Western Ontario (Geography):

Recent subalpine pedogenic environments, Mount Edith Cavell, Jasper National Park, Alberta, 1975-77; M.Sc. thesis (Farns).

An investigation of freely drained Podzols and Brunisols formed within the Subalpine zone of Mount Edith Cavell has revealed the presence of a complex clay mineral suite comprising montmorillonites, vermiculites, chlorites and illites. Previous studies of similar soils formed elsewhere within the Subalpine and Alpine zones of the Canadian Cordillera have shown that whereas vermiculite, chlorite and illite are frequently inherited from the local tills, montmorillonite is invariably associated with the presence of volcanic ash. Such studies have indicated that the degradation of the ashes appears to result in the formation of montmorillonite only within the eluviated A horizons. The present study, on the other hand, provides evidence for the presence of montmorillonite within illuviated B horizons on Mount Edith Cavell. Analytical evidence provided by X-ray diffraction, selective extraction techniques and the electron microprobe is used to demonstrate the role which volcanic ash and material of more local origin have played in clay mineral formation in these soils. In addition, evidence is also provided of the ways in which various analytical pretreatments can create clay mineral artifacts in soils derived from volcanic ashes and tills.

1268. FISHER, A., RUTHERFORD, G.K., Queen's Univ. (Geography):

The influence of atrazine on microbiologic populations in sandy soils and its transport through these soil materials, 1976-78; M.Sc. thesis (Fisher).

Field work to commence in spring 1977 and be continued during the summer. Laboratory work will commence immediately but the bulk of the work will be carried out in the winter of 1977-78.

1269. HERINGA, P.K., SUDOM, M.D., Agriculture Canada (Atlantic Soil Survey Unit):

Soil surveys of Newfoundland - Port aux Basques/Stephenville, Port au Port, Codroy Valley, Botwood (2E), and Sandy Lake (12H) areas.

1270. HUANG, P.M., Univ. Saskatchewan (Soil Science):  
Nature and physico-chemical properties of selected river and stream sediments in the upper Qu'Appelle River basin in Saskatchewan, 1977-80.

**See:**

The nature of a shield lake sediment; *Int. Revue Hydrobiol.*, 1977.

The overall objective of the proposed research is to uncover the nature and physico-chemical properties of the various sediment components of Qu'Appelle River and Moose Jaw and Wascana creeks in the

upper Qu'Appelle River basin, Saskatchewan with special reference to their individual roles as sources, carriers and sinks of selected inorganic water pollutants, namely, P, As and Hg. During the ice free period, the mixing of bottom materials with the overlying waters would significantly drive the sediment-water interactions and would consequently enhance the role of sediments in affecting the transport and transformations of water pollutants from agricultural runoff and municipal sewage discharge. In this connection, information on the particle size function of pollutant-sediment relationships is essential, since the solubility, degradability and the extent of the adsorption-desorption of pollutants in river sediments and its subsequent transport are expected to vary with the texture, chemical and mineralogical composition, and the degree of suspension of sediments. River sediments would be collected from representative areas of the said rivers. The sediments from Wascana and Moose Jaw creeks would be obtained as a function of distance from the source of discharge of sewage effluents. The sediments in Qu'Appelle River would be obtained from Qu'Appelle Dam to the outlet of Katepwa Lake. The contents of P, As, and Hg of the size fractions of the sediments would be determined after appropriate pretreatments. The extent of the binding of these pollutants with carbonates, silicates, sesquioxides and organic matter of the sediments would be examined by sequential selective dissolution treatments. The data to be obtained would be interpreted in terms of lithology and properties of sediments and sources of pollution.

1271. HUANG, P.M., LIVESEY, N.T., Univ. Saskatchewan (Soil Science):

Sources and fate of arsenic in soils, 1977-.

The long-term goals of the proposed research are to understand (1) the sources, concentrations and transformations of As in soils, and (2) the factors affecting the entry of As to the food chain by way of the soil. The specific objectives are outlined as follows: (1) the examination of the contents and the association of As with silicates, carbonates, sesquioxidic components, and organic matter in key soil profiles of major soil zones in Saskatchewan and its relation to the nature of parent materials, pedogenic processes and agronomic practices. (2) the examination of the rates, capacities and bonding strength of selected soils from major soil zones in Saskatchewan for the retention of As as influenced by the ionic environment commonly occurring in soils. The proposed research is expected to promote the fundamental understanding of the sources, forms, amounts, retention capacities, and transformations of As in important agricultural soils in Saskatchewan in relation to geological formations, climatic conditions, pedogenic processes, and agronomic practices. Attainment of this knowledge is an extremely significant advancement in the chemistry of soil As. This knowledge is also urgently needed in planning waste disposal and land management and in understanding the impact of As contamination on the food chain and the total environment.

1272. HUANG, P.M., NG KEE KWONG, K.F., LIVESEY, N.T., Univ. Saskatchewan (Soil Science):

Chemistry of inorganic soil colloids, sediments and pollutants.

Chemistry and mineralogy of feldspars, micas and ferromagnesian minerals, 1966-; Ph.D. thesis (Kwong).

See:

Retention of phenolic acids by noncrystalline hydroxy-aluminum and iron compounds and clay minerals of soils; *Soil Sci.*, v. 123, p. 213-219, 1977.

Adsorption of inorganic phosphorus by lake sediments; *J. Water Pollution Control Federation*, v. 48, p. 2754-2760, 1976.

1) The research data reveal the important role of citric acid in influencing the hydrolytic reaction of Al and the nature of the resulting solid phase reaction products which should be of concern in the study of pedogenesis and other soil physico-chemical reactions pertaining to transformations of nutrients and pollutants. 2) The rate and capacity of the noncrystalline hydroxy-Al and -Fe compounds for the retention of the phenolic acids (p-hydroxybenzoic acid, syringic acid, vanillic acid) were by far higher than kaolinite, illite and vermiculite. Hydroxy-Al and -Fe compounds may have the catalytic effect in an oxidative polycondensation of phenolic units resulting in the formation of stable skeletons in soil humic materials. 3) The colloidal and non-colloidal particles were found to be important in adsorption of phosphate in lake systems. Both inorganic and organic phosphate are present in a series of particle size fractions of lake sediments in Saskatchewan.

1273. FRANSHAM, P.B., *Geol. Surv. Can.*: Geological investigation of rocks in the Ottawa Valley, 1974-.

To evaluate the variability of the sensitive clays associated with the Champlain Sea in an attempt to understand the geological controls of landslides in the Ottawa Valley.

1274. KING, R.H., BOHDANOWICZ, A.J., GRIFFITH, M.A., MARK, F.J., Univ. Western Ontario (Geography):

The development of pedological indicators for archeological site analysis, 1976-78; M.Sc. theses (Bohdanowicz, Griffith), Ph.D. thesis (Mark).

To examine the chemical characteristics of soils and other surficial materials obtained from three excavated archeological sites in southern Ontario in order to determine the degree of chemical alteration effected by human habitation at these sites with a view to establishing the utility of soil chemical residues in future archeological site analysis. The research is focusing on two main aspects: 1) the analysis of samples from identifiable cultural features within the sites, and 2) the use of statistical methods and computer graphic models to display the form and content of the Iroquoian village sites.

1275. KINGSTON, M.S., KING, R.H., Univ. Western Ontario (Geography):

An analysis of a Paleosol of pre-Mazama ash age near Calgary, Alberta, 1976-78; M.Sc. thesis (Kingston).

The presence of a well developed paleosol beneath a recognizable ash layer near Calgary, Alberta has provided an excellent opportunity for the investigation of the morphological and analytical criteria which may be used to characterize such paleosols. Although paleosols in similar stratigraphic positions are known to exist elsewhere in southern Alberta few, if indeed any, are as well developed and so well exposed as the paleosol presently being investigated. Of particular importance in this investigation is the fact that the ash layer above the paleosol is comprised of Mazama ash with an established age of 6600 years B.P. The presence of

- this ash not only provides a minimum age for the underlying paleosol but also a firm time-stratigraphic control for the site. This project examines the physico-chemical characteristics of the paleosol and attempts to relate these characteristics to the general pedogenic state factors existing at the time that the paleosol and the present-day soil forming at the surface of the exposure. Particular attention is being given to the relative persistence of pedogenic characteristics within the paleosol and an evaluation will be made of the nature and degree of physical-chemical alteration which has taken place within the paleosol since it was buried.
1276. MACDOUGALL, J.I., Agriculture Canada (Atlantic Soil Survey Unit):  
Soil survey of Prince Edward Island, 1970-79.
1277. MARCOUX, R.M., BRUNELLE, A., COSSETTE, J.M., BLACKBURN, M., Agriculture Canada (Québec Soil Survey Unit):  
Pedology of the southeast area of Montreal, 1975-.
1278. PERCIVAL, J., RUTHERFORD, G.K., Queen's Univ. (Geography):  
Quantitative and qualitative adsorption of anions on sediments in two rivers in Eastern Ontario, 1976-78; M.Sc. thesis (Percival).  
First field work will commence with spring floods and run-off in April 1977. Samples will be collected by pumping with each flood during the spring, summer and autumn of 1977. Laboratory work will commence immediately but most will be carried out in the winter of 1977-78.
1279. RUTHERFORD, G.K., BARTLETT, G.A., Queen's Univ. (Geography, Geological Sciences):  
Chemical and mineralogical properties of soils and associated sediments in four watersheds in Prince Edward Island, Ontario, 1974-78.
1280. RUTHERFORD, G.K., GILBERT, R., VREEKEN, W., ROEDER, P.L., TAYLOR, C.E., Queen's Univ. (Geography):  
Soils of the Faroe Islands: genesis, composition and distribution, 1975-77; M.Sc. thesis (Taylor).  
The Faroes, an archipelago situated in the North Atlantic (Brito-Arctic) basalt province presents 18 trappen islands, covering 1399 km<sup>2</sup>. The Late Tertiary (Palaeocene-Eocene) basalts were extruded in three distinct phases: Differences in composition and resistance to erosion have produced distinct landscapes and soil associations. Strongly glaciated and severely weathered, alpine and sub-alpine soil forming processes and development are evidenced. Instability, cryoturbation, poor internal drainage, high wind and moisture conditions and an alpine subarctic vegetation have resulted in soils of the Podsollic, Organic, Gleysolic, Regosolic and Lithosolic Orders. Profile descriptions, pertinent physical and chemical data will be given for each of the soils classified as well as a discussion of the factors affecting each soils morphological properties. Soil associations and a map of the Faroes (1:100 000) will be produced as well as a presentation of the landscape units. Weathering rates and processes will be investigated and later soil micro-morphological techniques will be employed to aid in the interpretation of the soils genesis. X-ray diffraction radiocarbon dating techniques, DTA will be performed at a later date.
1281. SCHNITZER, M., Agriculture Canada (Soil Research Institute):  
Nitrogen in soils, 1976-81.  
To discover the nature of the "unknown" nitrogen in soils which constitutes about 50% of the total nitrogen. This large nitrogen reservoir is neither protein-like nor amino sugar nor ammonia. At this time practically nothing is known about the chemistry and availability to plant roots and microbes of this soil nitrogen fraction. In view of increasing costs of N-containing fertilizers and detrimental environmental effects of applying large amounts of such fertilizers, it is important to find out whether this form of N can be used by practical agriculture without causing harmful side effects.
1282. TABI, M., ROCHEFORT, B., Ministère de l'Agriculture du Québec (Service des Sols):  
Étude pédologique des comtés d'Arthabaska, Wolfe, Frontenac, Mégantic et Beauce, Québec, 1975-84.  
Prospection préliminaire, étude des formes de terrain, détermination des unités taxonomiques (séries de sols). Cartographie des sols sur une superficie approximative de 192 000 acres dans le comté d'Arthabaska et comtés environnants.
1283. VREEKEN, W.J., Queen's Univ. (Geography):  
Soil-geomorphic studies between Kingston and Trenton, Ontario: I. Soil variability on lacustrine clays. II. Stratigraphy of bog marl deposits, 1976-79.  
I. Elucidation of genesis and further history of crossvalley ridges in lacustrine clays; characterization of soil variability in slope traverses across such ridges; synthesis of this information towards a better understanding of lacustrine clay soil-landscapes in S. Ontario (comprising 184 000 acres in Frontenac and Lennox and Addington Counties). II Reconstruct the late- and postglacial history of the Kingston-Belleville-Beaver Lake triangle from pollen and mollusc shells in marl bogs using radiocarbon dating, amino acid dating, and paleomagnetism as geochronological techniques.
1284. WANG, C., MACMILLAN, J., Agriculture Canada (Atlantic Soil Survey Unit):  
Soil survey of Richibucto-Rogersville area, New Brunswick, 1973-79.
1285. WEBBER, M.D., MACLEAN, A.J., IVARSON, K.C., KOWALENKO, C.G., SINGH, S.S., SOWDEN, F.J., Agriculture Canada (Soil Research Institute):  
Nutrient and waste management in soils, 1975-80.  
**See:**  
The pyritization of basic ferric sulfates in acid sulfate soils - A mineralogical interpretation; Can. Soil Sci., Nov. 1976.  
Movement of nitrate nitrogen with different cropping systems in two soils; Can. J. Earth Sci., July, 1976.  
To further the understanding of the interactions of fertilizers, manures and wastes with soil so as to develop improved practices of supplying nutrients required for crop production and of disposing of wastes while avoiding pollution of the environment.



## PRECAMBRIAN

1286. AITKEN, J.D., Geol. Surv. Can.:  
Helikian and Hadrynian stratigraphy, Eastern Cordillera and Interior Platform, 1973-.
- See:**  
New data on correlation of the Little Dal Formation and a revision of Proterozoic map-unit "H5"; Geol. Surv. Can., Paper 77-1A, p. 131-136, 1977.  
Redstone River Formation (Upper Proterozoic) in Mount Eduni and Bonnet Plume Lake map-areas, District of Mackenzie; *ibid.*, p. 137-138, 1977.
1287. BARRETT, K.T., BRISSIN, W.C., Univ. Manitoba (Earth Sciences):  
Stratigraphy and structure of the Carr Lake area, Kaminak greenstone belt, District of Keewatin, Northwest Territories, 1976-78; M.Sc. thesis (Barrett).
1288. BEALES, F.W., ARENGI, J., Univ. Toronto (Geology):  
Sedimentology of the Onwatin Slate, Sudbury, Ontario, 1975-77; M.Sc. thesis (Arengi).  
The conclusions drawn from earlier studies at Brent have been applied to the Sudbury Basin sediments, in order to test the meteoritic impact theory of origin of the structure. The sediments of the Onwatin Formation are presently being studied. They appear to have been accumulated in a partially restricted basin, resulting in sedimentation under euxinic conditions, which conform to the rim-restricted phase of normal meteorite crater evolution. Again, recent paleomagnetic interpretations by Irving and Lapointe appear to fit an original subhorizontal sill-like form for the Nickel Irruptive at Sudbury. This is also consistent with the comparison of Sudbury Basin with the Brent meteorite crater in that Sudbury may also have developed a relatively flat crater floor at a very early stage. All these suggestions appear to permit formulation of a more satisfying model for the early stages of Sudbury basin evolution.
1289. BEALES, F.W., CORON, C.R., HARDY, J.L., MANN, F.T., Univ. Toronto (Geology):  
White sparry dolomite porosity and the former existence of evaporites in Mississippi valley-type ore host rocks.  
Coarse white sparry dolomite and to a lesser extent calcite, commonly occludes regionally important, carbonate rock porosity systems. Collapse breccias with or without fine rock matrix and basal trash zones, fluxo-breccias, i.e., those involving lateral translation of breccia clasts and pseudo-breccias which retain the original rock fabric orientation are all characterized by an earlier generation of neomorphic or paramorphic dolostone clasts, or remnants, in a sea of coarse white sparry dolomite. Centripetal layered crystal growth of carbonate and metallic sulfide minerals attests to the filling of open space. In addition, interstitial bitumen and less commonly quartz, bitumen, gypsum and sulfur and color zonations and coatings of euhedral crystals indicate episodic cementation. Former porosity, superbly delineated by white sparry dolomite, occurred within the host rocks of many Mississippi Valley-type ore bodies and was probably paleokarstic in origin, possibly initiated by the solution of interbedded evaporites. Breccia-moldic and breccia-interstitial porosity, commonly involving keystone-supported cavities and cavern
- roof arches certainly provided highly permeable, late diagenetic, fluid escape routes prior to the constriction of open throats by carbonate and sulfide cementation. Final occlusion of open space by coarse mosaic calcite is common. Re-brecciated blocks of breccia occur. Major lead-zinc ore bodies indicate long-sustained permeability, vast volumes of fluid migrating and probably complex fluid-mixing phenomena. Although lead-zinc ores are commonly associated with some traces of bitumen, why has oil field development drilling yet to encounter a major ore body? Proof of the former existence of evaporites, since removed by solution, is a major recurring problem of carbonate porosity research. Specifically, in the southeast Missouri ore district, despite the fact that neither macroscopic gypsum nor anhydrite exist in the host rocks of southeast Missouri, an evaporitic association appears to be indicated and best explains some of the ore-bearing breccias.
1290. BENNETT, G., INNES, D.G., Ontario Division Mines:  
Huronian volcanism, 1976-78.  
**See:**  
Huronian volcanism in the Thessalon area, District of Algoma; Ontario Division of Mines, Misc. Paper 67, p. 111-113, 1976.
1291. BRUECKNER, W.D., Memorial Univ. (Geology):  
Studies for IGCP project 73/1/2: Precambrian in mobile zones, 1973-.  
This project is concerned mainly with the correlation of geological units, or features, over distances of international significance. Stratigraphical and paleogeographical, as well as petrographic, structural, paleontological and geochronological features and methods are being used. Improved correlations within the Avalon Zone of eastern Canada, correlation of Late Proterozoic to Cambrian sequences in the eastern and western parts of the Avalon Zone in Newfoundland (between Avalon Peninsula and Burin-Peninsula zone), and improved correlation with rocks in the Maritime Provinces to the southwest are all being investigated.
1292. CARD, K.D., INNES, D.G., DEBICKI, R.L., Ontario Division Mines:  
Stratigraphy, sedimentology and petrology of the Huronian Supergroup of the Sudbury-Espanola area, Ontario.
1293. CHRISTIE, R.L., Geol. Surv. Can.:  
Stratigraphy and age of pre-Cambrian sedimentary rocks and contained sills and dykes, east coast of Canadian Arctic Islands, and north and northwest Greenland, 1967-.
1294. DELANEY, G.D., YOUNG, G.M., Univ. Western Ontario (Geology):  
The stratigraphy of the lowermost Proterozoic units in Wind River, Snake River, Nash Creek and Nadaleen River map-areas, Yukon Territory, 1976-78; Ph.D. thesis (Delaney).  
**See:**  
Geology of some uranium occurrences in Yukon Territory; Geol. Surv. Can., Paper 77-1A, p. 33-37, 1977.  
The recent discovery of several significant occurrences of uranium in Proterozoic rocks of the Wernecke Mtns. resulted in the initiation of detailed stratigraphic studies in the region during

- six weeks of the summer of 1976. Studies currently under (winter 1976-77) include: 1) thin section analysis of sample suites collected during the summer of 1976; 2) the preparation and submission (to GSC) of stratigraphic suites for geochemical analysis; 3) an interpretation of aerial photographs complemented by an analysis of LANDSAT imagery. During the summer of 1977, it is proposed to develop a detailed regional stratigraphic picture by building on the framework which has already been established. Tentative plans call for at least two and one-half months of field work during the summer of 1977.
1295. DIMROTH, E., TRUDEL, P., LAROUCHE, C., ROCHELEAU, M., BALD, R., MAURICE, O.D., Québec Min. Richesses Naturelles:  
Stratigraphie, volcanologie et tectonique de la région de Rouyn-Noranda, Québec, 1976-78.
1296. EISBACHER, G.H., Geol. Surv. Can.:  
Stratigraphy and sedimentation of the Proterozoic Rapitan Group and related rocks, Mackenzie, Wernecke and Ogilvie Mountains, 1975-.
- See:**  
Tectono-stratigraphic framework of the Redstone Copper Belt, District of Mackenzie; Geol. Surv. Can., Paper 77-1A, p. 229-234, 1977.
1297. HEBERT, C., CHOWN, E.H., DIMROTH, E., ARCHAMBAULT, G., GUHA, J., Univ. du Québec à Chicoutimi:  
Contexte géologique régional de la mine Chibex, Chibougamau, Québec, 1976-77; thèse de maîtrise (Hebert).
1298. HOFFMAN, P., Geol. Surv. Can.:  
A stratigraphic, sedimentological and structural geology of the Wilson Island and Union Island Groups, Great Slave Supergroup, and Et-Then Group, East Arm of Great Slave Lake, District of Mackenzie, 1966-.
- See:**  
Geology of the Athapuscow Aulacogen, East Arm of Great Slave Lake, District of Mackenzie; Geol. Surv. Can., Paper 77-1A, p. 117-129, 1977.
1299. IMREH, L., Québec Min. Richesses Naturelles:  
Etude géologique prévisionnelle, 1972-80.
1300. MORGAN, W.C., Geol. Surv. Can.:  
Study of the Ramah Group and of Proterozoic-Archean relationships in northern Labrador, 1971-.
1301. OKULITCH, A.V., Geol. Surv. Can.:  
Stratigraphy and structure of the Mount Ida Group, southern British Columbia, 1972-.
1302. PYKE, D.R., JENSEN, L.S., Ontario Division Mines:  
Stratigraphy and structure of the Timmins-Kirkland Lake area, 1975-78.
1303. RAMAEKERS, P., Sask. Geol. Surv.:  
Athabasca sandstone project, 1975-80.  
  
Reconnaissance geology of the Athabasca Basin edge - study of paleodrainage and environment of deposition, mapping of surficial Pleistocene deposits, and study of mineralization associated with the Athabasca Formation.
1304. ROCHELEAU, M., HOFMANN, H.J., DIMROTH, E., Univ. Montréal (Géologie):  
Stratigraphie et sédimentologie de certaines unités Archéennes des groupes de Timiskaming, de Pontiac et de Cadillac de la région de Rouyn-Noranda, Québec, 1973-77; Ph.D. thesis (Rocheleau).
- Nous présenteront un modèle stratigraphique et sédimentologique décrivant les provenances, les mécanismes de transport, les milieux de sédimentation et de diagenèse. Nous discuterons aussi des possibilités économiques de ces métasédiments.
1305. RUITENBERG, A.A., MCCUTCHEON, S.R., New Brunswick Dep. Nat. Res. (Mineral Res. Br.):  
Geology and mineral deposits Precambrian and Silurian rocks of southern New Brunswick, 1970-77.
- See:**  
Comparison of volcanogenic mineral deposits in the northern Appalachians and their relationship to tectonic evolution; Handbook of stratabound and stratiform ore deposits, v. 5, p. 109-159, 1976.  
  
Stratigraphy, paleogeography and tectonic setting of the Coldbrook Group in the Caledonia Highlands of southern New Brunswick; Can. J. Earth Sci., v. 14, no. 6, p. 1263-1275, 1977.  
  
In May, 1977, a study of the stratigraphy, structure and mineralization in the Moncton basin will commence.
1306. STAUFFER, M.R., REYNOLDS, J., Univ. Saskatchewan (Geological Sciences):  
Stratigraphy of the Missi Group near Flin Flon, Manitoba, 1971-77; M.Sc. thesis (Reynolds).  
  
The Missi Group can be divided into two formations and five members that can be correlated from one outcrop batch to the next. The Group consists of fluvial conglomerates and sandstones deposited in two fining-upward successions probably in a low latitude environment.
1307. TROWELL, N.F., BLACKBURN, C.E., Ontario Division Mines:  
Stratigraphy, structure and economic geology of the Savant Lake-Crow Lake volcanic belt, District of Kenora, Ontario, 1976-79.
1308. YEO, G.M., YOUNG, G.M., MORRIS, W.A., Univ. Western Ontario (Geology):  
Stratigraphy and sedimentation of the Rapitan Group, Yukon and N.W.T./iron-formation of the Rapitan Group, Yukon and N.W.T., 1974-78; Ph.D. thesis (Yeo).
- See:**  
Iron-formation and glaciogenic rocks of the Rapitan Group, Northwest Territories, Canada; Precambrian Res., v. 3, p. 137-158, 1976.  
  
The Rapitan Group is a dominantly glaciogenic, late Proterozoic sequence up to 2500 m thick extending about 650 km through the Mackenzie Mountains. Widespread iron-formation (including North America's largest iron deposit) occurs in the lower part. This study relies primarily on conventional sedimentological and stratigraphic techniques. In addition, geochemical, paleomagnetic, and geochronological studies are being carried out. One full (1976) and two partial field seasons have been completed. At least one more field season is planned. Thirty-five stratigraphic sections have been measured, generally less than 20 km apart, through most of the belt. Over a thousand paleocurrent measurements have been made. Nineteen major element analyses have been completed and rare-earth element analyses have been begun. W.A. Morris (Earth Physics Branch, E.M.R.) has done considerable work on the paleomagnetism of the Rapitan. K-Ar dating studies have yielded Mesozoic ages, indicating an unrecognized thermal event. Among the results of this study to date are the recognition of a new, previously undescribed

- unit, recognition of a new and economically very significant class of iron-formation, and convincing proof for a glacial origin for most of the Rapitan Group.
1309. YOUNG, F.G., Geol. Surv. Can.:  
Stratigraphy of Gog and Cariboo Groups near the Rocky Mountain Trench, McBride area, British Columbia, 1967-.
1310. YOUNG, G.M., DELANEY, G., JEFFERSON, C.W., YEO, G.M., Univ. Western Ontario (Geology):  
Stratigraphy and sedimentology of Upper Proterozoic rocks of northwestern Canada, 1971-80.  
Initiated in 1971 when stratigraphic and sedimentological studies were begun in the Shaler Group on Victoria Island, these studies have resulted in finer stratigraphic subdivision of the Precambrian succession. Measurement of thousands of paleocurrent indicators (mainly cross bedding) has permitted establishment of provenance in the case of some units, and has also helped in the definition of some environments of deposition. In attempts to relate the Shaler Group of Victoria Island to similar rocks elsewhere, studies have been extended to areas of mainland Canada (Coppermine Homocline, Brock Inlier). Stromatolites have been found to be useful in such attempts at intrabasinal correlation. These studies have also been extended into the northern part of the Canadian Cordillera where work is in progress on the Rapitan Group and unnamed pre-Rapitan Proterozoic rocks.
1311. ZWANZIG, H.V., Manitoba Geol. Serv. Br.:  
Lynn Lake project: Fox Mine-Kamuchawie Lake area, Manitoba, 1976-78.  
The Aphebian metasediments, metavolcanics and migmatites exposed between Fox Mine and Kamuchawie Lake, Manitoba provide a lateral transition from the Lynn Lake volcanic belt to the Kisseynew sedimentary gneiss belt. Their stratigraphic, structural and metallogenic relationships are under investigation.
- ### PALEOZOIC
1312. AITKEN, J.D., Geol. Surv. Can.:  
Lower Paleozoic stratigraphy, southern Rocky Mountains, Alberta and British Columbia, 1972-.
1313. AUSTIN, I.A., MOORE, R.G., COLWELL, J.A., STEVENS, G.R., Acadia Univ. (Geology):  
A search for time correlative marker horizons in the Windsor Group, 1976-78; MA thesis (Austin).  
Initial work indicates that external volcanic events may provide marker horizons enriched in volcanic ash material within the carbonate, silt, shale, and evaporites of the sequence. If consistent and traceable, these could erase some of the difficulties caused by tectonism and facies changes across the depositional basin.
1314. BOLTON, T.E., Geol. Surv. Can.:  
Ordovician-Silurian biostratigraphy, Southampton Island, District of Keewatin, 1970-.  
Determination of Bad Cache Rapids Formation, Middle Ordovician fauna nearly completed; preliminary studies of Late Ordovician fauna of Churchill River Formation underway.
1315. BOLTON, T.E., Geol. Surv. Can.:  
Silurian-Ordovician macrobiostratigraphy of Anticosti Island, Quebec, 1974-.
1316. BOURQUE, P.A., Université Laval (Géologie):  
Etude des ensembles à carbonates de type "récifal" du Siluro-Dévonien de la Gaspésie: leur paléogéographie et paléoécologie, 1974-79.  
2 étés de travaux de terrains complétés; 2 theses du M.Sc. en voie de complétion; étude des micro-facies actuellement eu cours; et 2 theses de M.Sc. pour l'an prochain.
1317. BUSSIÈRES, L., Univ. Laval (Geology):  
Study of Middle Ordovician slope facies in the Baie St. Paul-Malbaie area, Québec, 1976-77; M.Sc. thesis.  
The Trenton-Utica formations of Middle Ordovician age (corresponding to the *Corynoides americanus* to the early *C. spiniferus* zones) are represented by slumped distal facies followed by massive flysch intercalated with thick slumped beds in the coastal area between Baie St. Paul and Malbaie on the north shore of the St. Lawrence River, Québec. It is hoped to be able to interpret sedimentologically this unique sedimentary sequence and be able to correlate it with the standard Trenton-Utica succession.
1318. CHRISTIE, R.L., Geol. Surv. Can.:  
Geological reconnaissance of eastern Devon Island with additional stratigraphic studies on southeastern Ellesmere Island, District of Franklin, 1968-.
1319. DAVIES, G.R., Geol. Surv. Can.:  
Upper Paleozoic subsurface stratigraphy and basin analysis, Sverdrup Basin, Arctic Archipelago, 1975-.
1320. DIXON, O.A., JONES, B., NARBONNE, G.M., Univ. Ottawa (Geology):  
Stratigraphy and sedimentology of the Leopold Formation, Eastern Somerset Island, Northwest Territories, 1975-80.  
See:  
Stratigraphy and sedimentology of Upper Silurian rocks, northern Somerset Island, Arctic Canada; Can. J. Earth Sci., v. 14, no. 6, p. 1427-1453, 1977.  
A new formation, the intertidal-supratidal Leopold Formation, was defined (Jones and Dixon, 1975) on eastern Somerset Island and is apparently at least in part laterally equivalent to the subtidal rocks of the Silurian Read Bay Formation. Work on the Leopold Formation has subsequently been extended over 6 other reference sections on the east coast. Petrographic and faunal studies are in progress to evaluate depositional environments and their paleogeographic implications and to determine more precisely the relationship between the Leopold and associated facies.
1321. FRITZ, W.H., Geol. Surv. Can.:  
Cambrian biostratigraphy of the Canadian Cordillera, 1965-.
1322. GELDSETZER, H.H.J., Geol. Surv. Can.:  
Carboniferous and Triassic strata of Appalachian region, 1974-.  
See:  
Preliminary palynological investigation of the Windsor group (Mississippian) of Nova Scotia; Geol. Surv. Can., Paper 77-1A, p. 347-349, 1977.  
The Windsor group of Cape Breton Island, Nova Scotia; Geol. Surv. Can., *ibid.*, p. 425-428, 1977.
1323. GILES, P.S., RYAN, R.J., Nova Scotia Dep. Mines:  
Carbonate stratigraphy, 1974-.

**See:**

Guide to the invertebrate fauna of the Windsor Group in Atlantic Canada; Nova Scotia Dep. Mines, Paper 76-5, 1977.

Correlation of diamond drill cores plus geologic mapping of the Carboniferous basins of Nova Scotia.

1324. HOWIE, R.D., Geol. Surv. Can.:  
Subsurface geology of the Paleozoic basins of eastern Canada, 1971-.

1325. KENDALL, A.C., Sask. Geol. Surv.:  
The Ashern, Winnipegosis and lower Prairie evaporite formations of the commercial potash areas, Saskatchewan, 1974-77.

1326. KLOVAN, J.E., EMBRY, A.F., Univ. Calgary (Geology):

Devonian stratigraphy, Canadian Arctic Islands – The Middle-Upper Devonian clastic wedge of the Franklinian geosyncline, 1969-77; Ph.D. thesis (Embry).

**See:**

The Middle-Upper Devonian clastic wedge of the Franklinian geosyncline; Bull. Can. Pet. Geol., v. 25, 1977.

Seven years of field work have been conducted. Most exposures of Middle-Upper Devonian rocks in the Canadian Arctic Islands have been examined. The paleoecology of Upper Devonian reefs on Banks Island have been described. A new system of limestone classification emerged from this work. The clastic part of the Middle-Upper Devonian have been described and re-evaluated. Several cycles of deposition represented by newly proposed formations, are recognized in terms of their broad depositional environments. The source of the sediments has been documented as being largely from the Greenland Shield, Caledonian Mountains and Pearya. This result shows that several plate-tectonic models advanced to explain the evolution of the Arctic Basin are not tenable.

1327. KNIGHT, I., FONG, C.C.K., BROWN, P., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Carboniferous rocks of the Bay St. George area, southwest Newfoundland, 1974-77.

1328. KNIGHT, I., GREENE, B.A., Newfoundland Dep. Mines Energy:  
Daniels Harbour project, Newfoundland, 1976-82.

To compile stratigraphy, sedimentology, macro- and micro-palaeontology of Cambrian clastics and carbonates, Ordovician St. Georges Group, Table Head Formation, as well as zinc and lead mineralization, Daniels Harbour – evaluation and mechanism of formation.

1329. LACHANCE, S., Québec Min. Richesses Naturelles: Région de St-Alexis-de-Matapédia, Cte Bonaventure, 1976-78.

1330. MAMET, B.L., Univ. Montréal (Géologie):  
Corrélations stratigraphiques du Carbonifère mondial sur base de Foraminifères, 1962-.

1331. MAYR, U., Geol. Surv. Can.:  
Stratigraphy and correlation of lower Paleozoic subsurface sections, southern and central Arctic Islands, 1975-.

1332. MCCUGAN, A., MCRAE, J., Univ. Calgary (Geology):  
Permian stratigraphy and phosphate content Telford Plate, Ishbel Group, southeastern British Columbia, 1975-77.

1333. MCILREATH, I., WARDLAW, N.C., Univ. Calgary (Geology):

Stratigraphic relationships at the western edge of the Middle Cambrian carbonate facies belt, Field, British Columbia, 1971-77; Ph.D. thesis (McIlreath).

**See:**

Development of vertical escarpment at Middle Cambrian carbonate shelf edge and its contribution to auto-kinetic basinal lithofacies (abst.); Am. Assoc. Pet. Geol. Bull., v. 60, p. 27, 1976.

The Cathedral Escarpment exposed; Oilweek, v. 27, no. 4, p. 16, 1976.

The Cathedral Escarpment – a vertical shelf edge reef and its contribution to basinal lithofacies (abst.); Can. Soc. Pet. Geol. Reservoir, v. 3, no. 2, p. 1, 1976.

1334. MONGER, J.W.H., Geol. Surv. Can.:  
Upper Paleozoic rocks of western Canadian Cordillera, 1972-.

**See:**

Upper Paleozoic rocks of northwestern British Columbia; Geol. Surv. Can., Paper 77-1A, p. 255-262, 1977.

Geology of the Nahlin ultramafic body, Atlin and Tulsequah map-areas, northwestern British Columbia; Geol. Surv. Can., *ibid.*, p. 263-266, 1977.

Metamorphic terrane, northwestern coast mountains west of Atlin Lake, British Columbia; Geol. Surv. Can., *ibid.*, p. 267-269, 1977.

Revised stratigraphy of the Takla Group, north-central British Columbia; Can. J. Earth Sci., v. 14, no. 2, p. 318-320, 1977.

1335. MORROW, D.W., Geol. Surv. Can.:  
Stratigraphy, sedimentology and diagenesis of Paleozoic rocks in the southern Mackenzie Mountains and northern Rocky Mountains, Yukon Territory-British Columbia, 1975-.

**See:**

Sulphur isotope composition and strontium content of barite from Devonian rocks in northeastern British Columbia; Geol. Surv. Can., Paper 76-1C, p. 195-201, 1976.

1336. MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
Proterozoic-Paleozoic stratigraphy, Jasper-Mt. Robson region, Rocky Mountains, Alberta and British Columbia, 1959-.

Study of stratigraphic sections in the above region, mainly of Devonian and Cambrian strata. Paper in preparation on type section of Middle Cambrian Snake Indian Formation.

1337. NARBONNE, G.M., DIXON, O.A., Univ. Ottawa (Geology):

Silurian stratigraphy and depositional environments of southeastern Somerset Island, Northwest Territories, 1975-78; Ph.D. thesis (Narbonne).

Stratigraphic-paleoecological work on the Read Bay Formation on eastern Somerset Island has confirmed a broad cyclical pattern in the depositional history of this marine formation. The succession of rocks, fossils and trace fossils is being examined in detail in order to relate their occurrence to apparent deepening and shallowing trends. Completed work indicates that a succession of broad lithological units within the formation can be correlated with confidence over much of Somerset Island. The field work on this project was completed with a detailed re-examination of the

type section of the Read Bay Formation on Cornwallis Island, for purposes of regional stratigraphic correlation and comparison of the environmental successions.

1338. NASSICHUK, W.W., Geol. Surv. Can.:  
Stratigraphy and paleontology of Upper Paleozoic rocks on parts of Ellesmere and Axel Heiberg Islands, District of Franklin, 1968-.

**See:**

Permian conodonts in the Canadian Arctic Archipelago – biostratigraphic discussion; Geol. Surv. Can., Paper 77-1A, p. 139-143, 1977.

1339. NASSICHUK, W.W., Geol. Surv. Can.:  
Carboniferous biostratigraphy in the northern Yukon, British Columbia, Alberta and Alaska, 1975-.

1340. NORFORD, B.S., Geol. Surv. Can.:  
Ordovician and Silurian biostratigraphy of British Columbia, Alberta, Manitoba, Yukon, Mackenzie and Franklin, 1961-.

1341. NORRIS, A.W., Geol. Surv. Can.:  
Devonian biostratigraphy of Lake Manitoba-Lake Winnipegosis region, Manitoba, 1964-.

1342. NORRIS, A.W., Geol. Surv. Can.:  
Devonian biostratigraphy of northern Yukon Territory and adjacent District of Mackenzie, 1970-.

1343. NORRIS, A.W., UYENO, T.T., MCCABE, H.R., Geol. Surv. Can., Manitoba Geol. Serv. Br.:  
Devonian rocks of the Lake Winnipegosis-Lake Manitoba outcrop belt, southwestern Manitoba, 1969-77.

1344. PEDDER, A.E.H., Geol. Surv. Can.:  
Devonian biostratigraphy western and northern Canada, 1968-.

**See:**

Initial records of two unusual Late Silurian Rugose coral genera from Yukon Territory; Geol. Surv. Can., Paper 76-1B, p. 285-286, 1976.

1345. PETRYK, A.A., Québec Dept. Nat. Res. (Energy):  
Geology and oil and gas exploration of Anticosti Island, Gulf of St. Lawrence, Québec: Preliminary reconnaissance/Rapport préliminaire sur la géologie de l'île d'Anticosti, dans le golfe du St-Laurent, Province de Québec, en relation avec l'exploration pétrolière, 1976-78.

Preliminary investigations to reappraise the geology and the oil and gas prospects of the Anticosti Basin began in 1975, with a helicopter supported, reconnaissance survey of Anticosti Island, in the Gulf of St-Lawrence. Approximately 70% of the roughly 8000 kilometres<sup>2</sup> (3000 miles<sup>2</sup>) island was systematically examined and sampled. In western Anticosti, six predominantly carbonate formations, outcrop and dip about 2° southwest, as a homocline or northeast facing cuesta comprising an about 1200 m (3900 ft.) panel of sediments; downsection, they are: Chicotte (30 ± m/100 ± ft.), Jupiter (± 190 m/± 620 ft.) Gun River (± 190 m/± 620 ft.), Becscie (± 205 m/± 670 ft.), Ellis Bay (± 100 m/330 ft.), Vauréal (± 480 m/1575 ft.). The total stacked thickness of surficial exposures is closer to the equivalent subsurface stratal interval, in the ARCO-Anticosti No. 1 hole, than all previous estimations. The formational contacts are mainly gradational but, apparently conformable. Formation lithofacies are similar, that is, predominantly, fine-grained calcarenites, but they range from lime mudstones, calcisiltites, bioclastic wackestones,

packstones and grainstones, boundstones (biohermal) to intraformational conglomerates, with relatively minor, interbedded calcareous shales and argillaceous, siliciclastic sandstones (the latter, mainly in the southeast of the island). Visual porosities are rarely developed, however, significant porosity is inferred in the highly calcareous claystone zone (40 m/132 ft.), in the lower to middle Jupiter, in south-central Anticosti, and in the siliciclastic sandstones that comprise about 35% of the Vauréal and Ellis Bay on the northeast coast. The relatively thin bioherms (ca. 1 to 8 m/3 to 26 ft.) and thicker reefoid zones, in the upper parts of the formations, are not visibly porous; the granular, highly encrinitic, bank-like and reefoid, uppermost Jupiter and Chicotte seem dense, but could contain an intergranular or fracture porosity. Three seasons of surface exploration are envisaged on Anticosti Island. A wide range of physical, geochemical and paleontological analyses are proposed, or are underway. This information is to be integrated and correlated with subsurface geophysical data to complete the basin analysis. But ultime: synthèse géologique et interdisciplinaire du Bassin d'Anticosti, en relation avec l'exploration pétrolière.

1346. POUNDER, D.A., Chevron Standard Ltd. (Exploration):  
Carbonate and evaporite sediments of western and northern Canada – their importance in exploration for hydrocarbons, 1959-.

1347. SANFORD, B.V., Geol. Surv. Can.:  
Lower Paleozoic geology of Eastern Canada, 1975-.

1348. SHAWA, M., DUNN, P.J., Home Oil Co. Ltd. (Exploration):  
Paleogeographic study of Woodbend Group, Alberta and northeast British Columbia, 1977-.

1349. THOMPSON, R.I., Geol. Surv. Can.:  
Structure and stratigraphy of Paleozoic and Mesozoic rocks in the northwest quadrant of Halfway River map-area, northeastern British Columbia, 1975-.

1350. THORSTEINSSON, R., Geol. Surv. Can.:  
Structural stratigraphy of western Devon Island, District of Franklin, 1976-.

1351. TRETTIN, H.P., Geol. Surv. Can.:  
Stratigraphy, structure, and carbonate petrography of the Marble Canyon Formation (Permian) in the Marble Range, Cariboo District, British Columbia, 1967-.

**MESOZOIC**

1352. ASCOLI, P., Geol. Surv. Can.:  
Biostratigraphic zonation (Foraminifera-Ostracoda) of the Mesozoic and Cenozoic rocks of the Atlantic Shelf, 1971-.

1353. BALKWILL, H.R., Geol. Surv. Can.:  
Structure and stratigraphy, western Queen Elizabeth Islands, District of Franklin, 1976-.

1354. BUSTIN, R.M., HILLS, L.V., Univ. Calgary (Geology):  
The Tertiary of the Arctic Islands, 1975-; M.Sc. thesis (Bustin).

**See:**

Implications of coalification levels, Eureka Sound Formation, northeastern Arctic Canada; Can. J. Earth Sci., v. 14, no. 7, p. 1585-1597, 1977.

1355. CHRISTOPHER, J.E., Saskatchewan Geol. Surv.:  
Lower Cretaceous Mannville Group of Saskatchewan, 1976-78.

To map the stratigraphy and sedimentation patterns of the Mannville Group across Saskatchewan; to develop a consistent internal nomenclature; to reconstruct the history of depositional and tectonic events.

1356. DRUMMOND, J.M., TROLLOPE, F.H., Mobil Oil Canada, Ltd.:  
Evaluation of west coast sedimentary basins, 1975-77.

British Columbia typified by westward regression of marine areas during the Mesozoic with restriction of seas to most westerly portion by Tertiary. Detailed analysis of tectonic/depositional history possible from upper Eocene onwards. Olympics metamorphism related continental/oceanic transform fault during upper Eocene to lower Miocene. After subsequent major unconformity upper Miocene beds retransgressed area and extended into Charlotte Basin.

1357. EMBRY, A.F., BIRNIE, T.A., BP Exploration Canada Ltd. (Geological):  
Stratigraphy and hydrocarbon potential of Mackenzie Delta area, District of Franklin, 1976-77.

1. To subdivide the Mesozoic-Tertiary strata of the Delta area into mappable lithologic units; 2. to determine environments of deposition of the main lithotypes within the units and to delineate facies trends; 3. to correlate the units with seismic markers; 4. to determine Mesozoic-Tertiary geologic history and evolving paleogeography of the Delta region; and 5. to assess the hydrocarbon potential (reservoir, source, seal) of each unit and to outline areas of interest for each.

1358. GIBSON, D.W., Geol. Surv. Can.:  
Stratigraphic and sedimentological studies of the Cretaceous Gething Formation, Peace River Canyon of northeastern British Columbia, 1974-.

1359. GIBSON, D.W., Geol. Surv. Can.:  
Stratigraphic and sedimentological studies of Lower Cretaceous rocks, Rocky Mountain Foothills and Front Ranges, Alberta and British Columbia, 1975-.

**See:**

The Kootenay Formation of Alberta and British Columbia - a stratigraphic summary; Geol. Surv. Can., Paper 77-1A, p. 95-98, 1977.

1360. HENDRY, H.E., MISKO, R.M., SUTHERLAND, G., WING, S.J.C., Univ. Saskatchewan (Geological Sciences):

Petrology of sands of Frenchman and Ravenscrag Formations, 1973-77; M.Sc. thesis (Misko).

Depositional environment of Frenchman formation, Cretaceous, Saskatchewan, 1975-77; M.Sc. thesis (Sutherland).

Diagenesis of sands in Cretaceous Frenchman Formation, 1976-78; M.Sc. thesis (Wing).

1361. JELETZKY, J.A., Geol. Surv. Can.:  
Cretaceous and Jurassic of Richardson Mountains, Porcupine Plains and Eagle Plains, Yukon Territory and District of Mackenzie, 1955-.

1362. JELETZKY, J.A., Geol. Surv. Can.:  
Cretaceous and uppermost Jurassic biostratigraphy of western Cordillera, British Columbia, 1967-.

1363. MIALL, A.D., Geol. Surv. Can.:  
Stratigraphy and sedimentology of the sedimentary succession of Somerset Island and Boothia Peninsula, 1975-.

**See:**

Phanerozoic stratigraphy and sedimentology of Somerset Island and northeastern Boothia Peninsula; Geol. Surv. Can., Paper 77-1A, p. 99-106, 1977.

Sedimentary structures and paleocurrents in a Tertiary deltaic succession, northern Banks Basin, Arctic Canada; Can. J. Earth Sci., v. 13, no. 10, p. 1422-1432, 1976.

1364. POULTON, T.P., Geol. Surv. Can.:  
Mesozoic biostratigraphy and Jurassic paleontology of northern Yukon and adjacent District of Mackenzie, 1975-.

**See:**

Major features of the Lower and Middle Jurassic stratigraphy of northern Richardson Mountains, northeastern Yukon Territory and northeastern District of Mackenzie; Geol. Surv. Can., Paper 76-1B, p. 345-352, 1976.

1365. POULTON, T.P., Geol. Surv. Can.:  
Jurassic biostratigraphy of selected areas in British Columbia, Alberta, and southern Yukon Territory, 1976-.

**See:**

Hettangian (Lower Jurassic) rocks and faunas, northern Yukon Territory; Can. J. Earth Sci., v. 14, no. 1, p. 89-101, 1977.

1366. PRICE, L.L., Geol. Surv. Can.:  
Geological observations at shafts of potash mines, Saskatchewan, 1964-.

1367. PRICE, L.L., Geol. Surv. Can.:  
Studies of Cretaceous stratigraphy of the Plains of Saskatchewan, Manitoba and eastern Alberta, 1964-.

1368. SHAWA, M., DUNN, P.J., Home Oil Co. Ltd. (Exploration):  
Sedimentology of Mackenzie Delta (Cretaceous), 1976-.

1369. SHAWA, M., DUNN, P.J., Home Oil Co. Ltd. (Exploration):  
Paleogeographic study of Lower Mannville, Alberta and northeast British Columbia, 1977.

1370. SHEPHEARD, W.W., OGUNYOMI, O., HILLS, L.V., Univ. Calgary (Geology):  
Stratigraphy, sedimentation, palynology and paleoecology of late Cretaceous strata of the Plains area of Alberta, 1968-; M.Sc. theses.

To compile a detailed understanding of stratigraphic and depositional environments of late Cretaceous strata of Western Canada, to coordinate palynomorph distribution with sedimentation models, and to provide detailed models such that they can be used for subsurface studies of gas and coal.

1371. STAPLIN, F.L., Paleontological Staffs, Imperial Oil Ltd., Gulf Oil Canada, Mobil Oil Canada:  
Tertiary biostratigraphy, 1974-76.

**See:**

Tertiary biostratigraphy, Mackenzie Delta region, Canada; Bull. Can. Pet. Geol., v. 24, no. 1, p. 117-136, 1976.

1372. STOTT, D.F., Geol. Surv. Can.:  
Cretaceous stratigraphy, Peace River to 60 degrees, British Columbia, 1961-.

1373. TIPPER, H.W., Geol. Surv. Can.:  
Biostratigraphic study of Mesozoic rocks in the Intermontane and Insular Belts of the Canadian Cordillera, 1975-.



**See:**

Jurassic studies in Queen Charlotte Islands, Harbledown Island, and Taseko Lakes area, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 251-253, 1977.

1374. WADE, J.A., Geol. Surv. Can.:  
Regional subsurface geology of Mesozoic and Cenozoic rocks of the Atlantic continental shelf, 1972-.
1375. WILLIAMS, G.L., Geol. Surv. Can.:  
Biostratigraphic zonation (palynology) of the Mesozoic and Cenozoic rocks of the Atlantic Shelf, 1971-.
1376. WILSON, D.G., Geol. Surv. Can.:  
Mesozoic stratigraphy and basin analysis of Eastern Sverdrup Basin, Arctic Archipelago, 1975-.

**CENOZOIC**

1377. CHURCH, B.N., British Columbia Dep. Mines Pet. Res. (Geological):  
Geology of the Hat Creek coal basin, British Columbia, 1975-77.
1378. CHURCH, B.N., British Columbia Dep. Mines Pet. Res. (Geological):  
Stratigraphy, geochronology, and correlation of Tertiary bedded rocks in the Okanagan and Kettle River uranium district, British Columbia, 1977-78.
- To establish type sections for the Tertiary strata in the Okanagan and west Kettle River area of British Columbia; determine the petrography and

chemistry of the sequence in each section; geochronology for control of sections and to assist correlation (K/Ar dating); and reconnaissance mapping to confirm the lateral distribution of Tertiary bedded units and to establish the pattern of drainage in the Tertiary. Rock geochemistry: The basal members of the Marron Formation consisting of phonolite and mafic phonolite lavas and breccias is widely distributed in the study area and being quite radioactive are considered as a possible source of uranium. The theory that uranium contained in glass, apatite, and/or zeolites of these rocks is released by devitrification and leaching by ground waters will be tested. To assist in researching this concept samples will be submitted for U, Th, F, and P analysis. Property examination: Uranium prospects located in the study area in the bedded Tertiary sequence will be examined.

1379. HONCH, R., WHITAKER, S.H., MOSSMAN, D.J., Univ. Saskatchewan (Geological Sciences):  
Geological correlations in Tertiary coal measures, southern Saskatchewan, 1975-77; M.Sc. thesis (Honch).
1380. MATHEWS, W.H., ROUSE, G.E., Univ. British Columbia (Geological Sciences):  
Stratigraphy and geochronology of the Quesnel area, British Columbia, 1976-.

**STRUCTURAL GEOLOGY/TECTONICS**

**ALBERTA**

1381. BABCOCK, E.A., Alberta Research Council (Geology Div.):  
Fracture and lineament studies, Athabasca Oil Sands area, Alberta 1973-77.
1382. BABCOCK, E.A., Alberta Research Council (Geology Div.):  
Measurement of subsurface fractures using Schlumberge 4-Arm Dipmeter logs, 1973-78.
1383. CHARLESWORTH, H.A.K., KILBY, W.E., Univ. Alberta (Geology):  
Structural geology of coal measures and adjacent strata, Mountain Park, Alberta, 1976-78; M.Sc. thesis (Kilby).
- Data from 1000 outcrops and 500 boreholes in a 40 square-mile area centred on Mountain Park, Alberta are being used to define as precisely as possible the macroscopic and mesoscopic structure of the Nikanassin, Cadomin, Luscar, Mountain Park, Blackstone and Cardium Formations. Computer-based techniques are being used to construct structure-contour maps, overburden thicknesses, analyses the folding.
1384. CLOYD, D.S., MOUNTJOY, E.W., HYNES, A., McGill Univ. (Geological Sciences):  
Structure and stratigraphy of Miette Group within anticlinoria near Jasper, Alberta, 1976-78, M.Sc. thesis.
- To map the structure within the anticlinoria in an attempt to more accurately locate the position of major thrust faults within the Miette Group west of Jasper, and to determine the sequence of structural events within minor scale structures.

1385. DAS GUPTA, U., CURRIE, J.B., Univ. Toronto (Geology):  
A study of fractured reservoir rocks, with special reference to Mississippian carbonate rocks of southwest Alberta, 1973-77; Ph.D. thesis (Das Gupta).
- Fracture porosity in carbonate reservoir rocks is responsible for productivity of oil and gas in some major fields, e.g. the Asmari limestone fields of Iran, or the Danian chalk of the Ekofisk field in the North Sea. Yet no extensive and continuing investigation has been undertaken to understand the origin of fracture porosity in carbonate rocks. Essential to this understanding is detailed observation of relationships among fracture incidence, lithology, diagenetic processes and structural history. The Mississippian Turner Valley Formation comprises a reservoir rock that is fractured in several fields within the Foothills gas province of Alberta. Field and laboratory studies have been carried out on surface and subsurface rocks of the Turner Valley Formation. Results of the study delineate significant geological conditions that control development of natural fracture systems in carbonate strata, e.g. original composition of a carbonate facies, its history of diagenesis and the pattern of structural uplift and unloading experienced by carbonate strata.

1386. MOUNTJOY, E.W., McGill Univ. (Geological Sciences):  
Structure of Rocky Mountains between 52 and 54 degrees, 1965.
- Continuation of Bow-Athabasca project jointly with R.A. Price, Queen's Univ. Maps of Medicine Lake



83C/13E and W completed (on open file with GSC); compiling Jasper 83D/16 and Amethyst Lakes 83D/9 map sheets 1:50 000 scale.

1387. SPANG, J.H., Univ. Calgary (Geology):  
Mechanical behavior of the thrust plates in the Foothills and Front Ranges of the Canadian Rocky Mountains, 1971-79.

**See:**

Use of calcite twin lamellae to infer differential stress; Bull. Geol. Soc. Am., v. 87, p. 868-872, 1976.

**BRITISH COLUMBIA**

1388. CAMPBELL, R.B., Geol. Surv. Can.:  
Geology of the Cariboo Mountains, British Columbia, 1968-.

1389. DANNER, W.R., Univ. British Columbia (Geological Sciences):

Plate tectonics and the Upper Paleozoic of southern British Columbia, 1976.

Studies indicate that the western and central cordilleran regions of British Columbia consist of separate plates or island arcs which originated in the Pacific basin and collided with North America by Jruassic time. The Cache Creek Group (restricted sense) is a Tethyan belt which probably originated in the equatorial pacific. The Sicker Group is a much cooler environment and has close ties with Australia and Timor and originated in the Southern Hemisphere. Great sequences of bedded radiolarian chert are present in the Permian of the Cache Creek Group and are biogenic in origin and in part of shallow water environment.

1390. EISBACHER, G.H., Geol. Surv. Can.:  
Successor basins of the western Cordillera, 1975.

**See:**

Sedimentology of the Dezadeash flysch and its implications for strike-slip faulting along the Denali-Fault, Yukon Territory and Alaska; Can. J. Earth Sci., v. 13, no. 11, p. 1495-1513, 1976.

1391. GRETTE, J.F., ARMSTRONG, R.L., Univ. British Columbia (Geological Sciences):  
Cache Creek and Nicola Groups near Ashcroft, British Columbia, 1975-77; M.Sc. thesis (Grette).

Mapping, Petrography, Geochronology, Micropaled completed. Report in final preparation.

1392. OLLERENSHAW, N.C., Geol. Surv. Can.:  
Structural analysis of the Fernie Basin, British Columbia, 1975.

**See:**

Canadian government Coal Block, Parcel 73, Fernie Basin, British Columbia; Geol. Surv. Can., Paper 77-1A, p. 155-159, 1977.

**MANITOBA**

1393. STOETERAU, W., BRISBIN, W.C., Univ. Manitoba (Earth Sciences):

A structural synthesis of the Manibridge-Clarke Lake map area, Manitoba, 1975-77, M.Sc. thesis (Stoeterau).

To document the geometry of the structures within the gneissic and plutonic rocks of the Clarke Lake map area, and to interpret the style and mechanics of each of the deformational events; to relate this deformational history to the metamorphic and plutonic history and to the emplacement of the Nickeliferous ultramafic rocks of the Manibridge mine.

1394. THOMAS, M.W., BRISBIN, W.C., Univ. Manitoba Nickel (Earth Sciences):

The deformational history of Sickle Group meta-sedimentary rocks in the Laurie Lake area, Manitoba, 1976-77; M.Sc. thesis (Thomas).

**NEWFOUNDLAND/LABRADOR**

1395. BERGER, A.R., JAYASINGHE, N.R., Memorial Univ. (Geology):

Geology fo Northeast Gander Zone, 1976-78; Ph.D. thesis (Jayasinghe).

A detailed study of granitic and metamorphic rocks of the Northeast Gander Zone (NW Bonavista Bay) with emphasis on structure, petrology, geochemistry and geochronology.

**See:**

On the plutonic evolution of the Wesleyville area, Bonavista Bay, Newfoundland; Can. J. Earth Sci., v. 13, no. 11, p. 1560-1570, 1976.

1396. KENNEDY, M.J., CHORLTON, L.B., Brock Univ. (Geological Sciences); Memorial Univ. (Geology):

Structural development of the axial zone of the Newfoundland Appalachians, 1976-78; Ph.D. thesis (Chorlton).

**See:**

Southeastern margin of the northeastern Appalachians; late precambrian orogeny on a continental margin; Bull. Geol. Soc. Am., v. 87, p. 1317-1325, 1976.

Although the margins of the central Mobile Belt of Newfoundland have been the subject of several structural studies over the last few years little is known of the structural development of the central part of this region. Since this region contains the site of the lapetus suture its structural development has direct bearing on plate tectonic interpretations of the development of the Appalachian System.

1397. WILLIAMS, H., Memorial University (Geology):  
Structural-stratigraphic divisions of entire Appalachians. A new Appalachian tectonic map, 1976-79.

1398. WILLIAMS, H., HIBBARD, J.P., Memorial Univ. (Geology):

Geologic setting of asbestos-bearing ultramafic rocks along the Baie Verte Lineament, Newfoundland, 1976-78.

1399. WILLIAMS, H., HIBBARD, J.P., Memorial Univ. (Geology):

The Baie Verte-Brompton Line. A major structural feature of the Northern Appalachian and World's richest asbestos belt, 1976-79.

**See:**

Geological setting of asbestos-bearing ultramafic rocks along the Baie Verte Lineament, Newfoundland, Geol. Surv. Can., Paper 77-1A, p. 351-360, 1977.

**NORTHWEST TERRITORIES**

1400. BALKWILL, H.R., Geol. Surv. Can.:  
Structure and stratigraphy, Ringnes Island and nearby smaller islands, 1971-.

1401. DYKE, L.D., Geol. Surv. Can.:  
Comparative study of Campbell, Barn, White and Romanzof uplifts, 1973-.

1402. EADE, K., Geol. Surv. Can.:  
Structural and stratigraphic study of the Precambrian rocks of southwestern Keewatin, Northwest Territories, 1968-.

1403. OKULITCH, A.V., Geol. Surv. Can.:  
Geology of the Penrhyn Fold Belt, Melville Peninsula, District of Franklin, 1976 -.

**See:**

Geology of the Barron River map-area, Melville Peninsula, District of Franklin; Geol. Surv. Can., Paper 77-1A, p. 213-215, 1977.

1404. PUGH, D.C., Geol. Surv. Can.:  
Northern basin analysis program: Peel River map-area, 1971-.

1405. WILLIAMS, G.K., Geol. Surv. Can.:  
Northern basin analysis program: Redstone River map-area, District of Mackenzie, 1971-.

**See:**

Devonian coal in the subsurface of Great Slave Plain: a guide to exploration for oil and gas; Geol. Surv. Can., Paper 77-1A, p. 147-150, 1977.

1406. WILLIAMS, G.K., Geol. Surv. Can.:  
Northern basin analysis program: Great Bear River map-area (Mesozoic), District of Mackenzie, 1971-.

1407. WILLIAMS, G.K., Geol. Surv. Can.:  
Northern basin analysis program: Slave River map-area, District of Mackenzie, 1971-.

**See:**

The Hay River Formation and its relationship to adjacent formations, Slave River map-area, N.W.T., Geol. Surv. Can., Paper 75-12, 1977.

1408. YOUNG, F.G., Geol. Surv. Can.:  
Northern basin analyses program: Firth River and Horton River map-areas, 1971-.

**See:**

Lithostratigraphy and Dinoflagellate cyst succession in the Gulf Mobil Parsons N-10 well, District of Mackenzie; Geol. Surv. Can., Paper 76-1B, p. 235-249, 1976.

Geochemical properties of Cretaceous rocks and their use as a correlation tool, Mackenzie Delta and Yukon coastal plain areas; Geol. Surv. Can., *ibid.*, p. 311-314, 1976.

**NOVA SCOTIA**

1409. GRAVES, M.C., ZENTILLI, M., Dalhousie Univ. (Geology):

Tectonic and Metallogenetic history of Nova Scotia between the Acadian orogeny and the opening of the central North Atlantic Ocean, 1975-78; Ph.D. thesis (Graves).

Earthquakes are useful tools in interpreting the dynamics of the earth's crust of today. Earthquakes are manifestations of brittle failure within the earth's crust. Study of brittle failure in the laboratory and the field over the last fifty years has shown the importance of pore fluids in the formation and orientations of cracks during failure. Pore fluid theory has proved useful in interpreting earthquakes and their precursors. If pore fluids can fill cracks resulting from an earthquake or its precursor and if that fluid solidifies or precipitates a filling, those cracks may

be preserved and the orientations will reflect the stress field which caused the failure. Dating potassium-bearing minerals; sulphide, oxide, silicate and fluid inclusion studies; paleomagnetic analysis and careful field measurements of the fillings can allow a history of stress/strain conditions to be estimated. This approach is being attempted with basic dykes and quartz-carbonate-sulphide veins in Nova Scotia.

1410. KEPPIE, J.G., SMITH, P.K., Nova Scotia Dep. Mines:  
Structural and metamorphic studies, 1974-.

**See:**

Structural model for the Saddle Reef and Associated Gold Veins in the Meguma Group, Nova Scotia; Nova Scotia Dep. Mines, Paper 76-1, 1977.

1411. STEVENS, G.R., Acadia Univ. (Geology):  
Primary crystallization structures as control of cooling and fabric development in Triassic basalts, Bay of Fundy, Nova Scotia, 1975-77.

Development of polygonal cell structures ('honeycomb'), nodular structure, and columnar jointing in congealing basalts provides regular planar networks for outward migration of vapor and heat. These in turn result in hydrothermal alteration and silicification of basalt in concentric polygonal zones adjacent to the planar surfaces, chilled selvages, and textural differences in and within these zones. Columnar jointing forms as contraction takes advantage of a regular pre-existing microfracture network, generated by shearing forces in the flowing viscous mass. Polygonal cells, which mimic angular pillows, are formed by interference of dilating congealment spheres which grow about randomly distributed centers in a static cooling mass. As distribution of such centers approaches close-packing regularity, the resultant polygonal cells approach dodecahedral shape. These relationships have been demonstrated both in the field and by computer modelling, and physical modelling. Differential weathering of hydrothermally altered zones between congealment spheres, produces nodular (botryoidal) structure.

1412. TRAPASSO, L.S., STEVENS, G.R., Acadia Univ. (Geology):

Tectonic and metamorphic history of the Torbrook syncline, Nova Scotia, 1977-78; M.Sc. thesis (Trapasso).

Lower to Mid-Paleozoic sedimentary rocks in western Nova Scotia have been deformed at least twice, subjected to low grade metamorphism, and have been intruded by Devonian granitic magmas. (Taconic and Acadian imprints are not yet clearly discriminated.) Project will undertake detailed studies of structural elements (cleavages, lineations, fabric, joints), analyse them, and relate to metamorphism, intrusion, and tectonic events. Rocks in study area occupy well-mapped, tightly folded syncline cut by basic dikes, and truncated by intrusive granite. Cordierite in spotted hornfels suggests either post-granitic deformation or cleavage-controlled growth during intrusion. Preliminary study indicates possibility that younger strata were folded on different axes from older, and existence of cross folds affecting all units.

## ONTARIO

1413. BROWN, B., BRISBIN, N.C., Univ. Manitoba (Earth Sciences):  
Deformational history of the eastern Lake of The Woods greenstone belt, Ontario, 1974-77; Ph.D. thesis (Brown).  
The determination of the deformational style and sequence of layered sequence caught between diapiric granitic intrusions
1414. DALES, G.R., SCOTT, S.D., SCHWERDTNER, W.M., Univ. Toronto (Geology):  
Deformational and metamorphism of massive sulfide orebodies, 1976-78.  
The orientation of a stress field about a deformed orebody requires careful measurement of strain indicators in the sulfide ore and surrounding country rocks. At the South Bay mine, a volcanogenic Cu-Zn-Ag massive sulfide deposit in NW Ontario, such a study has revealed a relatively uncomplicated deformation involving cylindrical folding and is consistent with features in both the ore and wall rocks. Subsequent studies at the South Bay mine will focus on the rheological and chemical behaviour of the sulfide ores with a view to estimating the magnitude of stress during tectonism. Dales is extending such investigations to the small sulfide ore lenses of the Benny greenstone belt, north of Sudbury.
1415. FYSON, W.K., BAER, A.J., CULSHAW, N., Univ. Ottawa (Geology):  
Evaluation of Cheddar and Cardiff gneiss domes, Grenville Province, Ontario, 1976-77; M.Sc. thesis (Culshaw).  
The "domes" are completely folded structures that developed rather late in the history of the region.
1416. GOODWIN, A.M. WEST, G.F., Univ. Toronto (Geology, Geophysics):  
Superc Geotraverse project, 1972-78.  
Focus of research is a 300 mile long corridor of Archean crust in western Superior Province of the Canadian Shield. The corridor is selected such that all major problems posed by early Precambrian crust are represented including 1) the nature and origin of the macro-belt pattern featuring alternating volcanic-rich greenstone belts and metasedimentary-rich gneiss belts; 2) their relative ages and tectonic settings; 3) origin of sialic material present in the gneiss belts on the one hand and in large interior granite batholiths of the greenstone belts on the other; 4) the relationship of the crust at depth beneath the several east-trending micro-belts; and, all the proceeding in relationship to 5) the tectonic history of the crust from inception prior to 3850 m.y. (Minnesota River Valley) to 2560 m.y. (age of youngest Kenoran pegmatite intrusion). Field and laboratory studies are now in their fifth year.
1417. MORGAN, J., SCHWERDTNER, W.M., Univ. Toronto (Geology):  
Structural evolution of Finlayson Lake greenstone belt, 1976-79; M.Sc. thesis (Morgan).
1418. SCHWERDTNER, W.M., BAU, A.F.S., STOTT, G., CURRIE, J.B., ROBIN, P.Y., Univ. Toronto (Geology):  
Deformation of Quetico and Shebandowan Belts – Superior Geotraverse Region, 1972-80.  
The central Quetico Superbelt can be subdivided into three zones: 1) a northern sedimentary zone, 2) a southern sedimentary zone, and 3) a central migmatitic zone. The northern and southern zone grade into the central zone in terms of a general increase in the abundance of granitic rocks. In most places, the contact between the northern Wabigoon Superbelt and the Quetico Superbelt is marked by a structural discontinuity – the Quetico Fault. Locally, this contact is gradational in a lithologic sense. The contact between the Quetico Superbelt and the Shebandowan Superbelt to the south proves to be gradational. A portion of this contact was presumed by earlier workers to be marked by a fault (Postans Fault). Top directions observed along this boundary indicate that sedimentary rocks of the Quetico Superbelt are younger than the volcanic rocks of Shebandowan Superbelt. Tentative interpretation of structural and metamorphic relations suggest that the whole area has been subjected to a continuous northwest-southeast compression. A broad synclinorium developed in which the Quetico sedimentary rocks lies above the volcanic and/or granitic basement rocks. At the hinge area of this major downwarp, P-T conditions reached those of amphibolite grade, and partial melting generated granitic magma which caused subsequent widespread migmatization within the central zone of the Quetico Superbelt. Continuing compression in northwest-southeast direction later formed the Quetico Fault and its associated cataclastic rocks. The fault is interpreted as having a right-lateral strike slip.
1419. SCHWERDTNER, W.M., MASON, D., Univ. Toronto (Geology):  
Internal structure and lithology of Irene-Eltrut Lakes granitic complex, northwestern Ontario, 1975-79.  
This major granitic complex is a broad area of gneissic trondhjemite-granodiorite, which includes isolated or semi-isolated plutons consisting predominantly of massive granitic phases. The massive plutonic rocks are invariably younger than the gneissic trondhjemite-granodiorite, and in fact, there are few areas in which the older-suite rocks have not been invaded by minor dykes and small bodies of younger massive "granite". The foliation and/or lineation of the oldest rocks is generally defined by stretched mafic clots and quartz aggregates. Extreme deformation renders a mafic lamination, which locally grades into a prominent gneissosity. Minor folds are commonly found in the gneissic varieties of the trondhjemite-granodiorite suite. It appears that the gneisses are either derived from greenstone or represent strained magmatic rocks. The central part of the granitic complex is occupied by the White Otter Pluton, an oval body of massive quartz monzonite and minor granodiorite. The pluton has dimensions of a batholith, being >35 miles long and about 20 miles wide in map view. There is no compelling evidence that the enveloping gneisses are part of an extensive pre-greenstone basement. Trace element and other geochemical studies will be undertaken in 1977-78 to ascertain the origin of the gneisses.
1420. SCHWERDTNER, W.M., STONE, D., BAU, A.F.S., GRUNSKY, E., THEMISTOCLEOUS, S., ROBIN, R.Y., CURRIE, J.B., Univ. Toronto (Geology):  
Strain distribution in mylonitic zones, 1972-79; Ph.D. theses (Stone, Bau), M.Sc. theses (Grunsky, Themistocleous).  
Bau is concerned with a segment of the Quetico Fault in northwestern Ontario (Superior Geotraverse Region). The other graduate students are investigating the kinematic significance of 3

mylonitic zones in the Canadian Shield. More specifically, their research is directed toward the problem of whether mylonitic zones are due to compressive strain (tectonic flattening), simple shearing or a combination of both. Each thesis attempts to solve the problem on a different scale. Stone is conducting a large-scale regional study, analysing the structure of the Sidney Lake Fault System (boundary between Uchi and English River belts), Themistocleous is operating on the scale of a few miles, and has picked a well defined fault within the Grenville Front tectonic zone, near Temagami, Ontario. Grunsky expects to find the solution to the problem of a specimen scale, by rigorous study of the porphyroclastic fabric in samples from the Birch Rapids – Wapusko Bay fault zone, La Ronge Belt, Saskatchewan. Our preliminary results indicate that the "tectonic flattening" is not responsible for mylonitic zones, but that shearing plays a major role in their development.

## QUÉBEC

1421. BAER, A.J., Univ. Ottawa (Geology):  
Textures in the Lac St. Jean anorthosite, Québec, 1974.  
Comparative study of textures to recognize effects of the Grenvillian thermo-tectonic event.
1422. BAER, A.J., BISSONNETTE, R., Univ. Ottawa (Geology):  
Structure and petrology of the Borgia anorthosite (La Tugue, Québec), 1973-77; M.Sc. thesis (Bissonnette).  
The meta-anorthosite has been folded during the Grenvillian event, but the central part has been extended, drapir-like, probably during the same event.
1423. GOULET, N., PRICE, R.A., Queen's Univ. (Geological Sciences):  
Relations structurales, stratigraphiques et sédimentologiques des roches sédimentaires et volcano-sédimentaires situées au sud de Rouyn-Noranda, Québec, 1971-77; thèse de doctorate (Goulet).
1424. HUBERT, C., BÉLAND, J., LAJOIE, J., MAMET, B., LESPÉRANCE, P., DUCHARMÉ, D., THÉBERGE, R., Univ. Montréal (Géologie):  
Analyse stratigraphique intégrée des roches ordoviciennes et siluriennes de la ceinture d'Aroostook-Matapédia dans la Gaspésie, Appalaches du Québec, 1977-80; M.Sc. theses (Ducharme, Théberge).  
Plusieurs reconnaissances effectuées dans le secteur méridional de la Gaspésie au cours des étés de 1975 et 76 nous permettent de supposer que les roches ordoviciennes et, possiblement d'autres plus vieilles dans cette structure, appartiennent de fait à un contexte tectonique similaire à celui que nous avons identifié (cf. St-Julien et Hubert, 1975) dans les terrains des Basses-Terres du St-Laurent et la zone limitrophe appalachienne au SE de Montréal, à savoir une zone imbriguée dans du flysch ordovicien, laquelle est suivie plus au S d'une série de nappes mises en place par gravité. L'identification de tels éléments tectoniques dans la ceinture d'Aroostook-Matapédia remet en question toutes nos connaissances structurales et stratigraphiques sur les roches de ce vaste segment des Appalaches. Le but de notre étude est d'analyser et de déterminer les diverses unités

lithologiques et tectoniques dans le secteur des vallées de la Matapédia et de la Restigouche afin de pouvoir schématiser le style structural des roches, d'établir pour chaque unité lithologique reconnue une colonne stratigraphique et de définir les relations structurales et stratigraphiques entre ces unités.

1425. HYNES, A.J. McGill Univ. (Geological Sciences):  
Structural metamorphic studies in the Churchill Province east of the Labrador Trough, 1976-77.  
Studies northeast of the northern Labrador Trough, west of Fort Chimo in northern New Quebec have revealed the existence of large scale recumbent folds in the Aphebian metasediments of the eastern Labrador Trough. The development of recumbent folds is believed to be related to the large domal bodies of granitoid rock reported further east. It is probable that the folds formed in sediments that once overlay these granitoid rocks, which are interpreted as basement to the Aphebian succession. In view of the structural style observed it is probable that basement throughout much of the eastern trough region is separated from its cover by a décollement developed during recumbent folding.
1426. HYNES, A.J., McGill Univ. (Geological Sciences):  
Petrological study of rift-related volcanic rocks in southeastern Québec, 1976-79.  
A reconnaissance study of this project has already been undertaken. Several volcanic formations in southeastern Quebec have been examined in the field and sampled and some have been examined petrographically. The bulk of the project, including further field study, is however still to be done. The project involves a detailed petrological and petrochemical study of the Cambrian rift-related volcanic formations of southeastern Quebec, incorporating major element, trace element and rare-earth-element analyses. The intention is to characterise, where possible, both the magmatic and tectonic affinities of the sequences. Major and trace element analyses will be carried out using McGill's X-ray fluorescence and atomic absorption facilities. Rare earth-element analyses will be carried out at another university where facilities are available, probably the University of Toronto. Many Cambrian volcanic rocks in southeastern Quebec have been interpreted as rift-related on the basis of their field relationships. They are inferred to have formed when the Paleozoic Atlantic ocean opened. A detailed study of these rocks is intended to confirm the interpretation and to provide information about the early stages of opening of the basin.
1427. MARTIGNOLE, J.G., Univ. Montréal (Géologie):  
Recherche pétrologiques et structurales dans le sud de la provinces tectonique de Grenville, Québec, 1965-.

## YUKON TERRITORY

1428. COOK, D.G., Geol. Surv. Can.:  
Structural studies in the Mackenzie Arc, Franklin Mountains and Colville Hill, Yukon, 1975.  
See:  
Two stages of faulting, Virginia Falls map-area, District of Mackenzie; Geol. Surv. Can., Paper 77-1A, p. 113-115, 1977.

1429. NORRIS, D.K., Geol. Surv. Can.:  
Structural geology of northern Yukon Territory and northwestern District of Mackenzie, 1969-.
1430. TEMPELMAN-KLUIT, D., Geol. Surv. Can.:  
Stratigraphy, structure and metallogeny of Pelly Mountains, and Yukon Plateau, Yukon Territory, 1973-.
- See:  
Stratigraphic and structural studies in the Pelly Mountains, Yukon Territory; Geol. Surv. Can., Paper 76-1B, p. 1-5, 1976.  
Stratigraphic and structural relations between the Selwyn Basin, Pelly-Cassiar platform and Yukon crystalline terrane in the Pelly Mountains, Yukon; Geol. Surv. Can., Paper 77-1A, p. 223-227, 1977.
- GENERAL**
1431. FALCONER, R.K.H., Geol. Surv. Can.:  
Study of the structures and origin of Baffin Bay, 1976-.
- See:  
An oil slick occurrence off Baffin Island; Geol. Surv. Can., Paper 77-1A, p. 523-524, 1977.  
Paleomagnetic results on Early Tertiary lava flows from West Greenland and their bearing on the evolution history of the Baffin Bay-Labrador Sea region; Can. J. Earth Sci., v. 13, no. 10, p. 1491-1493, 1976.
1432. FYFE, W.S., Univ. Western Ontario (Geology):  
Chemical-tectonic evolution of the crust, 1972-.
1433. FYFE, W.S., NAWAB, Z.A., Univ. Western Ontario (Geology):  
Nature of the Al-Amar fault or suture, 1974-78; Ph.D. thesis (Nawab).
1434. GOODWIN, A.M., Univ. Toronto (Geology):  
Nature and origin of Archean crust, 1969-80.
- See:  
Volcanic rocks of the Blake River Group, Abitibi greenstone belt, Ontario and their sulfur content; Can. J. Earth Sci., vol. 14, no. 4, pt. 1, p. 539-550, 1977.  
Field and laboratory investigation of the chemical nature, tectonic setting and origin of the several main components of Archean crust, mainly in the Canadian Shield. Volcanic greenstone belts comprise numerous lensoid partly coalescing volcanic piles each displaying mafic to felsic compositional progressions with stratigraphic height. Distribution patterns indicate alignment of source magma chambers with respect to margins and interiors of large basin structures common to Archean crust. Volcanic belts themselves are interspersed with predominant granite gneiss terrains composed of generally older gneissic complexes together with younger metaphytonites. Complex age relationships have been established. Generally the gneissic terrain is older than adjoining volcanic belts but whether the volcanics accumulated upon the gneiss or within intragneiss extensional troughs and basins i.e. upon oceanic type crust, is under investigation with the aid of neutron activation techniques.
1435. GOODWIN, A.M., Univ. Toronto (Geology):  
Distribution and tectonic setting of global Precambrian crust, 1976-79.  
Global patterns of Precambrian crust of successive ages spell out changing tectonic environments. Early Precambrian time featured maximum crustal instability involving vertical and probably horizontal motions. Middle Precambrian time featured alterations in pattern with a predominance of apparent crustal stability broken by periodic rifting and limited horizontal motions. Late Precambrian - early Phanerozoic time again displays evidence of crustal stability with increasing crustal agitation culminating in Paleozoic "plate motions".
1436. HADA, S., Geol. Surv. Can.:  
Construction of structural and restored sections across the Canadian Appalachian Region, 1976-.
1437. HARRIS, I.M., Geol. Surv. Can.:  
Structural and stratigraphic synthesis of the Phanerozoic rocks of Eastern Canada, 1973-.
1438. HAYNES, S.J., Brock Univ. (Geology):  
Plate tectonics and metallogeny, Southern Iran, 1976-77.  
To relate the type and position of the mineral deposits to the plate tectonic model earlier proposed for the fars sector of southern Iran.
1439. KING, L.H., Geol. Surv. Can.:  
Regional bedrock geology, Grand Banks, 1973-80.
- See:  
Application of the Hunttec deep tow high-resolution seismic system to surficial and bedrock studies - Grand Banks of Newfoundland; Geol. Surv. Can., Paper 76-1C, p. 5-7, 1976.  
Relict iceberg furrows on the Laurentian Channel and western Grand Banks; Can. J. Earth Sci., v. 13, no. 8, p. 1082-1092, 1976.
1440. LAMBERT, R.St.J., McKERROW, W.S., PHILLIPS, W.E.A. Univ. Alberta (Geology):  
Caledonian geotectonics of Ireland and Scotland, 1973-79.
1441. MacDONALD, A.S., BARR, S.M., Acadia Univ. (Geology):  
Age and evolution of crystalline basement complex, Thailand, 1975-78.  
To define the nature of the contact between crystalline basement and overlying metamorphosed cover rocks of Cambro-Ordovician age in order to provide an upper age limit for the basement, and to attempt alternative age-dating techniques to directly date thermal events affecting the basement. Reconnaissance mapping of this terrain in the Hod-Mae Chaem districts of northern Thailand has been partially completed. Preliminary results indicate that the basement rocks record a high-grade regional metamorphic event and associated east-west structures which are not observed in the variably metamorphosed and polyphase deformed cover rocks. Comparative petrology of basement rocks and metamorphosed cover rocks is in progress. Fission track dating of accessory minerals from migmatites and pegmatites will be attempted.
1442. NARR, W.M., CURRIE, J.B., Univ. Toronto (Geology):  
The origin of fractures in Tertiary strata of the Unita Basin, Utah, 1976-77; M.Sc. thesis (Narr).  
Since 1970 a major oil reservoir has been developed by several companies in Tertiary Green River

strata of the Unita Basin. Production is entirely due to the existence of fracture porosity and permeability at depths between 11 000 feet and 15 000 feet. Geological conditions associated with the occurrence of this unusual and significant system of fractures are being investigated by study of joint systems observed at outcrops, by study of fractures in core from wells and by investigation of physical properties of both surface and subsurface rocks.

1443. ROBIN, P.-Y.F., SMITH, J., BAU, A.F.S., GRUNSKY, E., SCHWERDTNER, W.M., Univ. Toronto (Erindale Geology):

Strain and fabric analysis in gneissic and mylonitic rocks, 1976-78.

Four projects related to the study of strain in gneissic and mylonitic rocks of the Precambrian shield: 1. Methods of objective paleostain determination in rocks, using (i) randomly oriented strain markers of variable shape, and (ii) the "center point" method (Robin); 2. relationships between fault attitude, slip vector and fabric symmetry in mylonite zones (Robin, Bau); 3. a comparative petrographic study of the fabric and of the deformation mechanisms in two sheared peridotites from the Québec ophiolite belt (Thetford Mines, Mont Albert); strain rate/temperature determination as inferred from operative glide systems and amount of recrystallization in olivine and pyroxene (Smith, Robin); and 4. computer analysis of shapes and orientations of feldspar porphyroclasts in an Archean mylonite, inferences on the orienting strain (Grunsky, Robin, Schwerdtner).

1444. STARKEY, J., ALLISON, I., WHITE, J.C., Univ. Western Ontario (Geology):

The petrofabric analysis of deformed rocks by X-ray diffraction and optical methods. An analysis of the statistical basis of such analyses. The determination of the structures of deformed crystals, 1974-77; Ph.D. theses (White).

**See :**

The contouring of orientation data represented in spherical projection; Can. J. Earth Sci., v. 14, p. 268-277, 1977.

A search for the piezoelectric effect in quartz bearing rocks; Tectonophysics, 1977.

Methods for the analysis of three dimensional orientation data have been refined and applied to patterns of preferred crystallographic orientations in deformed rocks determined by optical and x-ray diffraction techniques. These analyses are being applied to rocks of known tectonic history in an attempt to define empirically the deformation mechanisms operative in minerals deformed under natural conditions. These data are to be compared with deformation maps derived theoretically by application of the techniques of material science. At the same time chemical changes which accompany the deformation are being investigated.

1445. STEINER, J., Univ. Alberta (Geology):

Seafloor spreading and subduction rates and our expanding earth, 1975-78.

Measurements of areas of seafloor broken up into age groups show that apparent areal global seafloor spreading rates increase exponentially from

Jurassic to Holocene time proving that subduction has taken place since that time. The seafloor spreading phenomenon is a co-ordinated global process where, at a given time, high spreading rates in one ocean basin are compensated for by low rates in another. Seafloor spreading is symmetric within 15% over periods of 60 to 165 m.y. This study shows that both global seafloor spreading and subduction rates have increased with the passage of time. It is estimated that during the past 165 m.y. seafloor spreading exceeded subduction by 33%. This is interpreted as an increase of the earth's surface area by expansion which yields a Jurassic paleoradius of  $5668 \text{ Km} \pm 13\%$  ( $0.89$  of the present radius). In spite of the high error margin which is due to global extrapolation of subduction and spreading in the time dimension, an expanding earth is strongly indicated.

1446. STEVENS, G.R., Acadia Univ. (Geology):

Optical linears as cause of layered structure of Mt. Hadley, Apollo 15 site, Moon, 1976-77.

Prominent lineated surface of Mt. Hadley, Apollo 15 landing site on Moon commonly explained as indicating layered internal structure. In fact two, not one linear directions are apparent, whose  $36^\circ$  dihedral angle is bisected by local sun-line. Such paired linears are not relief features, but are optically generated on any particulate surface illuminated by point source of light at glancing incidence angle. Verification provided by change of lineation angle with time, sun-angle, and glancing angle, and by experimental model duplication. These features also common to sand dunes and snow fields on earth. Recognition of this feature shows Mt. Hadley to be largely mantled with particulate blanket over a coarsely textured bedrock substrate. True bedrock structure can be made apparent by optical filtering of the Fourier transform diffraction spectrum of the original photographic transparency. Residual structure after filtering probably an irregular, nearly vertical splintery fracture system.

1447. VAN DER LINDEN, W.J.M., Geol. Surv. Can.:

Continental margin of Senegal, 1976-. Evolution of passive continental margins and of the world's rift system 1976-.

To complete literature study, comparing Labrador Sea margin southwest-Pacific-Arctic Archipelago-Red Sea-Rhine graben-North Sea rift systems.

1448. WILSON, J.T., Univ. Toronto (Geology):

Global plate tectonics, 1965-.

**See:**

Hot Spots on the Earth's Surface; Scientific American, v. 235, p. 46-57, 1976.

Continents Adrift and Continents Aground; W.H. Freeman and Co. San Francisco, U.S.A., 1976.

1449. AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Favourable Lake volcanic complex, Ontario, 1965.  
Within a 7.5 km thick sequence, 5 volcanic cycles have been recognized, each of which represents a separate volcano superimposed on older volcanoes. Most cycles grade upward from a subaqueous tholeiitic basalt to a subaerial calc-alkaline dacite. Alkalic rocks are locally present in the uppermost cycle. The lowermost cycle represents a subaerial andesitic to dacitic stratovolcano, the base of which has been destroyed by emplacement of granitic plutons. The four uppermost cycles represent smaller volcanoes superimposed on the northern flank of the stratovolcano, and progressively displaced northward. A major unconformity marks the top of the fourth cycle. Studies are in progress on the entire complex and on specific aspects.
1450. AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Alteration of basalt, 1972.  
Geochemical and petrologic studies are in progress on several types of alteration affecting basalt flows: 1) extensive fumarolic alteration, in part associated with chert deposition; and 2) less extensive sea-floor alteration. The project is confined to Archean greenstone belts where subsequent metamorphism has modified the alteration assemblage.
1451. BEVIER, M.L., ARMSTRONG, R.L., Univ. British Columbia (Geological Sciences):  
Late Tertiary volcanism in the Rainbow Range, west-central British Columbia, 1976-77; M.Sc. thesis (Bevier).  
Mapping is completed. Major and trace element geochemistry, K-Ar dating, Sr isotopes, and microprobe analyses are in progress. The Rainbow Range is a large (~800 sq. km.) alkaline shield volcano. A generalized stratigraphic section consists of trachyte flows, a series of trachybasalt flows and another section of trachyte flows. Alkali olivine basalts occur as capping flows and related feeder dikes. The Rainbow Range Shield lies within an east-west trending belt of Cenozoic alkaline volcanic centers. This volcanism is thought to be related to deep fractures formed along the northern edge of the subducting Juan de Fuca plate.
1452. CAR, D.P., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Facies analysis of adacitic, volcanoclastic sequence, northwestern Lake of the Woods, Ontario, 1975-77; M.Sc. thesis (Car).  
A 3 km thick, homoclinal largely volcanoclastic felsic to intermediate sequence is being examined in the western Peninsula Region. The sequence comprises heterolithic breccias, oligomictic volcanic conglomerate, tuff, volcanic sandstone, and greywacke. The simultaneous interaction of volcanic and alluvial processes has resulted in a clastic sequence with a high degree of internal complexity. A major emphasis of the project is location of vent or near-vent areas from facies relations in vent-derived breccias.
1453. DIMROTH, E., LICHTBLAU, A., RUEST, A., Univ. du Québec à Chicoutimi:  
Volcanologie et sédimentologie d'une zone volcano-sédimentaire archéenne, 1972-82.  
**See:**  
Physical volcanology and sedimentology of the Abitibi Greenstone Belt, Québec; Geol. Surv. Can., Paper 76-1B, p. 107-111, 1976.  
Flow direction of Archean basalts determined from imbricated pillow breccias; N. Jb. Mineral. Monatsh, p. 97-109, 1976.  
Archean subaqueous autoclastic volcanic rocks, Rouyn-Noranda area, Quebec: Classification, diagnosis and interpretation; Geol. Surv. Can., Paper 77-1A, p. 513-522, 1977.
1454. HARGREAVES, R., AYRES, L.D., Univ. Manitoba (Earth Sciences):  
Morphology and geochemistry of basalt flows, Utik Lake, Manitoba, 1975-77; M.Sc. thesis (Hargreaves).  
A 900 m thick sequence of aphyric to microporphyrific, pillowed massive and brecciated metabasalt flows is being examined. Many of the pillows have irregular shapes and some appear to be the submarine equivalent of Pahoehoe toes. Massive and pillowed flow units ranging in thickness from 3-35 m are intimately interlayered, and a major focus of the study is determining what constitutes a single flow. Geochemical work is in progress to determine the internal variation within flows, the effect of sea water alteration, and the interflow variation.
1455. NIXON, G.T., ARMSTRONG, R.L., LUIS DEL CASTILLO., Univ. British Columbia (Geological Sciences):  
Petrology of Volcan Iztaccihuatl, central Mexico, 1974-78; Ph.D. thesis (Nixon).  
Mapping is virtually completed. Another short (4 weeks) field season is planned in Oct.-Nov. 1977. K/Ar dating and geochemistry of the rocks is presently underway.
1456. THURSTON, P.C., HODDER, R.W., Univ. Western Ontario (Geology), Ontario Division Mines:  
Cyclical volcanism in the Uchi-Confederation Lakes area, northwestern Ontario, 1976-78.  
**See:**  
Confederation Lakes Synoptic Project; Ontario Division of Mines, Misc. Paper 67, p. 8-11, 1976.  
Cyclical volcanism in the Uchi-Confederation Lakes area consists of three mafic to felsic cycles. They will be examined in terms of physical volcanology, major and trace element chemistry with a view to petrogenetic modelling of cyclical volcanism in the Archean. Field work on the project is complete and laboratory work is underway.



## ORGANIZATIONS REPORTING

Acadia University,  
Department of Geology,  
Wolfville, Nova Scotia  
B0P 1X0

Agriculture Canada,  
Soil Research Institute,  
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K1A 0C6

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T6G 2C2

Alberta Research Council,  
Groundwater Division,  
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R7A 6A9

Bristol University,  
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Bristol, England  
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V6T 1W5

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Department of Geophysics and Astronomy,  
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V6T 1W5

British Columbia Department of Environment,  
Water Investigations Branch,  
Suite 1, Harbour Towers,  
345 Quebec Street,  
Victoria, British Columbia  
V8V 1X5

British Columbia Department of Mines and  
Petroleum Resources,  
Geological Division,  
Victoria, British Columbia,  
V8V 1X4

Brock University,  
Department of Geological Sciences,  
St. Catharines, Ontario  
L2S 3A1

Calgary University,  
Department of Geology,  
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Canada Centre for Mineral and  
Energy Technology (CANMET),  
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555 Booth Street,  
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K1A 0G1

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Department of Geology,  
Ottawa, Ontario  
K1S 5B6

Chevron Standard Limited,  
400 Fifth Avenue S.W.,  
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T2P 0L7

Colorado University,  
Institute of Arctic and Alpine Research,  
Boulder, Colorado  
U.S.A. 80302

Dalhousie University,  
Department of Geology,  
Sir James Dunn Building,  
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Canada Centre for Inland Waters, (CCIW),  
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Hydrology Research Division,  
Water Resources Branch,  
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Department of Energy, Mines and Resources,  
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Department of Land Resource Science,  
Guelph, Ontario  
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Geological Sciences,  
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Calgary, Alberta  
T2P 2H7

Home Oil Company Limited,  
304 Sixth Avenue S.W.,  
Calgary, Alberta  
T2P 0R4

Imperial Oil Limited,  
Exploration Department,  
500 Sixth Avenue S.W.,  
Calgary, Alberta  
T2P 0S1

Indian and Northern Affairs (DIAND)  
P.O. Box 1500,  
Yellowknife, Northwest Territories,  
X0E 1H0

Lakehead University,  
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P7B 5E1

Laurentian University  
Department of Geology,  
Subdury, Ontario  
P3E 2C6

Laval University,  
Département de Géologie et Minéralogie,  
Québec, Québec  
G1K 7P4

Lethbridge University,  
Department of Geogrpahy,  
Lethbridge, Alberta  
T1K 3M4

Manitoba University,  
Department of Earth Sciences,  
Winnipeg, Manitoba  
R3T 2N2

Manitoba Department of Mines, Resources and  
Environmental Management,  
Manitoba Geological Services Branch,  
993 Century Street,  
Winnipeg, Manitoba  
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McGill University,  
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3450 University Street,  
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H3A 2A7

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805 Sherbrooke St. West,  
Montréal, Québec  
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Redpath Museum,  
P.O. Box 6070, Station A,  
Montréal, Québec  
H3C 3G1

McMaster University,  
Department of Geology,  
Hamilton, Ontario  
L8S 4M1

Memorial University of Newfoundland,  
Department of Geology,  
St. John's, Newfoundland  
A1C 5S7

Memorial University of Newfoundland,  
Department of Physics,  
St. John's, Newfoundland  
A1C 5S7

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Department of Geology,  
Sackville, New Brunswick  
E0A 3C0

National Museum of Natural Sciences,  
Palaeontology Division,  
Ottawa, Ontario  
K1A 0M8

National Research Council  
Division of Building Research,  
Ottawa, Ontario  
K1A 0R6

New Brunswick University,  
Department of Geology,  
Fredericton, New Brunswick  
E3B 5A3

New Brunswick University,  
Department of Geology,  
Tucker Park,  
Saint John, New Brunswick  
E2L 4L5

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P.O. Box 6000,  
Fredericton, New Brunswick  
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New Brunswick Research and  
Productivity Council,  
P.O. Box 1236,  
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Newfoundland Department of Mines and Energy,  
Mineral Development Division,  
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Ontario Ministry of Natural Resources,  
Ontario Division of Mines,  
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Département de Géographie,  
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Polar Continental Shelf Project,  
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Ministère de l'Agriculture du Québec,  
Service des Sols,  
Complexe Scientifique B-1-23,  
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Kingston, Ontario

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Antigonish, Nova Scotia

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Scarborough College,  
Department of Botany,  
West Hill, Ontario  
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Scarborough College,  
Geography Division,  
West Hill, Ontario  
M1C 1A4

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M5S 1A7

Waterloo University,  
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N2L 3G1

Western Ontario University,  
Department of Geography,  
London, Ontario  
N6A 3K7

Western Ontario University,  
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London, Ontario  
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Windsor University,  
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Windsor, Ontario  
N9B 3P4

York University,  
Department of Geography,  
4700 Keele Street,  
Downsview, Ontario  
M3J 2R7

LIST OF GRANT AWARDS IN THE EARTH SCIENCES FOR 1976

DEPARTMENT OF ENERGY, MINES AND RESOURCES, RESEARCH AGREEMENTS

BRITISH COLUMBIA

University of British Columbia

- Chase, R.L. (Geological Sciences)  
Investigation of Sandspit Fault and associated faults, Queen Charlotte Islands and Sound, and Hecate Strait, \$2 500.00
- Clowes, R.M. (Geophysics and Astromony)  
Interpretation of a marine deep sounding survey, \$5000.00  
Southern trans-British Columbia seismic profile, \$3850.00
- Dragert, H. (Geophysics and Astromony)  
Local earthquake studies in the Canadian Cordillera, \$2400
- Finn, W.D.L. (Applied Science)  
Stability of slopes in Fraser Delta, \$5500.00
- Mathews, W.H. (Geological Sciences)  
An experimental model of glacial abrasion, \$1200
- Wynne-Edwards, H.R. (Geological Sciences)  
Quantitative approaches to exploration modelling in the MINDEP project, \$10 000.00

British Columbia Institute of Technology

- Tupper, W.A. (Survey)  
Fraser Delta mass transport study, \$4700.00

ALBERTA

University of Alberta

- Burwash, R.A. (Geology)  
Petrology and geochemistry of linear zones of anomalous radioactivity, \$2400.00
- Lerbekmo, J.F. (Geology)  
Paleomagnetic correlations in continental Upper Cretaceous and Paleocene sediments of Alberta, \$1000.00
- May, R.W. (Geology)  
Scanning electron microscope (SEM) study of Quaternary sediments, \$1500.00
- Rutter, N.W. (Geology)  
Paleosols of the Prairie Provinces, \$2050.00
- Scarfe, C.M. (Geology)  
The petrology of the Level Mountains volcanic centre, northern British Columbia, \$2000.00

University of Calgary

- Bennion, D.W. (Chemical Engineering)  
In Situ recovery of oil from the Alberta Oil sands, \$15 000.00
- McGugan, A. (Geology)  
Permian of southeastern British Columbia, \$5800.00
- Simony, P.S. (Geology)  
Metamorphic and structural evolution of a portion of the southern Canoe River area, British Columbia, \$7000.00

SASKATCHEWAN

University of Saskatchewan

- Braun, W.K. (Geological Sciences)  
Biostratigraphy and microfaunas of the Mesozoic rocks in Western Canada, \$5500.00

MANITOBA

University of Manitoba

- Ayres, L.D. (Earth Sciences)  
Precambrian porphyry copper and molybdenum deposits in Ontario and Saskatchewan, \$13 000.00
- Green, A.G. (Earth Sciences)  
Investigation of the Precambrian crustal structure using observatory records, \$2800.00

ONTARIO

Carleton University

- Brown, R.L. (Geology)  
Structural evolution of the northern Selkirk Mountains (Big Bend), British Columbia, \$12 000.00
- Ranalli, G. (Geology)  
Probabilistic seismic risk analysis, \$1200.00
- Watkinson, D.H. (Geology)  
Ni-Cu-Fe- sulfide-carbonate-silicate relationships in altered ultramafic rocks, \$7500.00

University of Guelph

- Kay, B.D. (Land Resources Science)  
Measurement and significance of unfrozen water content during freezing of soils under field conditions, \$5000.00

Lakehead University

- Kissin S.A. (Geology)  
The genesis of silver deposits in the Southern Province of Northwestern Ontario, \$2000.00

Laurentian University

- James, R.S. (Geology)  
Gabbo-anorthosite bodies in the Sudbury area, \$4500.00

McMaster University

- Clarke, W.B. (Physics)  
Development of a new prospecting method for uranium measurements of <sup>3</sup>He/<sup>4</sup>He, He, Ne, and tritium in ground-water and lakes, \$7500.00
- Crockett, J.H. (Geology)  
Gold mineralization in Archean greenstone belts: a study of genetic relationships using neutron activation analysis, \$9000.00
- Ford, D.C. (Geography)  
Radiometric geochronology and geothermometry of Pleistocene cave deposits in Canada, \$15 000.00

- McNutt, R.H. (Geology)  
Evolution of a greenstone belt, \$18 000.00
- Middleton, G.V. (Geology)  
Sediment in the Minas Basin, Bay of Fundy, \$16 000.00
- Risk, M.J. (Geology)  
Bioturbation rates in the Strait of Canso, \$1000.00

Queen's University

- Carmichel, D.M. (Geological Sciences)  
Metamorphism in the Grenville Province of Ontario, \$4000.00
- Gilbert, R. (Geography)  
Holocene lacustrine sediments in Cumberland Peninsula, Baffin Island, N.W.T., \$7575.00
- Nichol, I. (Geological Sciences)  
Factors affecting lake sediment composition in the Canadian Shield, \$10 000.00
- Price, R.A. (Geological Sciences)  
Tectonic analysis of the Southeastern Cordillera in Canada, \$6000.00
- Vreeken, W.J. (Geography)  
Ontogeny of marl lakes in Southern Ontario, \$4000.00

University of Toronto

- Garland, G.D. (Physics)  
Heat flow through lake bottoms in the Precambrian Shield, \$3400.00
- Goodwin, A.M. (Geology)  
Nature and origin of English River and Quetico Gneiss, \$5000.00
- Ludvigsen, R. (Geology)  
Ordovician trilobite biostratigraphy of the Northern Cordillera, \$4300.00
- Naldrett, A.J. (Geology)  
Platinum group elements and other trace elements in magmatic Ni-Cu sulfide ores associated with different host rocks, \$8500.00
- Norris, G. (Geology)  
Jurassic-Cretaceous palynostratigraphy of Western and Arctic Canada: a comparative study with European stratotypes, \$5100.00
- Schwerdtner, W.M. (Geology)  
Internal structure and emplacement of Irene Eltrut Lakes granitic complex, northwestern Ontario, \$6000.00
- West, G.F. (Physics)  
Midwest Superior Province geotraverse-gravity magnetics, seismic, \$8000.00
- York, D. (Physics)  
 $^{40}\text{Ar}/^{39}\text{Ar}$  dating of Canadian fossil meteorite craters, \$4500.00

University of Waterloo

- Appleyard, E.C. (Earth Sciences)  
Alteration zones associated with volcanogenic sulphide deposits in the Roberts Arm Group, central Newfoundland, \$4000.00
- Barnes, C.R. (Earth Sciences)  
Lower Paleozoic conodont biostratigraphy of the Canadian and Greenland Arctic, \$4000.00

University of Windsor

- Gravenor, C.P. (Science and Mathematics)  
Paleomagnetism of interstadial deposits in the Toronto area, \$4500.00

Ecole Polytechnique

- Gélinas, L. (Génie Minéral)  
Etude des coulées et des volcanoclastiques de composition rhyolitique de la région de Rouyn-Noranda, \$10 000.00
- Pham, V.N. (Génie Minéral)  
Cartographie des résistivités apparentes par les méthodes de profilages magnéto-tellurique, tellurique et géomagnétique, \$19 500.00
- Trzcienski, W.E. (Génie Minéral)  
Petrology and tectonics of the Cambro-Ordovician sequence in the Quebec Appalachians, \$5000.00

Université Laval

- Seguin, M.K. (Géologie et Minéralogie)  
Paléomagnétisme du Caldwell et des ophiolites des Appalaches du Sud de Québec, \$4650.00
- St-Arnaud, R. (Géodésie et de Cartographie)  
Cartographie Urbaine, \$9000.00

McGill University

- Bird, J.B. (Geography)  
Periglacial geomorphic processes in East Baffin Island, \$2175.00
- Doig, R. (Geological Sciences)  
Rb-Sr isotopic study of the Seven-Islands anorthosite suite, \$3000.00
- Hesse, R. (Geological Sciences and Marine Sciences Center)  
Labrador Sea sediments, \$5000.00
- Jensen, O.G. (Mining and Metallurgical Engineering)  
Wave-tilt applications to permafrost exploration, \$4000.00
- Yong, R.N. (Soil Mechanics)  
Dynamic behaviour and response of sensitive clays of the Champlain Sea deposit, \$10 000.00

Université du Québec à Chicoutimi

- Dimroth, E. (Sciences Appliquées)  
Volcanologie physique et sédimentologie d'un bassin volcano-sédimentaire Archéen, \$9000.00

Université du Québec à Montréal

- de Boutray, B. (Sciences de la Terre)  
Cartographie des dépôts meubles sur la côte ouest de la Baie d'Ungava, \$6800.00

Université de Sherbrooke

- Dubois, J.M.M. (Géographie)  
Géologie Quaternaire de la Côte Nord de l'estuaire maritime de Saint-Laurent, \$12 000.00

Institut National de la Recherche Scientifique

- Achab, A. (I.N.R.S.-Pétrole)  
Etude palynologique du Paléozoïque (Ordovicien) de l'est du Canada, \$9300.00
- Utting, J. (I.N.R.S.-Pétrole)  
Palynostratigraphic investigation of Upper Paleozoic and Triassic rocks of Arctic Canada, \$4500.00

NEW BRUNSWICK

University of New Brunswick

Govett, G.J.S. (Geology)

Processes of element dissolution and migration around sulphide deposits, \$20 000.00

Rast, N. (Geology)

The structure and petrology of the Pokiok granitic pluton, and its metamorphic aureole, \$2500.00

NOVA SCOTIA

University of Acadia

Stevens, G.R. and Colwell, J.A. (Geology)

Burial diagenesis and origin of clay minerals in Mesozoic-Tertiary strata on the Labrador-Newfoundland continental shelf, \$8400.00

Dalhousie University

Piper, D.J.W. (Geology)

Geological study of Lunenburg Bay, and nearby coastal bays, Nova Scotia, \$12 000.00

Zentilli, M. (Geology)

Distribution of uranium in minerals from selected ore environments, \$9500.00

NEWFOUNDLAND

Memorial University

Murthy, G.S. (Physics)

Paleomagnetic investigations of Precambrian and younger rock units from the Island of Newfoundland and their bearing on the interpretation of Newfoundland geologic structure, \$4650.00

Stewart, I.C.F. (Physics)

Seismotectonic studies of Newfoundland, \$3600.00

Williams, H. (Geology)

Geologic setting of asbestos-bearing ultramafic rocks along the Baie Verte lineament, Newfoundland, \$6700.00

Wright, J.A. (Physics)

Heat production and heat flow in Newfoundland, \$2150.00

DEPARTMENT OF THE ENVIRONMENT, WATER RESOURCES RESEARCH SUPPORT PROGRAM,  
RESEARCH AGREEMENTS

University of British Columbia

Clarke, G.K.G. (Geophysics and Astronomy)

Surging glacier research, \$10 500.00

University of Alberta

Gill, D. (Geography)

Potential environmental modification of the Slave River Delta by upstream river developments, \$6000.00

Vershuren, J.P. (Water Resources Centre)

Study program of lakes in Western Canada: Cooking Lake moraine \$8600.00

University of Saskatchewan

Gray, D.M. (Hydrology)

Hydrology of the Prairie environment, \$120 000.00

University of Guelph

Kay, B.D. (Land Resources Science)

Development of model to describe subsurface transport of solutes, as a consequence of freezing conditions, \$10 000.00

McMaster University

Crocket, J.H. (Geology)

Geochemical pathway studies of arsenic, selenium and palladium in freshwater systems by neutron activation analysis, \$10 000.00

Ford, D.C. (Geography)

Hydrology of canyon basins in the Mackenzie Mountains, Northwest Territories, \$9000.00

Kramer, J.R. (Geology)

Geochemical factors and terrain response to environmental contaminants, \$17 500.00

Dalhousie University

Ogden, J.G. (Chemistry)

Stream ecosystem impact of prospective lead and zinc mining at Gay's River, Nova Scotia, \$8500.00



DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS, GRANTS IN THE NATURAL SCIENCES

University of British Columbia

Godwin, C.I. (Geological Sciences)

Fluid inclusion study of sulphide deposits in the Ogilvie and Mackenzie Mountains, Yukon and Northwest Territories, \$9357.00

Sinclair, A.J. (Geological Sciences)

Clinton Creek ultrabasic pluton and associated asbestos deposit, Yukon Territory, \$10 357.00

University of Alberta

Scarfe, C.M. (Geology)

Magmatic and metamorphic history of the Athapuscow Aulacogen, Northwest Territories, \$7620.00

University of Calgary

Oldershaw, E.W. (Geology)

Stratigraphy and sedimentation of the Sekwi Formation in the Mackenzie Mountains, Northwest Territories, \$11 091.00

University of Manitoba

Laznicka, P. (Earth Sciences)

Metallogenic studies in the Proterozoic belt of copper mineralization, Ogilvie and Wernecke Mountains, Yukon and adjacent Northwest Territories, \$6672.00

University of Western Ontario

Hodder, R.W. (Geology)

Igneous rocks and associated mineral deposits of the Whitehorse copper belt, Yukon Territory, \$11 907.00

NATIONAL RESEARCH COUNCIL OF CANADA EARTH SCIENCE OPERATING GRANTS

Adamowski, K. Civil Engineering Ottawa	Stochastic analysis of hydrologic cycle	Beaumont, C. Oceanography Dalhousie	1) A study of aseismic strain accumulation on strike-slip faults with particular application to the San Andreas Fault System 2) A study of the rheological response of the earth to sediment loading in the Sverdrup Basin, 330-74 mybp
Aldridge, K.D. Physics York	Non axisymmetric inertial oscillations in spherical shells of rotating fluid	Beck, A.E. Geophysics Western	1) Geothermal investigations 2) Exploration methods
Anderson, G.M. Geology Toronto	Metasomatic and ore-forming solutions	Becker, A. Génie minéral Polytechnique	Nouvelles techniques de la prospection électromagnétique au sol
Anderson, M.M. Biology Memorial	Contributions to palaeontology and stratigraphy, mainly Newfoundland	Bell, K. Geology Carleton	Application of Sr isotopes to the petrogenesis of igneous rocks
Appleyard, E.C. Earth Sciences Waterloo	Studies of metasomatic and altered rocks	Berry, L.G. Geological Sciences Queen's	Crystal structure studies of minerals
Armbrust, G.A. Geology Ottawa	Distribution of major and trace elements as guides to mineralization in volcanic complexes	Beswick, A.E. Geology Laurentian	1) Trace-major element geochemistry of Precambrian volcanic belts 2) Theoretical and computer models for element distributions in multiphase assemblages 3) Experimental determination of trace metal distribution coefficients
Armstrong, R.L. Geological Sciences British Columbia	Geochronometry of cordilleran igneous and metamorphic rocks	Bird, J.B. Geography McGill	Late quaternary events and associated geomorphic processes along the Manitoba escarpment
Aumento, F. Geology Dalhousie	Detailed geological investigation of the oceanic crust	Black, T.A. Soil Science British Columbia	Evapotranspiration from forests
Ayres, L.D. Earth Sciences Manitoba	Early precambrian volcanism and granitic plutonism in the western part of the superior province, Ontario and Manitoba - a contribution to early crustal evolution	Bourque, P.A. Géologie Laval	Etude des ensembles carbonatés "récifaux" du Siluro-Dévonien de la Gaspésie. Leur paléogéographie et paléoécologie
Baadsgaard, H. Geology Alberta	Isotope geology of Precambrian polymetamorphic rocks	Bowen, A.J. Oceanography Dalhousie	The dynamics of coastal waters and sediments
Bachinski, D.J. Geology New Brunswick	Metamorphism of sulfide - rich rocks	Braun, W.K. Geological Sciences Saskatchewan	Microfaunas and biostratigraphy of western Canada
Bachinski, S.L.W. Geology New Brunswick	Devonian volcanic rocks of northern New Brunswick	Bristol, C.C. Geology Brandon	1) Ore mineralogy, orebody zoning and FeS, CdS, MnS contents of sphalerites from the Ruttan Lake Mine. 2) Alteration and metamorphic history of the Ruttan Lake orebody
Baer, A.J. Geology Ottawa	1) Relationships between anorthosites and granulite facies 2) Structural studies in the Grenville Province	Brookfield, M.E. Land Resource Sc Guelph	1) Stratigraphy, structure and paleontology of the Mesozoic rocks of Harrison Lake and the Cascade Mountains 2) Jurassic evolution of the Pacific margins
Bailey, R.C. Physics Toronto	Geomagnetic variation and magnetotelluric interpretation and tectonic structures	Brooks, C. Géologie Montréal	The evolution of Precambrian Shields (with special reference to Canada) as determined by geochemical, isotopic and geochronologic analysis
Barnes, C.R. Earth Sciences Waterloo	Lower Paleozoic conodont biostratigraphy, paleoecology and ultrastructure	Brown, A.C. Génie minéral Polytechnique	Etude métallogénique des gisements stratiformes de métaux non-ferreux
Barnes, W.C. Geological Sciences British Columbia	Organic geochemistry and sedimentology of lacustrine and shallow marine sediments of southwestern British Columbia	Brown, J.D. Civil Engineering N. S. T. C.	Structure and fabric of surficial marine cohesive soil
Bartlett, G.A. Geology Queen's	Biostratigraphy, environments of deposition and economic potential of the Canadian continental margins and adjoining coastal zone	Brown, M.C. Geography Alberta	River spectra; Karst hydrology
Bauer, A. Mining Eng. Queen's	Factors affecting the sensitivity of slurried explosives		
Bayliss, P. Geology Calgary	Applied crystallographic-mineralogy		
Beales, F.W. Geology Toronto	Limestone studies and strata-ground mineral deposits		

Brown, R.L. Geology Carleton	Tectonic models and fabric of mountain belts	Chase, R.L. Geological Sciences British Columbia	Tectonics, petrology and sedimentation of the continental margin of British Columbia and related plate margins and seamount chains of the northeast Pacific Ocean
Brown, T.H. Geological Sciences British Columbia	Phase equilibria and ore genesis	Chatterton, B.D.E. Geology Alberta	Conodont and trilobite systematics and biostratigraphy in western and northwestern Canada
Brueckner, W.D. Geology Memorial	Studies for IGCP project 73/1/2: precambrian in mobile zones	Cherry, J.A. Earth Sciences Waterloo	Multi-technique methodologies for investigating shallow groundwater flow systems
Bryan, R.B. Geography Toronto	Interaction of surface flow and intense rainfall in entrainment of soil particles	Chesworth, W. Land Resource Sc Guelph	Studies of granite and rock-weathering
Bunting, B.T. Geography McMaster	Studies of soil atmosphere and soil solute transmission in septic-polluted clayey soils of the Hamilton-Burlington area	Church, M.A. Geography British Columbia	Studies of hydraulics of gravel rivers
Burke, K.B.S. Geology New Brunswick	The development of seismic reflection techniques for shallow investigations	Church, W.R. Geology Western	Pre-Mesozoic Crustal Evolution of the North Atlantic region: Ophiolites, eclogites, diabase dyke swarms, and peralkaline granite
Burley, B.J. Geology McMaster	1) Study of alkaline intrusions by experimental and field techniques. 2) Study of mineralogy of minerals commonly occurring in and associated with alkaline rocks	Churcher, C.S. Zoology Toronto	Investigation and description of the quaternary mammalian faunas of Canada and comparison with those from other continents
Burwash, R.A. Geology Alberta	Petrologic control of uranium and thorium accumulation in crystalline rocks	Clark, A.H. Geological Sciences Queen's	The origin and delimitation of metallogenic provinces at Phanerozoic consuming plate margins
Calder, P.N. Mining Eng. Queen's	Evaluation of strength characteristics of rock masses	Clark, G.S. Earth Sciences Manitoba	Rubidium-Strontium isotopic age investigations in the Precambrian of Manitoba
Caldwell, W.G.E. Geological Sciences Saskatchewan	Biostratigraphic studies in western Canada	Clarke, D.B. Geology Dalhousie	Petrogenesis of igneous rocks
Campanella, R.G. Civil Engineering British Columbia	Engineering behaviour of natural and stabilized soils	Clarke, G.K.C. Geophysics British Columbia	Research in earth mechanics, applied geophysics and communication theory
Campbell, P.A. Geology Calgary	Geochemistry, mineralogy and isotope studies of rocks and ore deposits	Clement, P.M.J. Géographie Sherbrooke	Evaluation de l'érosion sur un bassin-versant des Appalaches du Québec
Campbell, I.A. Geography Alberta	Runoff and sediment yields in the Red Deer badlands	Clifford, P.M. Geology McMaster	1) Rock deformation and model studies in field and laboratory 2) Ancient and modern volcanicity
Cannon, W.H. Physics York	1) Applications of long baseline interferometry to geophysics and planetary science 2) Terrestrial gravity and tests of theories of general relativity	Clowes, R.M. Geophysics British Columbia	Explosion seismology on land and at sea for crustal/upper mantle investigations
Carmichael, C.M. Geophysics Western	Geomagnetism	Cogley, J.G. Geography Trent	Water balance, energy balance and fluvial geomorphic studies in Arctic catchments
Carroll, R.L. Redpath Museum McGill	Origin and early evolution of reptiles	Collerson, K.D. Geology Memorial	Crustal development of Archean rocks in the Nain Province, Labrador
Cerny, P. Earth Sciences Manitoba	Mineralogy and petrology of pegmatites	Collins, S.H. Engineering Guelph	Physical basis of earth resource imagery
Chao, G.Y. Geology Carleton	Descriptive, comparative and structural studies of rare minerals from Mont St. Hilaire, Quebec	Cooke, H.B.S. Geology Dalhousie	1) Studies on the quaternary in Nova Scotia and P.E.I. 2) Studies on the neogene of Africa and the near East
Chapman, C.H. Physics Toronto	Seismic body wave theory	Cooke, R.C. Oceanography Dalhousie	Pressure-regulated reactions in the sea
Charbonneau, R. INRS - Energie Québec-Ste-Foy	Etude comparative sur l'application de différentes méthodes de calcul de formation et de la fonte du manteau neigeux	Copper, P. Geology Laurentian	Paleoecology, evolution and morphology of Ordovician to Devonian atrypoid brachiopods on a global basis
Charlesworth, H.A.K. Geology Alberta	Numerical study of macroscopically folded and cleaved rocks	Cormier, R.F. Geology St. F. Xavier	Rubidium-strontium dating of rocks and minerals from the northern Appalachians

Crampton, C.B. Geography Simon Fraser	Shear patterns in permafrost terrain soils	Drake, J.J. Geography McGill	Snowmelt system and water quality investigations in Quebec
Crocket, J.H. Geology McMaster	Application of isotopic and minor element distributions to geological problems	Drapeau, G. INRS - Energie Québec-Rimouski	Sédimentologie et chronologie des sédiments marins dans la région L'Île-Verte - Saguenay
Cruden, D.M. Geology Alberta	Stability of natural slopes in rock	Dreimanis, A. Geology Western	Studies of glacial deposits in east-central Canada and their correlations with other areas
Cumming, G.L. Physics Alberta	Geophysical investigations in western Canada	Du Berger, R. Sc. appliquées Qué- Chicoutimi	Etudes sismiques dans la région du Haut-Saguenay
Currie, J.B. Geology Toronto	Mechanics and development of fractures in sedimentary strata: fracture porosity in carbonate and sandstone rocks	Duckworth, K. Geology Calgary	Development of methods and instrumentation in electromagnetic, induced polarization and radiometric prospecting
D'Anglejan, B.F. Marine Sci. Centre McGill	1. Particulate suspended matter in coastal waters. 2. Sedimentation in estuaries. 3. Trace elements geochemistry in the marine environment	Dudas, M.J. Soil Science Alberta	1) Biogeochemical nature of mercury in forested soils 2) Mineralogical transformations in sulphur contaminated soils 3) Anodic stripping voltammetry for trace metal analysis of soils 4) Mineralogical and micromorphological investigations of paleosols in Alberta
Danner, W.R. Geological Sciences British Columbia	Plate tectonics and the upper paleozoic of southern British Columbia	Dunlop, D.J. Physics Toronto	Magnetism of terrestrial and lunar rocks and their synthetic equivalents
Darling, R.G. Génie minéral Polytechnique	Lithogéochimie appliquée	Durand, M. Sciences de la terre Qué-Montréal	Etude des implications de la géologie urbaine pour l'aménagement et la construction à Montréal
David, M. Génie minéral Polytechnique	Informatique géologique	Edgar, A.D. Geology Western	Geochemical and experimental studies of igneous rocks and minerals
De Albuquerque, C.A.R. Geology Saint Mary's	Studies on the geochemistry of igneous and metamorphic rocks	Edwards, R.N. Physics Toronto	Magnetotelluric and magnetometric resistivity studies
Deutsch, E.R. Physics Memorial	Rock magnetism and geological structure in the Newfoundland region	Eisenstein, Z. Civil Engineering Alberta	1) Deformations of earth and earth-supported structures 2) Predictions of foundation behaviour using pressurometer technique
Dickinson, W.T. Engineering Guelph	Development and use of hydrologic models	El-Sabh, M. Sciences Québec-Rimouski	1) Circulation pattern and its implication on the primary production west of Anticosti Island 2) Circulation dynamics in the lower St. Lawrence Estuary
Dimroth, E. Sc. appliquées Qué-Chicoutimi	Volcanologie physique et sédimentologie d'un bassin volcano-sédimentaire Archéen	Ellis, R.M. Geophysics British Columbia	Seismology and tectonophysics
Dixon, J.M. Geological Sciences Queen's	Experimental model and field study of finite strain, progressive deformation, and fabric in large- and small-scale geological structures	Elrick, D.E. Land Resource Sc Guelph	Transport phenomena in natural porous media
Dixon, O.A. Geology Ottawa	1) Ordovician-Silurian faunas and sedimentary facies, Somerset and Prince of Wales Islands (Boothia Arch) 2) Ordovician-Silurian faunas and paleoecological studies, Anticosti Island	Emery, J.J. Civ Eng/Eng Mech McMaster	Dynamic interface behaviour of foundation - soil systems, simulation of creep and creep rupture in cohesive soils, rock and ice
Doig, R. Geological Sciences McGill	Geological applications of isotopic analysis	Evans, M.E. Physics Alberta	Palaeomagnetism of western Canadian rocks and rock magnetic studies
Donaldson, J.A. Geology Carleton	Comparative studies of Precambrian sedimentary rocks	Fahraeus, L.E. Geology Memorial	Studies of Paleozoic conodonts and depositional environments of Paleozoic sedimentary rocks with particular reference to Newfoundland material
Donnay, G. Geological Sciences McGill	Relation of physical and chemical properties to crystal structure	Farquhar, R.M. Physics Toronto	Geochronology and isotope studies
Dosso, H.W. Physics Victoria	Geomagnetic micropulsations and magneto-telluric modelling	Farquharson, R.B. Geology Calgary	Rb-Sr geochronology and isotope geochemistry studies in the Canadian Cordillera
Dostal, J. Geology Saint Mary's	Geochemical studies on some igneous and metamorphic rocks		

Farrar, E. Geological Sciences Queen's	Potassium-argon geochronology	Fritz, P. Earth Sciences Waterloo	1) Stable and radioactive isotopes in hydrological systems 2) Paleoenvironmental studies with <sup>18</sup> O and <sup>13</sup> C in freshwater mollusca
Farvolden, R.N. Earth Sciences Waterloo	Geologic and climatic controls on groundwater recharge	Fryer, B.J. Geology Western	Igneous and sedimentary geochemistry of the Precambrian
Fawcett, J.J. Geology Toronto	Experimental and field studies in igneous and metamorphic petrology	Fyfe, W.S. Geology Western	Solid earth hydrosphere interaction
Ferguson, R.B. Earth Sciences Manitoba	Crystal-chemical studies of rock-forming and ore minerals	Fyson, W.K. Geology Ottawa	Structural patterns in metamorphic rocks
Finn, W.D.L. Applied Science British Columbia	1) Yielding and deformation of soils. 2) Seismic response of ground, slopes and earth dams. 3) Simulated earthquake testing of soils. 4) Seismic water pressures against dams. 5) Soil-structure interaction. 6) Geotechnical engineering in ocean	Gangloff, P. Géographie Montréal	Paléogéographie de la région de Montréal entre 11 000 et 9 000 BP
Fleet, M.E.L. Geology Western	Crystallographic and chemical studies on ore and silicate minerals	Gardner, J.S. Geography Waterloo	Magnitude and frequency characteristics of the mass transfer of debris on mountain slopes
Fletcher, W.K. Geological Sciences British Columbia	Development and utilization of regional geochemical techniques	Garland, G.D. Physics Toronto	Study of electrical and thermal properties of the earth
Flint, J.J. Geology Brock	Distribution of longitudinal stream profiles in channel networks	Garrett, C.J.R. Oceanography Dalhousie	Physical oceanography
Folinsbee, R.E. Geology Alberta	Geochemistry, economic geology and geochronology of ancient cratons and later ore-bearing sedimentary basins	Gelinas, L. Génie minéral Polytechnique	Géochimie des éléments majeurs et mineurs des roches volcaniques de la ceinture volcanique de l'Abitibi, région Rouyn-Noranda
Ford, D.C. Geography McMaster	1) Groundwater flow and cavern genesis in soluble rocks 2) Quaternary dating & palaeothermometry 3) karst studies in Canada 4) geomorphology of the Mackenzie Mountains	Gelinas, P.J. Geology Ottawa	Fissuration and permeability of banded sediments, Lower Ottawa Valley
Forester, R.W. Geological Sciences Saskatchewan	Oxygen isotope studies of igneous and metamorphic rocks	Ghent, E.D. Geology Calgary	Petrologic and geochemical studies in the cordillera and electron microprobe study of minerals
Portin, J.P. INRS - Energie Québec-Ste-Foy	Etude des processus énergétiques régissant les relations entre les valeurs d'ETP à l'échelle locale et l'estimation d'ETR à l'échelle régionale	Gill, D.E. Génie minéral Polytechnique	1) Le poinçonnement des roches dans les trous de sonde. 2) Résistance des roches à long terme en atmosphères corrosives. 3) Théorie de chargement des revêtements des souterrains
Fox, R.C. Geology/Zoology Alberta	Upper cretaceous and lower tertiary vertebrates from western Canada	Gittins, J. Geology Toronto	Petrogenesis of alkalic rocks and carbonatite complexes
Francis, D.M. Geological Sciences McGill	Lherzolite xenoliths and the nature of the upper mantle. Origin of intrusive, cumulate ultramafic bodies in the Klugan Ranges, Yukon Territory	Godwin, C.I. Geological Sciences British Columbia	Geochronology, geochemistry and metallogeny of Skeena Arch, intermontane belt, central British Columbia
Fredlund, D.G. Civil Engineering Saskatchewan	Behavior of swelling clays	Goodwin, A.M. Geology Toronto	Origin of crust: nature and tectonic development of primitive earth's crust
Freeze, R.A. Geological Sciences British Columbia	Applications of mathematical models of subsurface flow in geological engineering	Gough, D.I. Physics Alberta	Magnetometer array studies and palaeomagnetism
French, H.M. Geography Ottawa	Thermokarst, ground ice and weathering studies, Western Arctic Islands	Govett, G.J.S. Geology New Brunswick	Geochemical exploration for deeply buried sulphide deposits and processes of element migration associated with sulphide deposits
Frenette, M. Génie civil Laval	1) Colmatage naturel des milieux poreux 2) Ecoulement secondaire dans les courbes de rivières 3) Hydrodynamique des estuaires, tributaires du Fleuve St-Laurent	Gravenor, C.P. Geology Windsor	The deposition of till from the base of moving ice
Frind, E.O. Earth Sciences Waterloo	Digital modelling of groundwater flow systems	Gray, D.M. Agric. Eng. Saskatchewan	Simulation of the hydrologic cycle
		Gray, J.T. Géographie Montréal	Morphologie glaciaire et périglaciaire et distribution du pergélisol sur la Côte ouest de la Baie d'Ungava
		Green, A.G. Earth Sciences Manitoba	Common depth point reflection survey of a greenstone belt near Flin Flon (Manitoba)

- Greenhouse, J.P.  
Earth Sciences  
Waterloo  
1) Geomagnetic variations 2) Groundwater and environmental geophysics
- Greenwood, B.  
Geography  
Toronto  
Coastal sedimentation: morphology and process in a microtidal, storm-surge, barred coastline
- Greenwood, H.J.  
Geological Sciences  
British Columbia  
Geological phase equilibrium studies
- Greggs, R.G.  
Geological Sciences  
Queen's  
1. Sedimentology and paleocurrent analysis of the Lower Paleozoic succession, southeastern Ont. 2. Conodont biostratigraphy of the Durness Formation, northwestern Scotland
- Gretener, P.E.  
Geology  
Calgary  
Quantitative structural geology (mechanism of thrust faulting)
- Grundy, H.D.  
Geology  
McMaster  
The crystallography of the silicate minerals
- Guha, J.  
Sc. appliquées  
Qué-Chicoutimi  
1) Minéralisation et problèmes d'exploitation de gisements dans la région de Chibougamau. 2) Etude de la minéralisation Pb-Zn dans le bassin de Mistassini
- Gunn, B.M.  
Géologie  
Montréal  
Analytical geochemistry
- Hajnal, Z.  
Geological Sciences  
Saskatchewan  
1) Seismic investigation of deep seated structures in Saskatchewan 2) Seismic investigation of Precambrian contact zones 3) Magnetotelluric investigation of mid-continent conductive zone
- Hall, D.H.  
Earth Sciences  
Manitoba  
Synthesis of crustal geophysics in studying the evolution of the earth's crust - Manitoba and northwestern Ontario
- Hall, J.M.  
Geology  
Dalhousie  
Investigations of the nature and motion of crustal plates as determined from magnetic studies and deep drilling investigations
- Halls, H.C.  
Geology  
Toronto  
Paleomagnetism of Precambrian rocks
- Harris, S.A.  
Geography  
Calgary  
Late glacial and postglacial geomorphology and climate in the south-eastern Rocky Mountains
- Harrison, R.S.  
Earth Sciences  
Manitoba  
Early subaerial diagenesis and porosity evolution in carbonate sequences
- Haugh, B.N.  
Geology  
Toronto  
Paleobiology of Paleozoic crinoids (Echinodermata)
- Hayatsu, A.  
Geophysics  
Western  
1) Study of initial argon by K-Ar isochron method 2) Uranium determination by gamma rays from 234Th
- Haynes, S.J.  
Geological Sciences  
Brock  
Lithospheric plate tectonics and metallogeny, S. Iran
- Helmstaedt, H.  
Geological Sciences  
Queen's  
Fabrics of metamorphic rocks and structural settings of mineral deposits
- Hendry, H.E.  
Geological Sciences  
Saskatchewan  
Studies in clastic sedimentology
- Henley, R.W.  
Geology  
Memorial  
Geochemical aspects of metallogeny in archaean and younger fold-belts
- Hesse, F.R.  
Geological Sciences  
McGill  
Processes and environments of deposition, diagenesis and lithification of clastic sedimentary sequences
- Hickin, E.J.  
Geography  
Simon Fraser  
1) Flood plain formation, lateral stream migration and channel form and pattern of rivers in North-eastern B.C. 2) Seismic classification of Pleistocene sediments in the lower mainland of British Columbia
- Hillaire-Marcel, C.  
Sciences de la terre  
Qué-Montréal  
Etablissement d'une courbe des variations eustatiques, pour l'Est du Canada, de -8 000 ans (BP) à aujourd'hui
- Hills, L.V.  
Geology  
Calgary  
Palynological and pleistocene research
- Hodder, R.W.  
Geology  
Western  
Determination of economic potential in copper occurrences using volcanic-plutonic relationships and nature of interflow sedimentary host rocks
- Hodgson, C.J.  
Geological Sciences  
Queen's  
Metallogenic studies of Canadian ore-bearing environments
- Hodych, J.P.  
Physics/Geology  
Memorial  
Magnetic properties of rock under stress; magnetic properties of serpentized peridotite
- Hofmann, H.J.  
Géologie  
Montréal  
Precambrian and lower paleozoic paleontology and stratigraphy
- Hogarth, D.D.  
Geology  
Ottawa  
1) Igneous and metamorphic history of S. Gatineau region. 2) Metamict minerals. 3) Genesis and nature of sodalite group minerals. 4) Petrology of "soapstone", S. Baffin Island
- Hooper, K.  
Geology  
Carleton  
1) Neogene Atlantic & Indopacific foraminiferal faunas 2) Foraminiferal fauna of the eastern Canadian continental slope and abyss 3) Modern foraminiferal fauna of the Gulf of St. Lawrence 4) Microfaunal/floral study of lower jurassic sediments of Portugal
- Howarth, P.J.  
Geography  
McMaster  
Remote sensing in geomorphological and hydrological studies
- Hron, F.  
Physics  
Alberta  
Seismic numerical modelling
- Hubert, C.  
Géologie  
Montréal  
Stratigraphie et tectonique des terrains cambro-or-doviciens des zones externe et interne des Appalaches québécoises entre St-Jean-Port-Joli et le lac Etchemin
- Hucka, V.J.  
Mines & métallurgie  
Laval  
Stabilité des excavations souterraines influencée par recouvrement des piliers
- Hughes, C.J.  
Geology  
Memorial  
Volcanic and granitic rocks of eastern Newfoundland
- Huntley, D.A.  
Oceanography  
Dalhousie  
Field measurement of nearshore and surf zone hydrodynamics
- Hutchinson, R.W.  
Geology  
Western  
Origin and metallogenic relationships of mineral deposits: especially of precambrian nickel and base metal sulfide, gold, iron and pegmatite deposits

Hynes, A.J. Geological Sciences McGill	1) Petrological study of rift-related volcanic rocks of southeastern Quebec 2) Structural/metamorphic studies in the Churchill Province E of the Labrador Trough, New Quebec	King, A.P. Geology Memorial	EO-Cambrian studies on the Avalon and western platforms of Newfoundland
Ingram, R.G. Marine Sci. Centre McGill	Circulation and mixing in the St. Lawrence estuary and their relation to distribution of non-physical oceanographic variables	King, M.S. Geological Sciences Saskatchewan	Mechanical and electrical properties of rocks and soils
Jacobs, J.D. Geography Windsor	Topoclimates of the eastern Baffin Island coast	King, R.H. Geography Western	Clay genesis in soils derived from volcanic ash
James, N.P. Geology Memorial	Facies anatomy and diagenetic evolution of paleozoic shelf carbonates: northern Maritime Appalachians	Kissin, S.A. Geology Lakehead	Crystal chemistry and stabilities of sulphide minerals
James, R.S. Geology Laurentian	Petrology and geochemistry of igneous and metamorphic rocks	Klován, J.E. Geology Calgary	Morphometric applications to paleozoic fossils
Jensen, O.G. Mining/Metallurgy McGill	1) Earth mechanics - response of earth to gravitational radiation 2) Seismology - non-linear communications theory applied in seismology	Krahn, J. Civil Engineering Saskatchewan	Slope stability in Cretaceous and Tertiary bedrock formations
Jeremic, M. Mineral Eng. Alberta	Deformation and failure of coal mine pillars in western Canada	Kretz, R. Geology Ottawa	Petrology of metamorphic rocks in the Canadian Shield
Johnson, P.G. Geography Ottawa	Mass movement and degradation processes in a mountain environment	Krouse, H.R. Physics Calgary	Stable isotope fractionation studies
Jolly, W.T. Geological Sciences Brock	Chemical and metamorphic petrology of Canadian Archean and other volcanic provinces, with emphasis on the prehnite-pumpellyite facies of regional metamorphism	Krupicka, J. Geology Alberta	Petrology of reworked crystalline rocks
Jones, F.W. Physics Alberta	Electromagnetic induction in the earth	Kugler-Gagnon, M.M.M. Géographie Ottawa	La détermination de la dynamique de l'impact sur le milieu physique
Jopling, A.V. Geography Toronto	Continuous monitoring of density flows in a lacustrine environment	Kukalova-Peck, J. Geology Carleton	Morphology and evolution of Paleozoic insects of North America, Europe and USSR with reference to phylogeny of recent insects
Jull, R.K. Geology Windsor	1) Corallite development and microstructures in rugose and tabulate corals 2) Taxonomy and stratigraphy of Upper Devonian corals from Western Canada, and of Siluro-Devonian faunas of Ontario	Kupsch, W.O. Geological Sciences Saskatchewan	Quaternary chronostratigraphy of the Interior Plains, Canada
Kanasewich, E.R. Physics Alberta	Geophysical investigation of the crust and upper mantle	La Rochelle, P. Génie civil Laval	Propriétés fondamentales et comportement des argiles sensibles
Karrow, P.F. Earth Sciences Waterloo	Stratigraphic and paleontologic studies of Quaternary sediments in southern Ontario	Ladanyi, B. Génie minéral Polytechnique	1) Résistance au poinçonnement des sols gelés. 2) Résistance mécanique du mélange silt-glace. 3) Stabilité des butées de fondations en rocher
Keen, M.J. Geology Dalhousie	Marine geophysical research on the eastern seaboard of Canada	Lajoie, J. Géologie Montréal	1) Sédimentologie du flysch cambro-ordovicien des Appalaches du Québec 2) Etude sédimentologique des volcanoclastiques de Rouyn-Noranda
Kehlenbeck, M.M. Geology Lakehead	Structural investigations leading to the tectonic evolution of part of the Superior Province	Lajtai, E.Z. Geology New Brunswick	Mechanisms of deformation and fracture
Kennedy, M.J. Geology Memorial	Structural development of the axial zone of the Appalachian Belt in Newfoundland and its relationship to adjacent regions	Lambert, R.S.J. Geology Alberta	Isotopic and geochemical researches applied to continental margin plate tectonics and Archean continental structure
Kenney, T.C. Civil Engineering Toronto	Properties and behaviours of soils and rocks	Langleben, M.P. Physics McGill	Drift and thermal regime of sea ice
Kesler, S.E. Geology Toronto	Geology and geochemistry of island arc ore deposits and related intrusive rocks	Laurent, R. Géologie Laval	Géologie des complexes ophiolitiques des Appalaches du Québec
Kimberley, H.M. Geology Toronto	Diagenesis and the origins of sedimentary ores	Le Blond, P.H. Inst. Oceanography British Columbia	Long waves and coastal oceanography
		Lefebvre, G. Génie civil Sherbrooke	Etude des caractéristiques de consolidation et de résistance au cisaillement des argiles cimentées



Lenz, A.C. Geology Western	Lower and middle paleozoic paleontology, biostratigraphy and fossil community analyses	Martini, I.P. Land Resource Sc Guelph	Quantitative studies of sands and sandstones
Lerbekmo, J.F. Geology Alberta	1) Sedimentation and correlation of upper cretaceous and paleocene continental coal-bearing formations in Alberta 2) Genesis of petroleum reservoir rocks in Alberta and the North West Territories	Massiera, M. Génie civil Moncton	Etude des sols très compressibles sous chargement bi-dimensionnel en relation avec le comportement de hauts remblais autoroutiers
Lesperance, P.J. Géologie Montréal	Biostratigraphie de l'ordovicien supérieur au dévonien inférieur de Québec	Mathewes, R.W. Biolog. Sciences Simon Fraser	Paleoecology of postglacial vegetation in coastal and interior biogeoclimatic zones of British Columbia
Levinson, A.A. Geology Calgary	Exploration and environmental geochemistry	Mathews, W.H. Geological Sciences British Columbia	Sedimentology, geomorphology and Cenozoic geochronology in southern British Columbia
Lewis, J.E. Geography McGill	Urban climate and land-cover: surface energy exchange as a function of urban terrain characteristics	May, R.W. Geology Alberta	1) Sedimentology and variability studies of till 2) Application of statistical methods to the analysis of geologic data
Liberty, B.A. Geological Sciences Brock	Detailed carbonate study	McCann, S.B. Geography McMaster	1) Beach and nearshore environments in the Eastern Arctic archipelago 2) Barrier Islands and sand spits in the Southern Gulf of St. Lawrence
Lo, K.Y. Fac. of Eng. Sci. Western	Structural defects and residual stresses in clays	McCaughey, J.H. Geography Queen's	Radiation and energy balance components in a forested watershed prior and post logging - Montmorency P.Q.
Logan, A. Geology New Brunswick	1) Ecology of recent reef-dwelling brachiopods, Caribbean 2) Recent brachiopod ecology, Mediterranean Sea	McGowan, C. Zoology Toronto	Systematics of ichthyosaurs (Reptilia) and Moas (Aves) and an investigation into the functional morphology of the heterocercal tail in selachians (Elasmobranchii)
Loubat, H. Sciences de la terre Qué-Montréal	1) Pétrologie des Ophiolites archéennes. 2) Pétrologie des ultramafites draguées	McGugan, A. Geology Calgary	1) Cretaceous micropaleontology (foraminifera) 2) Upper Paleozoic micropaleontology (conodonts) 3) Cambrian micropaleontology (problematica)
Luckman, B.H. Geography Western	The development and relationships between glaciers and rock glaciers in the Jasper area in post-Wisconsin time	McNutt, R.H. Geology McMaster	Geochemical and petrologic studies on selected field areas
Ludvigsen, R. Geology Toronto	Biostratigraphy and community paleoecology of Ordovician trilobites from the northern Cordillera	Meagher, E.P. Geological Sciences British Columbia	Crystal structure and chemistry of minerals
MacLean, W.H. Geological Sciences McGill	Phase relations and field studies pertaining to ore deposits	Mereu, R.F. Geophysics Western	Deep and shallow seismic sounding research
MacRae, N.D. Geology Western	Geochemistry of sulfur in mafic rocks	Michel, B. Génie civil Laval	Propriétés mécaniques de la glace
Mackay, J.R. Geography British Columbia	Permafrost and the growth of ground ice, western Arctic Coast and western Canadian cordillera	Middleton, G.V. Geology McMaster	Field and experimental studies of clastic sediments
Mahaney, W.C. Geography York	Holocene stratigraphy, Rouge River and West Dufferin Creek drainage areas, southern Ontario	Mitchell, R.H. Geology Lakehead	Petrology and geochemistry of kimberlites and alkaline rocks
Malpas, J.G. Geology Memorial	1) A petrochemical and field study of the long range mafic/ultramafic complex of S. W. Newfoundland, and of ultramafic and mafic complexes of the Gander Belt, Central Newfoundland 2) Petrochemical studies of ocean floor collections from M.A.R. 26degrees N and Pacific trenches	Mitchell, R.J. Civil Engineering Queen's	1) Behaviour of sensitive clays under repeated loadings. 2) Landslide control and prevention
Mamet, B.L. Géologie Montréal	Microfaciès carbonatés du Paléozoïque. Etude de la microfaune et de la microflore. (Stratigraphie, écologie, taxonomie)	Moore, J.M. Geology Carleton	1) Stratigraphy, structure and metamorphism of the Grenville Supergroup 2) Metamorphism of Precambrian volcanic rocks and ores
Marche, R. Génie civil Polytechnique	Sollicitation en flexion des pieux par les couches qu'ils traversent	Morgan, A.V. Earth Sciences Waterloo	An analysis of Late Pleistocene climatic fluctuations using fossil Coleoptera
Martignole, J. Géologie Montréal	Recherches pétrologiques et structurales dans le sud de la province tectonique de Grenville	Morgan, M.A. Biology Waterloo	Palaeontomology - an analysis of recent changes in climate and ecology
Martin, R.F. Geological Sciences McGill	Magmatic and metasomatic processes in the genesis of "igneous" rocks	Morgenstern, N.R. Civil Engineering Alberta	1) Geotechnical behaviour of frozen ground and ice 2) Geotechnical behaviour of Athabasca tar sand 3) Geotechnical behaviour of stiff clays and shales

Morin, G. INRS - Energie Québec-Ste-Foy	Modèle stochastique pluie-débit transposable à l'aide des caractéristiques physiographiques	Nuffield, E.W. Geology Toronto	Crystal chemistry of the ore minerals
Morin, J.P. Génie civil Sherbrooke	Semelles superficielles sur des argiles cimentées	Nyland, E. Physics Alberta	Automated geophysical data analysis and interpretation
Morton, R.D. Geology Alberta	Studies on the nature and origin of uranium deposits in northern and western Canada	Oke, T.R. Geography British Columbia	Comparison of rural and urban energy balance components
Mossman, D.J. Geological Sciences Saskatchewan	Petrology of ore deposits in the precambrian shield and environs	Oldershaw, A.E. Geology Calgary	Genesis and diagenesis of sedimentary rocks
Mountjoy, E.W. Geological Sciences McGill	Carbonate sedimentation and diagenesis of Paleozoic and Pleistocene reef and shelf margins and slopes	Ongley, E.D. Geography Queen's	Design and application of continuous-flow centrifugation in fluvial suspended sediment studies
Muecke, G.K. Geology Dalhousie	1) Development of a computerized neutron activation analysis and radiometric laboratory for geochemical studies on rocks and minerals. 2) Petrochemical, isotopic and mineralogical studies on metamorphic and igneous rocks	Osborn, G.D. Geology Calgary	Pleistocene geology, geomorphology, engineering geology
Muehlenbachs, K. Geology Alberta	Stable isotope exchange experiments and their application to geological problems	Osborn, T.R. Inst. Oceanography British Columbia	Direct measurement of the turbulent stress in a salt wedge estuary
Muller, F. Geography McGill	Glaciological research on Axel Heiberg Island (N.W.T.)	Ouellet, M. INRS - Energie Québec-Ste-Foy	Aspects physiques, chimiques et biologiques des sédiments du Lac St-Jean
Munro, D.S. Geography Toronto	Energy exchange and water loss from a swamp	Pajari, G.E. Geology New Brunswick	The geology and petrochemistry of Silurian and Devonian volcanic rocks, southwestern New Brunswick
Murray, J.W. Inst. Oceanography British Columbia	The marine geology of the inland waterway of southwestern British Columbia	Palmer, H.C. Geophysics Western	Paleomagnetism of Canadian and South American rock units
Murthy, G. Physics Memorial	Remanent magnetism of anorthosites as an additional tool in tracing the past positions of continents	Papezik, V.S. Geology Memorial	Study of chemistry, stratigraphy and tectonic setting of volcanic rocks of the Avalon Zone, Newfoundland
Naldrett, A.J. Geology Toronto	Field and experimental studies relating to the origin of ultramafic and related mafic rocks and their associated Ni-Cu ore deposits	Parslow, G.R. Geological Sciences Regina	1) Evaluation of uranium distribution in lake water and sediment 2) Mineralogy, petrology and sulphide potential of layered gabbros in the Lynn Lake area
Nelson, S.J. Geology Calgary	Palaeozoic correlations	Patterson, R.J. Geological Sciences Queen's	1) Interstitial water quality as an indicator of ground water inputs to lakes 2) Development, crystallography and diagenetic significance of carbonate "Whisker Crystals"
Nichol, I. Geological Sciences Queen's	Geochemical exploration in Canada	Pearce, G.W. Earth Sciences Toronto	Magnetic measurements of lunar and terrestrial samples
Nicholls, J.W. Geology Calgary	Petrology and geochemistry of peralkaline and related rocks from British Columbia and Arizona; chemical analyses of rocks and minerals	Pearce, T.H. Geological Sciences Queen's	Petrology of archaean igneous rocks
Nickling, W.G. Geography Guelph	Rates and mechanics of rock glacier flow in the icefield ranges, Yukon Territory	Perrault, G. Génie minéral Polytechnique	Recherche en minéralogie et en cristallographie
Nkemdirim, L.C. Geography Calgary	The urban heat island of Calgary	Pham, V.N. Génie minéral Polytechnique	Mise au point d'une nouvelle méthode de prospection magnéto-tellurique
Noble, J.P.A. Geology New Brunswick	1) Silurian-Devonian stratigraphy and paleoenvironments-New Brunswick 2) Recent shallow-water brachiopod communities-Eastern Canada	Pickard, G.L. Inst. Oceanography British Columbia	B.C. inlet study
Norris, G. Geology Toronto	Mesozoic stratigraphic palynology, paleoecology, and floral provincialism	Pickerill, R.K. Geology New Brunswick	1) Stratigraphy, sedimentology and palaeontology of the Siluro-Devonian rocks of southern New Brunswick 2) Trace fossils in eastern Canada
Norum, D.I. Agric. Eng. Saskatchewan	Heat and mass transfer in soil profiles under frozen and unfrozen conditions	Piper, D.J.W. Geology Dalhousie	1) Processes of deposition of fine clastic sediments in the ocean. 2) Marine quaternary of Atlantic Canada

Platt, R.G. Geology Lakehead	Petrogenetic studies of alkaline and related rocks of N. W. Ontario	Roeder, P. Geological Sciences Queen's	Electron probe and experimental studies of basaltic rocks
Pounder, E.R. Physics McGill	Ice drift	Roegiers, J.C. Civil Engineering Toronto	1) Influence of the permeability factor in hydraulic fracturing 2) Development of a 'Universite de Liege' cell
Price, R.A. Geological Sciences Queen's	Cordilleran tectonics, and the nature and significance of variations in tectonic style	Ross, J.V. Geological Sciences British Columbia	A) Structural stratigraphic and metamorphic studies in south central British Columbia. b) Structural and mechanical properties of common silicate minerals
Prichonnet, G.P. Sciences de la terre Qué-Montréal	Preuves géologiques et géomorphologiques du retrait glaciaire Wisconsinien, au nord de la région montréalaise	Rouse, G.E. Botany British Columbia	Palynology of late cretaceous and cenozoic sediments from British Columbia and Arctic Canada
Protz, R. Land Resource Sc Guelph	1) Quantification of soil variability (Northern Ontario) 2) Quantification of initial chemical changes in various soils. 3) Quantification of soil structure. 4) Computer modelling of soil development	Rouse, W.R. Geography McMaster	Radiation heat and water budgets of high latitude surfaces. Radiation and temperature in polluted urban atmospheres
Quigley, R.M. Fac. of Eng. Sci. Western	1) Permeability, diffusion, leachate reaction mineralogy & bonding in soils. 2) Completion of coastal erosion & bluff instability, Lakes Erie & Huron	Roy, M. Génie civil Laval	1) Etude des pieux flottants dans les argiles sensibles. 2) Mesure in situ de la résistance au cisaillement des argiles sensibles à l'aide du pressiomètre auto-toreur
Radforth, N.W. Biology New Brunswick	Use of palynology and modelling in unification of muskeg classification systems	Rucklidge, J.C. Geology Toronto	Geological studies with X-ray spectroscopy and diffraction
Ranalli, G. Geology Carleton	Global tectonics and the rheology of the earth	Russell, L.S. Geology Toronto	The cretaceous-tertiary transition in central Alberta
Rankin, D. Physics Alberta	Magnetotellurics and micropulsations	Russell, R.D. Geophysics British Columbia	1) Isotope ratio studies 2) Geophysical instrumentation
Rast, N. Geology New Brunswick	Caledonian Appalachian orogenic belt	Rust, B.R. Geology Ottawa	Studies of alluvial sediments, ancient and modern
Raymond, G.P. Civil Engineering Queen's	1) Stability and settlement of footings on soft soil 2) Stability, contact stress and settlement of repeatedly loaded footings on sands	Rutherford, G.K. Geography 1 Queen's	Systematic investigations of the pedogenesis and micromorphology of soils and sediments in S.E. Ontario
Reardon, E.J. Earth Sciences Waterloo	1) Thermodynamic properties of ion pairs in natural waters 2) <sup>13</sup> C Isotope fractionation factors for carbonate and bicarbonate ion pairs	Rutter, N.W. Geology 6 Alberta	Quaternary history of central and northwestern Alberta and northeastern British Columbia and development of amino acid racemization dating techniques
Reynolds, P.H. Physics/Geology Dalhousie	1) Potassium-argon dating of Nova Scotian granites, metamorphic rocks, and mineral deposits. 2) Argon-40/argon-39 dating of upper Precambrian volcanic rocks from Atlantic Canada. 3) Metallogenesis in Nova Scotia: a sulphur isotope study	Sarjeant, W.A.S. Geological Sciences 5 Saskatchewan	Dinoflagellates and acritarchs of the mesozoic: stratigraphical application in Western and Arctic Canada and use in intercontinental correlation
Risk, M.J. Geology McMaster	1) Bioerosion of carbonates. 2) Benthic fauna of the Thorold Sandstone	Sauer, E.K. Civil Engineering 6 Saskatchewan	Geological factors in slope instability in Saskatchewan
Riva, J.F. Geology Laval	Study and zonation of middle and late ordovician graptolites of North America	Scarfe, C.M. Geology 8 Alberta	Geochemical and geophysical properties of rocks and magmas at elevated temperatures and pressures
Robin, P.Y.F. Geology Toronto	Physical properties and phase changes in rocks and minerals under high pressure and triaxial stress	Scheidegger, A.E. Geology 9 Windsor	The geophysical stress field, ancient and present
Rochester, M.G. Physics Memorial	Theoretical solid-earth geophysics and planetary physics	Schenk, P.E. Geology 0 Dalhousie	Sedimentologic-stratigraphic studies of the early through late paleozoics of Nova Scotia
Roe, L.M. Geology Laurentian	Environmental subdivisions of the mississagi formation	Schloessin, H.H. Geophysics 7 Western	Physical properties of earth materials at mantle conditions
		Schroeder, J.M. Géographie 1 Moncton	Cartographie géomorphologique et spéléogénèse de grottes du 1er Canyon de la Nahanni Sud (TNO)
		Schroeder, J.M. Géographie 1 Qué-Montréal	Cartographie géomorphologique et spéléogénèse de grottes du 1er Canyon de la Nahanni Sud (TNO)

Schuepp, P.H. Agric. Physics Macdonald Coll.	Micrometeorological model experiments	Smith, D.L. Geological Sciences Queen's	Diagenetic and post-diagenetic cementation phases in the development of the Guelph (Middle Silurian) reefs, southwestern Ontario and the Abenaki (Upper Jurassic) bank margin carbonates, Scotian Shelf
Schwarcz, H.P. Geology McMaster	Isotopic geochemistry		
Schwartz, F.W. Geology Alberta	Investigation of regional water quality	Smith, F.G. Geology Toronto	Computer programs for statistical processing and compilation of mineral compositions
Schwerdtner, W.M. Geology Toronto	Paleostrain analysis in the Canadian Shield	Smith, T.E. Geology Windsor	Archean magmatism and tectonics: a geochemical study of the evolution of granitic rocks in the Superior Province and subsidiary projects
Scott, J.D. Civil Engineering Ottawa	1) Stability of slopes in the western Champlain Sea region 2) Pore pressure changes in partially saturated soils	Smylie, D.E. Physics York	Dynamics of the earth
Scott, S.D. Geology Toronto	Physical geochemistry of sulfide ores	Sonnenfeld, P. Geology Windsor	Evaporite formation
Seguin, M.K. Géologie Laval	Etude paléomagnétique des roches de la fosse du Labrador, d'un segment des Appalaches et de l'Abitibi	Spang, J.H. Geology Calgary	Mechanical behavior of the thrust plates in the foothills and front ranges of the Canadian Rocky Mountains
Selvadurai, A.P.S. Civil Engineering Carleton	Consolidation effects in soil-foundation interaction	St-Julien, P. Géologie Laval	Contexte structural des complexes ophiolitiques des Appalaches du Québec
Shaw, D.M. Geology McMaster	Geochemical studies of minerals and rocks	St-Onge, D.A. Géogr./planification Ottawa	Ravinement lié au déboisement, Swan Hills, Alberta
Shaw, J. Geography Alberta	Processes of deposition from turbidity currents in pro-glacial lakes	Starkey, J. Geology Western	The study of crystal orientation patterns in deformed rocks and the determination of the structures of deformed crystals and of plagioclase feldspars
Sheehan, P.M. Géologie Montréal	Paleobiogeography and biostratigraphy of late Ordovician and early Silurian brachiopods in eastern Canada	Stauffer, M.R. Geological Sciences Saskatchewan	Structures in rocks
Shoemaker, E.M. Mathematics Simon Fraser	Glacier surge studies	Stearn, C.W. Geological Sciences McGill	Paleoecology of paleozoic reefs
Simony, P.S. Geology Calgary	Volcanics to gneiss contact NW of Trail, B.C.	Stelck, C.R. Geology Alberta	Phytoplanktonic - foraminiferal zonation of the Mid-Cretaceous of northeastern British Columbia
Simpson, F. Geology Windsor	1) Stratigraphy and sedimentology of cretaceous deposits in the western interior 2) Confinement of waste and non-waste fluids in subsurface space	Stesky, R.M. Earth Sciences Toronto	Seismic and electrical properties of rocks at high pressure temperature and differential stress
Sinclair, A.J. Geological Sciences British Columbia	Mineral deposits and metallogeny in the Canadian cordillera	Stevens, R.K. Geology Memorial	Paleozoic evolution of Newfoundland
Skippen, G.B. Geology Carleton	A field and experimental study of metamorphic rocks from the Grenville Province of eastern Ontario and the Snow Lake district of Manitoba	Stewart, I.C.F. Physics Memorial	Seismotectonic studies of Newfoundland
Slatt, R.M. Geology Memorial	Sedimentological/sedimentary geochemical investigations on the Newfoundland continental shelf and adjacent coastal areas	Stimpson, B. Mineral Eng. Alberta	Mechanics of caving in jointed rock masses
Slymaker, H.J. Geography British Columbia	Rates of sediment production, sediment transport and sediment yield in Southern Coast Mountains, B.C.	Strangway, D.W. Geology Toronto	Magnetic and electrical studies of geological significance
Smith, D.G. Geography Calgary	1) Effect of river ice drives and jams on channel geometry and subsequent flood recurrence 2) Badland alluvial fans: their formation processes and sedimentology	Stringer, P. Geology New Brunswick	Relation of cleavage to folding in the Caledonian-Appalachian orogenic belt
Smith, D.G.W. Geology Alberta	Applications of electron microprobe analysis in mineralogy, economic geology and petrology	Strong, D.F. Geology Memorial	Geochemical, petrological and metallogenic studies in the Appalachian-Caledonian orogen
		Sundby, B. Sciences Québec-Rimouski	Estuarine geochemical processes
		Symons, D.T.A. Geology Windsor	Paleomagnetism and boundary geotectonics of the Superior Geologic Province

Tavenas, F.A. Génie civil Laval	1. Etude du comportement des fondations sur les argiles sensibles. 2. Détermination au laboratoire et in situ de la densité relative des sables	Watt, W.E. Civil Engineering Queen's	Prediction and simulation of discharge for urban and rural drainage basins
Taylor, C.H. Geography Trent	1) Runoff production in an inter-drainage swale 2) Effects of urbanization on streamflow of a small basin in Peterborough, Ontario	Weaver, J.T. Physics Victoria	Electromagnetic induction in the earth and oceans
Terasmae, J. Geological Sciences Brock	Quaternary paleoecology, geochronology, and climatic changes in eastern and northeastern Canada	Webber, G.R. Geological Sciences McGill	Investigations in applied geochemistry
Thomson, S. Civil Engineering Alberta	Investigations of laboratory and in-situ properties and behaviour of overconsolidated clays and soft rocks (Pleistocene and upper Cretaceous) of Western Canada	Webber, L.R. Land Resource Sc Guelph	Groundwater pollution
Trebath, L.T. Geology New Brunswick	Factors affecting the crystallization of feldspars in synthetic and natural systems	West, G.F. Physics Toronto	Regional and applied geophysics
Trenhaile, A.S. Geography Windsor	1) Shore platforms in Newfoundland; 2) Shore platforms in the Canadian Maritimes	Westermann, G.E.G. Geology McMaster	Jurassic ammonites and cephalopod shell function
Trzcienski, W.E. Génie minéral Polytechnique	Etudes minéralogiques et pétrologiques à l'aide de la microsonde	Westgate, J.A. Geology Toronto	1) Quaternary tephrochronology of the Yukon Territory & adjacent areas of Alaska 2) Quaternary geology of southern and central Alberta
Turnock, A.C. Earth Sciences Manitoba	Stability of pyroxenes	Whitehead, R.E.S. Geology Laurentian	A study of trace element distributions in volcanic rocks associated with ore deposits and the application of these distributions to mineral exploration
Ulrych, T.J. Geophysics British Columbia	1) Application of communication theory to geophysics and astronomy. 2) Interpretation and reduction of potential field data. 3) Uranium lead isotopic studies	Williams, H. Geology Memorial	Zonal subdivision of the northern Appalachians and correlations throughout the southern Appalachians and Caledonides of Europe
Van de Poll, H.W. Geology New Brunswick	1) Economic geology, stratigraphy and basin analysis of the Carboniferous succession of Eastern Canada 2) Sedimentation and facies distributions in the shallow marine coastal environment of the Northumberland Strait	Wilson, H.D.B. Earth Sciences Manitoba	1) A model of the igneous cycle of the Precambrian, and more detailed models of specific portions of the cycle including the relationships to sedimentation and ore deposits. 2) Continental distribution of ore deposits and earth geometry
Vanicek, P. Surveying Eng New Brunswick	Earth tides and crustal movement research	Wilson, J.T. Physics Toronto	Tectonics research with special reference to plume mechanisms
Veizer, J. Geology Ottawa	1) Chemical evolution of sediments during the Precambrian 2) Geochemical facies indicators in carbonates	Wilson, M.V.H. Zoology Alberta	Late Cretaceous and early Tertiary fishes of western North America
Vreeken, W.J. Geography Queen's	Soil-geomorphic studies between Kingston and Trenton, Ontario: 1) Soil variability on lacustrine clays 2) Stratigraphy of Holocene marl deposits	Wilson, N.E. Civ Eng/Eng Mech McMaster	Shear strength and consolidation characteristics of soils under cyclic loading
Walker, R.G. Geology McMaster	Development of facies models for ancient depositional environments	Woo, M.K. Geography McMaster	1) Hydrologic modelling of a swamp 2) Active layer hydrology and hydrology of a small Arctic lake
Wangersky, P.J. Oceanography Dalhousie	The carbon cycle in the open ocean	Wynne-Edwards, H.R. Geological Sciences British Columbia	Geological evolution of Canadian Continental Crust
Wardlaw, N.C. Geology Calgary	Reservoir properties of sedimentary rocks	Yong, R. Civ Eng/App Mech McGill	Influence of composition, physico-chemical forces and bond development on engineering properties of soils
Warkentin, B.P. Renewable Dev. Res Macdonald Coll.	Forces holding water in clay soils	York, D. Physics Toronto	Isotope studies and age determinations
Warren, H.V. Geological Sciences British Columbia	A) Biogeochemical vs. pedogeochemical techniques in gold and silver exploration B) "Pollen as a tool for regional mineral exploration"	Young, G.M. Geology Western	Studies of Precambrian supracrustal rocks
Watkinson, D.H. Geology Carleton	Relation of ore deposits to igneous rocks	Zentilli, M. Geology Dalhousie	1) Metallogenetic studies in Nova Scotia 2) Petrochemistry of igneous rocks from the Central Andes
		Zwack, P. Physique Qué-Montréal	Studies of urban atmospheres and air pollution