NATIONAL ADVISORY COMMITTEE ON RESEARCH IN THE GEOLOGICAL SCIENCES



# CURRENT RESEARCH IN THE GEOLOGICAL SCIENCES IN CANADA, 1969-70

Compiled by J.F. Henderson

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# CURRENT RESEARCH IN THE GEOLOGICAL SCIENCES IN CANADA, JUNE, 1969 - MAY, 1970

The research projects listed in this compilation have been obtained mainly from the universities, federal and provincial departments of mines, and other non-industrial institutions carrying on research in the geological sciences; they include some projects in geophysics and other fields concerned with geology and geological problems. With the exception of a few projects by some of the larger oil companies the compilation does not include research by mining and oil company geologists. The survey was made between October and December, 1969 and records research in progress from about June, 1969 to May, 1970.

The compilation is useful in enabling research workers to see who are working in similar fields and on similar problems. It indicates lines of research receiving the greatest attention and, by inference, those being neglected. It also serves to record the large number of research projects undertaken as graduate theses in our universities, of which the results are available in manuscript form in university libraries.

Success in assembling project titles and other information for such a compilation depends on the response of institutions and research workers. Acknowledgment is made in particular to those who assembled and forwarded the data on research projects in the organizations under their direction (see p. 248 for list of organizations reporting). However, in spite of general excellent cooperation, many projects on which no information was received are not included. Readers carrying on projects in geology and in allied fields of interest to geologists and which they consider should be included, should notify the Secretary, National Advisory Committee on Research in the Geological Sciences, 601 Booth Street, Ottawa. They will be placed on the list of those to receive the forms on which contributors forward information on their research projects in November of each year. This compilation is a cooperative undertaking.

## Use of the Compilation

In this compilation, projects are grouped under main headings that cover the different branches of the geological and allied sciences. The reader can thus find out readily the research in progress in the field in which he is interested. Many contributors have provided, in addition to the title, a short statement on the subject under investigation and references to their most recent publication on the project.

Many projects that seem to fall equally well under more than one heading are repeated under these headings. An author index (p. 236) lists after each author the numbers of projects, as listed in the compilation, on which he is currently engaged. Thus by reference to the author index, the fields of research and projects of any worker may be found.

# AREAL GEOLOGY

## Alberta

1. Godfrey, J.D., Bayrock, L.A., Research Council of Alberta:
Reconnaissance bedrock mapping, northeastern Alberta, 1969-.
Maps and report are in preparation on reconnaissance mapping of Pleistocene Geology, the Athabasca Formation and Precambrian basement in 7,000 square miles in northeastern Alberta.

2. Green, R., Research Council of Alberta:
Bedrock mapping (Oyen area), southeastern Alberta, 1967-70.
Geological mapping, on scale 1:250,000 of a region containing masses of glacially contorted bedrock.

3. Green, R., Carrigy, M.A., Mellon, G.B., Research Council of Alberta:
Bedrock geology, northern Alberta, 1962-69.
Maps and final report (north of 56° latitude) are in preparation.

4. Mellon, G.B., Carrigy, M.A., Hamilton, W.N., Research Council of Alberta:
Bedrock mapping Western Plains, Alberta, 1969-.

## British Columbia

5. Carter, N.C., British Columbia Dept. of Mines and Petroleum Resources:
Geology and mineral deposits of the Alice Arm area, British Columbia, 1 inch to ½ mile, 1968-70.
The most important mineral deposits of the area include porphyry-type molybdenite deposits and vein silver deposits, which were examined in detail. See Minister of Mines, British Columbia, Annual Reports, 1968 p. 56-68.

6. Leech, G.B., Geol. Surv. of Canada:
Kananaskis Lakes, British Columbia, 1 inch to 4 miles, 1962-68.
See Cretaceous strata in the west face of the Rocky Mountains, Geol. Surv. Canada Paper 67-1A, p. 72-73, 1967.

7. Muller, J.E., Geol. Surv. of Canada:
Geology, stratigraphy, petrology and mineral deposits of northern Vancouver Island (N.T.S. 102I, 92L, 92E, 92K).
See Geol. Surv. Can., Paper 69-1A, 1969.

8. Muller, J.E., Carson, D.J.T., Geol. Surv. of Canada:
Geology and mineral deposits of Alberni map-area, Vancouver Island and Gulf Islands, British Columbia.
Regional geology, stratigraphy, petrology and mineral deposits central part of Vancouver Island in the Strait of Georgia (N.T.S. 92F).

9. Northcote, K.E., British Columbia Dept. of Mines and Petroleum Resources:
Port McNeill - Cape Scott area, northern Vancouver Island, 1 inch to 1 mile, 1968-71.
A study of mineral deposits and their relationship to regional geology and distribution of plutonic rocks. See B.C. Minister of Mines Annual Report, 1968.

10. Preto, V.A., British Columbia Dept. of Mines and Petroleum Resources:
Geology and mineral deposits of Copper Mountain, British Columbia, 1 inch to 500 feet, 1968-70.
The study has involved mapping an area of approximately 50 square miles. Particualr attention has been paid to the stratigraphy, structure and metamorphism of the Nicola volcanic and sedimentary rocks which surround the Copper Mountain stock. A detailed examination of all known mineral deposits in the area has been made with particular attention to relationship of mineralization to distribution of intrusive rocks, rock alteration and structure. A number of samples for radiometric age dating of the various intrusives were also collected.

11. Roddick, J.A., Hutchison, W.W., Geol. Surv. of Canada:
Coast Mountains project, British Columbia, 1967-71.
A continuing investigation of the Coast Mountains between Vancouver and southeast Alaska with special emphasis on the development of plutonic rocks. See Coast Mountains project, British Columbia; Geol. Surv. Can., Paper 68-1, 1968, Paper 69-1, 1969 p. 29-39, and Recording geological field data for machine retrieval and processing; Western Miner, February, 1968.

12. Wheeler, J.O., Geol. Surv. Canada:
Lardeau West, British Columbia, 1 inch to 4 miles, 1965-70.
Reconnaissance study of part of the core zone of the Eastern Cordilleran fold belt and embracing Slocan and northern Kootenay Arc districts. See Lardeau (west half) map-area, British Columbia; Geol. Surv. Can., Paper 68-1A, p. 56-58, 1968.
Big Bend map-area, British Columbia, 1 inch to 4 miles, 1959-71.
Reconnaissance study of part of the core zone of the Eastern Cordilleran fold belt. See Big Bend map-area, British Columbia; Geol. Surv. Can., Paper 64-32, 1964.

## Manitoba

13. Church, B.N., Manitoba Dept. of Mines and Univ. of Manitoba:
Wanipigow area, Manitoba, 1968-69.
The field and laboratory study sheds new light on the history of the Rice Lake volcanic-metasedimentary belt. The stratigraphic pile in the Wanipigow area consists of about equal volumes of basalt and dacite with minor sediments (the Rice Lake group) overlain by granite pebble conglomerate and sandstone (the San Antonio formation). These beds have undergone early gravity faulting followed by transcurrent

movement, flexural slip folding and extensive kink band development. Primary structures are locally destroyed by intense cataclasis and the rocks have been raised to the blue amphibole-chloritoid level of regional metamorphism. See Manitoba Dept. of Mines Geological Paper 3/68.

14. Cranstone, D.A., Toogood, D.J., Manitoba Mines Branch:
Pakwa Lake and Pistol Lake map-areas, Manitoba, 1968-70.
A major cataclastic fault zone crosses the Pakwa-Pistol map-area. This fault zone consists of a vertical 3,000 foot thick layer of mylonites and related cataclastic rocks with an anastomosing network of sub-parallel subsidiary cataclastic faults. The main fault zone underlies Setting Lake and extends northeast to Thompson and Mystery Lake. It forms the boundary between two lithologically distinctive crustal blocks, with metasediments, derived paragneisses, and massive to gneissic pink granites to the northwest and with banded granitoid plagioclase-quartz-hornblende gneisses the predominant rock type to the southeast of this fault. See Manitoba Mines Branch Paper 3-68, p. 18-22 and preliminary maps 1969 D-1 and D-2.

15. Elphick, S.C., Manitoba Mines Branch:
Mynarski Lake area, Manitoba (part of Southern Indian Lake project), 1969-71; M.Sc. thesis, Univ. of Manitoba.

16. Ermanovics, I.F., Geol. Surv. of Canada:
Geological remapping of rocks of the Superior Province, Manitoba, 95°-97°W, 51°-53°N.
A comprehensive petrochemical and structural review of this Archaean 'root area' underlain by hybrid 'granitic' rocks of various compositional and textural kinds. See Hecla-Carroll Lake map-area, Manitoba and Ontario, Geol. Surv. Canada Paper 69-42, 196.

17. Haugh, I., Elphick, S.C., Manitoba Mines Branch:
Kettle Rapids - Moose Lake area, Manitoba, 1968-70.

18. Haugh, I., Campbell, F.H.A., Elphick, S.C., Schledewitz, Dave, Steeves, M.A., Hinds, R.W., Thomas, K., Frohlinger, T., Cranstone, J., Manitoba Mines Branch:
Southern Indian Lake project, 1968-71.
Systematic geological coverage of approximately 4,000 square miles of the Churchill province (Southern Indian Lake - Granville Lake - Rat River region) with special studies on sedimentation, volcanism, metamorphism and structure.

19. Schledewitz, Dave, Manitoba Mines Branch:
Southern Indian Lake area, Manitoba, 1969-71; M.Sc. thesis, Univ. of Manitoba.
The main interest is the structural aspect of the Rat Lake area.

## New Brunswick

20. Gordon, A.J., Logan, A., Patel, Ismail., Univ. of New Brunswick:
Geological investigations in Saint John New Brunswick, 1969-.

Construction work undertaken in conjunction with widespread urban redevelopment is resulting in many temporary exposure of rock sequences ranging from Precambrian to Carboniferous in age. Such exposures are proving of great value in the study of the complex geological history of the Saint John area.

21. Grant, Richard, New Brunswick Dept. of Natural Resources and Univ. of New Brunswick:
Loch Alva area, New Brunswick, 1969-70.

22. Skinner, R., Geol. Surv. of Canada:
Tuadook Lake map-area, New Brunswick, 1968-70.
An area in the central part of the Miramichi Highlands underlain by Cambro-Ordovician to Silurian and/or Devonian sedimentary and volcanic rocks intruded by Upper Ordovician(?) and Devonian granites and granodiorites and Devonian gabbro. See Tuadook Lake map-area, New Brunswick; Geol. Surv. Can., Paper 69-1A, 1969.

23. Williamson, D.H., Laurentian Univ.:
Geological study of northeastern part of Caledonia Mountains, southeast New Brunswick, 1962-71.

## Newfoundland & Labrador

24. Anderson, M.M., Memorial Univ. of Newfoundland:
Southeastern Avalon Peninsula, Newfoundland, 1969-72.

25. Brueckner, W.D., Memorial Univ. of Newfoundland:
Problems of Avalon Peninsula geology, 1959-.
This project deals with a variety of bedrock problems, emphasis being laid on the sedimentary formations and their diastrophic deformation without excluding the interrelationships with volcanic and intrusive rocks.

26. Clark, A.M.S., Kennedy, M.J., Memorial Univ. of Newfoundland:
Structural and petrologic investigations between Makkovik Bay and Kaipokok Bay, Labrador, 1969-; M.Sc. thesis (Clark).
Work on the Aillik Series has revealed a complex structural history involving at least three phases of intense deformation accompanied by amphibolite facies metamorphism.

27. Cumming, L.M., Bostock, H.H., Geol. Surv. of Canada:
Operation Strait of Belle Isle (Precambrian), Newfoundland and Labrador, 1969-72.
The project is coordinated by L.M. Cumming who is studying the Paleozoic rocks of the area. The field season of 1970 will be spent in completing 1 inch to 1 mile mapping of Precambrain rocks at the northern extremely of the Long Range Mountains, Newfoundland and 1971 on the Precambrian rocks north of the Strait of Belle Isle. See Geol. Surv. Can. Paper 70-1, Pt. A, 1970.

28. Kennedy, M.J., Coates, H.J., Memorial Univ.:
Structural investigations in the metamorphic and volcanic rocks of the Burlington Peninsula, Newfoundland, 1968-72; M.Sc. thesis (Coates).
The present phase of this investigation is a study of the structure, stratigraphy and metamorphic history of the region between Ming's Bight and Grand Cove, Confusion Bay.

29. Kennedy, M.J., Smyth, W.R., Memorial Univ. of Newfoundland:
Structural relations within the Appalachians of northwestern Newfoundland, 1969-72; M.Sc. thesis (Smyth).
Involves mapping of the area south of Hare Bay as far as Canada Harbour, recognition of allocthonous rocks which had been metamorphosed and deformed several times before emplacement as a klippe, and study of post-emplacement structures. Involves also structural studies of the Grey Islands and relations of the metasediments of these islands with the Fleur de Lys Supergroup on the eastern side of White Bay.

30. Mullins, J., Newfoundland Dept. of Mines, Agriculture and Resources:
Geology, St. Catherines (east half) map sheet, Newfoundland, 1968-69.
Involved detailed geological mapping and geochemical sampling of stream sediments and soil. Report on the project is in press.

31. Upadhyay, H.D., Kennedy, M.J., Neale, E.R.W., Memorial Univ. of Newfoundland:
Geology and mineral deposits of the Ordovician Snooks Arm Group and related rocks, 1969-71; M.Sc. thesis (Upadyay).
H. Upadhyay has commenced a detailed field study of the Snooks Arm Group, its contained mineral deposits, and the relationship of this Group to a subjacent belt of ultrabasic rocks and to the Silurian(?) Cape St. John Group mapped west of the ultrabasic belt. The first season's work involved study of several sections across the Snooks Arm Group which resulted in: 1) verification of the fact that rocks of the Group contain a single penetrative fabric and occupy the northwest limb of a major syncline which, however, contains several large scale flexures not previously recognized; 2) proof that the flanking ultrabasic rocks and the Cape St. John group have essentially the same structural history as the Snooks Arm although the Cape St. John rocks are more intensely deformed.

32. Williams, H., Memorial Univ. of Newfoundland:
Petrology, age and stratigraphy of eruptive rocks and basal Cambrian strata, Strait of Belle Isle, Newfoundland, 1968-72.
See Geology of Belle Isle, northweastern extremity of the Appalachian Miogeosynclinal Belt. Can. Jour. Earth Sci., v. 6, 1969.

## Nova Scotia

33. Benson, D.G., Geol. Surv. of Canada:
Antigonish Highlands, and Antigonish Basin areas, Nova Scotia, 1964-70.

34. King, L.H., MacLean Brian, Kranck, Kate (Miss):
Regional geology of the Scotian Shelf, 1964-.
A program to map the near surface structure and stratigraphy of the bedrock underlying the entire Scotian Shelf and Bay of Fundy is being conducted utilizing continuous seismic-reflection profiles and sample data obtained through dredging operations. Profiles representing some 8,000 miles of traverse have been accumulated, and are being interpreted utilizing differences in acoustical characteristics and unconformable relationships to delineate rock units. Interpretation of the surficial geology is based upon a detailed study of echograms, examination of bottom samples, continuous seismic-reflection profiles, radiogenic ages and paleontological data. Work currently in progress will provide surficial geological coverage for the whole of the Scotian Shelf, and Northumberland Strait and Georges Bay and Bay of Fundy. See Submarine end moraines and associated deposits on the Scotian Shelf: Geol. Soc. Amer. Bull., v. 80, p. 83-96, 1969.

35. Milligan, G.C., Chatterjee, A.K., Dalhousie Univ.:
Investigations in the George River Series, Cape Breton, Nova Scotia, 1962-. Ph.D. thesis (Chatterjee).
Publications now in preparation are primarily maps and preliminary reports on field work of four field seasons. They will be followed by more detailed studies of petrology, wall rock alteration associated with sulphides, structure, etc. There is some evidence that the Precambrian George River rocks are overthrust sheets overlying the Mississippian rocks in the area.

## Northwest Territories

36. Bell, R.T., Geol. Surv. Canada and Brock Univ.:
Study of the Hurwitz Group in the eastern part of the Rankin-Ennadai belt, 1967-70.
See Geol. Surv. Can., Paper 68-36, 1968.

37. Bostock, H.H., Geol. Surv. of Canada:
Itchen Lake map-area, District of Mackenzie, 1964-70.
The final report will include descriptions of gold-bearing sulphide-arsenide deposits at Point, Itchen, and Contwoyto Lakes. See Geol. Surv. Can. Paper 68-1B, 1968, p. 72-76

38. Christie, R.L., Geol. Surv. of Canada:
Geological reconnaissance of eastern Devon Island with additional stratigraphic studies on southeastern Ellesmere Island, 1968-71.
Reconnaissance study of Precambrian rocks and of lower Palaeozoic sections.

39. Eade, K.E., Geol. Surv. Canada:
Ennadai Lake map-area, District of Keewatin, 1 inch to 4 miles, 1968-70.
A study of the stratigraphy and structure of the Aphebian sedimentary rocks and of the post-orogenic fluorite-bearing granites which intrude the sedimentary rocks.

40. Heywood, W.W., Geol. Surv. Canada:
Geology of northern District of Keewatin and southern Melville Peninsula, 1960-70.
Includes study of petrology, structure, and metamorphism of Precambrian terrain mapped on Operations Back River (1960) and Wager (1964) and Southampton (1969). See Geological notes, northeastern District of Keewatin and southern Melville Peninsula, District of Franklin, Northwest Territories; Geol. Surv. Can., Paper 66-40, 1966.

41. Kerr, J.M., Geol. Surv. Canada:
Southwest Ellesmere Island and Western Devon Island, Northwest Territories, 1967-72.
See Geol. Surv. Canada, Paper 68-1, Pt. A, 1968, p. 199-200.

42. Sanford, B.V., Geol. Surv. of Canada:
Geology of Southampton Coats and Mansel Islands, Northwest Territories, 1968-70.
Much new information concerning the stratigraphy and sedimentation of the Ordovician and Silurian succession was obtained. In addition, Paleozoic deformation, hitherto unreported will help to shed new light on the tectonic history of the Northern Hudson Bay Basin and adjacent areas of the Canadian Shield. See Geol. Surv. Canada, Paper 70-1, 1970.

43. Thorsteinsson, R., Kerr, J.W., Geol. Surv. of Canada:
Geological mapping of Cornwallis and adjacent smaller islands, 1965-70.
See Cornwallis Island and adjacent smaller islands, Canadian Arctic Archipelago; Geol. Surv., Canada, Paper 67-64, 1968.

44. Trettin H.P., Geol. Surv. of Canada:
Geology of lower Paleozoic sediments, Foxe Basin, northeastern Melville Peninsula, and parts of northern and central Baffin Island, 1968-70.
See Geol. Surv. Canada, Paper 69-1, Pt. A, 1969, p. 246-252.

45. Yorath, C.J., Norris, D.K., Young, F.G., Havard, C.J., McCrossan, R.G., Hopkins, W.S., Geol. Surv. of Canada:
Beaufort - Mackenzie project, Northwest Territories, 1969-75.
A detailed basin analysis study of the Mackenzie Beaufort Basin, involving collaborative research among members of the Geological Survey, Dominion Observatory, Marine Sciences Branch and universities. See Geology of the eastern part of the Northern Interior and Arctic Coastal Plains, Northwest Territories, Geol. Surv. Can. Paper 68-27.

## Ontario

46. Ayres, L.D., Ontario Dept. Mines:
Favourable Lake - Poplar Hill compilation sheet, 1968-71.
See Summ. of field work, 1968; Ont. Dept. Mines, Misc. Pap. 22, p. 6-10.
Setting Net Lake area, 1968-71.
See Summ. of field work, 1969; Ont. Dept. Mines, Misc. Pap. 1969.

47. Baer, A.J., Geol. Surv. Canada:
Geology of the Precambrian Shield in the Rivière Gatineau map-area, Quebec and Ontario, 1968-.
See Geol. Surv. Canada Paper 69-1, p. 141-142, 1969 and Paper 70-1, 1970.

48. Bennett, Gerald, Ontario Dept. of Mines:
Townships of Strathcona and Briggs, 1 inch to ¼ mile, 1969-71.
See Ont. Dept. Mines summ. of field work, 1969.

49. Bennett, Gerald, Thurston, P., Giquere, J.F., Wolfe, W.J., Ont. Dept. of Mines:
Operation Pukuskwa, Ontario, 1968-70.
Areal geology of stream sediment geochemistry of the area between Marathon and Wawa, south of the Trans-Canada highway along the north shore of Lake Superior.
See Ont. Dept. Mines, Geol. Maps No. p. 506-507, 1968.

50. Bright, E.G., Ontario Dept. of Mines:
Operation Pamour, Timmins area, Ontario, 1970-71.
A helicopter supported geological field mapping and subsurface drill hole compilation survey of approximately 1800 square miles lying immediately north of Timmins, Ontario (Long 81° to 82°, Lat. 48°31' to 49°).
Moher-Hutt township, District of Sudbury, Ontario, 1968-70.
See Ont. Dept. Mines, Maps p. 489-491.
Beemer-Zavitz area, District of Sudbury, 1967-70.
See Ont. Dept. Mines Maps p. 453-455.

51. Card, K.D., Robertson, J.A., Ont. Dept. of Mines:
Geology and scenery, Sault Ste. Marie-Sudbury area, 1960-70.

52. Card, K.D., Palonen, P., Ontario Dept. of Mines:
Louise-Eden area, Ontario, 1968-71; graduate thesis (Palonen), Univ. of Calgary.
Part of a continuing project to map the Huronian Supergroup and to investigate the contact zone between the Southern and Grenville provinces.

53. Card, K.D., Meyn, H.D., McIlwaine, W.H., Ont. Dept. of Mines:
Operation Maple Mountain, 1969-70.
Part of a continuing project to map the Huronian Supergroup of the north shore of Lake Huron.

54. Carter, M.W., Ontario Dept. of Mines:
Operation Rossport - Reconnaissance geological mapping of an area bounded by Lat. 48°-45'-49°-30'N. and Long. 86°30'-88°15'W. (1 inch to 2 miles) and detailed

mapping of area bounded by Lat. 49°02'00"-49°20'00"N. and Long. 87°07'30"-87°45'00"W., 1 inch to ¼ mile, 1969-71.

55. Davies, J.C., Ontario Dept. of Mines:
Western Peninsula area, District of Kenora, 1969-70.
See Ontario Mines Misc. Paper, summary of field work, 1969.
North Shoal Lake Area, District of Kenora, 1968-69.
See Dept. Mines, Misc. Paper No. 22, summary of field work, 1968.
Atikwa Lake area, District of Kenora, 1966-70.
See Ont. Dept. Mines P.R. 1966-1, summ. of field work, 1966.

56. Fenwick, K.G., Ontario Dept. of Mines
Finlayson Lake area, District of Rainy River, 1967-70.
See Ont. Dept. Mines, summ. of field work, 1968.

57. Frarey, M.J., Geol. Surv. Canada:
Western North Channel area, Ontario, 1956-69.
Chiefly concerns Huronian stratigraphy and structure between Sault Ste. Marie and Blind River, Ontario. See Bruce Mines, Ontario; Geol. Surv. Can., Map 32-1962.
Lake Panache - Collins Inlet map-areas, 1964-70.
A general revision of earlier work with emphasis on Huronian stratigraphy and relationship of Southern Province to Grenville Province in this area, and nature of boundary. See Geol. Surv. Canada Paper 68-1 Pt. A, 1968, p. 133.

58. Harris, Fred, Ont. Dept. of Mines:
Rainy Lake area, 1968-71.
See Ont. Dept. Mines summ. field work, 1968.

59. Jensen, L., Ont. Dept. of Mines:
Clifford and Ben Nevis Townships, District of Timiskaming, 1970-71.
See Ont. Dept. Mines, Summary of Field Work, 1969.
Melba and Bisley Townships, District of Timiskaming, 1968-70.
See Ontario Dept. Mines, Misc. Paper 22, summ. of field work, 1968.

60. King, H.L., Ontario Dept. of Mines:
Keewatin - Kenora area, 1 inch to ½ mile, 1969-72.

61. Kustra, C.R., Ontario Dept. of Mines:
Obanga - Leigh Lakes area, District of Thunder Bay, 1965-69.
See Ontario Dept. Mines Misc. Paper No. 11, summ. of field work, 1967.

62. Kustra, C.R., Thurston, P.C., Ontario Dept. of Mines:
Obanga - Leigh Lakes area, 1966-70.
Areal geology (semi-detailed) of the Obanga Lake greenstone belt. See Ont. Dept. Mines Geol. Maps p. 456 461.

63. Lovell, Howard, Ontario Dept. of Mines:
Lebel township, Ontario, 1969-70.
Geology and scenery in and near the Lake Timiskaming Rift Valley, 1968-69.

64. Lumbers, S.B., Ontario Dept. of Mines:
Tomiko area, 1969-71.
Burwash area, 1967-70.
Part of a reconnaissance geological investigation of a 6000 square mile region in the northwestern Grenville Province of Ontario which includes the Grenville front. It is hoped the study will lead to a general understanding of the relationships between the Grenville Province and the Superior and southern provinces. See Ont. Dept. Mines, Misc. Paper 22, p. 58-61, 1968.

65. Mackasey, W.O., Ontario Dept. of Mines:
Eva and Summers townships, District of Thunder Bay, 1 inch to ¼ mile, 1969-70.
Area includes the Leitch, Northern Empire and Sand River Gold Mines. See Ont. Dept. Mines, summ. of field work, 1969.
Walters and Leduc townships, District of Thunder Bay, 1 inch to ¼ mile, 1968-70.
See Ont. Dept. Mines maps, p. 539-540, 1969.
Dorothea, Sandra and Irwin townships, District of Thunder Bay, 1 inch to ¼ mile, 1967-70.

66. McIlwaine, W.H., Ontario Dept. of Mines:
Gowganda area, District of Timiskaming, 1966-70.
See Ont. Dept. of Mines maps, p. 374, 475, 517, 518.

67. McIlwaine, W.H., Wallace, H., Ontario Dept. of Mines:
Black Bay Peninsula, 1969-71.
Study of the stratigraphy and economic geology of the Middle Keweenawan Osler Group volcanic rocks which underlie the peninsula.

68. Meyn, H.D., Ontario Dept. of Mines:
Marconi, Turner, and Seagram townships, 1969-70.
See Ont. Dept. Mines summ. of field work, 1969.
Grigg and Stobie townships, 1968-70.
See Ont. Dept. Mines, Misc. Paper 22, summ. of field work, 1968.

69. Pryslak, A.P., Ontario Dept. of Mines:
Dent and Mitchell townships, District of Red Lake, 1969-71.
See Ont. Dept. Mines, summ. of field work, 1969.
Tustin-Bridges area, District of Kenora, 1967-70; M.Sc. thesis, Univ. of Manitoba.
See Ont. Dept. Mines, summ. of field work, 1967 and 1968, and Maps p. 471, 472, 505, 544.

70. Pyke, D.R., Ontario Dept. of Mines:
Adams and Eldorado townships, 1969-70.
See Ont. Dept. Mines, summ. of field work, 1969.
Fallon and Fasken townships, 1968-70.
See Ont. Dept. Mines, Maps p. 496, 497.

71. Riley, R.A., Ontario. Dept. of Mines:
Mulcahy township, north half, 1968-70.
See Ont. Dept. Mines, summ. of field work, 1969.

72. Robertson, J.A., Ontario Dept. of Mines:
Flack Lake - Mount Lake areas, 1969-71.
Structure, stratigraphy and economic geology in vicinity of Flack Lake Fault. Of particular interest is the presence of Huronian Volcanic rocks on north limb of Quirke Syncline in townships 157 and 163.
Massey map area, 1966-69.
Regional geology, Blind River area, 1954-.
See Geology and uranium deposits of the Blind River area, Ont., Can. Inst. Min. Met., Trans. v. LXXII, p. 156-171, 1969.

73. Thurston, P., Carter, M.W., Ontario Dept. of Mines:
Operation Fort Hope, 1968-70.
Geology of an area in northwestern Ontario bounded by Long. 86°-89° and Lat. 50°31'-52°30'. See Ont. Dept. Mines Geol. Maps p. 562-565, 1969.

74. Trowell, Norman, Ontario Dept. of Mines:
Bell Lake - Sturgeon-Lake area, District of Kenora and Thunder Bay, 1969-70.
This mapping program was initiated to evaluate the Sturgeon Lake greenstone belt as a possible 'target' area for exploration for base-metal sulphide deposits. In succeeding years mapping will be concerned with evaluating potential host rocks for economic mineral deposits and in determining the general stratigraphic and structural history of the area. See Ont. Dept. Mines, Maps p. 524, 525.

## Quebec

75. Allard, G.O., Quebec Dept. of Natural Resources and Univ. of Georgia:
Northeast quarter Scott township, Chibougamau district, 1 inch to 1000 feet, 1966-.
Continuation of a detailed study of the Lac Dore Complex and a detailed survey of structures which might be worth exploring for ore deposits.

76. Baer, A.J., Geol. Surv. Canada:
Geology of the Precambrian Shield in the Rivière Gatineau map-area, Quebec and Ontario, 1968-.
See Geol. Surv. Canada Paper 69-1, p. 141-142, 1969 and paper 70-1, 1970.

77. Bassaget, J.P., Quebec Dept. of Natural Resources:
Study of the north shore of the St. Lawrence between Aquanish and La Romaine, 1968-.

78. Chown, E.H., Caty, J.L., Quebec Dept. of Natural Resources:
Geology of the Otish Mountains, 1963-70.

Includes studies of the Precambrian basin of clastic sedimentary rocks; of the petrology of partly differentiated gabbro sills; and of the structure of the Mountains.

79. Cimon, Jules, Quebec Dept. of Natural Resources:
Northeast quarter of Queylus and northwest quarter of Dollier townships, Chibougamau district, 1 inch to 1,000 feet, 1962-.
Part of a program which aims at mapping in detail an economically important section of the Chibougamau greenstone belt.

80. de Romer, H.S., Quebec Dept. of Natural Resources and Sir George Williams Univ.:
Mont Auclair area, Boisbuisson township, Gaspé-North county, 1 inch to 1,000 feet, 1966-.

81. Dimroth, E., Québec Dept. of Natural Resources:
Central Labrador Trough, 1963-72.
See Castignon Lake area, New Quebec, Quebec Dept. Natural Resources, P.R. No. 571.

82. Franconi, Antoine, Ministère des Richesses Naturelles du Quebec:
Project Grenville, 1969-72.

83. Gentile, F., Quebec Dept. of Natural Resources:
Lac Nicolet area, district of Wolfe, 1 inch to 1,000 feet, and structural study of the Solbec and Cupra copper-zinc deposits, Stratford township, Wolfe county, 1969-.
The purpose is to obtain a better knowledge of the petrography, chemistry, structure and stratigraphy of the main zones of the volcanic rocks in the Disraéli area by detailed mapping of the Cupra and Solbec deposits, the mapping and sampling of the volcanic sequence and a complementary study of other deposits in this area.

84. Germain, Marc, Quebec Dept. of Natural Resources:
Southwest quarter, Vauquelin township, Abitibi East County, 1 inch to 1,000 feet, 1969-.
Recent ore discoveries in adjacent Louvicourt township have led to this detailed study.

85. Globensky, Y.R., Quebec Dept. of Natural Resources:
Geology of the Becancour map-area, St. Lawrence Lowlands, 1969-70.
The conodont fauna of the Ordovician Newville section (Trenton) near Quebec City is also being studied.

86. Guilloux, L., Quebec Dept. of Natural Resources:
Southeast quarter, O'Sullivan township, Chibougamau district, 1 inch to 1,000 feet, 1969-70.
To obtain structural information and delimitate the contact between the Chibougamau and Mistassini series in an area where a copper deposit is presently exploited.

87. Héroux, Yvon, Quebec Dept. of Natural Resources:
Sayabec, Val Brillant and La Redemption area, Matapedia county, 1 inch to 1,000 feet, 1969-71.

88. Hogarth, D.D., Univ. of Ottawa:
Structure, geology and mineralogy of the southern Gatineau Park, Quebec, a continuing project.
See Biabsorption, Mossbauer and chemical investigation of five phlogopite samples from Quebec. Can. Mineralogist (in press).

89. Imreh, L., Quebec Dept. of Natural Resources:
Eastern half, Baby township, Temiscaming county, 1 inch to 1,000 feet, 1968-.
The second phase of a program of detailed mapping in an area of basic volcanic rocks intruded by granodiorite and quartz porphyry masses. The area is known to contain Cu and Ni mineralization.

90. Lahusen, Lutz, Quebec Dept. of Natural Resources:
Southeast quarter, Verneuil township, Abitibi-East County, 1 inch to 1,000 feet, 1968-70; Ph.D. thesis, Univ. of Munich.
Second year of a three years program of detailed mapping of a belt of volcanic and associated intrusive rocks where Cu-Mo-Au-Ag mineralization have been encountered.

91. MacIntosh, J.A., Quebec Dept. of Natural Resources:
Northern half, Clericy township, district of Rouyn-Noranda, 1 inch to 1,000 feet, 1967-69.
An area underlain by mafic to felsic flow and pyroclastic rocks, and acid intrusions.

92. Martignole, Jacques, Université de Montréal et Ministère des Richesses Naturelles du Québec.
Etude de la partie sud de la Province tectonique de Grenville au Nord de Montréal, 1965-1972.
Voir Relations chronologiques et structurales entre la Série de Grenville et la Série de Morin dans le Sud du Québec, Geol. Assoc. of Canada, Sp. Paper No. 5, 1969.

93. Pourret, Gerard, Ministère des Richesses Naturelles du Québec:
Region du Lac Kipawa, 1969-72. Ministère des Richesses Naturelles du Quebec.

94. Remick, J.H., Quebec Dept. of Natural Resources:
Evans Lake area, northern Quebec, 1 inch to 1 mile, 1969-71.
The relationship of the Evans Lake Series and Broadback Series is being investigated.

95. Stevenson, I.M., Geol. Surv. Canada:
Northwest River map-area, Labrador and Quebec, 1 inch to 4 miles, 1965-70.
See Rigolet-Groswater Bay map-area, Labrador; Paper 69-48, 1969.

96. van de Walle, M., Quebec Dept. of Natural Resources:
Northern half, Montbeillard township, district of Rouyn-Noranda, 1 inch to 1,000 feet, 1969-71.
Initial phase of a program leading to mapping of an area underlain by Precambrian rocks belonging to the Pontiac group of sediments.

97. Vogel, D.E., Quebec Dept. of Natural Resources:
Southwest quarter, Villebon township, Abitibi East county, 1 inch to 1,000 feet, 1969.

## Saskatchewan

98. Forsythe, L.H., Saskatchewan Dept. of Mineral Resources:
Geology of Morning Lake area (west half), Saskatchewan, 1969-70.
See Summ. Rept. of Geological Surveys in the Precambrian area of Saskatchewan, 1969.
Geology of the Stanley area (west half), Saskatchewan, 1964-70.
Part 2 of the report will include the study of mineral deposits in this area. See Geology of the Stanley area (west half): Sask. Dept. of Mineral Resources, Rept. No. 115 (part 1).

99. Johnston, W.G.Q., Saskatchewan Dept. of Mineral Resources:
Geology of May Lake area (northwest quarter) 1 inch to ½ mile, 1969-70.

100. Koster, F., Saskatchewan Dept. of Mineral Resources:
Geology of Burchnall Lake area (east half), Saskatchewan, 1 inch to 1 mile, 1969-70.
See Summ. rept. of Geological Surveys in the Precambrian area of Saskatchewan, 1969.

101. Scott, B.P., Saskatchewan Dept. of Mineral Resources:
Geology of Combe Lake area; 1 inch to 1 mile, 1968-70.
See Summ. Rept. of Geological Surveys in the Precambrian area of Saskatchewan, 1969.

102. Wallis, R.H., Saskatchewan Dept. of Mineral Resources:
Geology of Hidden Bay area, Saskatchewan, 1 inch to 1 mile 1969-70.
See Summ. Rept. of Geol. Surveys in the Precambrian area of Saskatchewan.

## General

103. Baer, A., Geol. Surv. Canada, Money, P.L., Carleton Univ., Scott, B., Wallis, R., Saskatchewan Dept. of Mineral Resources:
Wollaston Lake belt, Saskatchewan-Manitoba and Northwest Territories, 1969-70.
See The Wollaston Lake fold-belt system, Saskatchewan-Manitoba, Can. Journ. Earth Sciences v. 5, no. 6, p. 1489, 1968.

104. Ollerenshaw, N.C., Geol. Surv. of Canada:
Compilation of geological map and cross section of the Rocky Mountain Foothills, Phase I, 1969-70.
A cooperative project with the Alberta Society of Petroleum Geologists.

105. Tanguay, M.G., Ecole Polytechnique:
Optical processing of aerial photo patterns by coherent light, 1969-71.
Information acquired through remote sensing generally yields a great number of two-dimensional patterns in the form of photographs or imagery film strips. The quantity of available data is often too large for direct study by visual means alone. It is highly desirable and necessary to employ

automatic pattern recognition and data-handling techniques in order to quantify the information. The goal is to classify these two-dimensional patterns by means of the diffraction pattern obtained by shining a beam of coherent light on each pattern. The result would allow to (1) enhance through spatial filtering the reconstructed image and (2) to classify photo patterns on the basis of similar diffraction diagrams.

## DATA STORAGE, RETRIEVAL AND MANIPULATION

106. Alvey, G.C., Robertson, W.A., Chevron Standard Limited:
Application of computer science to exploration geology, 1964-.

107. Agterberg, F.P., Geol. Surv. Canada:
Statistical models for geologic processes, 1967-.
See Stochastic model for the deposition of varves in glacial Lake Barlow-Ojibway, Ontario, Canada: Can. Jour. Earth Sci., v. 6, p. 625-752, 1969.

108. Agterberg, F.P., Fabbri, A.G., Geol. Surv. Canada:
Computer oriented research on mineral deposits, 1967-.
The research has been extended to the greenstone belt of Eastern Ontario - Timmins Kirkland Lake area - and it is at present being continued for the greenstone belt in Western Quebec - Noranda - Val d'Or area.

109. Bidgood, D.E.T., Howells, K., Nova Scotia Research Foundation:
Regional studies of Nova Scotia aeromagnetic data, 1969-.
Existing aeromagnetic maps will be digitized to permit computation of regional trends, filtering, residual contouring and other methods of geophysical analyses, which will aid the study of geological structure in the Nova Scotia area.

110. Carlson, V.A., Research Council of Alberta:
Central Data File (formerly: "CARDEX" data storage system), 1956-.
"HYDRODAT", data storage and retrieval system, 1967-.

111. David, Michel, Ecole Polytechnique:
Preparation of programs for multivariate statistical analysis, 1968-.
Up to now the following programs have been implemented for the C.D.C. 6400 of the University of Montreal: disciminant analysis; principal component analysis; canonical correlations; canonical trend surface analysis; multiple regressions and trend surface analysis; mapping programs; and contouring programs.
Application of the theory of regionalized variable to ore reserve estimation, 1968-70.
Application of mathematical morphology to grain size and shape parameters, 1969-70.
It has already been possible to obtain the covariance function for several thousands of measurements made on sand thin sections; from this covariance function many interesting morphological parameters have been calculated including confidence intervals for various estimates. The problem of the reconstruction of 3-dimensional granulometry from linear measurements has also been solved.
Application of Universal Kriging to mapping problems of aeromagnetic data, 1969-70.
Several numerical interpolation techniques have been used to draw contour maps of aeromagnetic data. So far no

studies have been done to try to take into account as much as possible the spatial correlations which are encountered in the field of variation. Universal Kriging is a technique which has been suggested in 1969 by G. Matheron.

112. Dawson, K.R., Geol. Surv. Canada:
Geochemical data bank (Geodat), 1964-.
Batches of analytical results are being retrieved from the master tape (7-2400' reels) that contains more than 20,000 rock and mineral analysis of several types. The batches of data retrieved have been output as a hard copy table, on Lambert conformable projection index maps and as a norm calculation without any manual transcription of the data. Routine updating of the master file (entry of the data and correction of old data) and the retrieval of batches of data has been operative since July 1969. The output which is presently limited to hard copy will be replaced in the near future by BCD tape output and a wider variety of tabular formats on hard copy. Development is aimed to improve the user orientation of the system to provide outputs of plotted index maps on a variety of scales, cartesian and ternary plots, norm calculations, and statistical moments plus bar diagrams.

113. Grice, R.H., Gurevitch, S., McGill Univ.:
Geotechnical data handling by computer methods, storage and selective retrieval, 1965-.

114. Langford, F.F., Kipling, W., Univ. of Saskatchewan:
Computer geological data file of the Saskatchewan Department of Mineral Resources assessment file, 1968-70.

115. Mayr, Franz, Université de Montréal:
Counting and contouring a critical study of statistics as applied in geology, 1969-70.
Stratigraphy and palaeogeography of Wuerm (Wisconsin) in the Alps, 1965-75.
The aim is to improve correlation of the North American and European stratigraphy of the youngest part of the Quaternary. See Ueber den Beginn der Wuermeiszeit im Inntal bei Innsbruck. Eine palaeogeographische Skizze. Annals of Geomorphology (Berlin), N.F. 12, p. 256-295, 1968.

116. Perrault, Guy; Le Page, Yvon; Vincent, Henri; Vicat, Jean; Nguyen, San; Richard, Pierre; Ecole Polytechnique:
Programmation électronique pour les recherches en cristallographie, 1966-; étudiant D.Sc.A. (Le Page, Sang).
Nous continuons le développement de nouveaux programes de calculs électroniques pour les recherches en cristallographie. En novembre 1969, notre programmathèque comprenait 15 programmes distincts; nous comptons l'augmenter beaucoup en 1969-70 (environ 40 programmes en novembre 1970). Les programmes son centrés sur: 1) l'interprétation radiocristallographique; la définition de la structure cristalline. Nos programmes son écrits en Fortran IV pour la CDC-6400 de l'Université de Montréal. Voir Calculs et tracés de synthèses de Fourier et de Patterson par une

calculatrice électronique, par Yvon Le Page et Guy Perrault. 34 congrès annuel de l'ACFAS, Québec, Novembre 1966.

117. Roddick, J.A., Hutchison, W.W., Geol. Surv. Canada:
Coast Mountains project, British Columbia, 1967-71.
A continuing investigation of the Coast Mountains between Vancouver and southeast Alaska with special emphasis on the development of plutonic rocks. See Coast Mountains project, British Columbia; Geol. Surv. Can., Paper 68-1, 1968, Paper 69-1, 1969 pp. 29-39, and Recording geological field data for machine retrieval and processing; Western Miner, February, 1968.

118. Rucklidge, J.C., Gasparrini, E., University of Toronto:
Computer applications in mineralogical analyses, 1965-.
See A computer program for processing microprobe data. Jour. Geol. v. 65, p. 126, 1967.

119. Shaw, D.M., Jordan, D., McMaster Univ.:
Graphical and statistical methods for compositional discrimination of similar rock types.
The value of conventional graphical methods in petrology and trace element geochemistry is being tested using all available high quality data, recorded in a form for computer handling.

120. Smith, F.G., Univ. of Toronto:
Computation of crystal-liquid equilibria in multicomponent systems, 1963-73.
The literature on salt systems with one or more alkali halide components is being searched and put into computer accessible form for retrieval and statistical analyses. Preliminary work showed that rather simple empirical procedures could be used to give fair predictions of multicomponent liquidus temperatures from data of the constituent binary systems. See Machine plotting of liquidus data of binary and ternary salt system, Can. Mineral., v. 9, pp. 180-190, 1967.
Grain growth in metamorphic rocks, 1964-73.
The literature on recrystallization and grain growth is being searched, and data on metallic systems are being put into computer-accessible form for retrieval and analysis relative to solid-state processes in multicomponent silicate, oxide and sulphide systems.

121. Whitmore, D.R.E., Geol. Surv. Canada:
Development and supervision of Mineral Deposits Data Bank, 1968-.
The file now contains 6600 entries (deposits) over half of which were made during 1969. It is being modified to take advantage of the greater flexibility offered by SAFRAS.

122. Wynne-Edwards, H.R., Sharma, K.N.M., Nandi, A., Queen's Univ.:
Application of tectonic data processing to geological mapping in Quebec, 1968-72.
A co-operative project with the Quebec Department of National Resources, using field data co-ordinated by

Dr. A. Laurier. Voir Les applications des ordinateurs à la géologique régionale dans la province Grenville; Québec; Annales de l'Assoc. Canadienne-Française pour l'Avancement des Sciences, v. 36, p. 119-120, 1969.

## ENGINEERING GEOLOGY

123. Acar, K.Z., King, M.S., Univ. of Saskatchewan:
Rheological properties of Prairie Evaporites, 1967-72; M.Sc. thesis (Acar).
The long-term mechanical properties of the Prairie Evaporites are being studied at temperatures and pressures typical of those found in Saskatchewan at subsurface depths to 5000 ft. Knowledge of the rheological equations of state of the evaporites is basic to studies of the feasibility of mining potash by conventional means at depths greater than those presently mined, and of increasing the recovery of potash from mines already producing. The implications (of this reasearch) to date are that, under certain conditions, conventional mining of potash is feasible at subsurface depths to at least 4500 ft., and a greater recovery of potash can be made at depths presently mined. See Creep properties of Saskatchewan potash as a function of changes in temperature and stress, Proc. 3rd Symp. Salt, Cleveland, in press.

124. Achard, R.A., Geol. Surv. of Canada:
Landslides in southern British Columbia, 1969.
The purpose is to assess the current needs for geological investigation of past and potential landslides. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

125. Barron, K., Mines Branch, Dept. of Energy, Mines & Resources:
Fracture initiation and ultimate failure of rock specimens, 1966-1970.
To predict the strength of rock masses it will probably be necessary to take into account systematic discontinuities such as joints, bedding planes etc. that commonly occur. An attempt is being made to simulate the effects of such anisotropic properties by laboratory testing samples with predetermined failure planes. To date testing has confirmed theoretical postulates for the brittle failure of isotropic rocks. Theory and tests have been extended to cover the case of anisotropic rocks. By means of an anology between discontinuities present in the rock substance and those in the rock mass, estimates of rock mass properties have been made. These rock mass properties have then been applied to the problem of predicting fracture development around an underground haulageway. Comparison of these predictions of fracture zones around the haulageway with in situ measurements of fracture zone extent is encouraging.

126. Barron, K., Coates, D.F., Gyenge, M., Hedley, D., Yu, Y., Mines Branch, Dept. of Energy, Mines & Resources:
Stability of slopes in rock, 1963-.

Includes the determination of stress distribution in typical slopes by iterative processes using computers; attempts to predict slope failures by applying fracture criteria to the results obtained from stress distribution studies; co-operative field studies of particular open pit mines to determine slope deformation under stable and unstable conditions; instrument development for measurements of both stresses and displacements in slopes; field studies on the use of artificial support as a means of stabilizing slopes or as a means of increasing slope angle.

127. Bozozuk, M, Burn, K.N., Eden, W.J., Mitchell, R.J., Crawford, C.B., Division of Building Research, National Research Council:

Geotechnical properties of eastern marine clay, 1951-.

Both field and laboratory studies are being conducted on the "Champlain Sea" clay of the St. Lawrence lowlands. Field studies are concerned with landslide occurrences, settlement observation of highway embankments and the effect of volume change due to seasonal variations in soil moisture. Attempts are also being made to measure the loading of piles due to negative skin friction caused by subsiding clay layers. Laboratory investigations are being continued on the stress-deformation characteristics of the clay. See Settlement of a high embankment and overpass structures in Ottawa, Can. Geot. Jour., v. 6, no. 1, Feb. 1969.

128. Brown, R.J.E., Division of Building Research, National Research Council:

Permafrost distribution in Canada, 1953-.

Observations on the occurrence of permafrost throughout the permafrost region of Canada, with emphasis on the boundary of the discontinuous and continuous permafrost zones, are being collected continuously by direct field observations, review of the technical literature, and reports from other individuals and agencies. Accompanying this collection of information is the study of the climatic and terrain factors comprising the permafrost environment as a means of improving the understanding of and ability to predict the distribution and occurrence of permafrost. See Factors influencing discontinuous permafrost in Canada, the periglacial environment, McGill-Queen's Univ. Press, 1969, pp. 11-53.

129. Chagnon, J.Y., Quebec Dept. of Natural Resources:

Landslides and quick clays in the Province of Quebec, 1967-.

Landslides are studied in 3 different localities.

Study of clays near Desbiens, Lake St-John area, 1967-.

A seismic survey was carried out to learn something of the thickness and physical properties of the clays in this area.

Dam site investigations (8 sites in 1969), 1967-.

Vane investigation and seismic survey were conducted in 1969.

Study on the stability and erosion of "le Rocher Percé" in the Gaspé peninsula, 1967-.

130. Currie, J.B., Univ. of Toronto:
Experimental study of deformation features as indicators of conditions of rock fracturing, 1967-72.
A series of rock deformation experiments, at low to medium pressures and temperatures, in which deformation features induced in samples from several rock types are examined with a view to their use as indicators of deformational environment. See Fracture porosity in Alabaster: an experimental model of rock deformation; Bull. Can. Petrol. Geol. v. 17 no. 2, p. 117-132, 1969.

131. Garg, O.P., King, M.S., Univ. of Saskatchewan:
Static and dynamic elastic properties of rocks, 1967-73; Ph.D. thesis (Garg).
The elastic properties of sedimentary rocks are being measured experimentally by static and dynamic techniques. The static elastic moduli and ultrasonic shear and compressional-wave velocities are measured simultaneously on each rock sample as it is subjected to changes in triaxial loading conditions at a constant temperature in the range $0^{o}$-$120^{o}$F. It is anticipated that this research will lead to a better understanding of the reasons for the elastic moduli of rocks measured under static conditions differing from those determined by dynamic techniques. The research will also indicate the importance of the effect of changes in temperature on the mechanical properties of sedimentary rocks. See Static and dynamic elastic moduli of rocks under pressure, Proc. 11th Rock Mech. Symp., Berkeley, in press.

132. Gray, W.M., Toews, N.A., Barron, K., Mines Branch, Dept. of Energy, Mines & Resources:
Analysis for stress determination, 1966-.
See Stress determination from strain relief measurements on the ends of boreholes; planning, data evaluation and error assessment. Int. Symp. on Determination of Stresses in Rock Masses, Lisbon, 1969.

133. Grice, R.H., Gurevitch, S., McGill Univ:
Geotechnical data handling by computer methods, storage and selective retrieval, 1965-.

134. Grice, R.H., Sein, M., McGill Univ.
Weathering susceptibility of Utica shale, 1966-; M.Sc. thesis (Sein).
See Effect of temperature-humidity on the disintegration of non-expandible shales, Bull. Assoc. Eng. Geol., v. 5, no. 2, p. 69-77, 1968.

135. Grice, R.H., Ward, A.R., and others, McGill Univ:
Geotechnical data acquisition in Montreal, 1965-; M.Sc. thesis (Ward).
See Engineering geology of the Montreal subway, Engineering Geology, v. 3, no. 2, p. 59-64, 1967.

136. Hamilton, J.J., Division of Building Research, National Research Council:
Western Canada soils, 1960-.
Ground movements and soil moisture content are being measured and compared with weather records at four locations

in Manitoba and Saskatchewan in order to study climatic influences on these factors. A number of buildings are under observation to study the influence of ground movements on structures. See Effects of environment on the performance of shallow foundations, Can. Geot. Jour., v. 6, no. 1, p. 65-80, Feb. 1969.

137. Johnston, G.H., Division of Building Research, National Research Council:

Observations at Inuvik, Northwest Territories, 1954-.

The evaluation of the performance of various engineering facilities, e.g. building foundations, airstrip, roads, utilidors, etc. constructed on permafrost were continued by means of ground temperature and pile movement surveys. Depth of thaw surveys at sites having different soil and surface cover conditions in undisturbed areas and under buildings were carried out. Observations of the ground thermal regime and strains in structural members of the new wharf at Inuvik - begun in 1966 - were continued. Instrumentation for the study of a duct ventilation building foundation was installed and ground temperature measurements begun. Heat flow transducers and ground temperature cables were installed at the Inuvik airstrip as part of the second phase of this study following paving of the airstrip in 1969. Periodic measurements of net radiation were also made during the year. A co-operative study with the GSC/EMR was undertaken to evaluate the effects of the 1968 forest (tundra) fire on the terrain.

Dams and dykes on permafrost, 1958-.

The performance of dykes constructed on permafrost at the Kelsey Generating Station on the Nelson River in Northern Manitoba is being studied by means of ground temperature and dyke movement observations. A similar study, but with more detailed instrumentation (installed in 1969) including pore pressure measuring devices, was undertaken at the Kettle Generating Station, downstream from Kelsey, in co-operation with Manitoba Hydro. See Dykes on permafrost, Kelsey Generating Station, Manitoba, Can. Geot. Jour., v. VI, no. 2, May 1969, p. 139-157.

Permafrost at Thompson, Manitoba, 1969-.

Reconnaissance surveys including drilling and probing and terrain evaluation were carried out in the vicinity of Thompson to determine the occurrence and distribution of permafrost. Ground temperature and other instrumentation was installed at selected sites. Observations of permafrost occurrence and the ground thermal regime were continued in the Thompson townsite by means of visual examination of conditions in excavations, soil sampling and ground temperature measurements. A special test site was instrumented with heat flow transducers, radiometers, anemometers and ground temperature cables to assess the ground thermal regime and terrain and climate factors affecting the distribution and occurrence of permafrost at Thompson.

Anchorage in permafrost, 1965-.

Sustained load testing of grouted and screw type anchors installed in 1967 at a test site at Thompson, Manitoba - begun in 1967 - was continued in 1969. This

study was undertaken to evaluate the time-deformation (creep) characterictics and capacities of these anchors in frozen ground.

138. Lajtai, E.Z., Univ. of New Brunswick:
Strength of discontinuous rocks, 1965-.
Investigations of failure conditions in brittle, homogeneous and discontinuous materials under direct shear, triaxial and polyaxial loading conditions. See Strength of discontinuous rocks in direct shear, Geotechnique 19, no. 2, p. 218-233.

139. Leuschen, A.A., Kurfürst, P.J., King, M.S., Univ. of Saskatchewan:
Mechanical state of rock approaching failure, 1967-73;
Ph.D. thesis (Leuschen).
The purpose is to determine methods for predicting the onset of rock failure. Three laboratory techniques are used to study rock samples tested to failure under triaxial loading conditions: microseismic noise emitted by the rocks; velocities of compressional and shear waves in the rock; relationships between static and dynamic elastic mechanical properties of the rock. These tests are performed at a constant temperature in the range 0° - 120°F. This research has potential applications in the prediction of earthquakes and in the design of foundations for large structures to resist earthquakes, in both temperate and permafrost environments. In the oil, mining and construction industries there are important applications related to rock failure, especially at permafrost temperatures. See Static and dynamic elastic moduli of rocks under pressure, Proc. 11th Rock Mech. Symp., Berkeley, in press.

140. Locker, J.G., Research Council of Alberta:
Engineering properties of Upper Cretaceous-Tertiary shales in Central Alberta, 1967-; Ph.D. thesis, Univ. of Alberta.

141. MacFarlane, I.C., Division of Building Research, National Research Council:
Muskeg Research, 1954-.
See Muskeg engineering handbook, Univ. of Toronto Press, Toronto, 1969, 297 pp.

142. Mirkovich, V.V., Soles, J.A., Mines Branch, Dept. of Energy, Mines & Resources:
Thermal Conductivity of rocks and minerals, 1969-70.
See Experimental study relating thermal conductivity to thermal piercing of rocks, Int. J. Rock Mech. Min. Sci. v. 5, 205-218, 1968.

143. Owen, E.B., Geol. Surv. of Canada:
Engineering geology and mapping, Welland Canal, 1962-73.
See Stratigraphy and engineering description of soils on a section of the Welland Canal by-pass project; Geol. Surv. Can., Paper 69-31, 1969.
Engineering geology of dam sites and other construction project, northwestern Ontario, 1967-69.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

Interpretation of bedrock geology from photographs of de-watered American Falls, Niagara Falls, New York, U.S.A., 1969-.
This project consists of a detailed interpretation of geological features of bedrock from photographs taken of the de-watered American Falls at Niagara Falls, New York, U.S.A.

144. Penner, E., Division of Building Research, National Research Council:
Ground temperatures and frost action, 1948-.
Studies of adfreezing of soils to foundations and subsequent heaving have been extended. See Adfreezing of Leda clay to anchored footing columns, Can. Geot. Jour., v. I, no. 3, 1969.

145. Pouliot, G., Loiselle, A., Ballivy, G., Ecole Polytechnique:
Minéralogie et propriétés géotechniques des argiles de la Baie James, 1968-70; thèse de maîtrise (Ballivy).
Ce travail a pour but d'établir un parallèle entre certaines caractéristique géologiques et géotechniques des dépôts d'argile d'une même région mais d'origines différentes. Les caractéristiques géologiques étudiées sont le fabrique, la granulométrie, la composition chimique et minéralogique. Les études géotechniques portent essentiellement sur la résistance au cisaillement et la compressibilité de ces matériaux non remaniés. Les résultats sont utilisés pour mettre en évidence la présence d'argile lacustre (lac Barlow-Ojibway) à la base du dépôt d'argile marine (mer Tyrrel) à l'embouchure de la rivière Rupert dans la baie James.

146. Soles, J.A., Mines Branch, Dept. of Energy, Mines & Resources:
Mineralogy and petrolography of construction materials and their response to environmental conditions, 1959-.
Includes investigation to stability of sidewalk concrete, the relation between porosity and durability and comparison of methods of testing, and of gersdorffite from Sudbury.

## GEOCHEMISTRY

### Analytical Methods and Analysis

147. Abbey, S., Champ, W.H., Sen Gupta, J.G., Courville, S., Geol. Surv. of Canada:
Analysis of rock and minerals, a continuing project.
Development work is continuing on the refinement and extension of optical spectrographic methods (both photographic and direct-reading); improvement of precision and accuracy of X-ray fluorescence analysis for eight major components of rocks; improvement of methods for the determination of sulfur and carbon and in new applications of atomic absorption spectroscopy. The group is also collaborating in analysis of lunar rocks. See U.S. Geological Survey Standards: A critical study of published analytical data. Can. Spectroscopy, in press.

148. Alcock, F.G., Shaw, D.M., McMaster Univ.:
Analysis of trace constituents in rocks, 1969-; M.Sc. thesis (Alcock).
Further development of spectrographic methods for the determination of rare elements in silicate and sulphide rocks.

149. Delavault, R.E., Fletcher, W.K., Univ. of British Columbia:
Interferences in atomic absorption determination of trace elements in geological materials, 1969-.
Many reports of problems involving determinations of small amounts of various elements by atomic absorption techniques suggested that these problems should be investigated. Some of the causes of trouble have been identified and are to be described.

150. Gillieson, A.H.C.P., Dibbs, H.P., Moloughney, P.F., McMahon, Charles, Mines Branch, Dept. of Energy, Mines & Resources:
Determination of gold at the parts per billion level in rocks by neutron activation analysis combined with fire-assay preconcentration, 1968-69.
Using the much lower flux available from the antimony-beryllium source, in comparison with the reactor used by other workers, the same limits of detection (3 ppb.) were achieved, thus demonstrating that the method is contamination-limited and not flux-limited. Gold contents were determined in five samples, one from neighbouring Precambrian rocks, and four across the Gowganda silver and sulphide mineral deposit. See Mines Branch, Internal Report MS68-64.

151. Gillieson, A.H.C.P., McMahon, Charles, Mines Branch, Dept. of Energy, Mines and Resources:
Direct determination of oxygen in rocks and minerals by activation analysis using a fast-neutron generator, 1967-71.
The present work is directed towards improving the precision of the neutron activation analysis, particularly for high contents of oxygen, such as occur in silicates.

152. Lachance, G.R., Geol. Surv. of Canada:
X-ray emission analysis, 1960-.
See A practical solution to the matrix problem in X-ray analysis; Canadian Spectroscopy v. 11, no. 2 and 3, 1966.

153. Maxwell, J.A., Geol. Surv. of Canada:
Ultrabasic reference rock sample, 1962-70:
This was intended for use as an interlaboratory reference sample (ultrabasic) and particularly for use in the G.S.C. laboratories to test new methods and as a reference point in calibration curves. Several replicate analyses were made and the sample is used as a reference in the X-ray fluorescence method of rapid rock analysis. The preparation and release of a series of reference samples by the U.S. Geological Survey has made it unnecessary and its use will be confined to the Geological Survey of Canada.
Study of field sampling errors, 1967-70.
The project is intended to evaluate the magnitude of the error involved when three composite samples of a

selected small igneous intrusion were prepared in the field by three different geologists,using chemical analysis to determine differences in the composition of each sample. Analytical data have been obtained and it is hoped that evaluation of these data will be completed before 31 March, 1970.

BCRA survey of the accuracy of ceramic analysis, 1969-70.

The work involves collaboration, by invitation, in a second survey of the accuracy of ceramic analysis being conducted by the British Ceramic Research Association. Eight silicate samples will be analyzed by current analytical methods and techniques. Mr. J.L. Bouvier will assist in the analyses.

154. Muysson, J.R., Shaw, D.M., McMaster Univ.:
Calibration of geochemical standard samples.

Continued analytical efforts to improve on the knowledge of major and trace element abundances in widely used reference standard rocks and minerals.

155. Nebesar, B., Mines Branch, Dept. Energy Mines & Resources:
High-precision chemical analysis of sulphidic materials - differential spectrophotometric determination of sulphur, 1965-70.

Combustion method for determination of sulphur in iron ores, 1966-70.

156. Perrault, Guy, Hébert, Paul, Ecole Polytechnique:
Recherche sur les méthodes analytiques pour les oligo-éléments des roches et des minerais, 1965-.

Nous continuons nos recherches sur les méthodes de mesure des oligo-éléments des roches: 1) par fluorescence X; 2) par spectrophotométrie d'absorption atomique.

157. Smith, D.G.W., and O'Nions, R.K., Univ. of Alberta:
An investigation of electron microprobe techniques for determing the oxidation state of iron in minerals and natural glasses, 1969-.

Attempts are being made to develop accurate methods of determination of the $Fe^{2t}$ $Fe^{3t}$ ratio in minerals and glasses by means of the electron microprobe. A suite of 10 calciferous amphiboles and 3 natural glasses of known composition are being used initially to test the techniques.

158. Volborth, A., Dayal, R., Dalhousie Univ.:
Geochemical studies; stoichiometry of fluorine and oxygen; geochemistry of granites, 1968-; Ph.D. thesis (Dayal).

159. Webber, G.R., McGill Univ.:
Application of instrumental methods of analysis to geological materials, 1959-.

See Determination of zirconium in rocks by X-ray fluorescence using scattered radiation to correct for matrix effects. Canadian Spectroscopy, v. 12, no. 3, p. 105-110, 1967.

## Chemical Oceanography and Limnology

160. Buckley, D.E., Bedford Institute, Nova Scotia:
Chemical reactivity of inorganic particulate matter in the marine environment, 1967-69.
This project involves studies of diagenetic alteration of clay minerals in the marine environment. Detailed examination of the trace element and major element partition between the solid silicates and the aqueous environment are being undertaken in order to better understand the processes of elemental equilibrium in the oceans. See Clay-inorganic and organic-inorganic associations in aquatic environments - particulate organic-inorganic geochemistry of a glacial fiord. U.S. Atomic Energy Commission Report, AEC Contract AT-(04-3)-310, Paper no. 3, 1968.

161. Campbell, F.A., Oliver, T.A., Univ. of Calgary:
Mineralogy and chemistry of Ireton shales, Alberta to northeastern British Columbia, 1967-70.
See Mineralogic and chemical composition of Ireton and Duveronary Formation, Central Alberta. Bull. Can. Petrol. Geol. v. 16, no. 1, 1968, p. 46-63.

162. Cronan, D.S., Univ. of Ottawa:
The geochemistry and mineralogy of ferromanganese deposits from World Oceans, 1964-.
See the geochemistry of manganese nodules and associated pelagic deposits from the Pacific and Indian Oceans. Deep-Sea Research, v. 16, p. 335-359.
A statistical analysis of the geochemistry of pelagic sediments from the Pacific and Indian Oceans, 1966-.
A continuing study of the geochemistry of pelagic sediments from the Pacific and Indian Oceans using computerized statistical techniques. See Inter-element relationships in some pelagic deposits. Chem. Geol. v. 5, 1969.
The geochemistry of deep-sea sediments from the northeastern Atlantic Ocean, 1969-70.
Seven sediment cores from different topographic locations in the North Atlantic have been collected. The geochemistry of these sediments is being investigated in relation to their environment of formation and their location relative to potential sources of elements.

163. Cronan, D.S., Thomas, R., Univ. of Ottawa:
Geochemistry of ferromanganese deposits in Lake Ontario, 1969-71.
An investigation into the nature and origin of ferromanganese deposits in Lake Ontario, and their effect on the chemical balance of the lake.

164. Fletcher, W.K., Univ. of British Columbia:
Trace elements in sedimentary rocks, 1959-.
Wide variations have been found in the copper, zinc, lead, molybdenum, and selenium contents of sedimentary rocks and a paper reporting on the results so far obtained should be available in 1970.

165. Gees, R.A., Cok, A., Drapeau, G., Wilson, R., Grant, A.C., Stewart, J.M., Dalhousie Univ.:
Marine geology of the eastern seaboard of Canada with special emphasis on the continental slope and rise, 1969-72; Ph.D. theses (Cok, Grant, Drapeau), M.Sc. theses (Wilson, Stewart).
During the first phase of the project the bottom topography and the subbottom structures will be investigated. The second phase will be concerned with the surficial sediments. The sediments will be investigated as to their structural and textural features, as well as their geochemistry. Large box cores will be required for these studies. It is hoped that these studies will lead to a better understanding of the diagenesis of fine grained sediments. See Surface textures of beach and dune sands. An investigation with the scanning electron microscope. Beitrage zur Elektr. mikrosk. Direktabbildung. Bd. 2., 1969.

166. Guenther, C., Kramer, J.R., McMaster Univ.:
Chemical changes in lakes upon dredging, 1969-71; M.Sc. thesis (Guenther).

167. Jordan, F.W., Schwarcz, H.P., McMaster Univ.:
Boron isotope fractionation during clay mineral adsorption from sea water, 1967-71; Ph.D. thesis (Jordan). See Earth and Plan. Sci. Letters, v. 6, 1969, p. 1-5.

168. Kemp, A.L.W., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Great Lakes sediment organic program, Lakes Erie and Ontario, 1967-.
Chemical studies are being made to determine the nature and distribution of organic materials present in the recent sediments of Lakes Ontario, Erie and Huron, and to relate the results to modern diagenesis of organic matter in lacustrine environments.

169. Kramer, J.R., McMaster Univ.:
Chemistry and benthos of San Francisco Bay, 1968-.
Adsorption chemistry of clays, 1969-71.

170. Kramer, J.R., Tyrola, Paula, McMaster Univ.:
Adsorption of phosphate on clays, 1969-70.

171. Kuo, H.W., Crocket, J.H., McMaster Univ.:
Au, Pd and Ir in deep sea sediments, 1968-70; M.Sc. thesis (Kuo).
A neutron activation method is used for the determination of Au, Pd and Ir in several deep sea cores. The scope of this work is to study the behavior of these elements in different types of deep sea sediments. The possibility of extraterrestrial contribution in the deep-sea sediments will also be studied. See Pd, Ir and Au in deep-sea manganese nodules, Geochim, et Cosmochim. Acta, v. 32, p. 1049-1056, 1968.

172. Levinson, A.A., Hitchon, B., Univ. of Calgary:
Selected trace elements in Alberta brines, 1970-71.

173. Rashid, M.A., Bedford Institute, Nova Scotia:
Metal holding capacity of humic acids associated with marine sediments, 1969.
The phenomenon of migration and accumulation of various metals in all natural environments is associated with organic substances. Many trace and major elements occur in coals, shales, crude oils and marine sediments in concentrations appreciably higher than their average content in earth's crust. A study is, therefore, initiated to ascertain the metal holding capacity of humic acids associated with marine sediments. The metals included in this study are Al, Fe, Cu, Co, Ni, Zn, and Mg. See Modular weight distribution measurements on humic and fulvic acid fractions from marine clays on the Scotian Shelf, Geochem Cosmochim Acta 33; 147-151.
Metal holding capacity of humic acids associated with marine sediments, 1969.
The phenomenon of migration and accumulation of various metals in all natural environments is associated with organic substances. Many trace and major elements occur in coals, shales, crude oils and marine sediments in concentrations appreciably higher than their average content in earth's crust. A study is, therefore, initiated to ascertain the metal holding capacity of humic acids associated with marine sediments. The metals included in this study are Al, Fe, Cu, Co, Ni, Zn, and Mg. See Molecular weight distribution measurements on humic and fulvic acid fractions from marine clays on the Scotian Shelf, Geochem Cosmochim Acta 33: 147-151.
Chemical characteristics of humic compounds associated with marine sediments - degree of aromaticity and aliphaticity, 1969-70.
The geochemical investigations are aimed to characterize the chemical and physical nature of humic substances associated with marine sediments to correlate the structural details of these substances with depositional environment and to follow the geological development of organic matter as it is subjected to diagenetic and metamorphic changes. See Molecular weight distribution measurements on humic and fulvic acid fractions from marine clays on the Scotian Shelf, Geochem Cosmochim Acta 33; 147-151.

174. Sozanski, Andrew, Univ. of Ottawa:
Geochemistry of lacustrine ferromanganese concretions in Eastern Canada, 1969-71; M.Sc. thesis.

175. Thomas, R.L., Inland Waters Branch, Dept. of Energy, Mines & Resources:
The inorganic geochemistry of the Great Lakes sediments, 1969-.
A detailed examination on the spatial distribution of major and trace elements in the surface of the Great Lakes to determine the basic geochemistry of the lake sediments.

176. Thomas, R.L., Lewis, C.F.M., Inland Waters Branch, Dept. of Energy, Mines & Resources:
The sediments and geochemistry of the Kingston Basin, Lake Ontario, 1970-.
A detailed sediment sampling program is to be undertaken in the Kingston Basin and St. Lawrence River outlet of Lake Ontario. It is designed to provide detailed information, particularly with regard to the geochemical parameters, of the outflow environment of Lake Ontario.

177. Wardlaw, N.C., Univ. of Saskatchewan:
Petrology and geochemistry of Devonian carbonates, Norman Wells-Fort Good Hope area, Northwest Territories, 1967-70.
Geochemical investigations are being made on major and trace elements in whole rock samples, as well as on specific types of fossil materials, matrices and cements, in an attempt to account for chemical variations in terms of observable constituents which can be related to environmental controls. Few analysis have been made previously on specific constituents in ancient limestones and such data provide the key to understanding variations in whole rock chemistry. The chemical investigations are being undertaken in conjunction with petrographic and stratigraphic studies. The reservoir properties of these rocks, in relation to lithology and reconstructed environments are also being studied.

178. Williams, G.D., Univ. of Alberta:
Geochemical differentiation of depositional environments, 1966-71:
See Chemical composition of shales of the Manville Group (Lower Cretaceous) of central Alberta, Canada; Bull. Amer. Assoc. Petroleum Geol., v. 49, no. 1, p. 81., 1965.

## Exploration Geochemistry

179. Austria, V., New Brunswick Dept. of Natural Resources:
Regional geochemistry of stream and spring sediments, New Brunswick, 1965-70.
Systematic regional sampling of sediments, and analysis for 8 to 10 trace elements is followed by detailed examination of specific areas for the purpose of (a) developing criteria for distinguishing between significant and non-significant anomalies; and (b) obtaining fundamental information on the mobility of elements in the surficial environment.

180. Bennett, G., Thurston, P., Giquere, J.F., Wolfe, W., Ontario Dept. of Mines:
Operation Pukuskwa Ontario, 1968-70.
Areal geology and stream sediment geochemistry of the area between Marathon and Wawa, south of the Trans-Canada highway, along the north shore of Lake Superior. See Ont. Dept. Mines, Geol. Maps no. 506, 507, 1968.

181. Blain, C.F., Nichol, Ian, Queen's Univ:
Regional geochemical reconnaissance in northwest Ontario, 1969-72; graduate thesis (Blain).
The investigation is directed to evaluating the viability of low density sampling as a procedure for identifying large scale areas of increased mineral potential in the Canadian Shield of northwest Ontario.

182. Boyle, R.W., Geol. Surv. of Canada:
Geochemistry of gold deposits, 1965-71.
Consists of a study of the distribution, migration, and concentration of gold in rocks, soils, waters, and biological materials. The origin of all types of gold deposits is also being investigated, as are also geochemical methods for their discovery. Preliminary data indicate that As, Sb, Se, and Te are good indicators of gold deposits in geochemical surveys utilizing soils, waters, rocks, and biological materials in most parts of Canada as well as on a world-wide basis. See Hydrothermal transport and deposition of gold; Econ. Geol. v. 64, no. 1, p. 112 and The geochemistry of silver and its deposits; Geol. Surv. Canada Bull. 160.

183. Boyle, R.W., Dass, A.S., Geol. Surv. of Canada:
Wall rock alteration study of silver deposits - Cobalt and Gowganda areas, Ontario, 1967-69; Ph.D. thesis (Dass), Carleton Univ.
Includes a study of the migration and concentration of various elements and compounds during mineralization of the Ni-Co-As-Ag veins at Cobalt and Gowganda, Ontario. The habit of the trace elements (eg. Ag, Co, Ni, etc.) is detailed in G.S.C. Paper 67-35; that for the major constituents (eg. $Sio_2$ Ca, Fe, $Co_2$ etc.) will be detailed in thesis by Dass and in a paper to appear in the Canadian Mineralogist. See Geol. Surv. Canada Paper 67-35, 1967.

184. Brabec, D., Univ. of British Columbia:
The use of different methods of extraction of copper and zinc in eruptive rocks in exploration geochemistry, 1958-; Ph.D. thesis.
See Aqua regia-extractable versus total copper and zinc content of granitic rocks. A.I.M.E., in press.
Geochemistry of Guichon bathotith, British Columbia, 1967-70; Ph.D. thesis.

185. Callahan, J.E., McCartney, E.D., Queen's Univ.:
Heavy mineral fractions in stream sediments and a stream sediment geochemical survey applied to mineral exploration, Churchill Falls area, Labrador, 1968-71; Ph.D. thesis (Callahan).
The magnetic and non-magnetic heavy mineral fractions are being analyzed for selected trace elements and results evaluated as a prospecting method. Standard stream sediment geochemical prospecting methods are included in the study.

186. Cameron, E.M., Geol. Surv. of Canada:
Geochemical study of Proterozoic Papaskawasati Group, Lake Mistassini, Quebec, 1968-69.

Geochemical means to provide information on litho-geochemical variation within the Papaskwasati sediments and the correlation of units from bore hole to bore hole; the type and direction of the source of the sediments; zones favourable for the concentration of heavy minerals, including ore minerals; trends indicating where the maximum concentration of ore minerals should occur.

187. Campiglio, C., Quebec Dept. of Natural Resources:
Petrography and geochemistry of the Bourlamaque batholith, Val d'Or district, Quebec, 1969-70; Ph.D. thesis, Ecole Polytechnique.
The main purpose is to define the possibilities of mineral concentrations associated with this pluton and history of the magmatic crystallization and postmagmatic alteration, in relation to the formation of gold deposits and concentration of copper and molybdenite.

188. Coleman, L.C., Univ. of Saskatchewan:
Distribution of trace metals in bedrock of the Hanson Lake area, Saskatchewan, 1962-72.
Geology mapping has been done at 1"=500' in a 30 square mile area west of Hanson Lake, Saskatchewan. About 10,000 specimens of bedrock were collected at approximately 200' intervals and were analyzed by X-ray fluorescence techniques for Cu, Zn, Ni, and Fe. Of these, specimens containing anomalous amounts of Cu, Zn and Ni are being studied with the help of a microprobe in order to attempt to relate the distribution of these metals to known sulfide deposits in the area and to the geology of the area. See Preliminary report on the geology and geochemistry of the Hanson Lake west area, Saskatchewan, Part 2: Interim Geochemical Results, Saskatchewan Research Council, Geology Division, Circular 2, 1966.

189. Darling, Richard; Ambrosii, Georgio; Laliberté Lise; Ecole Polytechnique:
Exploration géochimique dans la région de Preissac-LaCorne, Québec, 1968-71; thèse de doctorat (Ambrosii), thèse de maîtrise (Laliberté).
a) Une étude de la distribution des oligo éléments chosis entre les minéraux majeurs des batholithes de Preissac, LaCorne et LaMotte. Le but de cette étude est de lier le comportement de ces éléments et leur redistribution pendent la période post-magmatique du refroidissement de granites à la formation des gisements post-magmatiques de Li et Mo qui se trouvent associés avec ces granites. b) Une étude comparative de la distribution des oligo éléments choisis entre les minéraux majeurs des pegmatites économiques (Li, Mo, Be) et non-économiques.

190. Darling, Richard; Gélinas, Léopold; Campiglio, Carlo; Guha, Jayanta; Ecole Polytechnique:
Le pétrologie et le géochemice du batholithe Bourlamaque, 1969-71; thèse de doctorate (Campiglio).
Le batholithe de Bourlamaque est composé d'un gabbro quartzite en partie altéré par des processus post-magmatiques. Il contient, dans quelque endroits, des sulphures (Cu, Mo) disséminés. Il y a aussi plusieurs mines

d'or dans les bordures du batholithe. Le but principal de ce project sera d'étudier la petrographie et la géochimie du batholithe, de préciser l'histoire de sa cristallisation magmatique et de son altération postmagmatique, de relier à cette histoire la formation des gisements d'or et des concentrations de Cu, Mo. On espère que ce travail pourra donner des indications pétrographiques, minéralogiques, ou géochimiques utiles à la prospection de ces métaux.

191. Darling, Richard; Spitz, Guy; Ecole Polytechnique:
La géochimie des roches autour du gisement de cuivre de SOQUEM, Canton de Louvicourt, Québec, 1969-71; thèse de maîtrise (Spitz).
Echantillonnage des roches autour du gisement et leur analyse pour des éléments majeurs et des oligo éléments choisis.

192. Davenport, P.H., Nichol, Ian, Queen's Univ.:
Geochemical dispersion associated with the Cu-Sn-Ag deposit at Uchi Lake, Northwest Ontario, 1969-72; graduate thesis (Davenport).
The investigation is aimed at recognizing diagnostic geochemical criteria which would serve to identify mineralization of the Uchi Lake type from low grade mineralization characterized by similar geophysical anomalies.

193. Delavault, R., Marshall, D.B., Univ. of British Columbia:
Spectroscopic analysis of geochemical samples and composition of volcanic rocks associated with mineralization, 1968-72.
See Aqua regia extractable copper and zinc in volcanic rocks in relation to copper mineralization (with H.V. Warren) Econ. Geol. v. 64, p. 672-676, 1969.

194. Delevault, R.E., Shiikawa, M., Warren, H.W., Cross, H., Univ. of British Columbia:
Mercury in agricultural soils, 1963-.
The primary interest is in mercury as a pathfinding element in discovery of ore deposits but its significance in relation to public health is also of interest.

195. Delavault, R.E., Warren, H.V., Univ. of British Columbia:
Relationship between arsenic in vegetal matter and economic mineralization, 1964.
See the arsenic content of Douglas Fir as a guide to some gold, silver and base metal deposits. Can. Inst. Min. Met., v. 61, no. 675, July, p. 860-866, 1968.

196. Dyck, W., Geol. Surv. of Canada:
Development of radiochemical exploration methods using radon, 1968-69.
Radon tests in surface waters and in soils were carried out in three different geological environments (the Gatineau Hills, Quebec, Sudbury and Elliot Lake, Ontario) to study the applicability of the radon method in detailed prospecting for uranium. See Development of uranium exploration methods using radon; Geol. Surv. Canada, Paper 69-46, 1969.

197. Fletcher, W.K., Hoffman, S., Univ. of British Columbia:
Geochemical dispersion of copper in relation to copper mineralization in south central British Columbia, 1969-; Ph.D. thesis (Hoffman).

198. Foster, J.R., Nichol, Ian, Queen's Univ.:
The application of partial extraction techniques in geochemical exploration, 1969-72.
The objectives are to assess the application of selected partial extraction techniques to specific problems of geochemical exploration.

199. Garrett, R.G., Geol. Surv. of Canada:
Geochemical study of economic elements in glacial till, 1968-69.
Surveys to study the geochemistry of tills around ore deposits have been carried out at Manitouwadge, Ontario (summer 1968) and Val d'Or, Quebec (January 1969). In addition soils and stream sediments were collected at Manitouwadge. Results indicate both the usefulness and limitations of exploration geochemistry in a glaciated environment. The results are being prepared for publication.
Regional geochemical census of plutonic rocks in the eastern Yukon, 1969-72.
The aims are: firstly, to outline areas of increased mineral potential (Cu, Mo, Su, W) in which exploration activity might be focused, and secondly, to provide regional geochemical data to aid metallogenetic and regional geological studies. A full scale sampling program is planned for the 1970 field season.

200. Gélinas, Léopold; Darling, Richard; Hardy, Richard; Ecole Polytechnique:
Le pétrologie et la géochimie des roches ultramafiques et des gisements de nickel associés de la région de Cape Smith, Québec, 1969-71; thèse de doctorat (Hardy).
L'étude de la pétrographie et de la distribution des éléments majeurs et oligo éléments choisis dans les roches ultramafiques et des gisements associés. Le but de cette recherche est: a) d'expliquer l'histoire de la cristallisation magmatique et métamorphique de ces minerais et de ces roches et le comportement des oligo éléments lors de ces processus et b) de trouver des indices chimiques qui seront utiles en prospection pour des gisements de Ni dans un milieu géologique semblable.

201. Govett, G.J., Univ. of New Brunswick:
Primary dispersion in Cyprus volcanics, 1967-70.

202. Govett, G.J., Lahti, H.R., Univ. of New Brunswick:
Some factors contributing to secondary dispersion of trace elements in glacial soils of the St. Stephen area, New Brunswick, 1969-70; M.Sc. thesis (Lahti).

203. Hornbrook, E.H.W., Geol. Surv. of Canada:
Development of biogeochemical exploration methods for metallic mineral deposits, 1967-69.

See Biogeochemical prospecting for molybdenum in west central British Columbia, Geol. Surv. Canada, Paper 68-56, 1969.

204. Kelly, R., Hirlemann, G., Ministère des Richesses Naturelles du Québec:
Etudes de la dispersion des éléments autour des gisements, 1969-.
Ces recherches fondamentales visent à mettre au point de nouvelles méthodes d'exploration qui devraient permettre de localiser des gisements par l'analyse d'auréoles d'éléments mineurs qui serviraient d'indicateurs. Trois régions distinctes ont été étudiées: (1) la région de Rouyn-Noranda; (2) les cantons de l'Est; (3) la Gaspésie.

205. Macdonald, J.A., McGill Univ.:
Processes of surficial dispersion of uranium in the vicinity of some pitchblende deposits, Beaverlodge, Saskatchewan, 1964-70; Ph.D. thesis.

206. Moore, J.C.G., Mount Allison Univ.:
Mercury haloes around sulphide bodies of northern New Brunswick, 1963-72.

207. Morse, R., Geol. Surv. of Canada:
Geochemical dispersion of uranium and its decay products, 1969; thesis project; Ph.D. thesis, Queen's Univ.
Involves development of a rapid method for the relative determination of radium-226 in sediments and its application to prospecting for uranium. The method discriminates against radiation from thorium, potassium and other sources. See Radium geochemistry applied to prospecting for uranium, Canadian Mining Journal May, 1969, p. 75-76.

208. Nigrini, A., Geol. Surv. of Canada:
Transport and deposition of ore indicator elements in streams and sediments, 1969-71.
The purpose is to determine the mechanism of transport and the chemical and/or physical controls in the deposition of trace elements that may be ore indicators in the surficial environment. It should provide a foundation on which to interpret regional geochemical data with particular reference to the search for buried ore deposits.

209. Mapping Parties, Quebec Dept. of Natural Resources:
Stream sediment sampling in geological mapping, 1965-.
A continuing program of geochemical investigation in course of mapping by geological parties. Samples collected are analyzed for Cu, Zn, Pb, Mo, U, Au, Ag, V, Cr, Ni, Pt, Sn, W. Subsequent to 1965 most preliminary geological maps indicate the assay results against stations where the samples were collected.
Rock geochemistry, 1968-.
In order to obtain chemical information on the lithological units encountered in the course of mapping, the field parties collect fresh rock samples which are

analysed for the oxides (Si, Al, Ca, Mg, K, Na, Ti, Fe) and trace elements (Cu, Pb, Zn, Au, Ag, Mo, U, V, Cr, Ni, Pt, Sn, W).

210. Siddeley, G., Geol. Surv. of Canada:
The geochemical composition of ultramafic rocks and its relation to their contained mineral deposits, 1968-70.

Many ultramafic bodies, mainly in the Canadian Shield have been sampled. A variety of ultramafic occurrences are involved. They may range from small lensoid bodies of homogeneous peridotite (Timmins area) to extensive sheets of well layered to poorly differentiated ultramafics (Ghost Range, Ontario; Ungava, Quebec). Where ores occur, they may be local or extensive, massive and/or disseminated, contact phenomena, differentiates or interstitial ores. The primary dispersion of ore indicator elements appears to depend largely on ore geometry and mobility of the individual elements. Factor analysis is being applied to the data of each ultramafic unit to resolve groupings of associated elements. Such grouping of factors generally represent mineral phases which may be interpreted as primary or metasomatic; they shed light on metasomatic processes affecting the rock and therefore on the history of certain elements useful as ore indicators.

211. Smith, Eric, McGill Univ.:
A study of the nature of mercury anomalies in rocks near certain mineralized zones, 1969-70; M.Sc. thesis.

212. Smith, J.R., Saskatchewan Research Council, Coleman, L.C., Gaskarth, J.W., Univ. of Saskatchewan:
Geochemistry of Precambrian rocks in Saskatchewan, 1965-69; M.Sc. thesis (Gaskarth).

Evaluation of the relationships between ore deposits and trace metal distributions in country rocks. See Preliminary reports on geology and geochemistry of Hanson Lake West Area, Saskatchewan, pt. 2, Interim geochemical results; Sask. Research Council, Circular 2, 1966.

213. Staplin, F.L., Turnbull, H., Imperial Oil Ltd., Calgary:
Sedimentary organic matter, organic matter, organic metamorphism, and oil and gas occurrence, 1963-.

Includes identification and characterization of organic debris in sediments; metamorphic state or "rank" of exine, cuticles and other organic matter in sediments; application to oil and gas exploration, source rock identification, etc. See Sedimentary organic matter, organic metamorphism and oil and gas occurrence. Bull. Canadian Petroleum Geology, v. 17 (1), p. 47-66, 1969.

214. Warren, H.V., Warren, Ian, Fletcher, W.K., Univ. of British Columbia:
Anomalous gold and silver in vegetal matter in relation to economic mineralization.

Wide variations in the gold and silver concentrations of vegetal matter suggest that biogeochemistry may be useful in searching for both small high-grade and large disseminated deposits of these precious metals. See Gold

and silver content of some trees and horsetails in British Columbia, Bull. of Geol. Soc. America, v. 61, February, p. 123-128, 1950.

215. Wolfe, W.J., Ontario Dept. of Mines:
Primary dispersion of copper, nickel, cobalt and sulphur in mafic intrusive rocks of the Kamiskotia-Whitesides area, District of Cochrane, Ontario, 1969-70.
Mafic intrusive rocks in a 100 square-mile area located approximately 20 miles west of Timmins, Ontario have been systematically sampled and analysed with the view to determining regional variability of total sulphur and aqua-regia extractable Cu, Ni and Co. See Ont. Dept. Mines, Summ. of Field Work, 1969.
Geochemical orientation surveys in areas of base metal mineralization - Nipigon-Schreiber, District of Thunder Bay Ontario, 1970-71.
Surveys in the vicinity of known base metal mineralization designed to test the effectiveness of various media in maximizing geochemical target areas in glaciated terrain. Data obtained from these surveys will be used to establish minimum sampling and analytical requirements for successful regional geochemical surveys in unexplored areas.

## Isotope Geochemistry

216. Baadsgaard, H., Lee, K.S., Univ. of Alberta:
U-Pb systematics in metamorphic recrystallization, 1969-71; M.Sc. thesis (Lee).

217. Baadsgaard, H., Morton, R.D., Ramsay, C., Univ. of Alberta:
Isotopic and geochemical study of the U-mineralization, Hab Mine, Saskatchewan, 1970-73; Ph.D. thesis (Ramsay).

218. Boyle, R.W., Geol. Surv. of Canada:
Lead and sulphur isotope geology of Keno and Galena Hills, Yukon, 1958-69.
See Sulphur isotope investigation of the lead-zinc-silver-cadmium deposits of the Keno Hill-Galena Hill area Yukon, Canada; Econ. Geology (in press, 1970).

219. Burnie, S.W., Crocket, J.H., Schwarcz, H.P., McMaster Univ:
Sulfur isotope geochemistry of the White Pine copper deposit, 1967-70; M.Sc. thesis (Burnie).

220. Campbell, F.A., Lusk, J., Univ. of Calgary:
S-isotope partitioning in sulphide minerals, 1969-71.
See A reconnaissance study of some Western Canadian lead-zinc deposits, Econ. Geol. v. 63, no. 4, 1968, p. 349-359.

221. Chrismas, L., Baadsgaard, H., Folinsbee, R.E., Fritz, P., Krouse, H.R., Sasaki, A., Univ. of Alberta:
Isotope studies of Craigmont ore deposit, British Columbia, 1967-69; M.Sc. thesis (Chrismas).

222. Clark, A.H., Queen's Univ., McNutt, R.H., McMaster Univ.:
Mineralogy, chemistry, and stable isotope distribution of Jurassic-Pleistocene andesitic and rhyolitic volcanics, Copiapo region, northern Chile, 1969-72.
Representative, radiometrically-dated specimens of andesitic and rhyolitic lavas and pyroclastics are under study, in an attempt to clarify the evolution of these dominant magma types during the orogenic and post-orogenic stages of the Andean mobile belt. In part, this work is directed towards the distinction of mineralized and barren extrusive units.

223. Draper, R.G., Montgomery, D.S., Wanless, R.K., Mines Branch, Dept. of Energy, Mines & Resources:
The variation of the sulphur isotope ratio of the bituminous sand from the McMurray Formation as a function of the oxygen content of the bitumen, 1967-70.

224. Farquhar, R.M., Univ. of Toronto:
Lead isotope studies of Precambrian leads, 1964-.
Studies of leads associated a) with Yellowknife area rocks and b) with Grenville province rocks, have shown variations in Pb isotopic composition which give information about the history of these leads in the earth's crust. Reanalysis of these samples is planned to provide the basis of more accurate interpretation of these variations.

225. Folinsbee, R.E., Smejkal, V., Kirkland, K., Univ. of Alberta:
Sulphur isotope studies of Chinkuashih copper mine, 1969; M.Sc. thesis (Kirkland).

226. Fritz, P., Univ. of Alberta:
The isotopic composition of minerals from hydro-thermal ore deposits - carbonates, sulphides, sulphates and oxides, and silicates, 1966-.
See The oxygen and carbon isotopic composition of carbonates from the Pine Point lead-zinc deposit. Econ. Geol., in press.

227. Goodwin, A.M., Geol. Surv. of Canada:
Sulphur isotope abundances in Archean volcanic and sedimentary rocks, 1965-.
This program is an outgrowth of related studies of sulphur isotope abundances in the Michipicoten and Woman River iron formations of Ontario recently completed in collaboration with H.G. Thode and J. Monster of McMaster University.

228. Goodwin, A.M., Univ. of Toronto, Thode, H.G., McMaster Univ., Wanless, R.K., Geol. Surv. Canada:
Sulphur isotope abundances in Precambrian supracrustal rocks, 1964-.

229. Greig, J., Folinsbee, R.E., Baadsgaard, H., Fritz, P., Krouse, H.R., Smejkal, V., Cumming, G.L., Sasaki, A., Univ. of Alberta:
Isotope studies of Irish base metal deposits using Pb, O, C, and S isotopes, 1967-70; Ph.D. thesis (Greig).

230. Grootenboer, J., Schwarcz, H.P., McMaster Univ.:
Sulphur isotope fractionation between coexisting sphalerite, pyrite and galena, 1966-69; Ph.D. thesis (Grootenboer).
See Experimentally determined sulphur isotope fractionation between sulphide minerals. Earth Plan. Sci., Lett., in press.

231. Kandalam, C., Folinsbee, R.E., Smejkal, V., Fritz, P., Univ. of Alberta:
Isotopic studies of depth effect in Con-Rycon mine, Yellowknife, Northwest Territories, on sulphur isotopes, 1969-70; M.Sc. thesis (Kandalam).
Study of cogenetic sulphide minerals in Con-Rycon mine to establish temperature of deposition and depth effect.

232. Kirkland, K., Folinsbee, R.E., Smejkal, V., Krouse, H.R., Univ. of Alberta:
Sulphur isotope studies of Noranda copper prospect, Clearwater, British Columbia, 1969-70; M.Sc. thesis (Kirkland).

233. McNutt, R.H., Crocket, J.H., Marchand, M., McMaster Univ.:
Isotopic and geochemical studies on possible meteorite craters, 1969-72; Ph.D. thesis (Marchand).
$Sr^{87}/Sr^{86}$ ratios of mineral phases of ultrabasic inclusions in kimberlites, 1969-70.
See Isotopic composition of strontium in some South African kimberlites. Trans. A.G.U. 50, p. 346.

234. Ohmoto, Hiroshi, Univ. of Alberta:
Fluid inclusions and isotope study of lead-zinc deposits at Kootenay arc, British Columbia and fluid inclusion study of mantle derived materials, 1969-70.
See Chemistry and origin of hydrothermal fluids at the Bluebell mine, British Columbia; Geol. Soc. Amer., Ann. Mtgs., Abst., p. 165, 1969.

235. Morton, R.D., Robinson, B.W., Univ. of Alberta:
The genesis of the Echo Bay Ag/U deposit: a geological, geochronological, geochemical and stable isotope investigation, Great Bear Lake, Northwest Territories, 1968-71; Ph.D. thesis (Robinson).
The Echo Bay deposit is a type example of uraninite-Co-Ni-arsinides-sulphides-silver mineralization within a Ag, Cu and U metallogenic province.

236. Schwarcz, H.P., Longinelli A., Fontes, J.C.; McMaster University:
Oxygen isotope studies of sulphate minerals, 1968-71.
Variation in $O^{18}/O^{16}$ and $S^{34}/S^{32}$ ratios in sulphate minerals formed in synthetic evaporite systems, in modern salt pans and in ancient evaporite basins; sulphate-water exchange in oil-field brines.

237. Shieh, Y., Schwarcz, H.P., McMaster Univ.:
Oxygen isotope studies of silicate rocks, 1968-70.
Analysis of silicate and oxide minerals by use of bromine pentafluoride reagent.

238. Smith, D.G.W., Morton, R.D., Fritz, P., Ohnoto, H., Clarke, D.B., Univ. of Alberta:
A geochemical and mineralogical investigation of spilites, 1969.
A new attempt to elucidate the genesis of these inigmatic rocks which will combine stable isotope (deuterium, oxygen and carbon) and electron microprobe studies with classical petrochemistry and petrography. Initial work will be mainly on specimens collected from the Canadian West Coast and the Olympic Peninsula of the U.S.A.

## Mineralogical Phase Chemistry

239. Anderson, G.M., Nriagu, Jerome, Univ. of Toronto:
Transport of lead sulphide in hydrothermal solutions, 1967-70; Ph.D. thesis (Nriagu).
See The solubility of PbS in $H_2S$-water solutions Econ. Geol. v. 57, p. 809-828, 1962.

240. Arnold, R.G., Saskatchewan Research Council:
Geochemistry of sulphides, 1965-70.
An investigation of geochemistry and phase relations of sulphides in ores in an effort to interpret modes of formation of ores. See Pyrrhotite phase relations below 304 $\pm$ 6°C at less than 1 atm. total pressure. Econ. Geol. v. 64, p. 405-419.

241. Arnold, R.G., Malik, O., Univ. of Saskatchewan:
Phase equilibrium studies in the Fe-Ni-S systems, 1966-71; Ph.D. thesis (Malik).
Phase equilibrium studies in the Fe-Ni-S system are being carried out at both high and low temperatures to aid in the interpretation of the natural assemblages.

242. Beswick, A.E., Laurentian Univ.:
Transition metal distributions between olivines, pyroxenes, and spinels, 1968-1972.
The aim is to obtain transition metal partition coefficients over a range of temperatures and pressure. The results will be applied to the Sudbury Nickel Irruptive in order to elucidate genetic history of these rocks and their associated ores.
Alkali metal distributions between sanidine, leucite, phlogopite and granitic glass, 1965-70.
The aim is to allow quantitative evaluation of alkali metal distribution during late stages of magmatic evolution.

243. Cabri, L.J., Mines Branch, Dept. Energy Mines & Resources:
Sulphide synthesis, 1964-.
Sulphide minerals of closely controlled compositions are synthesized to provide material for other investigations, and to provide fundamental data on phase equilibrium relationships in certain sulphide systems. See Density determinations: accuracy and application of sulphide stoichiometry - L.J. Cabri, Am. Min. v. 54, 1969, p. 539-548.

244. Cabri, L.J., Harris, D.C., Mines Branch, Dept. Energy, Mines & Resources:
Compositions and stability relations of copper-iron-sulphides, 1965-.
A low-temperature copper-iron sulphide (talnakhite) related to chalcopyrite has been characterized. The iron analogue of valeriite has been discovered, and is currently being studied. See A new copper-iron sulphide, Ec. Geol. v. 62, p. 910-925.

245. Caley, William, Queen's Univ.:
Iron and nickel distribution between olivine and a metallic phase, 1967-69; M.Sc. thesis.
See The stability of olivine and pyroxene in the Ni-Mg-Si-O System, American Mineralogist, v. 53, 1968.

246. Clark, A.H., Armstrong, R.C., Queen's Univ.:
Phase equilibria in ore mineral systems, 1969-; M.Sc. thesis (Armstrong).
Experimental studies will, as far as possible, be integrated with metallogenetic work in the Cordillera of North and South America. It is hoped to concentrate on sulphide-type systems involving mercury, in an effort to explain variations in the generally rather consistent mineralogy of commercial Hg deposits.

247. Currie, K.L., Ermanovics, I.F., Geol. Surv. of Canada:
Diffusion studies in supercritical water, 1962-70.
Currently, water rich parts of the system Q-Or-Ab-$H_2O$ are being investigated. A theoretical study of transport phenomena in dense fluids is continuing. See On the solubility of albite in supercritical water; Amer. Jour. Sci., v. 266, p. 321, 1968 and Geological transport in in interstitial fluids, Jour. of Geology (in press).

248. Edgar, A.D., MacRae, N.D., Univ. of Western Ontario, Mottana, A., Univ. of Milan:
Geochemistry of eclogites and their minerals, 1966-71.
See The chemistry and cell parameters of omphacites and related pyroxenes, Mineral. Mag. v. 37, p. 61-74, 1969.

249. Gordon, T.M., Univ. of British Columbia:
Phase equilibria in the system $CaO-Al_2O_3-SiO_2-CO_2-H_2O$; and oxygen fugacities and temperatures during the formation of some iron skarns, 1969-70.
Includes (1) experimental study of the phase relations of the minerals grossularite, zoisite, anorthite, wollastonite, calcite and quartz in the presence of an $H_2O-CO_2$ fluid and (2) study of the oxygen fugacity and temperature prevailing during the formation of anhydrous iron-bearing minerals as determined from measurements with a ceramic oxygen electrode which is being constructed and calibrated. See The stability of grossularite in $H_2O-CO_2$ mixtures (abstract). Geol. Soc. America. Program with abstracts of the 1969 Annual Meetings p. 82.

250. Greenwood, H.J., Gordon, T.M., LeCheminant, A.N., Francis, Donald, Fletcher, Chris, Misener, Jim; Univ. of British Columbia:
Geological phase equilibria, 1967-; Ph.D. theses (Fletcher, Misener), M.Sc. theses (Francis, Reamsbottom).
The project involves a variety of phase equilibrium studies in both laboratory experiments and in natural materials including: studies of oxygen activity associated with individual natural and synthetic minerals by means of solid-electrolyte specific ion electrodes at high temperatures; laboratory studies of the partition of Ni between pyrrhotite and olivine under controlled sulphur and oxygen partial pressures; laboratory study of the sulphur activity associated with various natural sulphides by means of the Barton-Toulmin electrum-tarnish method; laboratory studies of Fe-Mg counter diffusion in olivine at pressures up to 10 kilobars; field and analytical studies of natural assemblages of minerals found in a high-temperature metamorphic region in Central B.C.; and field studies of a granulite terrain in southern B.C.

251. Haughton, David, Queen's Univ.:
Sulphide-silicate melt equilibrium under controlled oxygen and sulphur fugacities, 1967-70; Ph.D. thesis.
Experimental studies on the equilibrium between a basaltic melt and a sulphide melt are being conducted under controlled conditions of oxygen and sulphur fugacity.

252. Hill, Robin, Roeder, Peter, Queen's Univ.:
Stability of spinel and basaltic melts, 1965-69; Ph.D. thesis (Hill).

253. James, R.S., Fawcett, J.J., Univ. of Toronto:
Stability and phase relations of Fe-Mg chlorites to 10kb, 1968-71.
This study is intended to illustrate the connection between the phase relations and stability of the chlorites clinochlore and daphnite.

254. Jongejan, A., Wilkins, A.L., Mines Branch, Dept. Energy Mines & Resources:
High-temperature phase equilibrium studies in the system $CaO$-$Nb_2O_5$-$TiO_2$-$SiO_2$ and relevant sub-systems, 1962-70.
Study of the range of temperature and compositional stability leading to the formation of niobium-bearing perovskite, titanium-bearing pyrochlores, etc. Studies in the four-component system have furnished an explanation of the non-occurrence of sphene, $CaO$-$TiO_2SiO_2$, in the Oka, P.Q., deposits, although all the requisite constituent oxides are present. See Phase relations in the high lime part of the system $CaO$-$Nb_2O_5$-$SiO$ and other papers, Jour. of Less Common Metals (in press).

255. Kim, K.T., Burley, B.J., McMaster Univ.:
Hydrothermal phase equilibria up to 13 kb of part of the feldspathoidal residua system, 1967-70; Ph.D. thesis (Kim).
The area of the system near to the albite-nepheline join has been mostly colsely studied, so far up to pressures

of 8 kb. It is itended to go to higher pressures to check the possibility of two predicted invariant points which so far have not been experimentally realized.

256. Kretschmar, Ulrich, Clark, L.A., McGill Univ.:
Arsenopyrite phase relations at low temperatures, 1968-71; Ph.D. thesis (Kretschmar).

257. Lake, R.H., Bright, N.F.H., Mines Branch, Dept. Energy Mines & Resources:
Studies in the tin-oxygen system, 1967-70.

258. MacLean, W.H., Makovicky, M., McGill Univ.:
Phase relations on the CuS-$Bi_2S_3$ join, 1968-70.
Liquidus and subsolidus phase relations are being determined in this system using quenching techniques.

259. MacRae, N.D., Univ. of Western Ontario.:
Sulphide-oxide-graphite relations, 1969-71.
Garnet-sulphur reactions, 1969-71.

260. Naldrett, A.J., Brown, G.M., Univ. of Toronto:
Study of chemical equilibria between Fe-Mg pyroxenes and Fe sulphides, 1967-70.
By studying tie-line relations between sulphides and pyroxenes as a function of oxygen fugacity and temperature it will be possible to establish the extent to which sulphides have equilibrated with their host rocks and hence determine whether they are magmatic or hydrothermal. See Reaction between pyrrhotite and enstatite-ferrosilite solid solutions. Ann. Rept. Director Geophysical Laboratory, Carnegie Institution of Washington, Year Book '66, p. 427-429.

261. Naldrett, A.J., Clark, T., Univ. of Toronto:
Chemical equilibria between Fe-Ni olivines and Fe-Ni sulphides, 1968-70; M.Sc. thesis (Clark).

262. Parker, Lynda, Edgar, A.D., Sood, M.K., Univ. of Western Ontario, Piotrowski, J.M., Southern Connecticut State College:
The melting relationships in undersaturated alkaline rocks, 1968-70; M.Sc. thesis (Parker), Ph.D. thesis (Sood).
The melting relationships of ten volcanic undersaturated volcanic rocks ranging in composition from trachybasanite→plagioclase phonolite→phonolite have been investigated at 1 atm. pressure. Presently research is being conducted on these rocks under hydrothermal conditions. Also the pyroxene phases obtained experimentally are being studied by electron probe to observe compositional changes in the pyroxenes with decreasing temperature of crystallization. See Melting relations of undersaturated alkaline rocks from Ilmansiaq and Gromedal Ika Greenland under controlled water vapor and oxygen pressures, Medd om Gron Bd. 181, Nr. 12, 40 p. 1970.

263. Philpotts, A.R., McGill Univ.:
Experimental investigation of liquid immiscibility in alkaline magmas, 1967-.

See Liquid immiscibility between syenitic and gabbroic magmas, Program Geol. Soc. of Amer. Annual Meeting, 1969, abstract.

264. Pressburger, Alex, Clark, L.A., McGill Univ.:
Chlorite compositions synthesized under controlled $f_{O_2}$ and $f_{S_2}$, 1968-70; M.Sc. thesis (Pressburger).

265. Roeder, Peter, Queen's Univ.:
The distribution of magnesium and iron between olivine and basaltic liquid, 1966-70.

266. Scott, S.D., Univ. of Toronto:
Studies on arsenide ores, 1960-.
The environment and mechanisms of transport, deposition, and zoning of arsenide ores will be determined by applying phase equilibrium studies to arsenide assemblages from Cobalt, Ont.

267. Scott, S.D., Hartlein, A.J., Univ. of Toronto:
Sphalerite geobarometry, 1968-71; M.Sc. thesis (Hartlein).
The iron content of sphalerite coexisting with pyrite and hexagonal pyrrhotite is pressure dependent and has potential use as a geobarometer. See Sphalerite geobarometry: presented at annual meetings Geol. Soc. America (abstract), 1969.

268. Scott, S.D., Kissin, S.A., Univ. of Toronto:
Stoichiometry and phase changes in sulphides, 1969-72; Ph.D. thesis (Kissin).
The stabilities of the iron sulphide minerals, particularily the pyrrhotite phases, are being examined as a function of pressure, temperature, and sulphur fugacity.

269. Shimazaki, H., Clark, L.A., McGill Univ.
Synthesis and stability of Fe-Cu disulfide solid solutions, 1968-70.
Liquidus relations in the $FeS-FeO-Fe_3O_4-SiO_2-Na_2O$ system, 1968-70.

270. Smith, F.G., Univ. of Toronto:
Computation of crystal-liquid equilibria in multicomponent systems, 1963-73.
The literature on salt systems with one or more alkali halide components is being searched and put into computer accessible form for retrieval and statistical analyses. Preliminary work showed that rather simple empirical procedures could be used to give fair predictions of multicomponent liquidus temperatures from data of the constituent binary systems. See Machine plotting of liquidus data of binary and ternary salt systems, Canad. Mineral. v. 9, p. 180-190, 1967.
Storage and retrieval of data required in scientific research in geochemistry, 1963-.
A system of storage and retrieval of information on published liquidus data of a restricted subset of salt systems was developed, tested and found feasible for rapid searches by computer. The project is now approaching

completion within the restriction of subject, and thus an analysis of the cost of such processing will soon be calculable. The items now accessible to the computer total 3068 plus about the same number being processed or in related files. The hard-copy file now contains 67,964 pages and the cards keypunched total 28,500.

271. Sood, M.K., Platt, R.G., Pearce, T.H., Edgar, A.D., Univ. of Western Ontario.
Phase relations in portions of the system $CaMgSi_2O_6$-$Mg_2SiO_4$-$NaAlSiO_4$-$KAlSiO_4$-$SiO_2$, 1968-71.
See Phase relations in portions of the system diopside-nepheline-kalsilite-silica and their importance in the genesis of alkaline rocks. Canad. Mineral. (in press).

272. Springer, G., Mines Branch, Dept. Energy, Mines & Resources:
Phase relations of bismuthinite, stibnite and aikinite, 1969-70.
Compounds in the pseudobinary systems $Sb_2S_3$-$Bi_2S_3$ and $CuPbBiS_3$-$Bi_2S_3$ will be synthesized, and the results correlated with natural occurrences of minerals in these systems. See Naturally occuring compositions on the solid-solution series $Bi_2S_3$-$Sb_2S_3$ Min. Mag. v. 37, p. 295-296, 1969.

273. Wanless, R.K., Boyle, R.W., Stevens, R.D., Geol. Surv. of Canada:
Lead and sulphur isotope geology of Keno and Galena Hills, Yukon, 1958-70.
To determine the isotope abundances of lead and sulphur in the lead-zinc-sulphur deposits and their host rocks and from the data to determine, if possible, the sources of elements in the deposits and the processes that have affected their concentration. See Sulphur isotope investigation of the lead-zinc-silver-cadmium deposits of the Keno Hill-Galena Hill Area, Yukon, Canada, Economic Geology (in press).
Isotopic investigations, lunar material, 1969.
To determine elemental concentrations and isotopic abundance ratios of geochronologically important elements. To use the data obtained to calculate the age of the sample.

274. Watkinson, D.H., Univ. of Toronto:
Experimental studies and the petrology and mineralization in alkalic rock - carbonatite complexes, 1967-73.
Studies have been carried out and the results are in press on experimental investigations in the joins $NaAlSiO_4$-$CaCO_3$-$H_2O$ and $CaO$-$Nb_2O_5$-$Co_2$-$H_2O$ at 1 kbar pressure and the implications for the genesis and niobium mineralization of carbonatites. See Phase equilibrium studies bearing on the limestone-assimilation hypothesis. Bull. Geol. Soc. America, v. 80, p. 1565-1576, 1969.

## General

275. Anderson, G.M., Cermignani, Claudio, Univ. of Toronto:
Geochemistry of the silicated marbles near Tweed, Ontario, 1968-70; M.Sc. thesis (Cermignani).

276. W.R.A. Baragar, Geol. Surv. of Canada:
Studies of Coppermine River volcanic rocks, Northwest Territories, 1966-72.
Investigations to date show an interesting variation in the composition and petrography of the flows from the base to the top of the main lava division (about 10,000 feet). Silica, magnesia, and potash decrease whereas iron, manganese, and less consistently, titania all increase upward in the sequence. Similarly copper, vanadium, scandium, and zinc generally increase and nickel and chronium decrease upwards. The quantity of devitrified class in the lavas also decreases upward in the succession. Mapping of the two sheets (86-O, 86-N) containing most of the flows was completed in 1969 and further studies of the lavas are planned. See Geochemistry of the Coppermine River basalts, Geol. Surv. of Canada, Paper 69-44, 1969.
Studies in the Seal Lake volcanic province, Northwest Territories, 1968-.
An investigation of the nature and type of volcanism that characterizes each of the Seal Lake, Croteau, and Letitia Groups, to determine the volcanic history of each in relation to the history of the groups; and to determine, if possible, the relationship of the volcanism to the associated mineral deposits. This is part of a larger investigation of volcanic rocks of the Canadian Shield that to data includes studies of the Yellowknife, Noranda, Coppermine, and Kaladar (Grenville) volcanic assemblages. See Volcanic studies in the Seal Lake area, Labrador; Geol. Surv. Can., Paper 69-1.

277. Baragar, W.R.A., Goodwin, A.M., Geol. Surv. Canada; Moodle, D.A., Ontario Dept. of Mines; Washington, R.A., Atomic Energy of Canada:
Trace gold content in Archean volcanic rocks, 1965-.
The trace gold content in Archean volcanic rocks of the Canadian Shield is being investigated by means of neutron activation techniques.

278. Beaton, W.D., McGill Univ.:
Cobalt and nickel content of the major sulphide minerals from the Lake Dufault Mine, Quebec, 1965-70; Ph.D. thesis.

279. Boulay, R.A., Geol. Surv. of Canada:
Sedimentological study of the Papaskwasati Basin, Quebec, 1968-.
A joint study with the Quebec Department of Natural Resources to investigate the sedimentology and geochemistry of the Basin, north of Lake Mistassini, Quebec. Information obtained from 32,000 feet of core is being used to outline the stratigraphy, sedimentology and possible geochemical trends in the Basin.

280. Brink, V.C., Fletcher, W.K., Univ. of British Columbia:
Geochemical distribution of trace elements in relation to agriculture, 1957-.
See Content of certain trace elements in range forages from south central British Columbia. Can. J. Plant Sci., v. 49, p. 517-520, 1969.

281. Davies, J.L., New Brunswick Dept. of Natural Resources:
Geology and geochemistry of the volcanic rocks of the Tetagouche Group, New Brunswick, 1964-70.

282. Dawson, K.R., Geol. Surv. of Canada:
Geochemical data bank (Geodat), 1964-.
Batches of analytical results are being retrieved from the master tape (7-2400' reels) that contains more than 70,000 records for more than 20,000 rock and mineral analyses of several types. The batches of data retrieved have been output as a hard copy table, on Lambert conformable projection index maps and as norm calculation without any manual transcription of the data. Routine updating of the master file (entry of the data and correction of old data) and the retrieval of batches of data has been operative since July 1969. The output which is presently limited to hard copy will be replaced in the near future by BCD tape output and a wider variety of tabular formats on hard copy. Development is aimed to improve the user orientation of the system to provide outputs of plotted index maps on a variety of scales, cartesian and ternary plots, norm calculations, and statistical moments plus bar diagrams.

283. de Albuquerque, C.A.R., Muysson, J.R., Shaw, D.M., McMaster Univ.:
Investigations on the geochemistry of thallium, 1968-.
Distribution of thallium in rocks, minerals and meteorites; abundances of thallium in the earth's crust and mantle and in meteorites. See The geochemistry of Ga, In and Tl, Phys. and Chem. of the Earth, v. 2, p. 164-211, 1957.

284. Duke, M., McGill Univ.:
Experimental determination of partition coefficients of the major oxides between ferro-magnesian silicates in basaltic magmas, 1969-70.

285. Eade, K.E., Fahrig, W.F., Geol. Surv. of Canada:
Element abundances in the Canadian Shield, 1962-70.
Constitution and geochemical evolutionary trends of continental sialic plates as indicated by the surface crystalline rocks of the Canadian Shield.

286. Ermanovics, I.F., Cameron, E.M., Geol. Surv. of Canada:
Chemical variance of rocks of the Superior Province, Manitoba, 95°-97°W, 51°-52°N.
A multi-stage hierarchal analysis of variance design to thest hypotheses of variance in rock types over on area of 13,000 square kilometers using major oxides, 'metals' and trace elements.

287. Folinsbee, R.E., Bayrock, L., Cumming, G.L., Smith, D., Univ. of Alberta:
Meteorite studies, 1960-.
Collection of Allende carbonaceous chrondrite, Chihuahua, Mexico, 1969 --- about 75 kilograms of the carbonaceous chrondrite Allende were collected in the fall area during April, 1969 by R.E. Folinsbee and D.A. Taylor and are now in the collection of the University of Alberta.

See Vilna meteorite, Camera, visual, seismic and analytic records Journal Roy. Astronomical Society of Canada, v. 63, April, 1969, p. 61-86.

288. Goodwin, A.M., Univ. of Toronto; Washington, R.A., Atomic Energy Commission.
Trace gold content in Archean volcanic rocks, 1964-.

289. Govett, G.J., Univ. of New Brunswick:
Sedimentary geochemistry of Fe, 1964-70.

290. Gunn, B.M., Université de Montréal:
Geochemistry of Subantarctic Islands, 1969-70.
Alkali basalt-hawaiite-trachyte series from Kerguelen and Crozet Id. show a unique positive correlation of Al and Ti. This has been suggested by Green and Ringwood to be the result of different pressure conditions during fusion and has not been before reported from natural rocks. This phenomena has not yet been examined in terms of mineralogy. Dredged samples from the nearby McQuarie Rise include enstatite peridotites and tholeiites, but no alkali basalts.

291. Gunn, B.M., Watkins, N.D., Université de Montréal:
Geochemistry of Steens Mountain basalts, Oregon, 1968-69.
Seventy successive lavas were analysed for major and trace elements and these show the sequence to be dominated by recurring fractionated sequences of up to 14 lavas. Two trends are apparent, one explicable by addition of plagioclase and the other by olivine. See Geochemistry of Steens Mountain basalts, Oregon. Bull. Geol. Soc. Amer. (in press).

292. Gunn, B.M., Université de Montréal; Mooser, F., Univ. of Mexico:
Geochemistry of the volcanics of central Mexico, 1968-70.
Further andesitic lavas have been analysed bringing the total to about 120. A computer technique for projecting the normative components on a basalt terahedron shows that all rocks lie on an invariant line defined by the fields of diopside-plagioclase-hypersthene-quartz. An origin by partial melting of a parental quartz basalt is suggested.

293. Gunn, B.M., Gast, P., Watkins N.D., Université de Montréal.
Alkaline volcanic islands of the Atlantic.
This work, undertaken in conjunction with Columbia and Florida State Universities includes analysis for major and trace elements, rare earths, and Pb and Sr/Rb isotope ratios as part of a study on the evolution of volcanic rocks removed from the Mid-Atlantic Rise. Many of the samples have also been K/Ar dated. A computer data file is being built up of all existing published analyses.

294. Gunn, B., Duquette, G., Université de Montréal:
Geochemistry of Archean metavolcanics, 1969-70.
The Archean metavolcanics of the Chibougamau region show a bimodal distribution into low-potassium tholeiite and into tuffs and tuffaceous greywacke of a general dacite-

rhyolite composition. The metabasalts are virtually unique in their low potassium content, high soda and intermediate K/Rb ratios. Isotopic and chemical variations against metamorphic grade are being tested. Special techniques have been evolved to determine K in the sub 20 ppm levels. The relationships of the metabasalts to the sodic batholiths are being explored but are not yet complete.

295. Hamilton-Smith, Terence, New Brunswick Dept. of Natural Resources:
Geochemical aspects of the origin of the Carys Mills formation, 1969-72.
Major and trace element determination in limestone and slate samples closely related to bed-by-bed descriptions of stratigraphic sequences and gross lateral facies changes to characterize the depositional environment of an argillaceous calcilutite.

296. Helsen, J., Shaw, D.M., McMaster Univ.:
Tungsten geochemistry, 1969-; M.Sc. thesis (Helsen).
An analytical and exploratory study of tungsten distribution in the minerals of common rocks, with particular reference to the Salmo, B.C. region.

297. James, R.S., Univ. of Toronto:
The geochemistry of the cordierite-anthophyllite rocks at Manitouwadge, Ontario, 1969-.
Detailed petrography and microprobe analyses of samples of the individual phases are planned.

298. Larson, L.R., Clark, L.A., Webber, G.R., McGill Univ.:
Geochemical and petrography characterization to enable stratigraphic subdivision of Noranda District rhyolites, 1969-71; M.Sc. thesis (Larson).

299. Levinson, A.A., Dewis, F.J.; Univ. of Calgary:
Hydrogeochemistry of the MacKenzie drainage basin, 1969-72; thesis project (Dewis).
See Major element composition of the MacKenzie River at Norman Wells, N.W.T., Canada, Geochem. Cosmochem, Acta, 33, p. 133-138, 1969.

300. Maxwell, J.A., Geol. Surv. of Canada:
Lunar crust investigation, 1967-70.
The chemical composition of lunar material, at present specifically that of material returned by the Apollo XI mission, is one of five areas under study by 5 principal investigators in the Geological Survey of Canada, in collaboration with NASA. With the help of co-investigators Sydney Abbey and W.H. Champ, the major, minor and trace element concentrations in two pieces of lunar rock, and one sample of loose surficial material, will be determined by classical chemical, X-ray fluorescence, atomic absorption spectroscopic and emission spectroscopic methods.

301. McCartney, W.D. and students, Queen's Univ.:
Temperatures of homogenization and freezing of liquid inclusions and approximations of their Na/K/Ca ratios, 1963-.

Active work is resuming in December, 1969, mainly in the form of coordinated under-graduate thesis projects. See Barite-fluorite study, Geol. Surv. Can., Paper 64-2, p. 75-78, 1964.

302. McNutt, R.H., Crocket, J.H., Barker, J., McMaster Univ.:
Rare earth element fractionation in minerals of anorthosites, 1969-70; M.Sc. thesis (Barker).

303. McNutt, R.H., Dostal, J., McMaster Univ.:
Rare earth element fractionation in alkaline intrusives, 1969-72; Ph.D. thesis (Dostal).

304. Mercer, William, Crocket, J.H., McMaster Univ.:
Geochemistry of the pyrite of the conglomeratic uranium ores of Elliot Lake, Ontario, 1969-72; Ph.D. thesis (Mercer).

305. Rambaldi, E., Univ. of Ottawa:
Geochemistry of some gneisses of the Bancroft Region, Ontario, 1966-70.

306. Rogers, M.A., Bailey, N.J.L., Imperial Oil Enterprises Ltd.:
Geochemistry of petroleum, 1968-.
A continuing research project on the generation, migration and alteration of petroleum deposits. Present emphasis is on using 1) stable isotopic studies (carbon and sulphur) and 2) gas chromatographic analyses to study the generation of C4-C7 light hydrocarbons in young sediments and the late-stage alteration (degradation) of oil and gas pools. Alteration can be by either thermal or non-thermal processes. See Organic carbon $SC^{13}$ values from Quaternary marine sequences in the Gulf of Mexico: a reflection of paleotemperature changes, Trans. Gulf Coast Assoc. of Geol. Societies, v. XIX, 1969, p. 529-534.

307. Saull, V.A., McGill University:
Geophysical role of energy changes in metamorphic processes, 1952-.
Solution calorimetry of minerals; mathematics of spontaneous combustion; role of chemical energy in tectonics.

308. Springer, G., Mines Branch, Dept. Energy, Mines & Resources:
Reaction kinetics of semiconducting mineral electrodes, 1969-70.
This study investigates the effect of semiconducting properties of sulphides on their electrochemical behaviour, thereby yielding information on reaction mechanisms. See Observations on the electrochemical properties of minerals, Trans. Inst. Min. Met., Sect. C (in press).

309. Stanton, M.S., Chevron Standard Limited, Calgary:
Petroleum chemistry, 1967-.

310. Steeves, M.A., Manitoba Mines Branch:
Geochemistry of the volcanic rocks of the Lynn Lake greenstone belt, Manitoba, 1969-71; M.Sc. thesis, Univ. of Manitoba.

311. Taylor, W.R., Memorial Univ. of Newfoundland:
Geology and geochemistry of a uranium rich gneissic area, Long Range Mountains, Newfoundland, 1969-70; M.Sc. thesis.

312. Villard, D.J., McGill Univ.:
Chemical denudation of Mont St. Hilaire, Quebec, 1969-71; M.Sc. thesis.
Chemical character of water as precipitation, soil water, and stream runoff and its relation to mineralogical changes during weathering and soil formation. Special consideration is given to the effects, if any, of air pollution by the city of Montreal on the weathering process.

313. Warren, H.V., Fletcher, W.K., Univ. of British Columbia:
Trace subtances in environmental health with some reference to pollution:
See Mineral contamination in soil and vegetation and its possible relation to public health, Proceedings, Univ. of Missouri Third Annual Conference on Trace Substances, in Environmental Health, in press.

314. Webb, A., McGill Univ.:
Direct measurement of oxygen fugacities in Monteregian rocks, 1969-70; M.Sc. thesis.

315. Weber, W., McRitchie, W.D.,
Project Pioneer - a structural and geochemical reinvestigation of the Rice Lake greenstone belt and associated gneisses and granites, Manitoba, 1966-71.
See preliminary maps of Manigotagan gneissic belt, Manitoba Mines Branch 1969-1-4, and Paper 1-69.

316. Wynne-Edwards, H.R., Fuh, Tsu-Min, Queen's Univ.:
Geochemical correlation of rocks on either side of the Grenville Front at Val d'Or, Quebec, 1967-70; Ph.D. thesis (Fuh).
A test by geochemical correlation using five sample areas, of the hypothesis that the Archean rocks near Val D'or including the Abitiba greenstone belt, continue eastward in the Grenville Province. See Tectonic overprinting in the Grenville Province, southwestern Quebec; Geol. Assoc. Can. Sp. Paper 5, p. 163-182, 1969.

317. Young, G.M., Univ. of Western Ontario:
Stratigraphy, sedimentology, geochemistry and paleoclimatology of Early Proterozoic rocks, 1965-.
See Geochemistry of Early Proterozoic tillites and argillites of the Gowganda Formation, Ontario, Canada. Geochim et Cosmochim. Acta. v. 33, pp. 483-492, 1969.

## GEOCHRONOLOGY

318. Adams, C.J., Univ. of Toronto:
Rb-Sr whole rock dating near Sudbury, Ontario, 1967-69.

319. Aumento, F., Geol. Surv. of Canada:
Fission track dating, 1969-70.
Fission track dating of oceanic volcanic glasses, tektites and Pliocene/Pleistocene volcanics in British Columbia. See The Mid-Atlantic Ridge near 45° N. V. - fission track and ferro-manganese chronology, Can. J. Earth Sci. v. 6, no. 12, December 1969.

320. Baadsgaard, H., Univ. of Alberta:
Thermally-induced migration of Rb and Sr, 1964-.
The research is beginning to give some information on the mechanism and nature of certain metamorphic reactions.

321. Baadsgaard, H., Godfrey, J.D., Koster, F., Univ. of Alberta:
Geochronology of Northeastern Alberta - Northwestern Saskatchewan, 1962-.
The area under investigation is proving to provide fertile ground for a number of academic theses projects on aspects of the regional geochronology. See Geochronology of the Canadian Shield in Northeastern Alberta - 1. The Andrew Lake area, Can. J. Earth Sci., v. 4, p. 541-563.

322. Baadsgaard, H., Lee, K.S., Univ. of Alberta:
U-Pb systematics in metamorphic recrystallization, 1969-71; M.Sc. thesis (Lee).

323. Baadsgaard, H., Narasimhachary, K., Univ. of Alberta:
K-Ca dating of Devonian sylvite, 1969-71; M.Sc. thesis, (Narasimhachary).

324. Barton, J., McGill Univ.:
Rb-Sr Isotopic study of Grenville rocks northeast of Montreal, 1968-69; Ph.D. thesis.

325. Blenkinsop, J., Univ. of British Columbia:
Rb-Sr geochronology; Ph.D. thesis.
Galenas appear to contain minute (<1 ppm) quantities of rubidium and strontium presumably in solid solution and can therefore be dated. A feasible chemical procedure has been developed, and measurements will be made on galena samples from Broken Hill, Australia.

326. Brooks, Christopher, Univ. of Montreal:
The development of the Canadian Shield (with special reference to Quebec) by means of isotopic/geochronologic analysis of Shield rocks, 1968-71.
The development of closely-constrained models of mantle Sr evolution demands accurate knowledge of the isotopic composition of supposed mantle derived rocks at different times in the past. This has been done for the 2.7 b.y. rocks of the Canadian Shield and current research involves the determination of similarly reliable data for 1.8 b.y. (Churchill) and 3.5 b.y. (Onverwacht) rocks. See Carbonate contents and $Sr^{87}/Sr^{86}$ of calcites from Archean metavolcanics, Earth and Planetary Science Letter 6, 1969.

327. Card, K.D., Fairbairn, W.H., Van Schmus, W.R., Ontario Dept. of Mines:
Age dating of Nipissing diabase, Huronian metasediments,

and other rocks in the Southern Province.
See Correlation of radiometric ages of Nipissing diabase and Huronian metasediments with Proterozoic orogenic events in Ontario. Canadian Jour. Earth Sciences, v. 6, no. 3, p. 489-497.

328. Carter, N.C., British Columbia Department of Mines and Petroleum Resources:
Potassium-argon age determinations of porphyry-type copper and molybdenite occurrences, north-central British Columbia, 1967-; Ph.D. thesis.

329. Chrismas, L., Baadsgaard, H., Folinsbee, R.E., Fritz, P., Krouse, H.R., Sasaki, A., Univ. of Alberta:
Isotope studies of Craigmont ore deposit, British Columbia, 1967-69; M.Sc. thesis (Chrismas).

330. Clark, A.H., Farrar, E., Quirt, G.S., Queen's Univ.:
Geochronogical studies of the Andean Mobile Belt of northern Chile (largely Lat. 26-29°S.), 1967-62; Ph.D. thesis (Quirt).
A critical part of an analysis of metallogenetic relationships in the Andean Mobile Belt is the establishment of a detailed chronology of intrusive and extrusive events, using K/Ar dating.

331. Clarke, W.B., Schwarcz, H.P., McMaster Univ.:
Mg-isotope studies of meteoritic feldspar, 1966-.
See $Al^{26}$ dating of meteoritic feldspar, Jour. Geophys. Res., in press.

332. Cranstone, D.A., Manitoba Mines Branch; Turek, A., Northern Illinois Univ.:
Rb-Sr geochronology of the Churchill-Superior boundary in Manitoba, and the Manitoba Nickel Belt, 1969-71.
See Rb-Sr contribution to the location of Churchill-Superior boundary in Manitoba; Can. Jour. Earth Science, in press.

333. Dey-Sarkar, S.K., Farquhar, R.M., Goodwin, A., Univ. of Toronto:
Rb-Sr study of rocks from the Blake River Group of the Canadian Shield, 1969-.
Rb-Sr ratios in the volcanics will be measured as a preliminary step in determining whether Rb/Sr whole rock isochron techniques can be applied in the hope of dating this group of rocks. Eventually it is hoped to be able to ascertain the original age of these rocks through the $2.5 \times 10^9$ year old metamorphism which overprints them.

334. Doig, Ronald, McGill Univ.:
Geological applications of nuclear spectrometry, 1964-.
See Current research in the application of natural and induced radioactivity to mineral exploration. Proceedings of the Centennial Conference on Mining and Groundwater Geophysics, 1969.
Isotopic studies of alkaline rocks, 1966-70.
See An alkaline rock province linking Europe and North America. Canadian Journal of Earth Sciences, v. 7, no. 1, 1970.

335. Ermanovics, I.F., Turek, A., Geol. Surv. of Canada:
Geochronological studies of rocks of the Superior Province, Manitoba, 95°-97°W, 51°-53°N, 1969-71.
Rb/Sr isochron studies to separate times of major plutonic chemical diversification from periods of recrystallization of gneisses.

336. Farquhar, R.M., Univ. of Toronto:
Lead isotope studies of Precambrian leads, 1964-.
Studies of leads associated a) with Yellowknife area rocks and b) with Grenville province rocks, have shown variations in Pb isotopic composition which give information about the history of these leads in the earth's crust. Re-analysis of these samples is planned to provide the basis of more accurate interpretation of these variations.

337. Frith, A., McGill Univ.:
Rb/Sr isotopic and petrologic study of Grenville Province rocks along a section from Chibougamau to the Gulf of St. Lawrence, 1968-71; Ph.D. thesis.

338. Gertner, B. (Mrs.), Farquhar, R.M., Univ. of Toronto:
Age data compilation, 1960-.
Rb/Sr mineral ages for Canada and Greenland are now being collected from the literature and checked. These will be supplemented by whole-rock Rb/Sr isochron ages, to provide a basis for geochronological studies in specific areas and to intercompare the times of igneous and metamorphic events on a world-wide basis.

339. McCorkell, R.H., Dalhousie Univ.:
Survey of fission track dating for new applications in dating of ores, fossil materials, feldspars, etc., 1969-70.

340. McNutt, R.H., McMaster Univ.:
Rb/Sr goechronology of a Grenville anorthosite, 1967-70.

341. McNutt, R.H., Gibbins, W., McMaster Univ.:
Rb/Sr geochronology of Murray granite and Sudbury norite, 1968-71; Ph.D. thesis (Gibbins).

342. McNutt, R.H., Schau, M.P.
Rb/Sr geochronology of the Ice River Complex, British Columbia, 1969-70.

343. Mitchell, Roger, Univ. of Alberta:
Potassium-argon and rubidium strontium geochronology of the Nisserdal supracrustal series Norway, 1966-.

344. O'Nions, R.K., Morton, R.D., Univ. of Alberta:
Geochronological, petrological and structural investigations in the Bamble Sector of the Fennoscandian Shield, S. Norway, 1966-73.
Present investigations have included K-Ar, Rb-Sn and U-Th-Pb dating of the Bamble sector of the Shield. Currently further whole rock Rb-Sn studies are being carried out on cataclastic and other metasedimentary rocks.

An electron probe study of coronite gabbros within the region is also planned for the coming year. See Potassium argon ages from the Bamble sector of the Fennoscandian Shield in S. Norway. Norsk Geol. Tidss., 49, p. 171-190, 1969.

345. Parker, M.L., Geol. Surv. of Canada:
Dendrochronological investigations, 1968-70.
Study of the tree-ring record in various parts of Canada to provide chronological and climatological data in order to date postglacial events and to relate available weather data to other kinds of evidence for reconstruction of past environments. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

346. Schindler, J.N., Schwarcz, H.P., Crocket, J.H., Clarke, W.B., McMaster Unvi.:
Rhenium-osmium dating, 1967-70; Ph.D. thesis (Schindler).

347. Terasmae, J., Brock Univ.:
Postglacial geochronology and palynology of the Hamilton area, Ontario, 1969-70.
The objective is to establish geochronological sequence of deglaciation and the following postglacial events. This study is a continuation of, and will be integrated with, the completed mapping of surficial deposits in the Hamilton area by P.F. Karrow and the drilling project undertaken by Terasmae and related to stratigraphy of Quaternary deposits in, and history of, the buried valley extending from Dundas to Lake Ontario.

348. Thompson, P., Schwarcz, H.P., Ford, D.C., McMaster Univ.:
Uranium desequilibrium dating of cave deposits, 1967-71; Ph.D. thesis (Thompson).

349. Wanless, R.K., Geol. Surv. of Canada:
Isotopic age map of Canada, 1969.
Involves preparation of a multi-coloured isotopic age map of Canada on a scale of 1:5,000,000 superimposed on the base of the tectonic map of Canada.

350. Wanless, R.K., Dawson, K.R., Geol. Surv. of Canada:
National isotopic age data file, 1967-.
To develop a national file for Canadian isotopic age data; to develop a flexible retrieval system; and to provide a service for scientists in industry and in universities.

351. Wanless, R.K., Loveridge, W.D., Stevens, R.D., Geol. Surv. of Cana Canada:
Isotopic study of mica-bearing rocks yielding anomalous K/Ar 'ages', 1965-70.
To investigate parent-daughter isotopic relationships using all available isotopic techniques and to relate the trends observed to major geologic features such as, for example, the boundary between the Superior and Grenville provinces. See Excess argon in biotites, Earth and Planetary Science Letters (in press).

Isotopic investigations, Lunar material, 1969.
To determine elemental concentrations and isotopic abundance ratios of geochronologically important elements. To use the data obtained to calculate the age of the sample.

352. Wanless, R.K., Loveridge, W.D., Geol. Surv. of Canada:
Development of a 15" radius solid source mass spectrometer, 1967-69.
To design, fabricate and assemble a solid source mass spectrometer embodying the most modern ideas and components. The instrument will be utilized for the precise determination of strontium and lead isotopic ratios.

353. Wanless, R.K., Shibata, Ken, Geol. Surv. of Canada:
Isotopic age determinations - Japanese rocks, 1968-69.
To apply Rb/Sr isochron dating techniques in an attempt to identify older rocks in the Hida metamorphic belt of Japan.

354. Wanless, R.K., Souther, J.G., Stevens, R.D., Geol. Surv. of Canada:
The development of K/Ar dating techniques and their application to very young continental basalts from British Columbia, 1969-.
To precisely establish the chronological order of stratigraphically controlled samples of the Mt. Edziza lava pile, British Columbia.

355. Wanless, R.K., Stevens, R.D., Lachance, G.R., Geol. Surv. of Canada:
Isotopic age determinations of rocks and minerals, 1954-.
To develop and apply K/Ar, Rb/Sr and U/Th/Pb methods required for the determination of the geological age of rocks and minerals and to apply the techniques to diverse geological problems. Particular emphasis is currently being placed on the identification of ancient terrains and the subdivision of Archean time. See K/Ar Isotopic Ages, Rept. No. 8, Geol. Surv. Canada Paper 67-2, Pt. A.

356. York, D., Baksi, A.K., Watkins, N.D., Univ. of Toronto:
K/Ar dating of magnetic field reversals, 1967-; Ph.D. thesis (Baksi).
See The age of Steens Mountain geomagnetic polarity transition, J. Geophys. Res. v. 72, 6299, 1967.

357. York, D., Baksi, A.K., Univ. of Toronto; Aumento, F.B., Dalhousie Univ.:
K/Ar dating of the Atlantic Ocean Floor, 1968-; Ph.D. thesis (Baksi).

358. York, D., Berger, G., Yanase, Y., Univ. of Toronto:
$Ar^{40}/Ar^{39}$ dating, 1969-; Ph.D. thesis (Yanase).

359. York, D., Gittens, J., Univ. of Toronto:
K/Ar dating of alkaline rocks, 1965-.
See K/Ar dating of nephelines, Earth and Planetary Science Letters, 7, 1969.

## GEOMORPHOLOGY AND GLACIOLOGY

360. Asthana, Virendra, Drapeau, Georges, Marlowe, J.I., Bedford Institute, Nova Scotia:
Coastal geodynamics, 1968-70.
Investigations in selected areas of Maritime coasts on a year-round basis, making observations on shore line features, measuring dynamic forces operating in the nearshore environment and their affect on processes of erosion, sediment transport and deposition.

361. Barnett, D.M., Geol. Surv. of Canada:
Proglacial geomorphology, Generator Lake, Baffin Island, 1965-71; Ph.D. thesis, Univ. of Western Ontario.
Model study of the proglacial lacustrine environment relating modern glaciofluvial processes to former glacial, lacustrine and related landforms and deposits associated with former and present levels of Generator Lake. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

362. Bik, M.J.J., Geol. Surv. of Canada:
Geomorphology of Cypress Hills and adjoining parts of southern Alberta, 1965-71.
Reconstruction of gradients of meltwater channel terraces indicates that crustal movements other than isostatic rebound occurred in southern Alberta since deglaciation; surface information on such movements is being compared with structural data derived from oil and gas wells. See The origin and age of the prairie mounds of southern Alberta, Canada; Biul, Perygl., v. 19 and Geol. Surv. Can., Paper 69-1, Pt. A, p. 59-60, 1969.
Surficial deposits and geomorphology, Central Research Forest, Ontario, 1968-70.
Includes detailed stratigraphy to a depth of 16 feet across the project area and 1/2,400 mapping of surficial deposits. The Inland Waters Branch, E.M.R., and the Forest Management Research Institute will gradually increase their contribution as the G.S.C. effort approaches completion. A detailed study of groundwater table behaviour relative to precipitation and microstratigraphy has been initiated. See Geol. Surv. Can., Paper 69-1, Pt. A, p. 187-188, 1969.

363. Bird, J.B., McGill Univ.:
The evolution of limestone landscapes in a periglacial environment, 1966-70.
A quantitative examination of postglacial changes on the limestone lowlands of Southampton Island, N.W.T.

364. Blake, W. Jr., Geol. Surv. of Canada:
Quaternary reconnaissance, southern Ellesmere Island, Northwest Territories, 1967-.
Reconnaissance of glacial geology and geomorphology with special emphasis on chronology of Pleistocene events and determination of regional pattern of postglacial uplift. See Geol. Surv. Can., Paper 69-1, Pt. A, 1969.

365. Brueckner, W.D., Anderson M.M., Memorial Univ. of Newfoundland:
Geomorphic problems of Newfoundland, 1959-67.

This project is not restricted to any particular geomorphic aspect; in the near future however, emphasis will be given to studies of shoreline features related to changes of sea level, and of glacial drift and its post-glacial fate.

366. Buckley, J.T., Geol. Surv. of Canada:
Geomorphological map, Gatineau Park, Quebec, 1967-70.
To provide a map and description of landforms and surface deposits of the park area and environs on request of the National Capital Commission.

367. Carson, M.A., McGill University:
The long-term stability of natural hillslopes, 1967-71.
Study of threshold slopes (angles of limiting stability) in a variety of climatic and lithologic environments as a basis for explaining actual frequency distribution of slope angles in nature. See Models of hillslope development under mass failure, Geographic Analysis, 1 (1), p. 76-100.

368. Grant, D.R., Geol. Surv. of Canada:
Quaternary geology St. Anthony-Blanc Sablon, Newfoundland, 1969-70.
Although basically a survey of landforms and materials for resource development, the study produced evidence of several regionally significant Quaternary events and processes, notably that glaciers from Labrador impinged on Newfoundland leaving a till of marine derivation, and that, as in the Maritime Provinces, glaciers both retreated to and readvanced from upland areas. See Geol. Surv. Canada, Paper 70-1, Pt. A., 1970.

369. Hattersley-Smith, G., Dept. of National Defence:
Geophysical research in the Arctic, 1963-.
This project covers glaciological, meteorological and oceanographic studies in northwestern Ellesmere Island. See Recent observations on the surging Otto Glacier, Ellesmere Island, Geogr. J., 135, 4, in press.

370. Lewis, C.P., Geol. Surv. of Canada:
Geomorphology of delta lakes, Mackenzie Delta, Northwest Territories, 1967-70; Ph.D. thesis, Univ. of British Columbia.
To determine the mechanisms and stages of development involved in the division of delta lakes by reversing-flow channels. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

371. Mackay, J.R., Geol. Surv. of Canada and Univ. of British Columbia:
Geomorphic processes, Mackenzie Valley-Arctic Coast.
Multi-faceted study of geomorphic features and processes related to permafrost and to fluvial, lacustrine, coastal, eolian and mass wasting activity in a permafrost environment involving ice-shove boulder pavements, ground temperature gradients in bore-holes, wind abrasion, pingos, soil freezing pressures, heat budget studies, and glacial and postglacial history. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

372. Mathews, W.H., Univ. of British Columbia:
Snow creep, southern British Columbia, 1958-.
See Observations on pressures exerted by creeping snow, Mount Seymour, British Columbia, Canada, Physics of Snow and Ice, Proc. Int Conf. on Low Temp. Science, 1966, p. 1185-97, 1967.

373. McDonald, B.C., Geol. Surv. of Canada:
Sedimentology and morphology of eskers, 1968-72.
Investigation of eskers and associated features involving their classification form, sedimentology, and origin. By documenting the sedimentation history of eskers, an attempt will be made to inter-relate morphology, sedimentary transport, and sediment types, and to contribute to an understanding of esker origin. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

374. Parry, J.T., Turner, H., Hutchinson, I., McGill Univ.:
Terrain evaluation project; M.Sc. theses (Turner, Hutchinson).
See Soil studies with color photos, Photogrammetric Engineering, v. 35, no. 1, 1969, p. 44-56.

375. Thom, B.G., Dredge, Lynda, McGill Univ.:
Postglacial shoreline development in the vicinity of Sept Iles, Quebec, 1969-71; M.Sc. thesis (Miss Dredge).
There has been little attempt to delineate morphologic and stratigraphic units in the terraced topography along the North Shore of the St. Lawrence. Urban development in the vicinity of Sept Iles has facilitated access to stratigraphic data. Emphasis has been placed on terrace relationships, landform types, stratigraphic units and soil characteristics. Shell samples have been collected for $C_{14}$ dating from upper ( 350 ft.) and lower ( 10 ft.) terraces. Field work during 1970 will place more emphasis on geometry of terrace deposits and determining the pattern of shoreline sedimentation during the past-glacial interval.

## GEOPHYSICS

### Electrical

376. Ahrens, P.H., Collett, L.S., Geol. Surv. Canada:
Audio frequency studies, 1964-70.
The purpose is to study the frequency dispersion effect with audio and sub-audio frequencies of in-phase and quadrature measurements of rocks and soils in the field. The prototype development has been completed; field tests have yet to be carried out. See Geol. Surv. Canada, Paper 69-1, Pt. B, p. 8-9, 1969.

377. Becker, A., Geol. Surv. of Canada:
VLF mapping, 1967-71.
The Geonics EM-16 VLF unit using NAA Cutler, Maine (17.8 $KH_z$) has shown that the Gloucester Fault, southwest of Leitrim, Ontario, can be outlined. Another test

carried out during 1969 tested the recently patented Radiohm method. In a manner quite analogous to the magneto-telluric method, Radiohm yields a measurement of ground conductivity from a comparison of the horizontal electric field along the direction of wave propagation and horizontal orthogonal magnetic field vector. The equipment was designed and fabricated for the Geological Survey of Canada by the Geoscience Division of Westinghouse. The result of the Radiohm test shows the method is effective for locating the fault. See Geol. Surv. Canada Paper 67-1, Pt. A, 1968, p. 130-131 and Radiohm method for earth resistivity mapping: Canadian Patent No. 795, 819, Oct. 1, 1968.

Airborne resistivity electromagnetic system (ARES), 1969-71.

The current work is a theoretical and laboratory evaluation of the general concepts outlined in the patent. The results of this study should provide design criteria for the construction of an airborne electromagnetic mapping device. This project is being carried out with the full co-operation of the Geological Survey of Canada.

378. Becker, A., Dyck, A.V., Geol. Surv. of Canada:
Time domain EM theory, 1968-71.

The general objective is to establish quantitative relationships between the electrical parameters of the ground and the response of electromagnetic pulse instrumentation. A set of transient curves for the INPUT system are being calculated for homogeneous and two layer cases. See Simulation of time domain airborne electromagnetic system response: Geophysics (in press), 1969.

ARES (airborne resistivity electromagnetic system), 1968-73.

This project is a result of assessing airborne EM systems for resistivity mapping. The apparatus is specifically being designed to map resistivity. See Airborne apparatus for and a method of determining electrical conductivity of bedrock and overburden: Canada Patent No. 789, 691, July 9, 1968.

379. Caner, B., Victoria Magnetic Observatory, Dominion Observatories:
Petrological interpretation of electrical conductivity structure in Western Canada, 1967-70:

The electrical conductivity structures derived for the lower crust and upper mantle in Western Canada are being interpreted in terms of composition, temperature and degree of hydration. Preliminary results were presented at Upper Mantle Symposium, IUGG Assembly, Madrid, 1969. Further results will be published in J. Geomag. Geoelectr., 1970.

380. Caner, B., Auld, D.R., Victoria Magnetic Observatory, Dominion Observatories:
Electrical conductivity of the lower crust and upper mantle, Western Canada, 1963-.

Geomagnetic induction methods (magneto-tellurics and geomagnetic depth-sounding) are being used to determine the electrical conductivity structure in Western Canada, particularly for the lower crust and upper mantle. This is a long-term co-operative project with the Department of Geophysics at the University of B.C. See A large-scale

magnetotelluric survey in Western Canada, Can. J. Earth Sc., v. 6, p. 1245-1261.

381. Collett, L.S., Geol. Surv. of Canada:
Electrical rock properties, 1967-71.
Prototype equipment for measuring resistivity of unconsolidated sample cores of clays and tills has been completed. A second unit has been constructed to measure resistivity of lunar samples at several frequencies between 20 KHz and 10 MHz. Dr. T.J. Katsube, post-doctorate fellow from Japan, is investigating the induced polarization of rocks and minerals.

382. Collett, L.S., Becker, A., Geol. Surv. of Canada:
Airborne input surveys, 1966-70.
The airborne input system is used in experimental test surveys to assess its usefulness as an aid in geological mapping. The output data is digitized and compiled and corrections have been made for drift and calibration of each channel. Publication is expected in 1970. See Geol. Surv. Canada, Paper 68-1, Pt. A, p. 69, 1968 and Paper 69-1, Pt. A, p. 78, 1969.
AFMAG/VLF surveys, 1968-73.
An AFMAG survey was flown in 1968 in the Upper Nelson River of Manitoba (3500 line miles) and in the Uranium City Area of Saskatchewan (660 mine miles) to test the usefulness of the method to detect faults and shear zones where they are known and to check if other unknown lithological features are detected especially beneath the overburden and sedimentary cover. A small VLF survey was flown as a test area northwest of Wabowden, Manitoba, to check its relative response in relation to AFMAG data. In 1969 an AFMAG survey was flown over the St. Mary's graben area in Nova Scotia (11 E/6E, 7, 8, 11 F/5). The AFMAG method is proving to be a valuable technique for mapping and tracing conductive faults, shear zones and peridotites. Improvements are needed in the apparatus and interpretive methods.

383. Faessler, C.W., Ecole Polytechnique:
Accurate calculation of resistivity curves for large electrode separations and resistivity contrasts, 1969-70.
The apparent resistivity function is an infinite series which is convergent very slowly for large resistivity contrasts and large electrode separations. In all the published material on this subject, these cases have been neglected or only approximated in a very rough way.
Etude préliminaire des paramètres contrôlant la chargeabilité des minéralisations disséminées en polarisation induite, 1969-.
Obtention, de façon empirique et sous conditions contrôlées, de quelques relations entre ces différents paramètres (teneur, grosseur des grains, porosité, salinité, etc.) et vérification au moyen d'échantillons naturels.

384. Koulomzine, Théodore, Lavoie, Clermont, Ecole Polytechnique:
Comparative study of electrical and electromagnetic methods as applied to the search for sulphide deposits,

1966-70; M.Sc. thesis (Lavoie).
Three known cases have been chosen where a body of pyrite is covered by a thick mantle 70-100' of particularly wet clay overburden topped by a swamp. The problem is to determine which geophysical method will give positive indications in spite of particularly difficult conditions.

385. Lazreg, Habib, Inland Waters Branch, Dept. Energy, Mines & Resources:
Geophysical methods applied to the study of seawater intrusion, 1969-71.
A study aiming to delineate the deformation, width, and horizontal extension of the diffusion zone between seawater and freshwater, using the principle of electrical conductivity as a criteria revealing horizontal and vertical change in groundwater quality has been carried out in the Maritimes (N.B. & P.E.I.) during the summer of 1969. An attempt to develop a digital computing technique of interpretation for resistivity measurements is underway.

386. Scott, W.J., Geol. Surv. of Canada:
Geophysical investigations, 1967-70; Ph.D. thesis, McGill Univ.
This project involves studies of the electrical parameter characteristics in overburden, over an aquifer and sulphide mineralized zones. Geol. Surv. Canada Papers 68-1, Pt. A, p. 87-88, 1968 and Paper 69-1, Pt. A., p. 99, 1969.

387. Slankis, J.A., Geol. Surv. of Canada:
Magnetotelluric investigations, 1966-70; Ph.D. thesis.
This project has investigated a new portable exploration method for detecting sulphide conductors using natural EM fields at 8 Hx. See Telluric and magnetotelluric measurements at 8 Hz: Trans. AIME, Soc. of Min. Eng. v. 244, p. 238-244, June 1969.

## Geothermal

388. Gretener, P.E., Univ. of Calgary:
Earth temperatures at very shallow depth, 1969-.
Investigation of earth temperatures in the top few feet and their significance. See Calibration of thermistors with the HP quartz thermometer in a drifting thermal bath; Analytical Advances, Summer 1969.

389. Jessop, A.M., Judge, A.S., Lewis, T., Cermak, V., Observatories Branch, Dept. of Energy, Mines & Resources:
Geothermal research, 1962-.
See Heat flow at Eldorado, Saskatchewan; Can. Jour. Earth Sci. v. 6, no. 5, p. 1191, 1969.

390. Mathews, W.H. (with cooperation of Granduc mine staff), Univ. of British Columbia:
Geothermal studies, Granduc area, British Columbia, 1968-70.
Records from the 11-mile long haulage tunnel complete and compatible with an electronic model having

uniform conduction and a temperature gradient of close to 125 feet per degree C. Records from the mine, where it will soon be possible to get access over a 1000 foot vertical range, are expected in 1970.

391. Saull, V.A., Fou, J., McGill Univ.:
Terrestrial heat flow in the St. Lawrence Lowland of Quebec, 1956-; M.Sc. thesis (Fou).

## Gravity

392. Bidgood, D.E.T., Howells, K., Nova Scotia Research Foundation:
Gravity studies in Nova Scotia, 1966-.
Existing gravity readings in central and northern Nova Scotia are being systematically checked and incorporated in a computer stored file of data. Programs have been developed for updating this file, and reading by geographic area, project description, year and other parameters. Data can be used for plotting maps and trend surface fitting, or any other geophysical analysis. Field surveys have been continued to extend the gravity coverage in the east of mainland Nova Scotia in an area located at one end of the Chedabucto Fault.

393. Bower, D.R., Observatories Branch, Dept. Energy, Mines & Resources:
Development of a sensitive long-base tiltmeter, 1968-71.
Sensitivity equal to that of a horizontal-pendulum tiltmeter has been obtained in a 200-foot system installed in an underground site. Development is continuing with the aim of ensuring long term stability.
Determination of the ocean-tide effect in measurements of the ocean tide, 1969-70.
A method has been developed for computing the theoretical effect of worldwide ocean tides on measurements of the earth tide made by gravimeter and tilt meter.

394. Dence, M.R., Robertson, P.B., Innes, M.J.S., Popelar, J., Observatories Branch, Dept. Energy, Mines & Resources:
Geological and geophysical studies of Canadian craters, 1953-.
Gravity and geologic surveys in the Sudbury area were carried out in 1969, and further geologic work was undertaken at the Mistastin Lake and Charlevoix structures. A detailed interpretation of the Sudbury data is in progress. See a probable meteorite origin for Mistastin Lake; Contr. Dom. Obs. no. 264, 1969.

395. Gibb, R.A., Observatories Branch, Dept. Energy, Mines & Resources:
Interpretation of the gravity anomaly field in northern Ontario, 1969-.
A study of gravity, aeromagnetic anomalies and geology in northern Ontario is in progress. The geophysical results suggest that large scale crustal faults may have been active during Proterozoic time in this area.

396. Gibb, R.A., van Boeckel, J.J.G.M., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity study of Round Lake Batholith, northeastern Ontario, 1967-69.
See Three-dimensional gravity interpretations of the Round Lake Batholith N.E. Ontario, Can. J. Earth Sci. (in press)

397. Coodacre, A.K., Cooper, R.V., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity measurements in the Great Lakes, 1968-70.
Regional underwater gravity measurements have been made in the Great Lakes to provide data for (i) the oil and mineral exploration industry, (ii) geodesy, (iii) investigations of the composition and structure of the earth's crust and upper mantle and (iv) studies of vertical movements. The gravity data will be published in the Gravity Map Series of the Dominion Observatory.

398. Hornal, R.W., Burke, W.E.F., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity survey in the Mackenzie River Basin, 1969-70.
More than 4500 gravity measurements were made at 12 km intervals between the southern boundary of the Northwest Territories and the Arctic Ocean and Great Bear and Great Slave Lakes and the Mackenzie and Richardson Mountains. A circular positive anomaly of over 120 mgal was discovered south of Darnley Bay and a gravity low of -55 mgal was observed over the Mackenzie Delta. The Bouguer anomalies were in general more negative over the mountain foothills except in the Richardson Mountains where a gravity high was observed.

399. Jacoby, W.R., Observatories Branch, Dept. Energy, Mines & Resources:
Seismic - gravity correlation, 1967-69.
A model of the crust and upper mantle along a N-S section of Canada derived by Wickens by the use of Love wave dispersion was combined with gravity. A density structure for this model was calculated. Similar results were obtained for the model from the topographical load and the assumption of (local) isostasy.
Gravity study of the Bancroft area, Ontario, 1967-69.
A detailed study of the Bancroft area is nearing completion. The mechanics of granite emplacement are considered with some quantitative estimates.
Nomagrams for gravity interpretation, 1968-69.
Simple nomograms were constructed to determine depths of exposed rock bodies using the peak gravity anomaly value for control.

400. Koulomzine, Théodore, Sylla, N'Fanly, Lamontagne, Yves, Nadeau, André, Ecole Polytechnique:
Study of methods of interpretation of magnetic and gravity anomalies, 1968-70; M.Sc. theses (Lamontagne, Sylla Nadeau).
Using GE-235 and CDC-6400 computers, more than 5,000 curves of magnetic anomalies caused by prisms, lenses and combined prisms have been calculated. Secondary master curves leading to simple interpretation of any given field magnetic profile are being constructed. See New methods

for the direct interpretation of magnetic anomalies caused by inclined dykes of infinite length; Geophysics (in press).

401. Sobczak, L.W., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity surveys in the Alexandria area, eastern Ontario, 1960-69.
The results of 1700 gravity observations completed by the Dominion Observatory from 1945 to 1964 are presented in the form of a Bouguer anomaly map. Seven profiles are analyzed. The Bouguer anomalies are correlated with magnetic and geological information and the interpretation of the gravity data is based on rock density measurements. Two maps showing the computed first and second vertical derivatives of gravity are also presented. Negative Bouguer anomalies are correlated with the Chatham-Grenville syenite stock and a similar intrusion at Mount Rigaud on the southern border of the Grenville-A subprovince. It is postulated that the negative anomaly near Plaisance indicates the presence of a similar intrusion below the Palaeozoic cover. The Alexandria High, a positive residual Bouguer anomaly which extends from Lunenburgh to Pointe-au-Chêne, may be explained by the presence of a basic lenticular body of thickness varying from 6000 to 9000 feet and width of 50,000 feet at a depth varying from 3000 to 5000 feet. The approximate thickness of the Grenville Series is 11,000 to 12,000 feet along the crest of the Alexandria High. The regional gravity gradient which increases from -30 milligals in the northwest to +10 milligals in the southeast of the area is correlated with a rise of over 3 kilometres (10,000 feet) of the Mohorovicic discontinuity. See Gravity Surveys in the Alexandria Area, Eastern Ontario; Pub. Dom. Obs. v. XXXIX, no. 6, 1969.

402. Sobczak, L.W., Stephens, L.E., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity survey of Beaufort Sea, Northwest Territories, 1969-.
Approximately 900 gravity stations at 8 mile intervals were observed on ice in the Beaufort Sea in conjunction with hydrographic surveys of the Polar Continental Shelf Project. The area extends from Tuktoyaktuk to 73° 30' and between longitude 131° and 135°

403. Sobczak, L.W., Weber, J.R., Bisson, J.L., Goodacre, A.K., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity measurements in the Queen Elizabeth Islands with maps (east and west), 1969-70.
Bouguer anomalies at about 9000 stations have been plotted at a scale of 1:1,000,000 on two maps which extend from latitude 74°N to 82°N and from longitude 60°W to 141°W. All gravity measurements taken up to 1968 and the Bouguer anomaly field over the different geological provinces will be discussed briefly. See Grav. Map. Ser. Dom. Obs. nos. 12-15, 1963.

404. Sobczak, L.W., Weber, J.R., Roots, E.F., Observatories Branch, Dept. Energy, Mines and Resources:
Rock densities in the Queen Elizabeth Islands Northwest

Territories, 1965-.

Results of 1900 density measurements of crystalline, carbonate and clastic rocks from the Queen Elizabeth Islands are presented graphically and in tables. The data were compiled directly from sampling of surface rocks and rock material from drillholes, and indirectly by relating densities to seismic velocities and from detailed gravity profiles across topographic features. The weighted mean densities of the Precambrian crystalline rocks, and of the Paleozoic carbonate rocks of the Franklinian miogeosyncline and Arctic Lowlands are each 2.76 g/cm$^3$. The Paleozoic evaporite rocks, sampled mainly in the Bathurst Island area but common throughout the Franklinian miogeosyncline, have a weighted mean density of 2.56 g/cm$^3$. The Franklinian clastic rocks exhibit a range of density, in part apparently related to age and/or depth of burial; the Silurian clastics have a weighted mean density of 2.62 g/cm$^3$ and the Devonian clastic formation 2.51 g/cm$^3$. In contrast, the Mesozoic clastic rocks of the Sverdrup basin have a weighted mean density of 2.32 g/cm$^3$. See Rock densities in the Queen Elezabeth Islands, Northwest Territories. Proc. Geol. Ass. Can. (in press).

405. Stacey, R.A., Observatories Branch, Dept. Energy, Mines & Resources:
West Coast Geophysical Survey, 1966-.

Gravity, magnetic and bathymetric maps at 1:250,000 for the Strait of Georgia and the Strait of Juan de Fuca should be available in 1970. The interpretation of the magnetic measurements is being carried out by University of British Columbia and the gravity data are being studied by members of the Gravity Division, Dominion Observatory. See Gravity measurements in British Columbia with map, Grav. Map Ser. Dom. Obs. No. 88.

406. Stacey, R.A., Stephens, L.E., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity survey of southern British Columbia, 1966-70.

All gravity observations south of Prince George, B.C. are expected to be corrected for terrain effects by the end of 1969. The interpretation of the Bouguer anomalies in the Cordillera region south of 51°N should be completed by late 1970. See Procedures for calculating terrain corrections for gravity measurements; Pub. Dom. Obs. (in press).

407. Syberg, F., Gretener, P.E., Univ. of Calgary:
Gravity anomalies over reef, 1969-71; M.Sc. thesis (Syeberg).

Investigation of postulate that gravity anomalies are associated with deep seated reefs.

408. Tanner, J.F., Observatories Branch, Dept. Energy, Mines & Resources:
A geophysical study of structural boundaries in northern Quebec, 1964-70.

In recent years structural boundaries within the Canadian Shield generally have been the subject of progressively more intense geological and geophysical studies. It is planned to combine this study of the gravity data over structural boundaries in northern Quebec with studies of structural boundaries outside Quebec and thus carry out a

much more comprehensive investigation of these features than has been hitherto possible.

A gravity study of anorthositic gabbro intrusions in the eastern Grenville, 1967-.

One of the major difficulties is the lack of regional geological information in the vicinity of these basic instrusions. Detailed geological mapping is a time consuming task because these intrusions may be as much as 100 km in diameter. Preliminary interpretation of the gravity data indicates that these intrusions have maximum thicknesses in the order of tens of kilometres.

409. Valliant, H.D., Goodacre, A.K., Observatories Branch, Dept. Energy, Mines and Resources:

A feasibility study of an aerogravity system, 1968-71:

Preliminary airborne tests using sophisticated navigational equipment are planned for March 1970 in the vicinity of Alexandria, Ontario.

410. Walcott, R.I., Observatories Branch, Dept. Energy, Mines & Resources:

Isostatic studies, 1968-71.

The following studies are also in progress: (1) flexure of the lithosphere at Hawaii; (2) an isostatic origin for basement uplifts; (3) strength of the lithosphere; (4) paralic sedimentation of growth of a geosyncline. See Isostatic response to loading of the crust in Canada; Can. J. Earth Sci. v. 7, 1970.

Gravity in the Interior Plains of Canada, 1969-70.

411. Winter, P.J., Iverson, R.M., Weber, J.R., Observatories Branch, Dept. Energy, Mines & Resources:

Gravity measurements from the Lincoln Sea to the North Pole, 1960-.

A gravity traverse from the Lincoln Sea along the Lomonosov Ridge to the North Pole was completed in April and May, 1969.

## Geomagnetic and Paleomagnetic

412. Bidgood, D.E.T., Howells, K., Nova Scotia Research Foundation:

Regional studies of Nova Scotia aeromagnetic data, 1969-.

Existing aeromagnetic maps will be digitized to permit computation of regional trends, filtering, residual contouring and other methods of geophysical analyses, which will aid the study of geological structure in the Nova Scotia area.

413. Caner, B., Victoria Magnetic Observatory, Dept. Energy, Mines & Resources:

Analysis, long aeromagnetic profiles, 1967-69.

Analysis of long-wavelength patterns on aeromagnetic profiles flown in Western Canada, to determine major regional differences indicative of crustal structure or composition (with particular reference to correlation with electrical conductivity structural regions). See Long aeromagnetic profiles and crustal structure in Western Canada, Earth and

Planet. Sc. Letters, v. 7 (no. 1), p. 3-11, 1969.

414. David, Michel, Ecole Polytechnique:
Application of Universal Kriging to mapping problems of aeromagnetic data, 1969-70.
Several numerical interpolation techniques have been used to draw contour maps of aeromagnetic data. So far no studies have been done to try to take into account as much as possible the spatial correlations which are encountered in the field of variation. Universal Kriging is a technique which has been suggested in 1969 by G. Matheron.

415. Gupta, V.K., Fitzpatrick, M., Queen's Univ.:
Quantitative interpretation of aeromagnetic results obtained by Bethlehem Steel north of Ontario by energy spectrum analysis, 1970-71; Ph.D. thesis (Gupta).

416. Hood, P.J., Geol. Surv. of Canada:
Magnetic gradient techniques, 1963-.
This is primarily a theoretical study, which involves the derivation of formulae for the first vertical derivative over various geometrical models, an analysis of the resultant theoretic curves obtained from the formulae by computer programming, and the development of comprehensive interpretation methods which utilize the various diagnostic parameters e.g. half widths, of the theoretical curves. See Vertical gradient studies: dipping dyke case and Euler's differential equation; Geol. Surv. Canada, Paper 68-1A, p. 14-18, 1968.

417. Hood, P.J., Sawatzky, P., Geol. Surv. of Canada:
Queenair high resolution aeromagnetics, 1968-.
Design and fabrication of a light-weight digitally-recording high resolution aeromagnetic survey system for installation in a Queenair B 80 aircraft.

418. Hood, P.J., Sawatzky, P., Bower, M.E., Geol. Surv. Canada and Godby, E.A., Baker, R.C., Davis, N., National Aeronautical Establishment:
The objectives of this project are (1) to conduct high resolution aeromagnetic surveys over the Canadian Continental Shelves for purposes of delineating sedimentary basins and (2) to obtain and study magnetic data over the ocean basin in order to shed light on the theories of magnetic imprinting of oceanic rocks, ocean floor spreading and continental drift. See Magnetic surveys in Hudson Bay: 1965 Oceanographic Project, in Earth Science Symposium on Hudson Bay, Geol. Surv. Canada, Paper 68-53, pp. 272-291, 1969.

419. Irving, E., Observatories Branch, Dept. Energy, Mines & Resources, Donaldson A., Carleton Univ.:
Paleomagnetism of Precambrian rocks of Hornby Bay Region, Great Bear Lake, Northwest Territories, 1968-70.

420. Irving, E., Roy, J.L., Observatories Branch, Dept. of Energy, Mines & Resources:
Magnetic properties of ocean floor rocks, 1968-.

See Measurement of polarity in oceanic basalt; Can. Jour. Earth Sci., v. 5, p. 1319, 1968.

421. Kornik, L.J., Geol. Surv. of Canada:
Regional aeromagnetic-geologic correlation, 1965-.
A regional study to correlate geology with magnetic patterns and anomalies by means of in situ magnetic susceptibility and remanent magnetism measurements of oriented samples. See An aeromagnetic study of the Moak Lake-Setting Lake Structure in Northern Manitoba, Can. Jour. Earth Sciences, v. 6, no. 3, p. 373-381, 1969.

422. Koulomzine, Théodore, Sylla, N'Fanly, Lamontagne, Yves, Nadeau, André, Ecole Polytechnique:
Study of methods of interpretation of magnetic and gravity anomalies, 1968-70; M.Sc. theses (Lamontagne, Sylla and Nadeau).
Using GE-235 and CDC-6400 computers, more than 5,000 curves of magnetic anomalies caused by prisms, lenses and combined prisms have been calculated. Secondary master curves leading to simple interpretation of any given field magnetic profile are being constructed. See New methods for the direct interpretation of magnetic anomalies, caused by inclined dykes of infinite length; Geophysics (in press).

423. Lajoie, J.J., Caner, B., Clarke, G.K.C., Dragert, H., Univ. of British Columbia:
Geomagnetic depth sounding.
J.J. Lajoie, with B. Caner and G.K.C. Clarke, is interpreting 1968 Geomagnetic Depth Sounding measurements in the Kootenay Lake region. The Kootenay Lake anomaly, appears to be a local convolution of the main low Z/H to high Z/H discontinuity. A three-dimensional model compatible with seismic and geomagnetic results has been proposed by Caner and is being analysed by J.J. Lajoie. In 1969 Lajoie carried out a conventional magnetic survey from Revelstoke, B.C. to Bonner's Ferry, Idaho. The purpose of this survey is to ascertain whether the upwelling of material giving rise to the GDS anomaly is associated with a flexure of the Curie isotherm. Mapping by geomagnetic depth-sounding of the high conductivity zone in British Columbia was continued. A new line extending from Prince Rupert to east of Jasper was established and the transition from an eastern to a western (high conductivity) regime found to coincide roughly with the Rocky Mountain Trench.

424. Larochelle, A., Schwarz, E.J., Symond, D.T.A., Pearce, G.W., Christie, K.W., Schaeffer, R.M., Geol. Surv. of Canada:
Research in paleomagnetism and rock magnetism, 1958-.
Papers in press by members of this research group include a study of the paleomagnetism of the Nipissing diabase at Cobalt, Ontario, an analysis of various paleointensity methods, a paleointensity study of late Miocene volcanic rocks from British Columbia, and a thermomagnetic study of various pyrrhotite phases. Papers are being prepared on the following subject: (I) paleomagnetism of the (a) North Mountain basalt of Nova Scotia, (b) Paleozoic volcanics in the Maritime provinces, (c) Nipissing diabase

at Blind River, Ontario, and (d) the Edsiza volcanic pile of British Columbia; (II) paleointensity of the Sudbury Irruptive; (III) thermomagnetic properties of basalts from the Mid-Atlantic Ridge; and (IV) AF demagnetization characteristics of Cenozoic lavas. Research in progress or planned for the coming year includes paleomagnetic studies on Appalachian intrusives and on Cordilleran plutons and flows, additional paleointensity work on the Sudbury Irruptive, paleomagnetic and rock magnetic properties of moon samples, the distribution of pyrrhotite phases in ore bodies and metamorphic rocks, development of a vibrator magnetometer, and completion of the high-sensitivity biastatic magnetometer and thermal demagnetizing apparatus at the Blackburn non-magnetic laboratory. See Apparatus for measuring magnetic susceptibility and its anisotropy Geol. Surv. Canada, Paper 69-41, 10 pp. 1969; Paleomagnetism of Sudbury Erruptive, Geol. Surv. Canada, Paper 69-19, 23pp., 1969; Thermomagnetics of pyrrhotite, Geol. Surv. Canada, Paper 69-1B, pp. 4-45, 1969; Geomagnetic intensity between 100 million and 2500 million years ago; Phys. Earth Planet. Interiors, v. 2, pp. 11-18, etc.

425. MacLaren, A.S., Morley, L.W., Charbonneau, B.W., Geol. Surv. of Canada:
Magnetic anomaly map of Canada, 1965-1976.
Recently the Bathurst Inlet area and the Maritime Provinces have been completed with the regional gradient removed adding 200,000 square miles to the already published Magnetic Anomaly Map of Canada. See Characteristics of magnetic data over major subdivisions of the Canadian Shield, Geol. Assn. Canada, v. 19, 1968.

426. McGlynn, J.C., Geol. Surv. of Canada, Irving, T., Dominion Observatory, Dept. Energy, Mines & Resources:
Paleomagnetic study of Nonacho and Et-then sedimentary rocks, Northwest Territories, 1969-71.

427. McGrath, P.H., Geol. Surv. of Canada:
Aeromagnetic interpretation - Appalachia, 1968-71.
A study of all available geophysical data in order to throw light on the geology of the Appalachian region with particular emphasis on areas where the sediments might be oil-bearing. In situ magnetic susceptibility data and drill cores for remanence measurements were collected in southern New Brunswick and Nova Scotia during the 1968 and 1969 field seasons to assist in the interpretation of aeromagnetic anomalies. See Magnetic investigations of the Charlotte and Pokiok. Intrusions of Southern New Brunswick; Geol. Assoc. Can. v. 21.

428. Middleton, R.S., Ontario Dept. of Mines:
Magnetic survey of Robb and Jamieson Townships, District of Cochrane, Ontario, 1968-70.
A detailed, ground magnetic survey was carried out utilizing previous surveys. Unsurveyed areas were traversed at 400, 600 and 800 foot intervals. Approximately 500 rock samples were tested for magnetic susceptibility and 80 sample sites were tested for remanent magnetism. It was found that remanent magnetism was not a problem in magnetic

interpretation however, similarity of magnetic susceptibility of mafic and felsic volcanics made the identification of these rock types difficult. The magnetic properties of the north-south diabase dykes indicates that they are not Matachewan in age, but may be related to the east-northeast variety found in northeastern Ontario. See Ont. Dept. Mines, Map p. 521, 1969.

Magnetic survey of Godfrey and Turnbull townships, District of Cochrane, Ontario, 1969-71.

Ground magnetic surveys were carried out utilizing surveys submitted by companies. Unsurveyed areas were covered by the field party using Sharpe MF-1-100 and McPhar M-700 magnetometers. Samples were collected for magnetic susceptibility and remanent magnetism analysis. Upon completion of the magnetic surveys an interpretation will be made to provide detailed geological maps of the two townships.

429. Park, J.K., Observatories Branch, Dept. Energy, Mines & Resources:
Chemical demagnetization of rocks.

The techniques for this work are being developed, the objective being to obtain a method for discovering which magnetic components are responsible for the magnetization of red sediments.

430. Robertson, W.A., Observatories Branch, Dept. Energy, Mines & Resources:
Paleomagnetism of the Proterozoic rocks of Lake Superior region, 1967-75.

A systematic paleomagnetic survey of the thick late Precambrian sequences in this region to determine the variations in the field at this time.

431. Robertson, W.A., Roy, J.L., Observatories Branch, Dept. Energy, Mines & Resources:
Paleomagnetism of the Proterozoic of Canada, 1967-80.

Involves the determination of the direction and intensity of the earth's magnetic field as expressed in the Proterozoic rocks particularly the Keeweenawan of Canada. The work will include detailed studies (both of direction and intensity) of restricted age ranges to obtain the age relations of normally and reversely magnetized rocks, and to set up paleomagnetic time horizons in conjunction with radiogenic dating. Where possible results will be used to test the validity of extrapolating the hypothesis of the diopole field and secular variation back into Precambrian time. See Dating the Precambrian paleomagnetically; Can. Jour. Earth Sci. (in press).

432. Roy, J.L., Observatories Branch, Dept. Energy, Mines & Resources:
Paleomagnetism of Upper Palaeozoic rocks from Maritime Provinces, 1955-69.

This systematic survey of beds is now nearing completion and a general picture of the behaviour of the geomagnetic field in the Upper Paleozoic in Canada has been obtained. See Evidence for diagenetic magnetization in the Maringouin Formation, Canadian Journ. Earth Sci., v.5, p. 275, 1968.

Paleomagnetism of Devonian and Mississippian Formations, 1968-71.

The purpose is to complete a polar wandering curve of the apparent dipole field from Devonian to Permian.

Paleomagnetism of the Cumberland Group (Carboniferous) of Nova Scotia, 1967-69.

Paleomagnetism of the Fisset Brook Formation (Carboniferous), Nova Scotia, 1967-72.

433. Roy, J.L., Park, J.K., Observatories Branch, Dept. Energy, Mines & Resources:
Mangetic properties of some Mississippian formations, 1965-69.

434. Roy, J.L., Robertson, W.A., Park, J.K., Observatories Branch, Dept. Energy, Mines & Resources:
Palaeomagnetism of the Carboniferous rocks of Eastern Canada, 1969-.

Directions of remanent magnetization of Carboniferous rocks from the Maritime Provinces are being tested for stability, and pole positions calculated from those that appear to be magnetized in the direction of the magnetic field when they were formed. The aim of the work is to elucidate the movement of North America relative to the pole in the Carboniferous period and give the pattern of reversals of the earth's magnetic field for this period for comparison with other continents.

435. Seguin, M.K., Université Laval:
Etude du magnétisme rémanent dans la partie centrale de la fosse du Labrador, 1968-70.

436. Sherwood, H.G., Nova Scotia Technical College:
The aeromagnetic-geologic compilation of Nova Scotia - a preliminary study, 1969.

A preliminary correlation and evaluation of geologic and total field aeromagnetic data. Mafic intrusive bodies appear to occur in two belts which can be outlined and extended using the magnetic data.

437. Stacey, R.A., Observatories Branch, Dept. Energy, Mines & Resources:
West Coast geophysical survey, 1966-.

Gravity, magnetic and bathymetric maps at 1:250,000 for the Strait of Georgia and the Strait of Juan de Fuca should be available in 1970. The interpretation of the magnetic measurements is being carried out by University of British Columbia and the gravity data are being studied by members of the Gravity Division, Dominion Observatory. See Gravity measurements in British Columbia with map, Grav. Map Ser. Dom. Obs. No. 88.

438. Strangway, D.W., Univ. of Toronto:
Paleomagnetism in annually banded sediments.

The magnetic directions of portions of the Eocene Green River shale have been studied. This has provided an almost continuous record for a period of about 200,000 years. Preliminary results show that secular variations

are about like those expected. In addition, a few short-lived transient events of a few thousand years' duration were found. A reversal was also found which indicated that the reversal took about 2,000 years. Further studies on the Castile formation from New Mexico of Permian age are being started in cooperation with Professor Anderson of the University of New Mexico.

Paleomagnetism of volcanics from southwestern United States:

A study of reversals and long duration secular variations in a sequence of mid-Tertiary volcanic rocks from Arizona and New Mexico is continuing. This work is being used for stratigraphic correlations in this extensive volcanic area. K-Ar dating by Professor York and J. Simpson is proving to be a valuable part of the study.

439. Strangway, D.W., Univ. of Toronto, Megrue, G., Smithsonian Astrophysical Laboratory:

Paleomagnetism of Ethiopian dykes.

Polarity sequences and pole positions for a series of younger Tertiary dykes are being studied. The study will include age dating and lead to useful additional pole positions for Africa.

440. Strangway, D.W., Pearce, G.W., Univ. of Toronto; Larson, E.E., Univ. of Colorado:

Lunar samples:

Magnetic studies of Apollo 11 moon samples have been completed and reported at the meeting of Lunar samples principal investigators in Houston, Texas. These results will be published in Science and in Geochemica et Cosmochimica Acta. Additional samples from Apollo 12 and 13 are expected in the future.

441. Strangway, D.W., Tesky, R., Univ. of Toronto:

Paleomagnetism of sedimentary cores from Mid-Atlantic Ridge; M.A. thesis (Tesky).

The Blake event believed to be about 100,000 years old has been confirmed and may be a useful stratigraphic marker for young sediments.

442. Strangway, D.W., Univ. of Toronto; Vogt, P.R., U.S. Navy:

Continental drift.

Compilation of airborne magnetic data from West Africa and northeastern South America is essentially complete and a preliminary paper has been submitted showing magnetic similarities in the basement from the two sides of the Atlantic Ocean. High-altitude magnetic profiles that supplement this work have been obtained in cooperation with Project Magnet of the U.S. Navy. Preliminary results will be published in Earth and Planetary Science Letters.

443. Washkurak, S., Geol. Surv. of Canada:

Overhauser magnetometer development, 1963-70.

Scintrex Limited of Toronto have been licensed to produce a prototype Overhauser magnetometer based on the GSC patent. A working model should be completed in the early part of 1970. Tests are being made on error readings caused by orientation and angular rotation.

444. York, D., Baksi, A.K., Watkins, N.D., Univ. of Toronto:
K-Ar dating of magnetic field reversals, 1967-; Ph.D. thesis (Baksi).
See The age of Steens Mountain geomagnetic polarity transition, J. Geophys. Res. v. 72, 6299, 1967.

## Seismic

445. Barr, K.G., Tyrlik, W.T., Berry, M.J., Forsyth, D.A. Bone, M.N., Jacoby, W.R., Observatories Branch, Dept. Energy, Mines & Resources:
Seismic crustal studies throughout Canada, 1964-.
Studies of the crust and upper mantle throughout Canada including the Arctic by seismic methods, including theoretical studies: Yellowknife, 1966, Polar Shelf, 1967 work on these projects has been completed, and will be published before the end of 1969; Cordillera, 1965, 1966, 1967, 1969 - this work will be published when the most recent data have been reduced; Yellowknife, 1969 - work on this data has not yet been started.

446. Dainty, A.M., Univ. of Toronto:
Studies of leaky modes, 1967-.
The basic theory of leaky modes has been studied by other authors. This investigator is mainly concerned with calculations of dispersion curves and excitation functions for particular cases to demonstrate the effect of varying clastic parameters. Also the formation of synthetic seismograms is of interest. It is hoped to extend the investigation to include observations of seismograms. Calculations of leading modes, Trans. Amer. Geophys. Union, v. 50, 233 (Abs.), 1969.

447. Davis, T., Gretener, P.E., Univ. of Calgary:
Seismic velocity over reefs, 1969-71; M.Sc. thesis (Davis).
An investigation of the postulate that seismic velocities over reefs are higher than normal.

448. Grant, A.C., Bedford Institute, Nova Scotia:
Reconnaissance seismic profile survey of the Continental Margin off Labrador and Newfoundland, from Ungava Bay to Flemish Cap, 1965-70; Ph.D. thesis, Dalhousie Univ.
See Recent crustal movements on the Labrador Shelf, Can. Jour. Earth Sciences, in press.

449. Hasegawa, H.S., Observatories Branch, Dept. Energy, Mines & Resources:
A study of the effect of a relatively simple geologic environment (the Canadian Shield) upon the P coda of teleseismic events, 1967-69.
After the analysis of the effect upon the P coda of the western shield area was completed, a similar study was carried out in the eastern shield area in the Schefferville region of the Labrador trough. The results were then compared with a similar study carried out by

Ellis and Basham (1968) in the Western Canada sedimentary basin in central Alberta.

450. Hobson, G.D., Geol. Surv. of Canada:
Hammer seismic surveys, 1962-.
Shallow seismic methods, including both refraction and reflection techniques, can be applied to the definition of problems in mining, engineering and groundwater studies. Reflected shear waves have been recorded on a hammer seismograph to determine thickness of glacial ice. See Pleistocene geology of the buried St. Davids Gorge, Niagara Falls, Ontario, Geol. Surv. Can., Paper 68-67, 1969 and In-situ determination of elastic constants in overburden using a hammer seismograph, Geoexploration, v. 7, p. 107-111, 1969.
Marine Seismic - Great Lakes, 1966-.
The application of shallow seismic techniques and high resolution repetitive sources to the definition of stratification and materials within the unconsolidated sediments overlying bedrock. A side-scan sonar device was also used during 1969 in Lake Huron to identify bottom materials. See High resolution reflection seismic survey in western Lake Erie: in Proc. 12th Conf. Great Lakes Res. 1969 and Transit sonar measurements in Lake Ontario off the mouth of the Niagara River; in Proc. 11th Conf. Great Lakes Res. 1968, p. 179-187, 1969.

451. Hobson, G.D., Overton, A., Geol. Surv. of Canada:
Marine seismic - Gulf of St. Lawrence, 1964-69.
Two-ship marine seismic refraction experiments to investigate the thickness, nature and attitude of the sedimentary rocks underlying the Gulf of St. Lawrence to the depth of the crystalline basement.

452. Hodgkinson, J., Gretener, P.E., Univ. of Calgary:
Velocity anistropy in rocks of Western Canada, 1969-70; M.Sc. thesis (Hodgkinson).

453. King, L.H., MacLean, Brian, Kranck, Kate (Miss), Bedford Institute, Nova Scotia:
Regional geology of the Scotian Shelf, 1964-.
A program to map the near surface structure and stratigraphy of the bedrock underlying the entire Scotian Shelf and Bay of Fundy is being conducted utilizing continuous seismic-relfection profiles and sample data obtained through dredging operations. Profiles representing some 8,000 miles of traverse have been accumulated, and are being interpreted utilizing differences in acoustical characteristics and unconformable relationships to delineate rock units. Interpretation of the surficial geology is based upon a detailed study of echograms, examination of bottom samples, continuous seismic-reflection profiles, radiogenic ages and paleontological data. Work currently in progress will provide surficial geological coverage for the whole of the Scotian Shelf, and Northumberland Strait and Georges Bay and Bay of Fundy. See Submarine end moraines and associated deposits on the Scotian Shelf: Geol. Soc. Amer. Bull., v. 80, p. 83-96, 1969.

454. Manchee, E.B., Weichert, D.H., Anglin, F., Basham, P.W., Whitham, K., Observatories Branch, Dept. Energy, Mines & Resources:
Array seismology, 1962-.
This project embraces research into detection and identification methods for explosions as well as general research into the characteristics of earthquakes and earth structure as they may be delineated by a medium aperture array. The outputs of U.K.A.E.A.-type arrays are analysed for analogue-digital means in Ottawa. See Upper Mantle structure under the Churchill Province of the Canadian Shield, east of the Yellowknife seismic array; Jour. Phys. Earth, v. 16, p. 93, 1969 and Canadian detection and discrimination thresholds for earthquakes and underground explosions in Asia, Can. Jour. Earth Sci., v. 6, no. 6, 1969.

455. Milne, W.G., Smith, W.E.T., Rogers, G.C., Whitham, K., Observatories Branch, Dept. Energy, Mines and Resources:
Seismic regionalization of Canada, including microearthquake studies - a continuing study.
Seismicity of Canada including epicentral and magnitude determinations, strain release maps, earthquake recurrence relations and extreme value theorem estimates of ground accelerations and intensities. In addition strong motion studies are being conducted on the west coast, and microearthquake studies pursued in the Arctic, British Columbia, and Eastern Canada. See Distribution of earthquake risk in Canada; Bull. Seismol. Soc. Amer., v. 59, p. 729-754, 1969 and Canadian Seismicity and microearthquake research in Canada; Can. Jour. Earth Sciences (in press).

456. Saull, V.A., Telford, W.M., Butler, R.B., McGill Univ.; Leblanc, G., Laval Univ.:
Earthquake prediction in southern Quebec, 1966-72; Ph.D. thesis (Butler).
Geological and geophysical field measurements and their correlation with seismicity.

457. Stevens, A.E., Hodgson, J.H., Observatories Branch, Dept. of Energy, Mines and Resources:
Earthquake mechanisms from P and S waves - a continuing study.
A study of earthquake focal mechanisms from the analysis of distribution patterns and other physical characteristics of body and surface waves, including research into improving our knowledge of focal mechanisms. See Earthquake mechanisms - world wide; Monograph on Upper Mantle, Am. Geophysical Union, 1969.

458. Wickens, A.J., Observatories Branch, Dept. Energy, Mines & Resources:
Reyleigh and Love Wave velocities in Canada, 1968-70.
Complete coverage of Canada is being attempted for adjacent station pairs. Inversion for upper mantle models is being done for areas where crustal results are available.

General

459. Babcock, E.A., Univ. of Alberta:
Geology and geophysics of the Durmid Area Imperial Valley California, thermal infrared survey of Red Deer Lake, 1965-69.

460. Bidgood, D.E.T., Howells, K., Nova Scotia Research Foundation:
Geophysics investigation of evaporites in Nova Scotia, 1956-.
Gravity, magnetic, seismic, bore hole geophysical and geological logs, provide data on the distribution and mode of occurrence of salt and related evaporite minerals in Nova Scotia. See The distribution and diapiric nature of some Nova Scotia evaporites - a geophysical evaluation; proceedings of the third symposium on salt, Cleveland, Ohio, 1969.
Geophysical studies of a Horton graben in central Nova Scotia, 1967-.
Gravity, electromagnetic (V.L.F. and Afmag), seismic and bore-hole methods are being used to investigate an area of Horton rocks bounded by major faults. This work is being carried out in conjunction with the Nova Scotia Department of Mines. See Two V.L.F. electromagnetic traverses in Pictou and Guysborough Co., Nova Scotia, Nova Scotia Research Foundation Report 1-69, 1969.

461. Bingley, J., Corbin, B., Nova Scotia Dept. of Mines:
Geological and geophysical investigation of St. Mary's River Basin, Pictou County, Nova Scotia, 1968-.
Gravimetric profiles and electromagnetic and magnemeter surveys were completed to obtain some clues as to the depth of the basin and indications as to favourable areas for finding mineral deposits.

462. Burke, K.B.S., Univ. of New Brunswick:
Interpretation of regional geophysical surveys in New Brunswick, 1969-.

463. Burwash, R.A., Krupicka, J., Univ. of Alberta:
Correlation of petrologic, geochemical and geophysical data for the subsurface Precambrian of Western Canada, 1968-.
See Cratonic reactivation in the Precambrian basement of Western Canada, Part 1: Deformation and chemistry. Can. Jour. Earth Sci., v. 6, no. 6, 1969.

464. Chase, R.L., Barr, Sandra, Thomlinson, Arnold, Univ. of British Columbia:
Geology of continental slope and adjoining areas of the northeast Pacific Ocean west of British Columbia, 1969-74; Ph.D. theses (Brown and Thomlinson).
Techniques used are seismic reflection profiling, echo sounding, dredging, coring, underwater photography and magnetometry. Canadian government vessels of the Defence Research Establishment (Pacific) and Department of Energy, Mines and Resources are used. Studies include the effects in the upper crust of interactions of the Pacific, Americas, and Juande Fuca lithospheric plates.

465. Darnley, A.G., Charbonneau, B.W., Geol. Surv. of Canada:
Gamma-ray support, 1967-72.
Ground and laboratory investigations (geological, geophysical, geochemical and petrological) to complement airborne investigations and also to provide ground calibration for quantitative use of airborne data. See Evaluation of airborne gamma-ray spectrometry in the Bancroft and Elliot Lake areas of Ontario, Canada, in Proceedings, Fifth symposium on Remote Sensing of Environment, Univ. of Michigan, Ann Arbor, Michigan (1968).

466. Darnley, A.G., Grasty, R.L., Geol. Surv. Canada:
Airborne gamma-ray spectrometry, 1966-72.
The objective is to develop an airborne gamma-ray spectrometer system for making contoured maps of K, U and Th content of surface materials. See Airborne gamma-ray spectrometer experiments over the Canadian Shield; I.A.E.A. symposium on the use of nuclear techniques in the prospecting and development of mineral resources, Vienna, 1968.

467. Darnley, A.G., Grasty, R.L., Ostrihansky, L., Geol. Surv. of Canada:
Radioisotope methods, 1967-72.
Includes (1) provision of laboratory radiometric analysis facility based on conventional NaI (Tl) and solid state Si (Li) detectors (2) investigation of analytical problems of using Si (Li) detectors in conjunction with radioisotope sources for X-ray fluorescence analysis with future field applications in view and (3) use of conventional portable radioisotope X-ray fluorescence probes in field trials in support of various investigations. See Radioisotope instruments in future mineral exploration: I.A.E.A. Panel on Radioisotope X-ray fluorescence applications, Vienna 1968 (in press).

468. Duckworth, K., Univ. of Calgary:
Development of electromagnetic induced polarization and radiometric mineral prospecting systems, 1969-.

469. Dyck, J.H., Saskatchewan Research Council:
Geophysical prospecting for groundwater in southern Saskatchewan - principally by electrical methods, 1964-69.
Current research is an ARDA supported program undertaken in 1964 to determine physical properties of glacial drift which could be used to detect and evaluate water bearing formations. Both surface and borehole electrical data have been correlated with geological data from a regional test drilling program. See Electrical logging and D.C. resistivity applied to groundwater in a glacial environment in Saskatchewan; preprint presented at S.E.G. convention in Oklahoma, 1967.

470. Grendzwill, D.J., Dyck, J., Pepper, T.P., Saskatchewan Research Council:
Geophysical prospecting for groundwater in southern Saskatchewan, 1963-70.
Evaluation and development of geophysical methods, particularly electrical, gravity, seismic, and well logging

techniques in their application to groundwater problems. See Geophysical methods for hydrologic search, 1966, Encyclopedia of Earth Sciences, Reinhold Publications (in press).

471. Goodacre, A.K., Observatories Branch, Dept. Energy, Mines & Resources:
A comparison of gravity and crustal seismic data in Canada, 1967-70.
Gravity and crustal seismic data from Canada are being analyzed to determine the composition and structure of the earth's crust and upper mantle. See An analysis of the crust-mantle boundary in Hudson Bay from gravity and seismic observations, Can. Jour. Earth Science, v. 5, no. 5, October 1968.

472. Hattersley-Smith, G., Dept. of National Defence:
Geophysical research in the Arctic, 1963-.
This project covers glaciological, meteorological and oceanographic studies in northwestern Ellesmere Island. See Recent observations on the surging Otto Glacier, Ellesmere Island. Can. J. Earth Sci., v. 6, no. 4, 1969, p. 883-889.

473. Keen, M.J., graduate students, Dalhousie Univ.:
Geophysical studies on eastern seaboard of Canada, 1961-.
The next stage of this work is (a) an investigation of Baffin Bay, (b) an attempt to obtain deep seismic reflections so that we can delineate the structure of the crust more accurately. See also report by Hyndman and Possible edge effect to explain magnetic anomalies off the eastern seaboard of the U.S., Nature, 222, p. 72-74, 1969.

474. Koulomzine, Théodore, Ecole Polytechnique:
Systematic study of the geophysical properties of the unconsolidated rocks of the St. Lawrence Lowlands, 1966-70.

475. Koulomzine, Théodore, Becker, Alex, Ecole Polytechnique:
Geophysical prospecting methods applicable to the search for deep seated metallic ore bodies, 1969-71.
The objectives are (1) to build modern detecting equipment to be lowered into sparsely distributed deep drill holes which in some mining camps are fairly numerous but have not been used for adequate geophysical studies; (2) to critically restudy and modify known techniques and devise new techniques with the aim of obtaining greater penetration.

476. Lee, L. (Mrs.), Ulrych, T.J., Ozard, J.M., Slawson, W.F., Culbert, R., Chen, T., LeCouteur, P., Univ. of British Columbia:
Isotope geophysics and mass spectrometry; Ph.D. theses (Lee, Ozard, Culbert, LeCouteur), M.Sc. thesis (Chen).
Mrs. Lee is undertaking measurement of the isotopic composition of lead in ocean basalts from the ridge system off the coast of British Columbia; Ozard has measured the isotopic composition and lead and uranium concentrations in rocks by the 3-filament technique. Slawson is making a geochronological investigation of the Vredefort Ring

Structures; Culbert is investigating the use of the Coast Range intrusive complex as a suitable geochemical and isotopic model for crustal prehistory of the parent material of cratonal granites; Chen is carrying out a hydrothermal experiment pertaining to the exchange of lead between an aqueous phase and a potash feldspar; and LeCouteur has begun a study of lead isotopes in galena samples from central Yukon and southeastern British Columbia.

477. Morrison, B., Saskatchewan Research Council:
Natural potential studies, 1967-70:
Investigation of sources of atmospheric, tree, and snow potentials and their relation to mineral deposits.

478. Saull, V.A., McGill Univ.:
Geophysical role of energy changes in metamorphic processes, 1952-.
Solution calorimetry of minerals; mathematics of spontaneous combustion; role of chemical energy in tectonics.

479. Schloessin, H.H., Univ. of Western Ontario:
Physical properties of mantle materials under conditions of high pressures and high temperatures, 1969-.
Apparatus includes cubic press, range up to 60-100 kb depending on anvil size, and up to 2000°C. Studies include pressure dependence of lattice thermal conductivity of pyrophyllite, enstatite and α-quartz; diamond synthesis.

480. Slaney, V.R., Geol. Surv. of Canada:
Multispectral photography, 1967-.
An investigation of the use of colour and other films from high altitude aircraft for geological purposes and evaluation of satellite imagery as a source of geological information.

481. Slaney, V.R., Gross, H., Geol. Surv. of Canada:
Infrared scanning, 1966-70.
To investigate the applicability of the airborne I.R. line-scanner for geological and hydrological purposes. See Airborne infrared scanning survey along the shorelines of the Lower Great Lakes, Proc. 2nd seminar on air photo interpretation in the development of Canada, Ottawa, March 1967.

482. Sobczak, L.W. Taylor, G.J., Observatories Branch, Dept. Energy, Mines & Resources:
Results of a differential Omega test in the Mackenzie River Delta, 1969.
An evaluation of the Omega navigational system as to positional accuracy, strength, stability and feasibility for helicopter in-flight use was completed for the Polar Continental Shelf Project of the Depatment of Energy, Mines and Resources. Thrity-six Omega phase measurements taken during the period of daylight propogation and used in the "Differential mode" yielded a r.m.s. positional error of 1.59 statute miles with a range in error of 0.138 to 3.771 statute miles at various topographic and hydrographic stations along the Mackenzie River Delta. Monitor phase measurements from April 22 to May 12, 1969 taken at

Tuktoyaktuk indicated a range in diurnal variation from ±0.616 to ±2.898 statute miles. When the Omega equipment was installed in a Bell 205A helicopter, neither a 100 inch whip antenna nor a H.F. antenna with a passive antenna coupler provided sufficient signal-to-noise ratio for in-the-air navigation. See Results of a differential Omega test in the Mackenzie River Delta. Geophysics (in press).

483. Sobczak, L.W., Weber, J.R., Roots, E.F., Observatories Branch, Dept. Energy, Mines and Resources:
Crustal structure of the Queen Elizabeth Islands and Polar Continental Margin, Northwest Territories, 1965-70.
Gravity and seismic measurements made during the period 1960 to 1966 are correlated with geological information along two regional profiles which cross the Queen Elizabeth Islands and adjacent polar continental margin. These anomalies vary in length from 150 km to 320 km and have amplitudes of over 100 mgal and are explained by the combined effects of variable thickening of clastic sediments (maximum thickness 10 km) and uniform thinning of the continental crust to 20 km.

484. Ulrych, T.J., Tiffin, D.L., Michkofsky, R., Univ. of British Columbia:
Marine geophysics; Ph.D. theses (Tiffin, Michkofsky).
Magnetic data from the Straits of Juan de Fuca and Strait of Georgia were obtained in 1969 and are being processed; two theses have been completed on the results of continuous seismic reflection profiling in the Strait of Georgia and on the magnetic properties of the Bowie Seamount; and dredged samples from near the peak of the Bowie Seamount have yielded a K-Ar age of 70,000 years.

485. Wyder, J.E., Geol. Surv. of Canada:
Borehole and related geophysical techniques, 1968-.
Evaluation of potential use of borehole geophysical techniques as tools for studying Quaternary deposits and low grade metamorphosed Precambrian sediments near Kimberley, B.C.

## MINERAL DEPOSITS

### Base Metals

486. Allen, D.G., Clark, A.H., Queen's Univ.:
Mineralogy and geochemistry of the Galore Creek copper deposit, British Columbia, 1967-70; Ph.D. thesis (Allen).
A study of sulphide, oxide, and silicate minerals in an unusual, quartz-free, syenitic porphyry copper deposit, stressing phase relations involving biotite, K-feldspar, sphalerite, pyrite, and magnetite. Chemical and microprobe analyses of these minerals are defining a narrow fugacity-temperature region for ore deposition and alteration.

487. Arnold, R.G., Malik, O., Univ. of Sask.:
Phase equilibrium studies in the Fe-Ni-S systems, 1966-71; Ph.D. thesis (Malik).
Phase equilibrium studies in the Fe-Ni-S system are being carried out at both high and low temperatures to aid in the interpretation of the natural assemblages.

488. Assad, J.R., Ecole Polytechnique:
Geology and metallogeny of nickel deposits in the Grenville Province, 1969-70.
Field investigations have commenced on the Renzy Lake deposit (New Hosco Mines) and the Soquem occurrence in Bickerdike township, Quebec.

489. Bachinski, D.J.
Metamorphism of sulphide-rich rocks, 1969-.
See Textural changes and sulphur isotopic composition in metamorphosed ore deposits, Notre Dame Bay, Newfoundland in Abs. Geol. Soc. America Annual Meeting, Atlantic City, 1969.

490. Beaton, W.D., McGill Univ.:
Cobalt and nickel content of the major sulphide minerals from the Lake Dufault Mines, Quebec, 1965-70; Ph.D. thesis.

491. Bishop, David, Nova Scotia Dept. of Mines:
Manganese and barite deposits of Nova Scotia, 1967-.
Mineralogical and trace element studies of the manganese and barite deposits to determine which element may indicate base metal deposits at greater depth.

492. Blais, R.A., Gentile, Francesco, Ecole Polytechnique:
Geology and base metal deposits of the Stratford and Disraeli Areas of Quebec, with special reference to the Cupra Mine, 1969-71; Ph.D. thesis (Gentile).

493. Blais, R.A., Guilloux, Louis, Ecole Polytechnique:
Geology and metallogeny of the base metal occurrences in the Waconichi and Mistassini sedimentary basins, Quebec, 1968-71; Ph.D. thesis (Guilloux).

494. Campbell, F.A., Lusk, J., Univ. of Calgary:
S-isotope partitioning in sulphide minerals, 1969-71.
See A reconnaissance study of some Western Canadian lead-zinc deposits Econ. Geol. v. 63, no. 4, 1968, p. 349-359.
The strata-bound Pb-Zn deposit at Anvil Mines, Yukon, 1969-71.

495. Carter, N.C., British Columbia Department of Mines and Petroleum Resources:
Potassium-argon age determinations of porphyry-type copper and molybdenite occurrences, north-central British Columbia, 1967-; Ph.D. thesis.

496. Chrismas, L., Baadsgaard, H., Folinsbee, R.E., Fritz, P., Krouse, H.R., Sasaki, A., Univ. of Alberta:
Isotope studies of Craigmont ore deposits, British Columbia, 1967-69; M.Sc. thesis (Chrismas).

497. Chyi, L.L., Crocket, J.H., McMaster Univ.:
Precious metals of Strathcona Mine, Sudbury, Ontario, 1968-71; Ph.D. thesis (Chyi).
The purpose of the present research is to study: enrichment trends of the noble metals during sulphide differentiation; abundances of the noble metals in various mineral phases; design experiments to test theories about their states of existence.

498. Clark, A.H., Queen's Univ.:
Mineralogy and geochemistry of the Yiöjärvi copper-tungsten deposit, southwest Finland, 1960-.
Microprobe studies have confirmed the occurrence in this unmetamorphosed Precambrian deposit of several rare ore minerals, which permit more precise estimation of the conditions of ore formation. Particular attention is being paid to the unusual copper-iron sulphides in the ores, which include cuprian pyrrhotite, cubic cubanite, three compositionally distinct forms of chalcopyrite, and a probable very copper-rich mackinawite-type mineral.
Compositional relations of sphalerite in natural, low temperature environments, 1966-70.
Phase relations at low temperatures in the Fe-Zn-S system may probably be predicted from the iron contents of sphalerites in well-defined natural assemblages. Sphalerite coexisting with primary monoclinic pyrrhotite and pyrite in the Panasqueira deposit contains 11.6-12.4 mole % FeS, while sphalerite associated with greigite and pyrite in the Mina Alacran deposit of Chile contains 7.5 mole % FeS. These data are considered to define equilibrium curves of geothermometric interest.

499. Clark, A.H., Farrar, E., Haynes, S.J., Lortie, R.B., Zentilli, M., Quirt, G.S., Queen's Univ. in cooperation with McNutt, R.N., McMaster Univ. and Conn, H., Mortimer, C. and Sillitoe, R.H., Instituto de Investigaciones Geologicas de Chile:
Metallogenetic relationships in the Andean copper province of northern Chile, 1967-73; Ph.D. theses (Haynes, Lortie, Quirt, Zentilli).
A comprehensive investigation of the temporal and spatial relationships of diverse ore deposits in the Andes of northern Chile, directed towards an assessment of the sources and modes in concentration of the economically valuable metals. It is hoped that this work will permit the better definition of the parameters characteristic of metallogenetic provinces or metallotects.

500. Clark, A.H., Lortie, R.B., Zentilli, M., Queen's Univ.:
Genesis of disseminated, strata-bound copper deposits in felsic pyroclastic flows, Copiago region, northern Chile, 1968-72; Ph.D. theses (Lortie, Gentilli).
Detailed studies of the petrology and chemistry of mineralized and barren ignimbrite flows are yielding information on the mode of formation of these unusual and important continental strata-bound ore deposits.

501. Clark, A.H., Queen's Univ., McNutt, R.H., McMaster Univ.:
Mineralogy, chemistry, and stable isotope distribution of Jurassic-Pleistocene andesitic and rhyolitic volcanics, Copiapo region, northern Chile, 1969-72.
Representative, radiometrically-dated specimens of andesitic and rhyolitic lavas and pyroclastics are under study, in an attempt to clarify the evolution of these dominant magma types during the orogenic and post-orogenic stages of the Andean mobile belt. In part, this work is directed towards the distinction of mineralized and barren extrusive units.

502. Clark, A.H., Zentilli, M., Queen's Univ.:
The localization and genesis of sulphide mineralization in the Hornitos Formation of northern Chile, Lat. 26-29°S., 1968-72; Ph.D. thesis (Zentilli).
Ore deposits formed during the development of the Upper-Cretaceous or Lr. Tertiary continental sediments and volcanics of the Hornitos Formation are under study, with emphasis on regional and local controls; part of a comprehensive analysis of metallogenetic relationships in this region.

503. Clark, L.A., McGill Univ.:
Genesis of stratiform massive-sulphide deposits in volcanic terranes, 1965-70.

504. Collins, J.A., Queen's Univ.:
Carbonate lithostratigraphy and diagenesis of the Upper St. George and Lower Table Head Formations - west coast of Newfoundland, 1969-71; M.Sc. thesis.
The zinc deposits near Daniel's Harbour, Newfoundland occur in the upper part of the St. George dolomite. It is hoped that a combined field and laboratory study of the carbonate rocks hosting the ore will contribute to a better understanding of the deposits.

505. Cranstone, D.A., Manitoba Mines Branch:
Geological study of the Manitoba Nickel Belt, 1968-73.
Involves a comprehensive study of the regional geology, structure, metamorphism and mineral deposits in the area between Assean and Split Lakes in the northeast and Kiski and Gormley Lakes in the southwest.

506. Cranstone, D.A., Manitoba Mines Branch, Turek, A., Northern Illinois Univ.:
Rb-Sr geochronology of the Churchill-Superior boundary in Manitoba, and the Manitoba Nickel Belt, 1969-71.
See Rb-Sr contribution to the location of Churchill-Superior boundary in Manitoba; Can. Jour. Earth Science (in press).

507. Darling, Richard; Spitz, Guy; Ecole Polytechnique:
La géochimie des roches autour du gisement de cuivre de SOQUEM, Canton de Louvicourt, Quebec, 1969-71; thèse de maîtrise (Spitz).
Echantillonage des roches autour du gisement et leur analyse pour des éléments majeurs et des oligo éléments choisis.

508. Davis, J.F., Laurentian Univ.:
Determination and interpretation of fabrics in sulphides, 1969-71.
The objective is to determine dimensional orientation of sulphides by microscopic methods and lattice orientation by X-ray methods (texture goniometer). Such techniques are applicable to the interpretation of fabric of deformed or remobilized sulphides (eg. strata-bound sulphides that have suffered a post-depositional orogeny). Work is commencing on the Chisel Lake orebody of Hudson Bay Mining and Smelting Company and will be extended to the Brunswick no. 6 orebody.

509. Eakins, P.R., Bliss, Neil, McGill Univ.:
Significance of Mg and Ni rich olivine basalts in north-western Quebec, 1968-71; Ph.D. thesis (Bliss).

510. Eastwood, G.E.P., British Columbia Dept. of Mines and Petroleum Resources:
Granite Mountain stock, Cariboo District, British Columbia, 1969.
A petrographic and structural study of the stock was made in relation to widespread low-grade Cu-Mo mineralization.

511. Eckstrand, O.R., Geol. Surv. of Canada:
Geology of Canadian nickel and platinum group deposits, 1963-.
Field and laboratory studies directed toward the characterization and classification of the economically interesting occurrences of nickel in Canada.

512. Fenwick, K.G., Ontario Dept. of Mines:
Origin of strata-bound pyrite deposits in the Finlayson Lake area, Ontario, 1968-70; M.Sc. thesis, Michigan Technical Univ.

513. Fisher, D.F., Univ. of Western Ontario:
The Number Five sulphide zone at the Horne Mine Noranda, Quebec, 1968-70; M.Sc. thesis.

514. Fletcher, W.K., Hoffman, S., Univ. of British Columbia:
Geochemical dispersion of copper in relation to copper mineralization in south central British Columbia, 1969-; Ph.D. thesis (Hoffman).

515. Folinsbee, R.E., Smejkal, V., Kirkland, K., Univ. of Alberta:
Sulphur isotope studies of Chinkuashih copper mine, 1969; M.Sc. thesis (Kirkland).

516. Gill, J.E., Roscoe, W.E., McGill Univ.:
Deformation and annealing of sulphides, 1950-; Ph.D. thesis (Roscoe).
See Experimental deformation and annealing of sulphides and interpretation of ore textures: Economic Geology v. 64, 1969, p. 500-508.

517. Goble, R., Morton, R.D. Univ. of Alberta:
Nature and origin of Cu mineralization in Precambrian sediments around Waterton, Alberta, 1969-70; M.Sc. thesis (Goble).
The extensive Cu mineralization encountered within the arenaceous and argillaceous members of the Appekunny and Grinnell formations is being studied both mineralogically and isotopically.

518. Govett, G.J., Pilch, P., Univ. of New Brunswick:
Secondary dispersion base metals in vicinity of specific Bathurst ore deposits, 1968-70; M.Sc. thesis (Pilch).

519. Graham, R.A.F., Univ. of Western Ontario.
Nature and genesis of the base metal ores at Silvermines Co. Tipperary, Ireland, 1967-70; Ph.D. thesis.
As the ores are little metamorphosed or deformed, the genesis of the sulphides and relation to their environment of deposition seem clear.

520. Greig, J., Folinsbee, R.E., Baadsgaard, H., Fritz, P., Krouse, H.R., Smejkal, V., Cumming, G.L., Sasaki, A., Univ. of Alberta:
Isotope studies of Irish base metal deposits using Pb, O, C, and S isotopes, 1967-70; Ph.D. thesis (Greig).

521. Gummer, P.K., McCartney, W.D., Queen's Univ.:
Massive sulphide deposits in relation to the volcanic sequence in the southeastern Bathurst district, New Brunswick, 1968-71; M.Sc. thesis (Gummer).

522. Harris, D.C., Cabri, L.J., Mines Branch; Dept. Energy, Mines & Resources:
Mineralogical examination of the base metals deposits of the Red Lake area, Ontario, 1969-.

523. Helmstaedt, Hewart, Geol. Surv. of Canada:
Structural evolution of rocks of the Bathurst-Newcastle District, New Brunswick, 1969-71.
The objective is to establish the style and sequence of deformation, age of structures and their relationship to base-metal sulphide deposits of the district.

524. Kindle, E.D., Geol. Surv. of Canada:
Geology of copper deposits in Canada, 1960-.
A report on the copper deposits of the Coppermine River Area, N.W.T. will be completed in 1970. See A Statistical analysis of 1700 copper deposits, Cordilleran Region of Canada, Geol. Surv. Canada, Paper 69-1, Pt. B, 1969.

525. Kirkland, K., Folinsbee, R.E., Smejkal, V., Krouse, H.R., Univ. of Alberta:
Sulphur isotope studies of Noranda copper prospect, Clearwater, British Columbia, 1969-70; M.Sc. thesis (Kirkland).

526. Koulomzine, Théodore; Lavoie, Clermont, Ecole Polytechnique:
Comparative study of electrical and electromagnetic methods as applied to the search for sulphide deposits, 1966-70;

M.Sc. thesis (Lavoie).
Three known cases have been chosen where a body of pyrite is covered by a thick mantle 70-100' of particularly wet clay overburden topped by a swamp. The problem is to determine which geophysical method will give positive indications in spite of particularly difficult conditions.

527. Lamarche, R.Y., Université de Sherbrooke:
Etude de la genèse et de la tectonique des gisements de sulfures des mines Solbec et Culpra-d'Estrie, cantons de l'Est, Québec, 1969-71.
Voir Ministère des Richesses naturelles du Québec, R.P. no. 30, 196 et no. 560, 1967.

528. Lydon, J.W., Clark, A.H., Queen's Univ.:
Sedimentary and geochemical controls of strata-bound lead-zinc-silver-copper-iron mineralization in the Aracena-Portal belt of sourthern Iberia, 1968-72, Ph.D. thesis (Lydon).
The unravelling of metallogenetic relationships in this complex area is at present focussed on the study of the known orebodies and their carbonate-and volcanic environments.

529. Masters, K., McCartney, W.D., Queen's Univ.:
Major and trace element content of selected marbles in southern Ontario in relation to sphalerite-galena occurrences, M.Sc. thesis (Masters).
An outgrowth of the regional metallogenic study in progress by A.L. Sangster.

530. Milne, V.G., Ontario Dept. Mines:
Manitouwadge Area, 1 inch to 800 feet, 1968-71.
Entails surface mapping of the belt including the Geco, Willroy, Big Nama and Willecho Mines to determine the lithological, stratigraphic and structural setting of the various orebodies. Detailed studies of the orebodies are also being undertaken. See Ont. Dept. Mines, Misc. Paper 22, 1968.

531. Moore, J.C.G., Mount Allison Univ.:
Mercury haloes around sulphide bodies of northern New Brunswick, 1963-72.

532. Morton, R.D., Univ. of Alberta:
A study of nickeliferous pyrrhotite ores from southern Norway.
Nickel ores from Vissestad, Norway exhibiting liquid immiscibility textures are being described and the various coexisting phases analysed. See Geological investigations in the Bamble sector of the Fennoscandian Shield. 1. The geology of Eastern Bamble, Norges Geol. Under., in press.

533. Mackasey, W.O., Michigan Technological Univ.:
Geology of Jaculet Mines, Chibougamau, Quebec, 1966-70; Ph.D. thesis.
Study of general geology of mine including comparison of the No. 1 and No. 2 copper zones; trace element study of chalcopyrite within the mine.

534. McAllister, A.L., Bhatia, D.M.S. Univ. of New Brunswick:
Facies changes in iron formation, Brunswick No. 12 mine, Bathurst, New Brunswick, 1966-70; M.Sc. thesis (Bhatia).

535. McArthur, J.G., Memorial Univ.:
Sterling copper deposit, Springdale, Newfoundland, 1969-70; M.Sc. thesis.
A detailed study of the lithology, structure and ore mineralogy of a copper deposit in volcanic rocks that is typical of a number of similar deposits in the Springdale Peninsula.

536. McBride, D.E., Clark, A.H., Queen's Univ.:
Geology and chemistry of the Macex copper prospect, Terrace, British Columbia, 1969-71; M.Sc. thesis (McBride).
Involves an investigation of minor element dispersion in a prophyry copper environment.

537. McDonald, J.A., Sangameshwar, S.R., Kennedy, D.J., Koo, J.H., Univ. of Saskatchewan:
Geochemistry and origins of sulphide deposits, 1967-; Ph.D. theses (Sangameshwar, Kennedy, Koo).
This project involves (1) effects of metamorphism on sulphide textures, phase assemblages, composition, and possible sulphide silicate reactions; natural assemblages are being studied where local metamorphic effects can be differentiated from regional effects; regional metamorphism of similar ore types is also being examined; (2) studies of sulphide ores in the Flin Flon-Snow Lake area to determine whether geochemical differences exist between economic and uneconomic sulphide deposits; geochemical characteristics of a range of sulphide assemblages from this area are being established. See Metamorphism and its effects on sulphide assemblages, Mineralium Deposita, 2, p. 200-220, 1967.

538. McMillan, W.J., British Columbia Dept. of Mines and Petroleum Resources:
Guichon Creek batholith, British Columbia, 1969-71.
It is proposed to map the Guichon batholith at scale one inch to 1000 feet. Emphasis will be placed on the structural history of the batholith and the relationships between ore deposits and structural features.

539. Naldrett, A.J., Greenman, L., Univ. of Toronto:
Study of footwall breccias in the vicinity of the Strathcona Mine, 1967-70; Ph.D. thesis (Greenman).
See A study of the Strathcona mine and its bearing on the origin of the nickel-copper ores of the Sudbury district, Ontario. Jour. Petrol. v. 8, p. 453-531, 1967.

540. Naldrett, A.J., Hewins, R.H., Univ. of Toronto:
Study of rocks marginal to the Nickel Irruptive in the vicinity of the Strathcona and Fecunis Mines, Sudbury. Ontario, 1967-70; Ph.D. thesis.
See A study of the Strathcona mine and its bearing on the origin of the nickel-copper ores of the Sudbury district, Ontario, Jour. Petrol. v. 8, p. 453-531, 1967.

541. Naldrett, A.J., Muir, J.E., Univ. of Toronto:
Giant Mascot nickel sulphide deposit, Hope, British Columbia, 1969-71; M.Sc. thesis (Muir).
The purpose is to determine the relationship between mineralization and the different ultramafic rocks present.

542. Naldrett, A.J., Peredery, W., Univ. of Toronto:
Study of rocks between the Sudbury Nickel Irruptive and the overyling Onaping Formation, 1968-71; Ph.D. thesis (Peredery).
The purpose is to determine whether or not the unusual rocks at the top of the Nickel Irruptive are related to the impact of a meteorite.

543. Ohmoto, Hiroshi, Univ. of Alberta:
Fluid inclusions and isotope study of lead-zinc deposits at Kootenay arc, British Columbia and fluid inclusion study of mantle derived materials, 1969-70.
See Chemistry and origin of hydrothermal fluids at the Bluebell mine, British Columbia; Geol. Soc. Amer., Ann. Mtgs., Abst., p. 165, 1969.

544. Petruk, W., Mines Branch, Dept. Energy, Mines & Resources:
Mineralogy and geochemistry of the porphyry copper-molybdenite deposits in British Columbia, 1969-.
A study of the ore minerals in the porphyry copper-molybdenite deposits in British Columbia to determine the mineral assemblages present in each deposit and to correlate the compositions and physical properties of the individual minerals to each assemblage. In addition the assemblages will be correlated to the host rock and wall rock alteration products.

545. Ridler, R.H., Suffel, G.G., Univ. of Western Ontario:
Genesis and metamorphism of massive sulphide ores: occurrence, mineralogy and geochemistry of associated precious metals, 1968-70.
Favourable circumstances suggested the diversion of this study from the Horne massive sulphide ores to the regional study of the iron formations along the Kirkland Lake Bourlamaque Break (Ontario-Quebec), testing the thesis that some sulphide ores may be related to sulphide facies of iron formation and that gold-bearing carbonate-rich rocks may be carbonate facies of the same sediments. See Relation of mineralization to volcanic stratigraphy in the Kirkland-Larder Lakes area, Ontario: Geol. Assoc. Canada, Abstracts of papers, Montreal Meeting, 1968, p. 43.

546. Roscoe, W.E., McGill Univ.:
Experimental sulphide mineral deformation under controlled conditions, 1969-72; Ph.D. thesis.

547. Sangster, D.F., Geol. Surv. of Canada:
Geology of lead and zinc deposits in Canada, 1965-.
Long-term comprehensive research on the geology of lead and zinc deposits to provide a geological basis for exploration and an assessment of lead and zinc potential in Canada. The first phase, a study of those lead-zinc deposits

occurring in carbonate rocks, is nearing completion. Meanwhile, field work is being directed toward the second phase, that is deposits occurring in volcanic or volcanically derived rocks.

548. Sims, W.A., Mount Allison Univ.:
Study of heavy minerals of eastern Gaspe, Quebec, 1964-70.
An attempt to use heavy minerals as prospecting guides to skarn-associated copper deposits.

549. Struman, B.D., Queen's Univ.:
Investigation of sulphide mineralization near Clyde Forks, Ontario, 1969-71.

550. Touborg, J., Univ. of Ottawa:
Sulphide mineralogy, Geco Mine, Manitouwadge, Ontario, 1969-71; Ph.D. thesis.

551. Trueman, E.A., Clark, A.H., Queen's Univ.:
Minor element studies on sulphides, oxides and silicates from the Copper Mountain area, British Columbia, 1968-70; M.Sc. thesis (Trueman).
This geochemical study forms part of a more comprehensive metallogenetic project in south-central British Columbia (see McCartney and Procyshyn).

552. Upadhyay, H.D., Memorial Univ. of Newfoundland:
Gullbridge Copper Mine, Newfoundland, 1968-69; M.Sc. thesis.
A petrographic and mineralogical study of a copper sulphide deposit occurring in a cordierite-anthophyllite host rock that developed from mafic volcanic rocks.

553. van Ingen, R., McGill Univ.:
Some relations of Cu-Zn and Mo ore formation to granite emplacement in the Eastern Townships, Quebec, 1964-; Ph.D. thesis.

554. Wanless, R.K., Boyle, R.W., Stevens, R.D., Geol. Surv. of Canada:
Lead and sulphur isotope geology of Keno and Galena Hills, Yukon, 1958-70.
To determine the isotope abundances of lead and sulphur in the lead-zinc-sulphur deposits and their host rocks and from the data to determine, if possible, the source of the elements in the deposits and the processes that have affected their concentration. See Sulphur isotope investigation of the lead-zinc-silver-cadmium deposits of the Keno Hill-Galena Hill Area, Yukon, Canada, Economic Geology (in press).

555. Whitmore, D.R.E., Geol. Surv. of Canada:
Whalesback comprehensive mine study, Newfoundland, 1964-69.
A final report is in preparation.

556. Wolfe, W.J., Ont. Dept. of Mines:
Geochemical orientation surveys in areas of base metal mineralization - Nipigon-Schreiber, District of Thunder Bay, Ontario, 1960-71.
Surveys in the vicinity of known base metal mineralization designed to test the effectiveness of various sampling

patterns, analytical methods, chemical elements and dispersion media in maximizing geochemical target areas in glaciated terrain. Data obtained from these surveys will be used to establish minimum sampling and analytical requirements for successful regional geochemical surveys in unexplored areas.

## Ferrous Metals

557. Gross, G.A., Geol. Surv. of Canada:
Geology of iron and manganese deposits in Canada, 1957-.
Investigation continues of the varieties of environment of sedimentary facies of Algoma type iron-formation and their relationship to various sulphide and gold deposits in volcanic rocks. See Geology of iron deposits in Canada, v. 111, Iron ranges of the Labrador Geosyncline; Geol. Surv. Canada, Econ. Geol. Report no. 22, v. III, 1969.

558. McAllister, A.L., Bhatia, D.M.S., Univ. of New Brunswick:
Facies changes in iron formation, Brunswick No. 12 mine, Bathurst, New Brunswick, 1966-70; M.Sc. thesis (Bhatia).

559. Morton, R.D., Sanche, H., Univ. of Alberta:
A study of intrusive magnetite-apatite bodies near Sawmill Bay, Northwest Territories, 1968-70.
Intrusive bodies of Kiruna-type magnetite-apatite ore which cut the Precambrian Echo Bay Series are being subjected to mineralogic studies. The ores are possibly genetically related to a nearby monzonitic intrusive.

## Radioactive Deposits

560. Baadsgaard, H., Morton, R.D., Ramsay, C., Univ. of Alberta:
Isotopic and geochemical study of the U-mineralization, Hab Mine, Saskatchewan, 1970-73; Ph.D. thesis (Ramsay).

561. Barua, M.C., McCartney, W.D., Queen's Univ.:
Geology of uranium-molybdenum-zones, Makkovic area, Labrador, 1967-69; M.Sc. thesis (Barua).

562. Béland, René, Université Laval:
Uranium mineralization in the Otish Mountain basin, New Quebec, 1968-72.

563. Bottrill, T.J., Geol. Surv. of Canada:
Study of conglomeratic uranium deposits in Canada, 1969-.
Studies of the mineralogy and elemental distribution in the ore-bearing horizons of the Matinenda formation, the true geological form of the quartz pebble conglomerate and environment of sedimentation; trace elements in sulphides as indicative of the provenance of the Elliot Lake quartz pebble conglomerates; mineralogical investigation of the two-phase uranium-titanium compound, referred to as "Brannerite"

and sedimentology and stratigraphy of the Huronian to determine features of significance to uranium occurrences. See Geol. Surv. Canada, Paper 70-1A, 1970.

564. Cameron, E.M., Geol. Surv. of Canada:
Geochemical study of Proterozoic Papaskawasati Group, Lake Mistassini, Quebec, 1968-69.
By geochemical means to provide information on lithogeochemical variation within the Papaskwasati sediments and the correlation of units from bore hole to bore hole; the type and direction of the source of the sediments; zones favourable for the concentration of heavy minerals, including ore minerals; trends indicating where the maximum concentration of ore minerals should occur.

565. Cameron, A.R., Hacquebard, P.A., Birmingham, T.F., Donaldson, J.R., Geol. Surv. of Canada:
Uranium possibilities in lignite, 1966-71.
The objective is to check the radioactivity of Tertiary lignite deposits with a view toward delineating areas that are geologically favourable for the occurrence of uranium. Much of the data gathered to date have been field measurements on low rank coals in Saskatchewan and British Columbia.

566. Dyck W., Geol. Surv. of Canada:
Development of radiochemical exploration methods using radon, 1968-69.
Radon tests in surface waters and in soils were carried out in three different geological environments, the Gatineau Hills, Quebec, and Sudbury, and Elliot Lake Ontario to study the applicability of the radon method in detailed prospecting for uranium. See Development of uranium exploration methods using radon; Geol. Surv. Canada, Paper 69-46, 1969.

567. Eisbacher, G.H., Geol. Surv. of Canada:
Regional structural study in the Elliot Lake area, Ontario, 1968-70.
Cooperative investigation by Geological Survey and Mines Branch of crustal stresses around mines. See Contemporaneous faulting and clastic intrusions near Elliot Lake; (in press) Can. Jour. Earth Sci.

568. Fratta, M., Geol. Surv. of Canada:
Study of pegmatitic uranium deposits of the Grenville Province, 1968-69; Ph.D. thesis, Univ. of Ottawa.
See Geol. Surv. Canada, Paper 69-1A, p. 110-111, 1969.

569. Kish, L., Quebec Dept. of Natural Resources:
Radioactive occurrences in the Grenville of Quebec, 1969-.
An environmental, chemical and equilibrium study of the radioactive mineralizations in the Grenville of Quebec. The field relations of the occurrences along the northern shore of the Saint-Lawrence River, in the Mont Laurier area and around Kipawa Lake were studied in 1969. The collected specimens will be analysed for U, Th, and $K^{40}$ and the radioactive equilibrium of the U and Th isotope series determined.

570. Little, H.W., Geol. Surv. of Canada:
Geology of uranium and thorium deposits of Canada, 1967-.
The project comprises coordination of research within the Branch on uranium and thorium deposits, direct supervision of certain research projects, keeping abreast of exploration and development of deposits of uranium and thorium in Canada, assessment of the potential of various regions for uranium and thorium, and direct research on specific deposits of uranium and thorium. See Techniques currently used in uranium prospecting in Canada; in Nuclear Techniques and Mineral Resources, Int. Atomic Energy Agency, Vienna, 1969.

571. Macdonald, J.A., McGill Univ.:
Processes of surficial dispersion of uranium in the vicinity of some pitchblende deposits, Beaverlodge, Saskatchewan, 1964-70; Ph.D. thesis.

572. Mercer, William, Crocket, J.H., McMaster Univ.:
Geochemistry of the pyrite of the conglomeratic uranium ores of Elliot Lake, Ontario, 1969-72; Ph.D. thesis (Mercer).

573. Morse, R.H., Geol. Surv. of Canada:
Radium in soils and stream sediments and uranium and radon in waters of the Bancroft area, Ontario, 1968-70; Ph.D. thesis, Queen's Univ.
Chemical dispersion of uranium and its decay products, 1969; Ph.D. thesis, Queen's Univ.
Includes development of a rapid method for the relative determination of radium-226 in sediments and its application to prospecting for uranium. The method discriminates against radiation from thorium, potassium and other sources.

574. Robinson, B.W., Morton, R.D., Univ. of Alberta:
The genesis of the Echo Bay Ag/U deposit: a geological, geochronological, geochemical and stable isotope investigation, Great Bear Lake, Northwest Territories, 1968-71; Ph.D. thesis (Robinson).
The Echo Bay deposit is a type example of uraninite-Co-Ni-arsenides-sulphides-silver mineralization within a Ag Cu and U metallogenic province.

575. Ruzicka, V., Geol. Surv. of Canada:
Geology of uranium and thorium deposits of Canada, 1968-70.
Includes comparison of geological features of East European and Canadian uranium deposits.

576. Sassano, G., Morton, R.D., Univ. of Alberta:
The nature and origin of U mineralization in the Fay mine, Uranium City, Saskatchewan, 1969-73; Ph.D. thesis (Sassano).
A complete study of the ore paragenesis and the petrology and geochemistry of the country rocks is being performed to gain information concerning the possible origins of the U deposits and the controls of ore deposition.

577. Taylor, W.R., Memorial Univ.:
Geology and geochemistry of a uranium rich gneissic area, Long Range Mountains, Newfoundland, 1969-70; M.Sc. thesis.

578. Wynne-Edwards, H.R., Allen, J.M., Queen's Univ.:
The nature and occurrence of uranium mineralization at the Mekoos prospect, Mont Laurier, Quebec, 1969-70; M.Sc. thesis (Allen).

## Other Metals

579. Baragar, W.R.A., Goodwin, A.M., Geol. Surv. Canada; Moodle, D.A., Ontario Dept. Mines; Washington, R.A., Atomic Energy of Canada:
Trace gold content in Archean volcanic rocks, 1965-.
The trace gold content in Archean volcanic rocks of the Canadian Shield is being investigated by means of neutron activation techniques.

580. Bostock, H.H., Geol. Surv. of Canada:
Itchen Lake map-area, District of Mackenzie, 1964-70.
The final report will include descriptions of gold bearing sulphide-arsenide deposits at Point, Itchen, and Contwoyto Lakes. See Geol. Surv. Can. Paper 68-1B, 1968, p. 72-76.

581. Boyle, R.W., Geol. Surv. of Canada:
Geochemistry of gold deposits, 1965-71.
Consists of a study of the distribution, migration, and concentration of gold in rocks, soils, waters, and biological materials. The origin of all types of gold deposits is also being investigated, as are also geochemical methods for their discovery. Preliminary data indicate that As, Sb, Se, and Te are good indicators of gold deposits in geochemical surveys utilizing soils waters, rocks, and biological materials in most parts of Canada as well as on a world-wide basis. See Hydrothermal transport and deposition of gold; Econ. Geol. v. 64 no. 1, p. 112 and The geochemistry of silver and its deposits; Geol. Surv. Canada Bull. 160.

582. Boyle, R.W., Dass, A.S., Geol. Surv. of Canada:
Wall rock alteration study of silver deposits - Cobalt and Gowganda areas, Ontario, 1967-69; Ph.D. thesis (Dass), Carleton Univ.
Includes a study of the migration and concentration of various elements and compounds during mineralization in the Ni-Co-As-Ag veins at Cobalt and Gowganda, Ontario. The habit of the trace elements (eg. Ag, Co, Ni, etc.) is detailed in G.S.C. Paper 67-35; that for the major constituents (eg. $Sio_2$ Ca, Fe, $Co_2$, etc.) will be detailed in thesis by Dass and in a paper to appear in the Canadian Mineralogist, See Geol. Surv. Canada Paper 67-35, 1967.

583. Clark, A.H., Queen's Univ.:
Mineralogy and geochemistry of the Panasqueira tungsten-tin deposit, Northern Portugal, 1959-.
Work recently completed includes analytical studies of cubic cubanite and rhombohedral and hexagonal molybdenite. See Sulphurization of cordierite, Minas da Panasqueira, Portugal. Bull. Geol. Soc. Finland, v. 41, p. 231-234, 1969.
Ore mineralogy of the Alacran Ag-As-Sb deposit, Pampa Larga, northern Chile, 1967-71.
The complex ore mineral assemblages in this unusual low-temperature deposit are yielding information on the phase relationships in several sulphide-type systems. Among those minerals which have been recognized are greigite, smithite, arsenolamprite, high realgar, and arsenian sphalerite.

584. Clark, A.H., Queen's Univ, in cooperation with C. Mortimer and R.H. Sillitoe, Instituto de Investigaciones Geologicas de Chile:
Mineralogy and tectonic/geomorphic controls of supergene alteration in the Copiapo region, northern Chile, 1965-71.
Reconstruction of the former distribution of hypogene and supergene silver minerals, with emphasis on Ag-sulphosalts and phases in the Ag-Hg-haloid systems.

585. Chyi, L.L., Crocket, J.H., McMaster Univ.:
Precious metals of Strathcona Mine, Sudbury, Ontario, 1968-71; Ph.D. thesis (Chyi).
The purpose of the present research is to study: enrichment trends of the noble metals during sulphide differentiation; abundances of the noble metals in various mineral phases; design experiments to test theories about their states of existence.

586. Darling, Richard; Ambrosii, Georgio; Laliberté, Lise; Ecole Polytechnique:
Exploration géochimique dans la région de Preissac-La Corne, Québec, 1968-71; thèse de doctorat (Ambrosii), thèse de maîtrise (Laliberté).
Une étude de la distribution des oligo éléments choisis entre les minéraux majeurs des batholithes de Preissac, LaCorne et LaMotte. Le but de cette étude est de lier le comportement de ces éléments et leur redistribution pendant la période post-magmatique de refroidissement des granites à la formation des gisements post-magmatiques de Li et Mo qui se trouvent associés avec ces granites et une étude comparative de la distribution des oligo éléments choisis entre les minéraux majeurs des pegmatites économiques (Li, Mo, Be) et non-économiques.

587. Gillieson, A.H.C.P., Dibbs, H.P., Moloughney, P.F., McMahon, C., Mines Branch, Dept. of Energy, Mines & Resources:
Determination of gold at the parts per billion level in rocks by neutron activation analysis combined with fire-assay preconcentration, 1968-69.
Using the much lower flux available from the antimony-beryllium source, in comparison with the reactor used by

other workers, the same limits of detection (3 ppb.) were achieved, thus demonstrating that the method is contamination-limited and not flux-limited. Gold contents were determined in five samples, one from neighbouring Precambrian rock, and four across the Gowganda silver and sulphide mineral deposit. See Mines Branch, Internal Report MS68-64.

588. Gunn, C.B., Univ. of Western Ontario:
Nature and genesis of silver deposits at Melville Sound, District of Mackenzie, Northwest Territories, 1967-70; Ph.D. thesis.
The deposits have certain similarities to the Cobalt, Ontario deposits.

589. Kandalam, C., Folinsbee, R.E., Smejkal, V., Fritz, P., Univ. of Alberta:
Isotopic studies of depth effect on sulphur isotopes in Con-Rycon mine, Yellowknife, Northwest Territories, 1969-70; M.Sc. thesis (Kandalam).
Study of cogenetic sulphide minerals in Con-Rycon mine to establish temperature of deposition and depth effect.

590. Mahajan, S.K., McGill Univ.:
Molybdenite deposits in Preissac Township, Quebec, 1968-70.
Detailed mapping and laboratory studies of the granite mass in which the deposits occur; also a study of the structure of the vein system and of the minerals in the veins, Ph.D. thesis.

591. Mulligan, R., Geol. Surv. of Canada:
Geology of Canadian lithophile metals (Li, Be, Sm, W, Mo), 1956-.
See The Circum Pacific Tin Belt in North America, International Tin Council, London (in press).

592. Mulligan, R., Geol. Surv. of Canada:
Metallogenic study of the beryllium-tin province of the Cassiar batholith, 1965-72.

593. Nikols, C.A. (Miss), Queen's Univ.:
Origin of the Clyde Forks mercury deposit, Ontario, 1967-70; M.Sc. thesis.
An aerial and structural study of a remarkable mercury-bearing deposit, near Clyde Forks, Ontario.

594. Petruk, W., Harris, D.C., Mines Branch, Dept. Energy, Mines & Resources:
Mineralogy and geochemistry of the silver deposits in the Cobalt and Gowganda areas, Ontario, 1964-70.
A study of the sulphides and sulph-antimonides in the Cobalt-Gowganda area to determine the varieties of minerals present, to establish the compositions and physical properties of those that can have variable compositions, and to correlate them with the mineralogical and geological characteristics of the deposits. See Mineralogy and origin of the Silverfields silver deposit in the Cobalt area: Econ. Geol. v. 63, 1968, p. 512-531.

595. Pouliot, G., Valiquette, G., Coulomb, J.J., Ecole Polytechnique:
Mineralogy and paragenesis of feldspars in some economically important granites, 1968-70; M.Sc. thesis (Coulomb).
Tertiary granitic rocks with which are associated major Mo deposits have been collected brom B.C., Montana, Colorado and New Mexico. Several sub-projects will originate from this broader project. The research involves principally the systematic mineralogical and chemical study of each of these occurrences, in trying to determine similarities and/or differences in their origin.

596. Prochnau, J.F., McGill Univ.:
Gold deposits in Chibougamau District, Quebec, 1964-70; M.Sc. thesis (Prochnau).

597. Rose, E.R., Geol. Surv. of Canada:
Geology of titanium and titaniferous deposits of Canada, 1958-.
This work attempts to describe the nature and distribution of titanium and titaniferous deposits in Canada, to indicate their potential importance, and to show how and where they may be found. See Geology of Titanium and Titaniferous Deposits of Canada; Geol. Surv. Canada, E.G. No. 25, 177 p., maps, 1969.
Geology of vanadium deposits in Canada, 1963-.
This work attempts to show that vanadium is of more widespread distribution in Canada than has generally been realized, and to indicate the possibilities of finding commercially important vanadium deposits in Canada. See Vanadium: its occurrence and prospects in Canada; Can. Min. Jour. v. 90, no. 4, April 1969, p. 102-104.
Geology of rare earth deposits of Canada, 1967-.
The immediate objective is to devise simple practical field tests for the detection of rare-earth elements useful to geologists and prospectors who are concerned with these elements. The long range objective is to determine the nature of occurrence and distribution of rare-earth elements in Canada, and to indicate their potential economic importance. See A progress report on experiments with chemical field tests for the detection of the rare-earth elements cerium and yttrium; Geol. Surv. Can. Paper 69-15, 1969.

598. Sanche, H., Morton, R.D., Univ. of Alberta:
The nature and controls of Ag-Cu-Bi mineralization at Sawmill Bay, Northwest Territories, 1969-70; M.Sc. thesis (Sanche).
A study of the mineral paragenesis and lithologies encountered in the operation of Terra Mines, Ltd. with description of structural controls of ore deposition.

599. Thomas, R.L., Inland Waters Branch, Dept. Energy, Mines & Resources:
Occurrence and origin of Lake Ontario manganese deposits, 1969-70.
This study is designed to provide an understanding of the processes involved in the formation of one of the various manganese deposits, located in different parts of the Great Lakes.

600. Thorpe, R.I., Geol. Surv. of Canada:
Geology of silver and gold deposits in Canada.
Collection of data, including field studies will be done first for silver deposits. The aims are to classify the deposits and to develop concepts concerning their environment and genesis.

## Industrial Minerals

601. Bannatyne, B., Manitoba Mines Branch:
Clays and shales of Manitoba, 1962-7-.

602. Berard, Jean, Ecole Polytechnique:
Les calcaires de la région de Montréal et leur comportement dans les bétons à ciment Portland.
Il semble que certains calcaires lithographiques soient réactifs en présence d'alcalis. C'est du moins ce qu'indiquent les mesures de près de 1000 prismes de calcaires submergés dans des solutions d'alcalis. En présence d'alcalis du ciment Portland nous croyons que ces mêmes roches seront expansives.

603. Bishop, David, Nova Scotia Dept. of Mines:
Manganese and barite deposits of Nova Scotia, 1967-.
Mineralogical and trace element studies of the manganese and barite deposits with the objective of determining which element may indicate base metal deposits at greater depth.

604. Butler, J., Bartlett, G., Fong, C., Newfoundland Dept. of Mines, Agriculture and Resources.
Silica assessment project, 1965-70.
Involves geological mapping, diamond drilling and quantitative analysis for $SiO_2$, $Fe_2O_3$, $Al_2O_3$, MgO, CaO, $Na_2O$, $K_2O$.

605. Carrigy, M.A., Research Council of Alberta:
Silica sand deposits in the vicinity of Edmonton, Alberta, 1968-69.
See Res. Counc. Rept. 69-5.

606. Dean, R.S., Mines Branch, Dept. Energy, Mines and Resources:
Mineralogy of argillaceous materials in Canada, 1958-.
See Mineralogical examination of two clays from the Musquodoboit River Valley, Nova Scotia, Mines Branch Investigation Report IR 69-70, 1969.

607. Easdon, M., Eakins, P.R., McGill Univ.:
A compilation of graphite occurrences in the Archean of part of northwestern Quebec, 1968-69; M.Sc. thesis (Easdon).

608. Halferdahl, L.B., Research Council of Alberta:
Fort McMurray clay, Alberta, 1965-69.
See composition and ceramic properties of some clays from northeastern Alberta; Res. Coun. Prelim. Rept. 69-3.

609. Hamilton, J.B., New Brunswick Dept. of Natural Resources:
Industrial mineral investigations, New Brunswick, 1963-70.
Barite and silica occurrences in the Province have been investigated, and gypsum-anhydrite deposits studied in 1968. Investigations of the sand and gravel resources were started in 1969. See Silica in New Brunswick; Mineral Resources Branch, New Brunswick Dept. of Natural Resources, Report of Investigations No. 2, 1968.

610. Hamilton, W.N., Research Council of Alberta:
Salt deposits, Alberta, 1966-69.
Four salt formations of the Elk Point Group in east-central Alberta have been defined in terms of purity, thickness, extent, and depth. Two of these, the thicker and more extensive Prairie Evaporite and upper Lotsberg salts, have also been defined in terms of "brinability". A report on salt deposits of east-central Alberta is in preparation.
Dolomite deposits, Alberta, 1967-69.
A reconnaissance survey of the physical and chemical properties of quarryable Alberta dolomites, toward determining this suitability for industrial use. Analytical work on more than 200 dolomite samples is now completed.

611. Hewitt, D.F., Ont. Dept. of Mines:
Industrial mineral resources of the Oshawa area, Ontario, 1969-70.
Limestone industries of Ontario, 1969-70.

612. Holter, M.E., Research Council of Alberta:
Silica sand deposits of southern Alberta, 1969.

613. Hughes, Marie, Univ. of Western Ontario:
Petrology of the Gasport Member of the Lockport (Silurian) Queenston, Ontario, 1969-71; M.Sc. thesis.
This rock is used as a building stone.

614. Maurice, O.D., Sirois, R., Paré, C., Quebec Dept. of Natural Resources:
Investigations of industrial minerals and building stone occurrences in Quebec.
A continuing program of investigation to advise owners as to the value of industrial mineral deposits and to furnish information regarding the extraction and marketing of their products.

615. Murray, D.A., Nova Scotia Dept. of Mines:
Preliminary assessment of the limestone and dolomite deposits, mainland, Nova Scotia, 1967-70.
A continuing program of investigation with the purpose of informing owners and interested parties as to the economic importance of the deposits. Chemical analyses and preliminary assessment of deposits by diamond drilling is included.

616. McLaws, I.J., Research Council of Alberta:
Sulphur in Alberta, 1968-.
Many geological reports have been received upon the one-year expiry data on sulphur prospecting permits in northeastern Alberta. These have been indexed with brief

reference to type of study, nature of sulphur deposit, and assay results.

Uses and specifications of sand and gravel, 1968-.

Detailed information on the uses and specifications of sands and gravels is currently being compiled as a general reference manual for Alberta.

617. Scafe, D.W., Research Council of Alberta:
Alberta bentonite studies, 1968-.

Initial results indicate a wide variation in the amount of sand and silt present in bentonite samples taken at six-inch vertical intervals or less. Sand has a range of 0.12-41% and silt 6-30% by weight. Typical volcanic minerals have been identified from the sand and silt fractions. Some feldspars seem to be altering to a clay mineral, probably montmorillonite. Determination of exchangeable cations on the clay fraction is presently in progress.

618. Skippen, G.B., Höy, Trygve, Carleton Univ.:
Origin of brucite at Wakefield, Quebec, 1968-70; M.Sc. thesis (Höy).

A study of the mineralogy and petrology of marble within a 20 square-mile area centered about Wakefield, Quebec. The development of brucite in roof pendants within the Wakefield syenite is of particular interest.

619. Soles, J.A., Mines Branch, Dept. Energy, Mines & Resources:
Mineralogy and petrography of construction materials and their response to environmental conditions, 1959-.

Includes investigation of stability of sidewalk concrete, the relation between porosity and durability and comparison of methods of testing; and of gersdorffite from Sudbury.

620. Sutarno, Bowman, W.S., Alexander, G.E., Bright, N.F.H., Mines Branch, Dept. Energy, Mines & Resources:

Work is being done in an attempt to develop an economic way of using this sulphate ore for the manufacture of strontium hexaferrite.

621. Vos, M.A., Ontario Dept. Mines:
Asbestos in Ontario, 1969-70.

The purpose is to revise "Asbestos in Ontario", Ontario Department of Mines, Industrial Minerals Circular No. 1, 1953.

Ordovician limestone resources of southern Ontario, 1969-70.

A survey of Ordovician limestone resources for the production of aggregate and cement. Of 74 quarries examined in the area 44 were active in 1969. Important factors in evaluation of limestone resources are chemical purity, physical characteristics of the rock and thickness of overburden. These will be studied in the present project.

622. Wright, J.R., Fowler, J.F., Nova Scotia Dept. of Mines:
Evaluations of clay deposits of the Musquodoboit and Stewiacke Valleys, Nova Scotia, 1967-70.

Involves geological mapping diamond drilling and ceramic evaluation of the Cretaceous clay deposits located under a thin mantle of glacial debris. Large

bodies of medium- to high duty refractory clays have been defined.

Evaluation of silica deposits, Musquodoboit Valley, Halifax County, Nova Scotia, 1968-70.

Involves geological mapping, diamond drilling and chemical analyses to find out if Cretaceous deposits carrying up to 98 per cent $SiO_2$ are of industrial use.

## Petroleum

623. Charbonnier, R.P., Draper, R.G., Harper, W.H., Yates, A., Mines Branch Dept. of Energy, Mines & Resources:
Directory of reservoir data and analyses of typical Canadian crude oils, 1964-.

This directory will contain detailed analyses of numerous Canadian oil samples and geological, reservoir and secondary recovery data on selected oil pools from which these samples were taken. See analysis and characteristics of oil samples from British Columbia and Northwest Territories, Mines Branch Information Circular IC 220.

624. Christopher, J.E., Saskatchewan Dept. of Mineral Resources:
Basal Cretaceous-Upper Jurassic Formations (Cantuar and Vanguard) of southwestern Saskatchewan, 1966-70.

The study will emphasize stratigraphy, sedimentation and economic geology of the formations.

625. Dickie, G.J., Williams, G.D., Univ. of Alberta:
Characteristics of oil and gas pools relative to the structure and stratigraphy of Alberta, 1967-71; Ph.D. thesis (Dickie).

626. Draper, R.G., Montgomery, D.S., Wanless, R.K., Mines Branch, Dept. of Energy, Mines & Resources:
The variation of the sulphur isotope ratio of the bituminous sand from the McMurray Formation as a function of the oxygen content of the bitumen, 1967-70.

627. Fleming, J., Newfoundland Dept. of Mines, Agriculture and Resources:
Petroleum and natural gas, Newfoundland and Labrador, 1968-69.

This research project will culminate in a publication in the Mineral Resources Report Series that will consist of a history of all exploration that has been carried out both onshore and offshore and a resumé of the geology of the area insofar as it relates to the potential for petroleum and natural gas.

628. Fuzesy, L.M., Saskatchewan Dept. of Mineral Resources:
Geology of the Ratcliffe Beds (Mississippian) in south-central Saskatchewan, 1969-71.

Special emphasis will be given to the geological aspects related to the possibility of oil accumulation.

629. Gibson, D.W., Geol. Surv. of Canada:
Triassic stratigraphy and petrology in the Foothills and Front Ranges of Western Canada, 1962-.
A detailed study of the stratigraphy and petrology of the Triassic rocks in the Foothills and eastern Rocky Mountains of Alberta and British Columbia, to provide data on the character, structure, distribution, age, stratigraphic relationships, origin of the bedrock, and other geological data that are required to evaluate the oil, gas, and mineral potentialities of the region. See Triassic stratigraphy of the Bow River-Crowsnest Pass Region, Rocky Mountains of Alberta and British Columbia, Geol. Surv. Canada, Paper 68-29, 1968.

630. Goodacre, A.K., Cooper, R.V., Observatories Branch, Dept. Energy, Mines & Resources:
Gravity measurements in the Great Lakes, 1968-70.
Regional underwater gravity measurements have been made in the Great Lakes to provide data for (1) the oil and mineral exploration industry, (2) geodesy, (3) investigations of the composition and structure of the earth's crust and upper mantle and (4) studies of vertical movements. The gravity data will be published in the Gravity Map Series of the Dominion Observatory.

631. Hitchon, Brian, Research Council of Alberta:
Geochemistry of formation waters, oil and gases in Western Canada, and surface waters of Mackenzie River drainage basin.
See Geochemistry and origin of formation waters in the Western Canada Sedimentary Basin, II. Alkali Metals Chem. Geol. v. 4, p. 211-223, 1969.

632. Kliske, A.E., Chevron Standard Limited:
Leduc Formation biostratigraphy - Rocky Mountain surface exposures, 1969-.

633. Maiklem, W.R., Bebout, D.G., Imperial Oil Limited:
Evaporite-carbonate relationships, 1968-70.
The main objectives are: to develop a descriptive classification of evaporites; to interpret the geologic history of the Upper Elk Point including the environment of deposition, the sequence, timing and pattern of basin filling and diagenesis; and to determine the source potential of evaporites. See Classification of anhydrite - a practical approach: Bull. Can. Petroleum Geol., v. 17, no. 2, p. 194-233, 1969.

634. McGillivray, J.G., McGill Univ.:
Porosity and permeability variations, Leduc Formation, Golden Spike Field,Alberta, 1969-70; M.S thesis.
Porosity, permeability, and water saturation variations will be evaluated using available reservoir data in relation to staging and associated facies variations in the reef.

635. Nelson, H.W., Imperial Oil Enterprises Limited:
Sandstone diagenesis, 1968-70.
Objective of the present work is to achieve better insight into the origin, distribution and time of emplacement

of chemical cements, plugging the porosity. The Mitsue field has been selected as a model for this project.

636. Rogers, M.A., Bailey, N.J.L., Imperial Oil Enterprises Limited:
Geochemistry of petroleum, 1968-.
A continuing research project on the generation, migration and alteration of petroleum deposits. Present emphasis is on using (1) stable isotopic studies (carbon and sulphur) and (2) gas chromatographic analyses to study the generation of $C_4$-$C_7$ light hydrocarbons in young sediments and the late-stage alteration (degradation) of oil and gas pools. Alteration can be by either thermal or non-thermal processes. See Organic carbon $SC^{13}$ values from Quaternary marine sequences in the Gulf of Mexico: a reflection of paleotemperature changes, Trans. Gulf Coast Assoc. of Geol. Societies, v. XIX, 1969, p. 529-534.

637. Stabbins, Richard, Saskatchewan Dept. of Mineral Resources:
The Middle Devonian Dawson Bay Formation of southeastern Saskatchewan, 1969-71.
The study will emphasize stratigraphy, paleoecology and economic geology.

638. Stanton, M.S., Chevron Standard Limited, Calgary
Petroleum chemistry, 1967-.

639. Staplin, F.L., Turnbull, H., Imperial Oil Limited, Calgary:
Sedimentary organic matter, organic matter, organic metamorphism, and oil and gas occurrence, 1963-.
Includes identification and characterization of organic debris in sediments; metamorphic state or "rank" of exine, cuticles and other organic matter in sediments; application to oil and gas exploration, source rock identification, etc. See Sedimentary organic matter, organic metamorphism and oil and gas occurrence. Bull. Canadian Petroleum Geology, v. 17 (1), p. 47-66; 1969.

640. Toth, J., Research Council of Alberta:
Relation between groundwater movement and hydrocarbon accumulation, 1968-.

641. Trettin, H.P., Geol. Surv. of Canada:
Geology of lower Paleozoic sediments, Foxe Basin, northeastern Melville Peninsula, and parts of northern and central Baffin Island, 1968-70.
See Geol. Surv. Canada, Paper 69-1; Pt. A, 1969, p. 246-252.

642. White, W.I., Saskatchewan Dept. of Mineral Resources:
Geology and petroleum accumulations of the North Hoosier area, west central Saskatchewan, 1968-70.
Includes study of the stratigraphy and structure of the sediments from the base of the Bakken Formation to the top of the Viking Formation in an area including and contiguous with the North Hoosier Bakken Sand and basal Blairmore sand pools. The history of oil and gas production will be described and porognosis of future development attempted.

## Coal and Peat

643. Cameron, A.R., Geol. Surv. of Canada:
Petrographic study of particle types in coking coal charges.
The study involves the description of some 40 coking coals in terms of microlithotypes. The objective is to see whether or not the microlithotype approach to petrographic description can be related to parameters of coke quality. The emphasis will be on Western Canadian coals but will include coals from the Sydney coalfield in Nova Scotia.

644. Cameron, A.R., Donaldson, J.R., Babu, S.K., Nakayanagi, Y., Geol. Surv. Canada:
Petrographic examination of coking coals from Michel, British Columbia, 1961-.
The objective is to study the petrography of the coal seams in the Fernie Basin in order to determine coking properties and to prepare seam profiles for correlation and environmental studies. See The petrology of the No. 10 (Balmer) coal seam in the Natal area of the Fernie Basin, British Columbia; Geol. Surv. Can., Paper 68-35, 1969.

645. Hacquebard, P.A., Birmingham, T.F., Geol. Surv. of Canada:
Petrographic correlation of coal seams at Carmachs, Yukon, 1969-71.
The objective of this project is to determine the extent of mineable coals in the Carmachs area presently under exploitation, by correlating the major seams that are separated by faulting.

646. Hacquebard, P.A., Donaldson, J.R., Birmingham, T.F., Barss, M.S., Geol. Surv. of Canada:
Environmental and facies studies of coal, 1962-.
Includes fundamental research on the origin of coal constituents and deposition of coal by coal petrological, palynological and sedimentological investigations. See Carboniferous coal deposition associated with flood-plan and limnic environments in Nova Scotia; Geol. Soc. Amer., Special Paper 114, 1969.

647. Simard, M.A., Quebec Dept. of Natural Resources:
Inventory of peat-bogs in Quebec, 1969-.
Includes surveying of Senneterre peat-bog, Abitibi East and "Canrobert," l'Ange Gardien, Rouville County and preliminary examination of bogs in the countries of Arthabasca, Bagol, Drummond, d'Iberville, Missisquoi, Nicolet, Shefford, Yamaska.

## General

648. Agterberg, F.P., Fabbri, A.G., Geol. Surv. of Canada:
Computer oriented research on mineral deposits, 1967-.
The research has been extended to the greenstone belt of eastern Ontario-Timmins Kirkland Lake area and is at present being continued for the greenstone belt in western Quebec-Noranda-Val d'Or area. See Two-stage least squares model for the relationship between mappable geological

variables, Bull. Int. Assoc. Math. Geology (in press).

649. Alvey, G.C., Robertson, W.A., Chevron Standard Limited:
Application of computer science to exploration geology, 1964-.

650. Arnold, R.G., Saskatchewan Research Council:
Geochemisrry of sulphides, 1965-70.
An investigation of geochemistry and phase relations of sulphides in ores in an effort to interpret modes of formation of ores. See Pyrrhotite phase relations below 304 $\pm$ 6° C at less than 1 atm. total pressure. Econ. Geol. v. 64, p. 405-419.

651. Arnold, R.G., Sangameshwar, S., Univ. of Saskatchewan:
Comparative study of sulphide and silicate mineralogy in ores of the Flin Flon area, Saskatchewan and Snow Lake area, Manitoba, 1967-71; Ph.D. thesis (Sangameshwar).
The structure and compositions of sulphides and silicates in ore deposits of the two areas are being studied to determine if they are genetically related.

652. Austria, V., New Brunswick Dept. of Natural Resources:
Regional geochemistry of stream and spring sediments, New Brunswick, 1965-70.
Systematic regional sampling of sediments and analysis for 8 to 10 trace elements is followed by detailed examination of specific areas for the purpose of (a) developing criteria for distinguishing between significant and non-significant anomalies; and (b) obtaining fundamental information on the mobility of elements in the surficial environment.

653. Baragar, W.R.A., Geol. Surv. of Canada:
Studies in the Seal Lake volcanic province, Northwest Territories, 1968-.
An investigation of the nature and type of volcanism that characterizes each of the Seal Lake, Croteau, and Letitia Groups, to determine the volcanic history of each in relation to the history of the groups; and to determine, if possible, the relationship of the volcanism to the associated mineral deposits. This is part of a larger investigation of volcanic rocks of the Canadian Shield that to date includes studies of the Yellowknife, Noranda, Coppermine, and Kaladar (Grenville) volcanic assemblages. See Volcanic studies in the Seal Lake area, Labrador; Geol. Surv. Can., Paper 69-1, 1969.

654. Bingley, J., Corbin, B., Nova Scotia Dept. of Mines:
Geological and geophysical investigation of St. Mary's River Basin Pictou County, Nova Scotia, 1968-.
Gravimetric profiles and electro-magnetic and magnetometer surveys were completed to obtain some clues as to the depth of the basin and indications as to favourable areas for finding mineral deposits.

655. Blain, C.F., Nichol, Ian, Queen's Univ.:
Regional geochemical reconnaissance in northwest Ontario, 1969-72; graduate thesis (Blain).
The investigation is directed to evaluating the viability of low density sampling as a procedure for identifying large scale areas of increased mineral potential in the Canadian Shield of northwest Ontario.

656. Boyle, R.W., Geol. Surv. of Canada:
Lead and sulphur isotope geology of Keno and Galena Hills, Yukon, 1958-69.
See Sulphur isotope investigation of the lead-zinc-silver-cadmium deposits of the Keno Hill-Galena Hill area, Yukon, Canada; Econ. Geology, (in press), 1970.

657. Callahan, J.E., McCartney, W.D., Queen's Univ.:
Heavy mineral fractions in stream sediments and a stream sediment geochemical survey applied to mineral exploration, Churchill Falls area, Labrador, 1968-71; Ph.D. thesis (Callahan).
The magnetic and non-magnetic heavy mineral fractions are being analyzed for selected trace elements and results evaluated as a prospecting method. Standard stream sediment geochemical prospecting methods are included in the study.

658. Campiglio, C., Quebec Dept. of Natural Resources:
Petrography and geochemistry of the Bourlamaque batholith, Val d'Or district, Quebec, 1969-70; Ph.D. thesis, Ecole Polytechnique.
The main purpose is to define the possibilities of mineral concentrations associated with this pluton and the history of the magmatic crystallization and postmagmatic alteration, in relation to the formation of gold deposits and concentration of copper and molybdenite.

659. Church, B.N., British Columbia Dept. of Mines and Petroleum Resources:
Volcanism and ore deposits in central British Columbia, 1969-.
Examples of contemporaneous, late, and post volcanic episodes of mineralization are displayed in the Smiths-Houston area of British Columbia. Work to date has been focussed mainly on stratigraphy and structure, in the Dominion Basin, Sam Goosly Lake area and at Nadina mine.

660. Cimon, Jules, Quebec Dept. of Natural Resources:
Northeast quarter of Queylus and northwest quarter of Dollier townships, Chibougamau district, 1 inch to 1,000 feet, 1962-.
Part of a program which aims at mapping in detail an economically important section of the Chibougamau greenstone belt.

661. Clark, A.H., Queen's Univ.:
Iron sulphide relationships in selected ore deposits and rocks, 1963-.
Attention is being focussed on the rare, very iron-deficient hexagonal pyrrhotites, and on "abnormal monoclinic

pyrrhotites" showing asymmetrical peak splitting; on the chemistry of mackinawite in diverse assemblages; and on occurrences of smythite (Wedge, N.B.) and greigite (Mina Alacran, Chile).

662. Clark, A.H., Armstrong, R.C., Queen's Univ.:
Phase equilibria in ore mineral systems, 1969-; M.Sc. thesis (Armstrong).
Experimental studies will, as far as possible, be integrated with metallogenetic work in the Cordillera of North and South America. It is hoped to concentrate on sulphide-type systems involving mercury, in an effort to explain variations in the generally rather consistent mineralogy of commercial Hg deposits.

663. Clark, A.H., Farrar, E., Quirt, G.S., Queen's Univ.:
Geochronological studies of the Andean Mobile Belt of northern Chile (largely Lat. 26-29°S.), 1967-72; Ph.D. thesis (Quirt).
A critical part of an analysis of metallogenetic relationships in the Andean Mobile Belt is the establishment of a detailed chronology of intrusive and extrusive events, using K/Ar dating.

664. Clark, A.H., Haynes, S.J., Queen's Univ.:
Chemistry of highly- and poorly-mineralized intrusions in the Andes of northern Chile, 1969-72; Ph.D. thesis (Haynes).
Involves the study of the rock and mineral chemistry of dated granitic bodies, ranging in age from Lr. Jurassic to Mid-Tertiary, in an attempt to relate chemical factors to the distribution, type, and volume of associated hydrothermal mineralization. The inter-relationships of porphyry copper mineralization with other types of ore deposits throughout northern Chile are receiving attention; part of a broader analysis of metallogenic relationships in the region.

665. Davenport, P.H., Nichol, Ian, Queen's Univ.:
Geochemical dispersion associated with the Cu-Sn-Ag deposit at Uchi Lake, Northwest Ontario, 1969-72; graduate thesis (Davenport).
The investigation is aimed at recognizing diagnostic geochemical criteria which would serve to identify mineralization of the Uchi Lake type from low grade mineralization characterized by similar geophysical anomalies.

666. Michel, D., Ecole Polytechnique:
Application of the theory of regionalized variable to ore reserve estimation, 1968-70.
See The notion of extension variance and its application to the grade estimation of stratiform deposits. International Computer Symposium, A.I.M.E. Special Volume, A Decade of Digital Computing, 1969.

667. Delavault, R., Marshall, D.B., Univ. of British Columbia:
Spectroscopic analysis of geochemical samples and composition of volcanic rocks associated with mineralization, 1968-72.

See Aqua regia extractable copper and zinc in volcanic rocks in relation to copper mineralization, Econ. Geol. v. 64, p. 672-676, 1969.

668. Duckworth, K., Univ. of Calgary:
Development of electromagnetic induced polarization and radiometric mineral prospecting systems, 1969-.

669. Dugas, J., Quebec Dept. of Natural Resources:
Compilation of a metallogenic map of the nickel belt, Ungava Bay, Quebec, 1969-.
The area covered by this map is between Cape Smith and Wakeham Bay, in the northern part of Quebec (Ungava Bay).

670. Eastwood, G.E.P., Jackson, E.V., British Columbia Dept. of Mines and Petroleum Resources:
British Columbia Mineral Inventory 1967-.
The location of each property is plotted on a set of N.T.S. 2-mile and 1:250,000 topographic maps, and the available data entered on comprehensive printed cards. See British Columbia Inventory Maps, 92B, 92B-C, 92E, 92H/SE, 92L, 102-B-C and 103F.

671. Findlay, D.C., Geol. Surv. of Canada:
Study of ultramafic and related rocks, Yukon Territory, 1967-70.
The project is designed to collect sufficient field and laboratory data to allow petrologic and chemical classification of Yukon ultramafic rocks, with particular emphasis on their associated mineral deposits. See Geol. Surv. Canada, Paper 68-68, p. 18-19, 1968.

672. Fogwill, D., Newfoundland Dept. of Mines, Agriculture and Resources:
A study of mineral deposits and prospecting environment in Newfoundland, 1969-70.
The study involves the application of modern concepts of metallogenesis to the island of Newfoundland.

673. Foster, J.R., Nichol, Ian, Queen's Univ.:
The application of partial extraction techniques in geochemical exploration, 1969-72.
The objectives are to assess the application of selected partial extraction techniques to specific problems of geochemical exploration.

674. Fritz, P., Univ. of Alberta:
The isotopic composition of minerals from hydro-thermal ore deposits - carbonates, sulphides, sulphates and oxides, and silicates, 1966-.
See The oxygen and carbon isotopic composition of carbonates from the Pine Point Lead-Zinc deposit. Econ. Geol. (in press).

675. Fyles, J.T., British Columbia Dept. of Mines and Petroleum Resources:
Rossland Project - a re-study of the geology of the Rossland

mining camp with special emphasis on the structure and molybdenite mineralization, 1968-70.

676. Garrett, R.G., Geol. Surv. of Canada:
Geochemical study of economic elements in glacial till, 1968-69.
Surveys to study the geochemistry of tills around ore deposits have been carried out at Manitouwadge, Ontario (summer 1968) and Val d'Or, Quebec (January 1969). In addition soils and stream sediments were collected at Manitouwadge. Results indicate both the usefulness and limitations of exploration geochemistry in a glaciated environment. The results are being prepared for publication.
Regional geochemical census of plutonic rocks in the eastern Yukon, 1969-72.
The aims are firstly, to outline areas of increased mineral potential (Cu, Mo, Su, W) in which exploration activity might be focussed, and secondly, to provide regional geochemical data to aid metallogenetic and regional geological studies. A full scale sampling program is planned for the 1970 field season.

677. Gentile, F., Quebec Dept. of Natural Resources:
Lac Nicolet area, district of Wolfe, 1 inch to 1,000 feet, and structural study of the Solbec and Cupra copper-zinc deposits, Stratford township, Wolfe country, 1964-.
The purpose is to obtain a better knowledge of the petrography, chemistry, structure and stratigraphy of the main zones of the volcanic rocks in the Disraéli area, by detailed mapping of the Cupra and Solbec deposits, the mapping and sampling of the volcanic sequence and a complementary study of the other deposits in this area.

678. Goodwin, A.M., Geol. Surv. Canada:
Volcanic studies in the Timmins-Kirkland Lake-Noranda region as part of the program of volcanic studies in Canada, 1965-68.
See Volcanic studies in the Timmins-Kirkland Lake-Noranda region of Ontario and Quebec; Geol. Surv. Can., Paper 68-1, Pt. A, p. 135-137, 1968.

679. Hacquebard, P.A., Donaldson, J.R., Geol. Surv. Canada:
Rank studies of coal and carbonaceous matter, 1967-70.
The objective is to obtain information on local and regional changes in organic metamorphism of sedimentary rocks, with application towards the search for oil and gas, structural geology and possibly areas of mineralization. See Coal metamorphism and hydrocarbon potential in the Upper Paleozoic of Eastern Canada; Geol. Soc. Amer. Program, 1968 Annual Meeting (abstract).

680. Hornbrook E.H.W., Geol. Surv. of Canada:
Development of biogeochemical exploration methods for use in winter for metallic mineral deposits, 1967-69.
See Biogeochemical prospecting for molybdenum in west central British Columbia, Geol. Surv. Canada, Paper 68-56, 1969.

681. Jambor, J.L., Geol. Surv. of Canada:
Study of non-metallic vein minerals and wall-rock alteration, Cobalt camp, 1966-70.
Includes petrographic, microprobe, and X-ray studies of differentiation in the Nipissing diabase, Cobalt-Gowganda area.

682. Kaiman, S., Hughson, M.R., Mines Branch, Dept. of Energy, Mines & Resources:
Mineralogical investigation of ore samples - a continuing project.

683. Kelly, R., Hirlemann, G., Ministère des Richesses Naturelles du Québec:
Etudes de la dispersion des éléments autour des gisements, 1969-.
Ces recherches fondamentales visent à mettre au point de nouvelles méthodes d'exploration qui devraient permettre de localiser des gisements par l'analyse d'auréoles d'éléments mineurs qui serviraient d'indicateurs. Trois régions distinctes ont été étudiées; la région de Rouyn-Noranda; les cantons de l'Est; la Gaspésie.

684. Koulomzine, Théodore, Becker, Alex, Ecole Polytechnique:
Geophysical prospecting methods applicable to the search for deep seated metallic ore bodies, 1969-71.
The objectives are (1) to build modern detecting equipment to be lowered in sparsely distributed deep drill holes which in some mining camps are fairly numerous but have not been used for adequate geophysical studies; (2) critically restudy and modify known techniques and devise new techniques with the aim of obtaining greater penetration.

685. Kutina, J., Geol. Surv. of Canada:
Relationship of structural lineaments and mineral occurrences in the Abitibi area of the Canadian Shield, Quebec, 1969-70.

686. Lang, A.H., Geol. Surv. of Canada:
Prospecting in Canada, 4th edition, 1966-69.
The book has been largely rewritten and considerably expanded, particularly with respect to advanced methods of prospecting. A good deal of research has been involved particularly in assessing the current relative uses and successes of different approaches to prospecting.

687. Lasalle, Pierre, Quebec Dept. of Natural Resources:
Mineralogy (heavy minerals) and geochemistry of eskers in the Abitibi area, Quebec, 1968-.

688. Leech, G.B., Geol. Surv. of Canada:
General metallogeny of Canada, 1966-.
See Metallogenic maps of North America and Canada; Geol. Surv. Canada Paper 69-1B, p. 53-54, 1967.

689. May, R.W., Univ. of Western Ontario:
Chemical investigation of tills of southern Ontario, 1968-71; Ph.D. thesis.
The purpose is to find out the principal chemical

differences between tills of various lobes in S. Ontario, and to develop rapid methods for correlation of tills, using small samples. Application to mineral exploration will be considered.

690. McCartney, W.D., Queen's University:
Metallogenic studies in New Brunswick and Nova Scotia, and their relations to other geosynclinal belts, 1961-.
Limited current field studies and field supervision of various metallogenic theses, combined with continuing graduate seminar discussion and library research serve to strengthen the overall validity of the role of mineral deposits as an intrinsic and orderly part of their tectonic, stratigraphic and plutonic setting. Synthesis and refinement of these concepts continues in conjunction with faculty colleagues and graduate students. See Metallogeny of post-Precambrian Geosynclines, Geol. Surv. Can., Paper 65-6, 1965.

691. McLeod, C.R., Geol. Surv. of Canada; Cameron, E.N., Univ. of Wisconsin; Leonard, B.F., United States Geological Survey:
Microhardness, reflectivity and rotation properties of ore minerals, 1969-70.
A collection of data on the reflectivity, microhardness, and rotation properties of ore minerals, intended to bring together information now scattered in the world literature and make it available to investigators. See Reflectivity and Vickers microhardness of ore minerals, Geol. Surv. Can., Paper 68-64, 1969.

692. Morrison, B., Saskatchewan Research Council:
Natural potential studies, 1967-70:
Investigation of sources of atmorpheric, tree, and snow potentials and their relation to mineral deposits.

693. Muller, J.E., Carson, D.J.T., Geol. Surv. Canada:
Geology and mineral deposits of Alberni map-area, Vancouver Island and Gulf Islands, British Columbia.
Regional geology, stratigraphy, petrology and mineral deposits of the central part of Vancouver Island in the Strait of Georgia (N.T.S. 92F).

694. Nigrini, A., Geol. Surv. of Canada:
Transport and deposition of ore indicator elements in streams and sediments, 1969-71.
The purpose is to determine the mechanism of transport and the chemical and/or physical controls in the deposition of trace elements that may be ore indicators in the surficial environment. It should provide a foundation on which to interpret regional geochemical data with particular references to the search for buried ore deposits.

695. Northcote, K.E., British Columbia Dept. of Mines and Petroleum Resources:
Port McNeill-Cape Scott area, northern Vancouver Island, 1 inch to 1 mile, 1968-71.
A study of mineral deposits and their relationship to regional geology and distribution of plutonic rocks. See

B.C. Minister of Mines Annual Report, 1968.

696. O'Donnell, N.D., Univ. of Western Ont.:
Investigation of an indicator train of sulphide ore at Gull Pond, Newfoundland, 1967-70; M.Sc. thesis.

697. Mapping Parties, Quebec Dept. of Natural Resources:
Stream sediment sampling in geological mapping, 1965-.
A continuing program of geochemical investigation in the course of mapping by geological parties. Samples collected are analysed for Cu, Zn, Pb, Mo, U, Au, Ag, V, Cr, Ni, Pt, Sn, W. Subsequent to 1965 most preliminary geological maps indicate the assay results against stations where the samples were collected.
Rock geochemistry, 1968-.
In order to obtain chemical information on the lithological units encountered in the course of mapping, the field parties collect fresh rock samples which are analysed for the oxides (Si, Al, Ca, Mg, K, Na, Ti, Fe) and trace elements (Cu, Pb, Zn, Au, Ag, Mo, U, V, Cr, Ni, Pt, Sn, W).

698. Peatfield, G.R., McCartney, W.D., Queen's Univ.:
Metallogeny of the Grennwood district, southern British Columbia, 1969-71; M.Sc. thesis (Peatfield).
A metallogenic study adjacent to and east of the much larger area under investigation by E.R. Procyshyn. Concurrent but original studies in progress in the region stimulate and augment the group effort (see also J.C. Roddick, E. Farrar, E.A. Trueman, A.H., Clark, E.R. Procyshyn, W.D. McCartney).

699. Potter, R.R., New Brunswick Dept. of Natural Resources:
Metallogenic investigations in New Brunswick, 1965-70.
Includes the examination and evaluation of all known mineral occurrences in the Province. The regional factors controlling their distribution in space and time will be investigated. See Metallogenic Investigations, Kennebecasis Zone; Mines Branch, Department of Natural Resources, Information Circular 67-1, 1967.

700. Preto, V.A., British Columbia Dept. of Mines and Petroleum Resources:
Geology and mineral deposits of Copper Mountain, British Columbia, 1 inch to 500 feet, 1968-70.
The study has involved mapping an area of approximately 50 square miles. Particular attention has been paid to the stratigraphy, structure and metamorphism of the Nicola volcanic and sedimentary rocks which surround the Copper Mountain stock. A detailed examination of all known mineral deposits in the area has been made with particular attention to relationship of mineralization to distribution of intrusive rocks, rock alteration and structure. A number of samples for radiometric age dating of the various intrusives were also collected.

701. Procyshyn, E.R., McCartney, W.D., Queen's Univ.:
Metallogeny of part of south-central British Columbia, 1967-71; Ph.D. thesis (Procyshyn).

The study seeks to clarify and correlate classes of mineral deposits with tectonics, stratigraphic and a magmatic event with which many deposits are interrelated. Absolute age determination (see J. Roddick and E. Farrar) are coordinated with this work. Trace element variations in magmatic rocks and in selected minerals in these rocks will be studied to seek differences in mineralized and non-mineralized intrusives and in intrusives of different age. (See Also E.A. Trueman and A.H. Clark). See Metallogeny of post-Precambrian Geosynclines, Geol. Surv. Can., Paper 65-6, 1965.

702. Ruitenberg, A.A., New Brunswick Dept. of Natural Resources:
Geology and mineral deposits of southern New Brunswick, 1967-70.
A long term project to examine in detail and evaluate the mineral potential of this part of the Province. Special emphasis will be placed on the structural control for base metal occurrences in this area. See Mineral deposits in granitic intrusions and related metamorphic aureoles in parts of the Welsford, Loch Alva, Musquash and Pennfield Areas; Mineral Resources Branch, New Brunswick Dept. of Natural Resources, Report of Investigation No. 9, 1969.

703. Sangster, A.L., McCartney, W.D., Queen's Univ.:
Metallogenic study in the Grenville Province, Southeastern Ontario, 1967-69; Ph.D. thesis (Sangster).
An overall evaluation of the mineral deposit relations in the area leading to and in part guiding a proposed, long range series of studies of individual classes of deposits in Grenville rocks.

704. Scott, S.D., Univ. of Toronto:
Studies on arsenide ores, 1970-.
The environment and mechanism of transport, deposition, and zoning of arsenide ores will be determined by applying phase equilibrium studies to arsenide assemblages from Cobalt, Ont.

705. Scott, S.D., Kissin, S.A., Univ. of Alberta:
Stoichiometry and phase changes in sulphides, 1969-72; Ph.D. thesis (Kissin).
The stabilities of the iron sulphide minerals, particularily the pyrrhotite phases, are being examined as a function of pressure, temperature, and sulphur fugacity.

706. Siddeley, G., Geol. Surv. of Canada:
The geochemical composition of ultramafic rocks and its relation to their contained mineral deposits, 1968-70.
Many ultramafic bodies, mainly in the Canadian Shield have been sampled. They range from small lensoid bodies of homogeneous peridotite (Timmins area) to extensive sheets of well layered to poorly differentiated ultramafics (Ghost Range, Ontario; Ungava, Quebec). Where ores occur, they may be local or extensive, massive and/or disseminated, contact phenomena, differentiates or interstitial ores. The primary dispersion of ore indicator elements appears to depend largely on ore geometry and mobility of the individual elements. Factor analysis is being applied to

the data of each ultramafic unit to resolve groupings of associated elements. Such grouping or factors generally represent mineral phases which may be interpreted as primary or metasomatic; they shed light on metasomatic processes affecting the rock and therefore on the history of certain elements useful as ore indicators.

707. Slankis, J.A., Geol. Surv. of Canada:
Magnetotelluric investigations, 1966-70; Ph.D. thesis, McGill Univ., 1970.
This project has investigated a new portable exploration method for detecting sulphide conductors using natural EM fields at 8 Hz. See Telluric and magnetotelluric measurements at 8 Hz: Trans. AIME, Soc. of Min. Eng. v. 255, p. 237-244, June 1969.

708. Smith, Eric, McGill Univ.:
A study of the nature of mercury anomalies in rocks near certain mineralized zones, 1969-70; M.Sc. thesis.

709. Smith, J.R., Saskatchewan Research Council; Coleman, L.C., Univ. of Saskatchewan; Gaskarth, J.W.:
Geochemistry of Precambrian rocks in Saskatchewan, 1965-69; M.Sc. thesis (Gaskarth).
Evaluation of the relationships between ore deposits and trace metal distribution in country rocks. See Preliminary reports on geology and geochemistry of Hanson Lake West Area, Sask., Pt. 2, Interim geochemical results; Sask. Research Council, Circular 2, 1966.

710. Sutherland-Brown, Atholl, British Columbia Dept. of Mines and Petroleum Resources:
Copper and molybdenum deposits of British Columbia, 1967-71.
A comparative study of the copper and molybdenum deposits, their metallogeny and relation to other metal deposits. See Mineralization in British Columbia and the Copper and Molybdenum Deposits, C.I.M. Bulletin 1969, p. 1-13.

711. Thorpe, R.I., Geol. Surv. of Canada:
Metallogenic maps and reports, District of Mackenzie, 1965-70.
Information is being incorporated in a metallogenic map. Preparation of a paper on metallogenesis in the Northwest Territories is planned.

712. Whitmore, D.R.E., Geol. Surv. of Canada:
Development and supervision of Mineral Deposits Data Bank, 1968-.
The file now contains 6600 entries (deposits) over half of which were made during 1969. It is being modified to take advantage of the greater flexibility offered by SAFRAS.

713. Wolfe, W.J., Ont. Dept. of Mines:
Primary dispersion of copper, nickel, cobalt and sulphur in mafic intrusive rocks of the Kamiskotia-Whitesides area, District of Cochrane, Ontario, 1969-70.
Mafic intrusive rocks in a 100 square-mile area located

approximately 20 miles west of Timmins, Ontario have been systematically sampled and analysed with the view to determining regional variability of total sulphur and aqua-regia extractable Cu, Ni and Co. See Ont. Dept. of Mines, Summ. of Field Work, 1969.

Use of cobalt in reconnaissance biogeochemical prospecting for Ag-Ni-Co mineralization of the Gowganda-type, 1969-70.

A pattern of widely spaced sampling (20-25 samples per square mile) of vegetation and soils has been used to test the possibility of outlining large-scale chemically anomalous areas suitable for further exploration for Ag-Ni-Co mineralization of the Gowganda-type. Samples collected at regular intervals along hillside slopes in areas underlain by Nipissing diabase have been analysed for Ag, Ni, Co, Cu, Pb, Zn and Mn.

## MINERALOGY

### Specific Minerals

714. Appleyard, E.C., Salter, D.L., Univ. of Waterloo:
An occurrence of palygorskite and montmorillonite in the nepheline syenite at Lillebukt, Stjerny, north Norway, 1969-70.

715. Aumento, F., Geol. Surv. of Canada and Dalhousie Univ.:
Study of serpentine group minerals, 1966-69.
See Serpentine mineralogy of ultrabasic instusions in Canada and on the Mid-Atlantic Ridge, Geol. Surv. Canada, Paper 69-53, 1969.

716. Bachechi, F., Rucklidge, J.C., Univ. of Toronto:
Crystal structure of Montbrayite, 1967-70; Ph.D. thesis (Bachechi).

717. Bayliss, P., Univ. of Calgary:
Crystal structure analysis of minerals in pyrite group, 1964-72.

718. Berry, L.G., Queen's Univ.:
Crystal structure studies of sulphur-salt minerals, 1950-.
See Crystallography of hatchite, Indian Mineralogist, Naidn volume, in press.

719. Chen, S.M., Burley, B.J., McMaster Univ.:
Superlattice structures in cancrinite, 1967-69; M.Sc. thesis (Chen).
Cancrinites are characterized by numerous superlattice reflections. These appear to be due to random stacking disorders in the structural planes containing the 6 fold rings.

720. Clarke, D.B., Biggar, G.M., Univ. of Alberta:
Solid solution effects in orthopyroxenes, 1969-70.

721. Edgar, A.D., Univ. of Western Ontario, Dr. D.L. Hamilton, Univ. of Manchester:
Determination of ternary feldspar compositions, 1966-69.
See The variation of the $\bar{2}01$ reflection in plagioclases. Mineral. Mag., v. 37, p. 16-25, 1969.

722. Farrell, D.M., Mines Branch, Dept. of Energy, Mines and Resources:
Determination of the course of structural changes and of the kinetics of conversion of magnetite through maghemite to $\alpha$-hematite by infrared spectroscopy, 1968-70; M.Sc. thesis, Ottawa Univ.:

723. Fawcett, J.J., James, R.S., Univ. of Toronto:
Phase relations of the iron chlorite, daphnite, 1967-70.
See Stability and phase relations of the iron chlorite daphnite to 8.5 Kb (Abstract), Geol. Soc. Amer., Annual Meeting, 1969.

724. Fraser, J.R., Univ. of British Columbia:
A nephrite occurrence on O'Ne-ell Creek, British Columbia, 1969-70; M.Sc. thesis.

725. Friedlaender, C.G.I., Dalhousie Univ.:
Observations on tridymite, 1966-69.
See Iridymite in the gangue of a Pb-Cu-Zn occurrence Schweiz. Min. petr. Mitt., v. 49, 3 (in press).

726. Gillieson, A.H.C.P., Farrell, D.M., Mines Branch, Dept. of Energy, Mines & Resources:
The determination of quartz in dusts by infrared spectroscopy, 1967-71.
Alpha-quartz has been determined down to one tenth of a milligram when collected on a polyvinylidene chloride ("Saran") filter, by the absorption of its characteristic peak at a wavelength of 12.5 microns.

727. Gittins, J., Univ. of Toronto:
Mineralogy and petrology of the Sheffield Lake alkaline complex, Quebec, 1965-.
A study of minerals in the wöhlerite group and of other rare earth and zirconium minerals.

728. Harris, D.C., Mines Branch, Dept. of Energy, Mines & Resources:
Characterization of copper selenides, 1968-70.

729. Hawthorne, F.C., Grundy, H.D., McMaster Univ.:
Crystallography of the silicate minerals (amphibole), 1968-72; Ph.D. thesis (Hawthorne).
Structural determination of a hastingsitic amphibole from Sudbury to elucidate the cation partitioning between the available sites.

730. Hogarth, D.D., Univ. of Ottawa:
Lapis lazuli in Baffin Island, 1968-70.

731. Jambor, J.L., Geol. Surv. of Canada:
Studies of new and rare minerals, 1961-.
See Coalingite from the Muskox Intrusion, N.W.T., Amer. Mineral. v. 54, p. 437-447; muskoxite, a new magnesium-ferric iron oxide from the Muskox Intrusion, Northwest Territories, Canada, Amer. Mineral. v. 54, p. 684-696.

732. Ledoux, R.L., Université Laval:
Etude de la décomposition de la muscovite, de la phlogopite et de la biotite par infrarouge, 1968-71.
Les spectres d'absorption en infrarouge de séries de micas de différentes compositions chimiques sont enregistrés de 4000 à 200 $cm^{-1}$. Ces mêmes micas son décomposés par un traitement avec NaCl et $NaB(Ph)_4$. Les cations interlamellaires libérés par l'ouverture des feuillets sont analysés. L'étude de la position et du dichroïsme des bandes d'absorption en infrarouge et la mesure des paramètres cristallins par rayons-X permet de suivre les changements structuraux des micas à différents stages de décomposition.

733. Lin, S.B., Burley, B.J., McMaster Univ.:
Structure of scapolite, 1967-70; Ph.D. thesis (Lin).
The structure of a scapolite having the composition 80% marialite, 20% meionite has been determined. Structures of other members in the solid solution series marialite-meionite are being determined.

734. Makovicky, Emil, McGill Univ.:
Crystallography, crustal structure and composition of cylindrite, 1967-70.

735. Naldrett, A.J., Simpson, P., Univ. of Toronto:
Relationship between reflectivity and composition of the $Fe_{1-x}S$ - $Ni_{1-x}S$ solid solution in the Fe-Ni-S system, 1969-71.
The purpose is to determine how well compositions in the $Fe_{1-x}S$ - $Ni_{1-x}S$ solid solution can be determined by measurements of reflectivity.

736. Pearce, T.H., Edgar, A.D., Univ. of Western Ontario:
Iron-bearing analcite stability relations, 1969.
See Primary analcite in volcanic rocks from Alberta, Canada, Proc. Geol. Soc. London, 1969, no. 1651, p. 204-207.

737. Perrault, Guy; Rigaud, Michel; Richard, Pierre; Vicat, Jean:
Cristallochimie du niobium, 1968-75; thèse de doctorat (Richard).
A ce jour, nos avons établi l'identité cristallographique des oxydes de niobium et leurs principaux paramètres thermodynamiques (publication prochaine). Les travaux de continuation porte: 1) sur la définition de la structure atomique des certains silicates de niobium; 2) sur l'étude bibliographique de d'autres fammiles de composés du niobium.

738. Rimsaite, J.H.Y. (Miss), Geol. Surv. of Canada:
Study of mica group minerals and associated host rocks, 1959-.
Studies continue on: physical and chemical properties of micas in relation to geochemistry and mineralization;

the relationship between changes in chemical composition of mica and changes of environmental conditions; argon retentivity (and adsorption of atmospheric argon) in partly dehydrated and oxidized micas; and thermal stability of hydroxyl group contents. See Evolution of Zoned Mica and Associated Silicates in the Oka Carbonatite, Can. Mineral., v. 10, pt. 1, 1969, p. 145.

739. Rucklidge, J.C., Univ. of Toronto:
Platinum metal minerals, 1967-.
See Electron microprobe investigations of platinum metal minerals from Ontario. Canadian Mineralogist, v. 9, p. 617-628.

740. Scott, J.D., Queen's Univ.:
Crystal structure analysis of franckeite, 1967-71; Ph.D. thesis.
A re-examination of structural crystallography and chemistry of franckeite based on a study of many crystals from several specimens, using X-ray diffraction and electron microprobe analyses.

741. Skippen, G.B., Carleton Univ. and Reinhardt, E.W., Geol. Surv. of Canada:
Physical properties of synthetic micas, 1969-70.
Synthetic micas within the quadrilateral, eastonite-siderophyllite-annite-phlogopite are being synthesized and their optical and X-ray properties measured.

742. Springer, G., Mines Branch, Dept. Energy, Mines & Resources:
Phase relations of bismuthinite, stibnite and aikinite, 1969-70.
Compounds in the pseudobinary system $Sb_2S_3$ - $Bi_2S_3$ and $CuPbBiS_3$ - $Bi_2S_3$ will be synthesized, and the results correlated with natural occurrences of minerals in these systems. See Naturally occurring compositions on the solid-solution series $Bi_2S_3$ - $Sb_2S_3$, Min. Mag. v. 36, p. 295-296, 1969.

## General

743. Arnold, R.B., Sangameshwar, Univ. of Saskatchewan:
A comparative study of sulphide and silicate mineralogy in ores of the Flin Flon area, Saskatchewan and Snow Lake area, Manitoba, 1967-71; Ph.D. thesis (Sangaseshwar).
The structure and compositions of sulphides and silicates in ore deposits of the two areas are being studied to determine if they are genetically related.

744. Campbell, F.A., Oliver, T.A., Univ. of Calgary:
Mineralogy and chemistry of Ireton shales, Alberta to northeastern British Columbia, 1967-70.
See Mineralogic and chemical composition of Ireton and Duvernay Formations, Central Alberta, Bull. Can. Petrol. Geol. v. 16, no. 1, 1968, p. 46-63.

745. Clark, A.H., Queen's Univ.:
Mineralogy and geochemistry of the Yiöjärvi copper-tungsten deposit, southwest Finland, 1960-.
Microprobe studies have confirmed the occurrence in this unmetamorphosed Precambrian deposit of several rare ore minerals, which permit more precise estimation of the conditions of ore formation. Particular attention is being paid to the unusual copper-iron sulphides in the ores, which include cuprian pyrrhotite, cubic cubanite, three compositionally distinct forms of chalcopyrite, and a probable very copper-rich mackinawite-type mineral.
Iron sulphide relationships in selected ore deposits and rocks, 1963-.
Attention is being focussed on the rare, very iron-deficient hexagonal pyrrhotite, and on "abnormal monoclinic pyrrhotites" showing asymmetrical peak splitting; on the chemistry of mackinawite in diverse assemblages; and on occurrences of smythite (Wedge, N.B.) and greigite (Mina Alacran, Chile).
Ore mineralogy of the Alacran Ag-As-Sb deposit, Pampa Larga, northern Chile, 1967-71.
The complex ore mineral assemblages in this unusual low-temperature deposit are yielding information on the phase relationships in several sulphide-type systems. Among those minerals which have been recognized are greigite, smithite, arsenolamprite, high realgar, and arsenian sphalerite.

746. Cortes, M.A. (Mrs.), Nova Scotia Technical College:
Quantitative iron mineralogy of sulphide ore samples by differential thermal analysis, 1969-70; M.Sc. thesis.
This study has been undertaken to test the potential of the DTA method for determining the amounts of pyrite, pyrrhotite and magnetite in sulphide ore samples.

747. Coy-yll, Ramon, Ecole Polytechnique:
Quantitative procedure in electron probe analysis of silicate series, 1969-70.
The correction models used in quantitative microprobe analysis have been reviewed and it appears that more reliable input parameters such as mass-absorption coefficients fluorescence yield and electron scattering are needed. However, the correction errors that result from uncertainty in these input parameters may be minimized by the use of optimum operating conditions. The basic problems involved in microprobe analysis of silicate series such as olivines, pyroxenes, amphiboles, garnets and feldspars are being studied and a new correction procedure has been proposed: the use of correction curves plotted from computer-calculated absorption and atomic number corrections. These corrections depend on the concentration of variable elements in each silicate series: e.g., iron for olivines and calcium for plagioclases. The correction procedure has been perfected for an M.A.C. electron probe but the method may be extended to other probe types. See Utilization des courbes prédéterminées pour l'analyse quantitative des olivines à la microsonde électronique. Bull. Soc. Fr. Min. et Cristallogr. (in press).

748. Douglas, J.A.V., Geol. Surv. Canada:
Meteorite studies, 1965-.
The investigation of the mineralogy and petrology of Canadian meteorites. See Amphibole: first occurrence in an enstate chondrite; Abstract, 31st Annual Meeting of Meteoritical Society, 1965-.

749. Douglas, J.A.V., Currie, K.L., Dence, M.R., Plant, A.G., Traill, R.J., Geol. Surv. of Canada:
Petrological-mineralogical investigation of some lunar samples from Apollo 11, 1969-70.

750. Faye, G.H., Mines Branch, Dept. Energy, Mines & Resources:
The correlation of absorption spectra with structure of minerals and inorganic complexes, 1965-.
See The optical absorption spectrum of tetrahedrally bonded $Fe^{3+}$ in orthoclase, Can. Mineral., v. 10, 112, 1969.

751. Foscolos, A.E., Geol. Surv. of Canada:
Clay mineral investigation, 1968-.
Includes investigation of clay synthesis, clay diagenesis, halmyrolysis, equilibria, clay mineral separation from marine sediments and transformation of fresh water clays on contact with sea water. See Equilibirum constants between both freshly prepared and aged H.montmorillonite and chloride salt solutions; Soil Science Soc. of Amer. Proc., March-April, 1969.

752. Foscolos, A.E., Procter, R.M., Stott, D.F. Geol. Surv. of Canada:
Clay mineralogy of Lower Cretaceous shales of northeastern British Columbia, 1968-70.
To identify and examine the distribution of clay mineral facies geographically and stratigraphically and investigate the relationship between clay distribution and other stratigraphic parameters with the objective of integrated paleoecological and paleogeographical studies.

753. Friedlaender, C.G.I., Dalhousie Univ.:
Brownian movement, 1967-69.
Measurements carried out on a movie film, resulted in the determination of the viscosity of the liquid in the inclusion. See Brownian movement in liquid inclusions in quartz Canad. Mineralogist, v. 10, 2 (in press).

754. Gabe, E.J., Hall, S.R., Rowland, J.F., Mines Branch, Dept. Energy, Mines & Resources:
Crystal structure analysis of minerals, 1968-.
During 1968-69, the systems involved have been fully operational. Work has been carried out on 8 structures, 4 of which have been solved and 2 refined.

755. Gill, J.E., Roscoe, W.E., McGill Univ.:
Deformation and annealing of sulphides; 1950-; Ph.D. thesis (Roscoe).
See Experimental deformation and annealing of sulphides and interpretation of ore textures: Economic Geology v. 64, 1969, p. 500-508.

756. Gillieson, A.H.C.P., Farrell, D.M., Mines Branch, Dept. of Energy, Mines & Resources:
Infrared vibration spectra of sulphide minerals, 1966-70.
By use of the UNIVAC 1108 Computer and to a first approximation, the bond strengths of the atomic linkages in pyrite, marcasite, cattierite, vaesite, arsenopyrite, cobaltite, gersdorffite, loellingite, safflorite rammelsbergite and chalcopyrite have been calculated. From these and the vibration frequencies, the specific heat and cohesive energy of the first three minerals have been derived.

757. Grundy, H.D., McMaster Univ.:
Crystallography of the silicate minerals, 1968-71.
Structural determination on single crystals from the cancrinite group of minerals.

758. Harris, D.C., Mines Branch, Dept. Energy, Mines & Resources:
Electron-probe microanalysis of ore minerals, 1968-.
See New observations on matildite. Can. Min. v. 9, p. 654-662.

759. Hughson, M.R., Mines Branch, Dept. Energy, Mines & Resources:
High-temperature X-ray diffraction analysis, 1967-69.
Calibration of Rigaku-Denki camera has been completed and its use is being applied to identification of crystalline phases at temperatures up to approximately 650°C.

760. Jambor, Geol. Surv. of Canada:
Study of non-metallic vein minerals and wall-rock alteration, Cobalt camp, 1966-70.
Includes petrographic, microprobe, and X-ray studies of differentiation in the Nipissing diabase, Cobalt-Gowganda area.

761. Levinson, A.A., Bayliss, P., Univ. of Calgary:
Clay mineralogy of shales in the Mackenzie Delta area, 1968-.
See Clay mineralogy and boron determinations of the shales from the Reindeer Well, MacKenzie River Delta, N.W.T., Canada, Can. Bull. Petrol. Geology, in press.
Clay mineralogy of Hudson Bay sediments, 1969-70.

762. MacLean, W.H., Schryver, K., McGill Univ.:
Microprobe analysis of metamorphic mineral reactions at the boundary of the clinopyroxene-almandine subfacies in the Lac-Croche Plutonic Complex, Quebec, 1969-70.
See The Lac-Croche Plutonic Complex, Quebec. Basement of Grenville Paragneiss. Leidse Geologische Mededelingen, v. 43, p. 18, 1968.

763. McLeod, C.R., Geol. Surv. of Canada; Cameron, E.N., Univ. of Wisconsin; Leonard, B.F., United States Geol. Surv.:
Microhardness, reflectivity and rotation properties of ore minerals, 1969-70.
A collection of data on the reflectivity, microhardness, and rotation properties of ore minerals, intended to bring together information, now scattered in the world literature, and make it available to investigators. See

Reflectivity and Vickers microhardness of ore minerals, Geol. Surv. Can., Paper 68-64, 1969.

764. Nickel, E.H., Mines Branch, Dept. Energy, Mines & Resources:
The fundamental properties of sulphides and related minerals, 1964-.
This study seeks to relate the physical, chemical and optical properties of sulphides to their structure and bonding. Current studies are concerned with the relationship between microhardness, infrared absorption characteristics and bond strengths. See Structural stability of minerals with the pyrite, marcasite, arsenopyrite and löllingite structures, Can. Mineral. 9 (1968), 311-321.

765. Owens, D.R., Pinard, R.G., Mines Branch, Dept. Energy, Mines and Resources:
Mineralogical investigation of Canadian ores in conjunction with mineral processing research, a continuing project.

766. Perrault, Guy; Hébert, Paul; Ecole Polytechnique:
Recherche sur les méthodes analytiques pour les oligo-éléments des roches et des minerais, 1965-.
Nous continuons nos recherches sur les méthodes de mesure des ologi-éléments des roches: 1) par fluorescence X; 2) par spectrophotométrie d'absorption atomique.
Préparation de standards minéraux pour l'analyse instrumentale, 1968-71.
A ce jour, now avons réalisé un standard, MRG-1 gabbro à olivine du Mont Royal. Ce standard sera soumis prochainement à la Société Canadienne de Spectroscopie, pour diffusion. Les analyses de contrôle devraient être complètes vers décembre 1969. Nous participons aussi à l'analyse des roches volcanologie du C.N.R.

767. Perrault, Guy; Le Page, Yvon; Vincent, Henri; Vicat, Jean; Sang, Nguyen; Richard, Pierre; Ecole Polytechnique:
Programmation électronique pour les recherches en cristollographie, 1966-; étudiant D.Sc.A. (Le Page, Richard), étudiant M.Sc. (Lang).
Nous continuons le développement de nouveaux programmes de calculs électroniques pour les recherches en cristallographie. En novembre 1969, notre programmathèque comprenait 15 programmes distincts; nous comptons l'augmenter beaucoup en 1969-70 (environ 40 programmes en novembre 1970). Les programmes sont centrés sur: 1)l'interprétation radiocristallographique; 2) la définition de la structure cristalline. Nos programmes sont écrits en Fortran IV pour la CDC-6400 de l'Université de Montréal. Voir Calculs et et tracés de synthèse de Fourier et de Patterson par une calculatrice électronique, 34e congrès annuel de l'ACFAS, Québec, Novembre 1966.

768. Perrault, Guy; Vicat, Jean; Aarden, Dick; Ecole Polytechnique:
Minéralogie du Mont St-Hilaire, 1964-72.
Travaux actuels sur St-Hilaire portent sur les sujets suivants: 1) les associations minérales des veines de pegmatites. Il semble que les principes de Korzhensky et de Thomson expliquent bien un grand nombre d'association observées; 2) la définition d'un nouveau silicate de niobium

voisin de la nenadkevichite (UK-19 de la publication 1967); 3) la définition d'un nouveau silicate de manganèse; 4) la définition de UK-4 (publication de 1967); 5) la cartographie des Carrère De-Mix et Poudrette. Voir La lemoynite, un nouveau silicate hydraté de zirconium et de sodium de St-Hilaire, Québec, Canadian Mineralogist, v. 9, Part 5, 1969.

769. Plant, A.G., Lachance, G.R., Delabio, R.N., Geol. Surv. of Canada:
Electron probe microanalysis, 1962-.

Current research includes procedures and methods in electron probe microanalysis; mineralogy of Mid-Atlantic Ridge Rocks; mineralogy of selected meteorites; and mineralogy of weloganite-bearing rocks from Montreal. See Weloganite, a new strontium zirconium carbonate from Montreal Island, Canada; Canadian Mineralogist, v. 9, pt. 4, p. 468-477.

770. Pouliot, G., Ecole Polytechnique:
Le mesure de la structure des argiles glaciaires par méthodes de diffraction-X, 1969-72.

Ce travail vise à développer et à utiliser un appareil de type goniomètre universel pour la mesure de l'orientation des minéraux argileux au sein des argiles. Le travail effectué à data comprend: (1) une revue bibliographique (2) quelques essais d'imprégnation au carbowax 6000 ainsi que des mesures d'intensité des pics (001) de l'illite dans diverses coupes sur un même échantillon.

771. Pouliot, G., Loiselle, A., Ballivy, G., Ecole Polytechnique:
Minéralogie et propriétés géotechniques des argiles de la Baie James, 1968-70; thèse de maîtrise (Ballivy).

Ce travail a pour but d'établir un parallèle entre certaines caractéristiques géologiques et géotechniques des dépôts d'argile d'une même région mais d'origines différentes. Les caractéristiques géologiques étudiées sont le fabrique, la granulométrie, la composition chimique et minéralogique. Les études géotechniques portent essentiellement sur la résistance au cisaillement et la compressibilité de ces matériaux non remaniés. Les résultats sont utilisés pour mettre en évidence la présence d'argile lacustre (Lac Barlow-Ojibway) à la base du dépôt d'argile marine (mer Tyrrel) à l'embouchure de la rivière Rupert dans la baie James.

772. Rahmani, R., Lerbekmo, J.F., Godfrey, J.D., Univ. of Alberta:
Composition and chemical stability of heavy minerals in Precambrian source rocks of northeast Alberta, 1969-71.

773. Ripley, L.G., Mines Branch, Dept. Energy, Mines & Resources:
Growth of single cyrstals of base metal sulphides of controlled composition, 1964-70.

This project includes growth of single cyrstals of zinc sulphide (sphalerite and wurtzite) crystals grown by chemical vapour transport with iodine and by sublimation; $FeS_2$ (pyrite), $NiS_2$ (vaesite) and $CoS_2$ (cattierite) grown by chemical vapour transport with iodine and from $PbCl_2$ fluxes; and $FeAs_2$ (loellingite), HgS and ZrSe grown by

chemical vapour transport with iodine.

774. Rucklidge, J.C., Gasparini, E., Univ. of Toronto:
Computer applications in mineralogical analysis, 1965-.
See A computer program for processing microprobe data Jour. Geol. v. 75, p. 126, 1967.

775. Sabina, A.P., Geol. Surv. of Canada:
Study of mineral collecting areas of interest to rockhounds and tourists, 1964-.
See Rocks and minerals for the Collector. Hull Maniwaki, Quebec; Ottawa-Peterborough, Ontario, Geol. Surv. Canada, Paper 69-50, 1969.

776. Schryver, K., MacLean, W.H., McGill Univ.:
On the reproducibility of count rates and ratios of count rates in electron microprobe analyses, 1968-70.
An application of statistical concepts to electron microprobe analysis in order to show that the measurement process can be brought under "statistical control" where variance of count rate on an homogeneous sample can be predicted.

777. Sherwood, H.G. and graduate student, Nova Scotia Technical College:
Mineralogical study of seaflow minerals.
Compositional and mineralogical studies of nodular and pavement materials from the Pacific, Atlantic and Great Lakes areas is proposed. The distribution of the metallic elements in these deposits will be studied using the electron probe and electron microscope.

778. Smith, D.G.W., O'Nions, R.K., Univ. of Alberta:
An investigation of electron microprobe techniques for determining the oxidation state of iron in minerals and natural glasses, 1969-.
Attempts are being made to develop accurate methods of determination of the $Fe^{2t}$ $Fe^{3t}$ ratio in minerals and glasses by means of the electron microprobe. A suite of 10 calciferous amphiboles and 3 natural glasses of known composition are being used initially to test the techniques.

779. Steacy, H.R., Gauthier, C.H.R., Geol. Surv. of Canada:
Systematic Reference Series of the National Mineral Collection and G.S.C. collections of minerals and ore suites, 1955-.
The need for an active working collection of minerals to support geological research in Canada has been recognized by the establishment in 1961, and maintenance by the Geological Survey of Canada, of the Systematic Reference Series of the National Mineral Collection. This Series currently contains examples of some 1600 different minerals, from Canada and abroad. The Series is a continuing repository for Canadian minerals and specimen material accruing from mineralogical research.

780. Townsend, M.G., Horwood, J.L., Mines Branch, Dept. Energy, Mines & Resources:
Electrical and magnetic measurements on sulphides, 1969-.

781. Traill, R.J., Geol. Surv. of Canada:
Catalogue of Canadian minerals, 1958-69.
Canadian minerals are listed in alphabetical order, and localities of occurrence are given by Province or Territory in order of increasing NTS reference number. Data entries include details of the location and information concerning the mineral found at that location. Chemical analyses are reported.

## PALEONTOLOGY

### Invertebrate

782. Anan-Yorke, R., Given, M., Univ. of Alberta:
Foraminiferal studies, Western Canadian Cretaceous, 1950-; M.Sc. theses (Anan-Yorke, Given).

783. Barnes, C.R., Univ. of Waterloo:
Ordovician conodonts from the Arctic, 1969-.

784. Barnes, C.R., Univ. of Waterloo; Sassk, D.B., Alfred Univ.:
Electron microscopy of conodonts, 1968-.
An investigation of the ultrastructure of conodonts and its relation to phylogeny and natural assemblages.

785. Broad, D.S., Univ. of Bristol, England:
Biostratigraphy of Siluro-Devonian ostracoderm faunas from Somerset and Prince of Wales Islands, Northwest Territories; Ph.D.
Large collections of Siluro-Devonian vertebrates from the Peel Sound Formation (and some from the Read Bay Formation) include representatives of the cyathaspidids, pteraspids, cephalaspids, arthrodires, and early osteichthyes. Study of the cyathaspids indicates a closer relationship with European faunas, in particular with those of Spitsbergen, than with North American faunas. See Arctic, Journal of the Arctic Institute of North America, v. 21, no. 2, p. 84-91, 1968.

786. Bertrand, R., Université de Montréal:
Biométrie de Cryptolithus (Trilobita, Ordovicien moyen), 1969-70; thèse de maîtrise.
Les expèces lorettensis et tesselatus sont étudiées.

787. Bolton, T.E., Geol. Surv. of Canada:
Silurian coral faunas of Eastern and Arctic Canada, 1952-.
Study and description of coral faunas from the Silurian system principally of Manitoulin Island, Ontario, Anticosti Island, Quebec, and Arctic Canada to determine finer faunal zonations and detailed assemblages. See Silurian faunal assemblages, Manitoulin Island, Ontario; Michigan Basin Geol. Soc., Guidebook to Annual Field Excursion, p. 38-49, 1968.

788. Braun, W.K., Univ. of Saskatchewan:
Devonian microfaunas of Western Canada, 1965-73.
See Upper Devonian ostracod faunas of the Great Slave Lake and northeastern Alberta. Proc. Int. Symp. on the Devonian System, Calgary, 1967, p. 612-652.

789. Caldwell, W.G.E., Grabec, J., Univ. of Saskatchewan:
Devonian faunas of the Mackenzie River valley, 1959-; M.Sc. thesis (Grabec).
See Ambocoeliid brachiopods from the Middle Devonian rocks of Northern Canada: Proc. International Symp. on Devonian System, v. 2, p. 601-616, 6 text-figs., 1 pl., 1967.

790. Chian, Kam Kuen, Univ. of Western Ontario:
Brachipods of the Fossil Hill and Amabel Formations of Manitoulin Island and Bruce Peninsula, 1967-69; M.Sc. thesis.
Studies of brachiopods of the Fossil Hill and Amabel formation confirm a late Llandoverian age for the former, and indicates a late Wenlockian age for the latter. The discovery of a previously unknown, rich, silicified fauna in the Amabel permitted a much more precise dating than heretofore possible.

791. Collins, D.H., Royal Ontario Museum:
Shell structure in shell-bearing cephalopods, 1967-70.
A study on buoyancy and balance in chambered Cephalopods. See Devonian nautiloids from Northern Canada, Geol. Surv. Canada, Bull. 182, 1969, p. 31-50.

792. Copeland, M.J., Geol. Surv. Canada:
Ordovician and Silurian ostracoda from Anticosti Island, Quebec, 1964-.
Work continues on ostracoda from the Ordovician Ellis Bay Formation and beyrichiid ostracods from the several Silurian formations. See Ostracods from the Vaurial Formation (Upper Ordovician) of Anticosti Island, Quebec; Geol. Surv. Can., Bull. (in press).

793. Copper, Paul, Laurentian Univ.:
Morphology, evolution and ecology of the atrypoid brachiopods in Western Europe and Eastern North America, 1968-72.
The object of this study is to bring together as much information on the group as possible. This involves not only sampling of prime fossil localities to determine accurately the time, space and environmental distributions of species, but also re-examination of all museum material.

794. Dineley, D.L., Univ. of Bristol, England:
Taxonomy, evolution, ecology and biostratigraphy of Siluro/Devonian vertebrates from Northern and Western Canada, 1965-73.
A continuation of work originally begun at the University of Ottawa and concerned with material from the Delorme formation and the Peel Sound Formation. See The Peel Sound Formation (Devonian) of Prince of Wales and adjacent islands: A Preliminary Report. Arctic, Journal of the Arctic Institute of North America, v. 21, no. 2, p. 84-91, 1968.

795. Duthie, H.C., Rani, R.G.M., Univ. of Waterloo:
Diatoms of the Toronto interglacial, 1963-70.
See Stratigraphic studies in the Toronto Pleistocene.
Geol. Assoc. Can. Proc. v. 20, p. 4-16, 1969.

796. Gregory, M.R., Dalhousie Univ.:
Foraminiferal distribution patterns, Halifax harbour with observations on palaeoecological significance, 1967-69; Ph.D. thesis.

797. Hui, H.T., Fernando, C.H., Karrow, P.F., Univ. of Waterloo:
Molluscs of the Toronto interglacial, 1967-70.
See Stratigraphic studies in the Toronto Pleistocene;
Geol. Assoc. Can., Proc. v. 20, p. 4-16, 1969.

798. Jeletzky, J.A., Geol. Surv. of Canada:
Monograph of the Canadian Buchia (= Aucella), 1959-75.
The objective is to describe and to illustrate all known Canadian representatives of the stratigraphically important genus Buchia (= Aucella) using fossil collections available in this Survey and other Canadian institutions. The zonal value of all Buchia species described is to be investigated in detail. Critical evaluation of synonymy of Canadian and foreign Buchia species is to be undertaken to improve the existing correlation of the Canadian zones with the international standard stages.
Mid- to late Cretaceous (Hauterivian to Maestrichtian) index fossils of Western Canadian Cordillera, 1961-71.
The objective is to prepare a series of fossil plates illustrating a selection of best known and most useful mid- to late Cretaceous (Hauterivian to Maestrichtian) marine investebrate fossils of the Western Canadian Cordillera.

799. Jeletzky, J.A., Geol. Surv. of Canada; Mackenzie, Gordon, Jr., United States Geol. Surv.:
Dibranchiate volume, Treatise on Invertebrate Paleontology, edited by R.C. Moore.
The preparation of an authoritative summary of the present state of knowledge of subclass Debranchiata (Mollusca) based on study of the literature on a global scale supplemented by personal research on subclass by the authors.

800. Kapp, Ulla (Miss), Stearn, C.W., McGill Univ.:
Role of stronatoporoids in the Chazyan Reefs of the Lake Champlain region and southern Quebec, 1969-70; M.Sc. thesis (Miss Kapp).

801. Legault, J.A. (Miss), Geol. Surv. of Canada:
Chitinozoams and acritarchs from the Hamilton Group (subsurface) of southern Ontario, 1966-70; Ph.D. thesis, Univ. of Oklahoma.

802. Lenz, A.C., Univ. of Western Ontario:
Late Silurian and early Devonian graptolites of the Canadian Cordillera, 1964-70.
The objective is to establish a biostratigraphic zonation based on graptolites, to correlate precisely with other regions of the world, and to aid in the working out of

the geologic history of Western Canada during Silurian and Early Devonian times. See Latest Silurian Graptolites from Porcupine River, Yukon Territory: Geol. Surv. Canada, Bull. 182, 1969.

803. Lespérance, P.J., Université de Montréal:
Trilobites de l'Ordovicien supérieur, Silurien et Devonien inférieur, 1962-.
La stratigraphie paléontologique, stratigraphie physique sont accessoirement étudiées avec la paléontologie systématique. Voir Lower Llandovery of the Northern Appalachians and adjacent regions. Bull. Geol. Soc. Am. v. 80, pp. 459-484.

804. Logan, A., Univ. of New Brunswick:
Restudy of type-species of Palaeozoic bivalve genera belonging to orders Arcoida, Mytiloida and Pterioida 1969-72.
The investigation will attempt to maintain a wholly objective approach in the redescription of type-species (and thus type-specimens) of certain poorly-known Palaeozoic bivalve genera and thus render the descriptions suitable for eventual coding and computer storage.
Pennsylvanian and Permian Bivalvia from the Canadian Arctic, 1967-.
See The new bivalve genus Arctomyalina from the Pennsylvanian of the Canadian Arctic Archipelago, Jour. Paleontology (in press).

805. Ludvigsen, Rolf, Univ. of Western Ontario:
Brachiopods and dacryoconarid tentaculites of the Michelle Formation (Emsian), northern Yukon, 1968; M.Sc. thesis.
Study shows that the entire formation is probably early Emsian in age, and that it can be readily correlated, in part, with the pinyonensis zone of Nevada.

806. Medioli, Franco, Stehman, C., Igbal, J., Langhus, Corbett, J., Dalhousie Univ.:
Foraminiferal ecology on the Scotian Shelf and other selected areas, 1967-71; Ph.D. theses (Stehman, Langhus), M.Sc. theses (Igbal, Corbett):
See The physical influence of a paleosol etc. on Sable Island, Quaternary Soils, Proc. VII INQUA Congr., v. 9, 1967.

807. Nassichuk, W.W., Geol. Surv. of Canada:
Upper Paleozoic ammonoids of Arctic and Western Canada, 1967-.
See A late Pennsylvanian ammonoid from Ellesmere Island, Canadian Arctic Archipelago, Geol. Surv. Canada, Bull. 182, pp. 123-127, 1969.

808. Norford, B.S. Geol. Surv. of Canada:
Monograph of brachiopod family Trimerellidae, 1966-71.
See The Ordovician trimerellid brachiopod Eodinobolus from southeast Ontario; Paleontology, v. 12, p. 161-171.

809. Oxley, J., Waterhouse, J.B., Univ. of Toronto:
Permian gastropods from Khao Phrik, Thailand, 1969-70.
See New Zealand Permian gastropods: Part IV. Platyceratacea, Anomphalacea, Neritacea and correlations, N.Z.J. Geol. Geophys. 6:817-842.

810. Pauzé, R., Université de Montréal:
Paléoécologie des brachiopodes et trilobites du Sayabec, région de La Rédemption, Québec (Silurien: Wenlockien et Ludlovien), 1970-72; thèse de maîtrise.

811. Perry, David, Univ. of Western Ontario:
Faunas and age of the Ogilvie Formation of northern Yukon, 1969-70; M.Sc. thesis.
The objective is to ascertain the age of the Ogilvie Formation, its relationship to the underlying Michelle Formation, and to work up the taxonomy of the Ogilvie brachiopods and corals.

812. Poplawski, S., Karrow, P.F., Univ. of Waterloo:
Ostracods of the Toronto interglacial, 1969-70.
See Stratigraphic studies in the Toronto Pleistocene; Proc. Geol. Assoc. Can. v. 20, p. 4-16, 1969.

813. Riccardi, A.C., Westermann, G.E.G., McMaster Univ.:
Dimorphic Olcostephanus and Leopoldia from the Hauterivian of Neuquen, Argentina (Cret. Ammonitina), 1968-69.
Valanginian Dobrodgeiceras Nikolov (Ammonitina) from Peru, 1969.

814. Schafer, C.T., Bedford Institute, Nova Scotia:
Ecology of nearshore Benthonic Foraminefera along the east coast of Canada and Northeast United States, 1967-.
Distribution of benthonic Foraminifera is being investigated with particular emphasis on areas contaminated by sewage and industrial pollutants. See Current transport and deposition of foraminiferal tests, planktonic organisms and lithogenic particles in Bedford Basin, Nova Scotia, Maritime sediments, v. 4, no. 3, p. 100-103, 1968.

815. Stearn, C.W., McGill Univ.:
Paleoecology of Devonian stromatoporoids on the south flank of the Ancient Wall Carbonate complex, Jasper National Park, 1964-.
See A preliminary study of the distribution of stromatoporoids on the southern flank of the Ancient Wall Carbonate Complex, Alberta Int. Devonian Symposium, Calgary, v. 2, p. 797-806, 1967.

816. Tozer, E.T., Geol. Surv. of Canada:
Triassic Ammonoidea and Bivalvia, 1960-72.
A morphological, taxonomic, biostratigraphic investigation with the object of refining Triassic biochronology.
See A standard for triassic time, Geol. Surv., Canada, Bull. 156.

817. Vilks, G., Bedford Institute, Nova Scotia:
Ecology of planktonic foraminifera in the Atlantic Ocean, 1967-71; Ph.D. thesis, Dalhousie Univ.
Planktonic foraminifera are collected from surface waters to establish possible correlations between species distribution and oceanographic parameters.
Quantitative analysis of planktonic foraminifera off Bermuda Island, 1969; Ph.D. thesis, Dalhousie Univ.
Living planktonic foraminifera are collected from the surface waters in Sargasso Sea in January, April, July and November. The field work is designed to provide information on the reproducibility of a standard plankton tow by testing seasonal and lateral variations in an area of ten square miles.

818. Vilks, G., Igbal, J., Bedford Institute, Nova Scotia:
Recent foraminifera in the Canadian Arctic, 1962-.
Ph.D. thesis (Igbal), Dalhousie Univ.
Holocene history and recent foraminiferae ecology of the Canadian Arctic Archipelago is studied by sampling foraminifera from the watercolumn and sediment cores. See Recent foraminifera in the Canadian Arctic, Micropaleontology, v. 15, no. 1, p. 35-60, 1969.

819. Wagner, F.J.E. (Miss), Bedford Institute, Nova Scotia:
Arctic and subarctic molluscan faunas - Pleistocene and Recent.
See Faunal study, Hudson Bay and Tyrrell Sea, Geol. Surv. Canada, Paper 68-53, 1968.

820. Wall, J.H., Research Council of Alberta:
Cretaceous microfaunas of northern Alberta, 1962-.
A stratigraphic and systematic study of the Cretaceous foraminiferal faunas from outcrops in the northern Alberta Plains (north of 56° latitude). See Cretaceous foraminiferal faunas of the northern Alberta Plains: Geol. Soc. Amer. Abstracts with Programs for 1969, Part 5, Rocky Mountain Section, p. 86-87.

821. Wall, J.H., Given, M.M., Anan-Yorke, R., Research Council of Alberta:
Bearpaw microfaunal studies, 1966-; M.Sc. theses (Given, Aran-Yorke) Univ. of Alberta:
In addition to the theses which have been completed and partial publication of which is planned, microfaunal studies of subsurface sections of the Bearpaw Formation (late Cretaceous) in the Calgary and Cypress Hills areas have commenced.

822. Warwick, W., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Chironomidae of Lake Ontario, 1968-.
This faunal group can be used to relate, on a very precise basis, present and past environmental conditions, trends and changes. Both as individuals and as groups they are excellent indicators of eutrophication.

823. Waterhouse, J.B., Univ. of Toronto:
Permian brachiopods of Canada, 1967-72.

A comprehensive systematic study of the Permian brachiopods of the Canadian Arctic, Yukon, western Alberta and British Columbia, with emphasis on correlation, paleontology, paleogeography, and shell structure (through use of scanning electron microscope).

824. Waterhouse, J.B., Riccardi, Alberto, Univ. of Toronto:
Maccoyella from Cretaceous of Argentine, 1969-70.
See A new species of Maccoyella from Raukumara Peninsula, with a revision of Maccoyella Magnata, Marwick, N.Z. J. Geol. Geophys. 2:489-500, 1959.

825. Westermann, G.E.G., Riccardi, A.C., Vicencio, R., McMaster Univ.:
Taxonomy and biostratigraphy of the Andean Middle Jurassic, Ammonitina, 1965-70; Ph.D. thesis (Vicencio).
A comprehensive effort to revise the classification and chronostratigraphic correlation of the rich but poorly known ammonite faunas, based on field work in Chile and Argentina of 1965. All available type specimens of other workers have been assembled. See Sucesion de ammonites del Jurasico Modio en Autofagasta Atacama, Mendoza y Neuquen. Rev. Asoc. Geol. Argent. XXII, no. 1, 63-73.

826. Westermann, G.E.G., Verma, Harish, McMaster Univ.:
Upper Jurassic Ammonitina of Sierra Catorce, Northcentral Mexico, 1967-71; Ph.D. thesis (Verma).

827. Westermann, G.E.G., Vicencio, Raul, McMaster Univ.:
Form and functional morphology of ammonoid shells, 1966-70; Ph.D. thesis (Vincencio).
A theoretical model of geometrically possible forms an their mechanical significance are being tested against the actually occurring forms in different phylogenetic sequences, by means of multivariate statistical procedures.

## Vertebrate

828. Churcher, C.S., Royal Ontario Museum:
Revision of the Genus Smilodon, 1960-.
Pleistocene mammals of the Canadian prairies, 1965.
The investigation of the Pleistocene mammals of the Canadian prairies is in co-operation with Dr. A. Mac S. Stalker, Geol. Surv. of Canada.

829. Cooke, H.B.S., Dalhousie Univ.:
Study of fossil mammals and Pliocene-Pleistocene deposits in Africa, 1938-.
A continuation of a long term undertaking to provide a well-based stratigraphic framework for the dating of human and hominid fossil material and stone tools which occur widely in continents in deposits up to at least 5 million years ago. Ecological and environmental interpretations are also being attempted.

830. Dodson, Peter, Univ. of Alberta:
Sedimentology and biostratonomy of the dinosaur beds of the Oldman Formation, Steveville, Alberta, 1968-70; M.Sc. thesis.

831. Edmund, A.G., Royal Ontario Museum:
Osteology and evolutionary history of giant ground sloths, 1961-.
A Late Pleistocene fauna from Santa Elena Peninsula of Ecuador, Royal Ont. Museum, Contrib. 63, Life Sciences, 1965.

832. Fox, R.C., Univ. of Alberta:
Late Cretaceous microvertebrates from Alberta, 1966-.
A taxonomic, evolutionary, and facies study of Companian and Maestrichtian small vertebrates (with initial attention paid to mammals) through use of collecting techniques that thoroughly sample fossil occurrences that could not otherwise be studied. See Studies of late Cretaceous vertebrates, III. A triconodont mammal from Alberta. Canadian Journ. Zoology, November, 1969.

833. Harington, C.R., Univ. of Alberta:
Pleistocene mammals of the Yukon Territory, 1966-71; Ph.D. thesis.

834. Kisko, L.M., Royal Ontario Museum:
Comparison of the North American wolves assigned to Canis dirus, 1966-70; Ph.D. thesis, Univ. of Toronto:

835. Krishtalka, Leonard, Univ. of Alberta:
Paleocene mammals from Cypress Hills, Alberta, 1969-71; M.Sc. thesis.

836. McGowan, C., Royal Ontario Museum:
An investigation into the structure, composition and growth of bone in Mesozoic reptiles, 1969-.

837. Ramaekers, P.P.J., Royal Ontario Museum:
The vertebrate fauna of the Willwood Formation, Lower Eocene of Wyoming.
A study of the vertebrate fossils from the Willwood Formation in the Royal Ontario Museum and the National Museum of Natural Sicences. During 1969 the Bighorn Basin of Wyoming was visited to determine the geographic and stratigraphic provenance of the specimens. Large series of specimens of certain genera are being studied by means of computerized statistics to establish the range of variation in various species.

838. Russell, L.S., Royal Ontario Museum:
Tertiary mammals of Saskatchewan - Part II - The Oligocene fauna, 1954-70.
The first section of the report dealing with the non-ungulate orders of mammals was completed this year but additional material obtained during the field season of 1969 has to be incorporated. See Tertiary mammals of Saskatchewan, Part I, The Eocene fauna, Royal Ontario Mus., Life Sci. Contrib. 67, 33 pp., 7 pls., 1965.

839. Wilson, M.V.H., Royal Ontario Museum:
Fossil fishes from the Tertiary of British Columbia, 1968-71.

The collections of the National Museum of Natural Sciences, the Royal Ontario Museum, and the University of British Columbia are being studied together to provide the first comprehensive review of the fauna and assist in correlation of Tertiary deposits in the interior of British Columiba.

## Paleobotany

840. Anderson, T., Univ. of Waterloo:
Late glacial and postglacial pollen from lakes and bogs in southwestern Ontario, 1967-70; Ph.D. thesis.

841. Barss, M.S., Hacquebard, P.A., Geol. Surv. Canada:
Carboniferous and Permian palynology, 1955-.
To determine the spore content of the Upper Paleozoic succession of Canada as an aid to stratigraphy and for worldwide correlations and to study taxonomy of new forms and adequately describe them. See Stratigraphy and palynology of a Permian section, Tatonduk River, Yukon Territory, Geol. Surv. Canada, Paper 68-18, 1969.

842. Berti, A.A., Univ. of Western Ontario:
Paleobotanic investigation of Mid-Wisconsin interstadial deposits in the Lake Erie and Ontario basins, 1966-70; Ph.D. thesis.
Palynologic and macrofossil studies have been done or are in progress from the following sites: Port Talbot-Plum Point area, and Scarborough Bluffs in Ontario, Garfield Heights in Ohio, Titusville, Penn.

843. Kuc, M., Geol. Surv. of Canada:
Fossil mosses in the Arctic, 1969-70.
Investigations of stratigraphy, paleobotanical characteristics of fossil floras (vascular plants, bryophytes, lichens, etc.) of interglacial and postglacial deposits in the Canadian Arctic Archipelago. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

844. McAndrews, J.H., Royal Ontario Museum:
Scanning electron microscopy of modern and fossil seeds and pollen, 1969-71.

845. McAndrews, J.H., Berti, A.A., Norris, Geof., Royal Ontario Museum:
Illustrated key to the common fossil pollen and spores of the Great Lakes region, 1968-69.
Manuscript of 100 taxa nearing completion; to be published in the Occasional Papers of the Royal Ontario Museum.

846. McAndrews, J.H., Royal Ontario Museum; Ross, Karen, Univ. of Toronto:
Vegetation and climatic history of northwestern Ontario, 1969-71; M.Sc. thesis (Ross).
Two 8-meter cores have been collected; pollen analysis to be done. See Paleobotony of a wild rice lake in Minnesota. Can. J. Bot. (in press).

847. McAndrews, J.H., Tovell, W.M., Royal Ontario Museum; Lewis, C.F.M., Geol. Surv. of Canada:
Pollen stratigraphy of Great Lakes sediment, 1968-70.
Pollen analysis has been completed on 65 surface samples from Lake Ontario; computer analysis of results is in progress. Pollen diagrams have been completed from cores taken from Georgian Bay, Lake Ontario and Lake Erie.

848. McAndrews, J.H., Tovell, W.M., Norris, Geof., Royal Ontario Museum:
Pollen analysis and paleoecology of lakes in southern Ontario, 1968-70.

849. McGregor, D.C., Geol. Surv. of Canada:
Devonian plant microfossils of eastern Canada, 1960-.
Spores and other palynomorphs from Devonian strata of the Gaspé Peninsula, northern New Brunswick and the Hudson Bay Lowland, are being described and their biostratigraphic significance assessed. See Composition and range of some Devonian spore assemblages of Canada; Rev. of Paleobot. and Palynol., v. 1, p. 173-183, 1967.

850. McIntyre, D.J., Chevron Standard Limited:
Mesozoic and Tertiary palynology, 1966-.

851. Mott, R.J., Geol. Surv. of Canada:
Palynological studies, central Saskatchewan, 1965-69.
See Palynological studies in central Saskatchewan: Part I, Contemporary pollen spectra from surface samples: Geol. Surv. Can., Paper (in press).

852. Mott, R.J., Lichti-Federovich, S., Geol. Surv. of Canada:
Quaternary palynology, 1969-.
See A palynological study and postglacial geochronology in the St. John River Valley, New Brunswick; Geol. Surv. Can., Paper (in press).

853. Playford, G., Univ. of Alberta:
Lower Cretaceous palynology, Western Canada, 1969-70.
Spore-pollen content of subsurface and outcrop material from Saskatchewan and Manitoba are under investigation.

854. Pocock, S.A.J., Imperial Oil Limited, Calgary:
Cretaceous and Tertiary palynology of the coastal region of British Columbia, 1961-71.
A general investigation of the palynology of the Cretaceous and Tertiary sediments of the coastal region of British Columbia and the value of the plant microfossils investigated for purposes of local and long range correlation and zonation.
Palynology of the Jurassic sediments of Western Canada, 1964-70.
This comprehensive study of the palynology of Canadian Jurassic sediments is almost complete. The first parts, including a general introduction and systematic descriptions of terrestrial species, are in press and due for publication early in 1970. The final section, including a discussion of the stratigraphic significance of the floras

and systematic descriptions of marine species, is currently being prepared for press. See Palynology of the Jurassic Sediments of Western Canada - Terrestrial species, Palaeontographica, (in press).

855. Singh, Ch., Research Council of Alberta:
Lower Cretaceous microfloras of the Peach River district, Alberta, 1965-70.
Formal descriptions of 202 species of microspores and pollen, 13 species of megaspores, and 114 species of dinoflagellates and acritarchs have been completed. These species have been illustrated on 80 plates, and range charts showing the distribution and relative abundances of the various microfloral species are complete. It is proposed to complete the remaining portions of the report for publication in 1970.
Cenomanian-Turonian microfloras of the Peace River District, 1969-.
The main objective is to describe the microfloral assemblages and succession from the top of the "Fish-scale" marker bed to the base of the "Second White-speckled Shale" interval. The program is a logical follow-up to the current investigation of Lower Cretaceous microfloras of the region. Fieldwork for this study was carried out in 1966, during which about 165 samples were collected from outcrop of the upper Shaftesbury Formation, St. John Shale, Dunvegan Formation, and lower Kaskapau Formation along Peach River, Pouce Coupe River, and Howard Creek.

856. Steeves, Margaret W., Univ. of Saskatchewan:
Palynological studies in Saskatchewan.
Pollen and spores of several zones within the type section of the Eastend Formation, and also from the Battle Formation are being studied. See Spores and Pollen from the Lower Cretaceous of Saskatchewan, Canada Part 1., Sporites, Can. Jour. of Bot. 45, p. 2329-2365, 1967.

857. Stelck, C.R., Eliuk, L., Bihl, G., Harland, R., Univ. of Alberta:
Late Cretaceous palynology studies in Western Canada, 1950-; Ph.D. thesis (Harlan), M.Sc. thesis (Eliuk Bihl).
See New evidence on the age of the Sheerness Badlands, East Central, Alberta. Bull. Can. Petrol. Geol. v. 18, no. 1, 1970.

858. Walton, H.S., Chevron Standard Limited:
Paleozoic palynology, 1960-.

## General

859. Anderson, M.M., Memorial Univ. of Newfoundland:
Precambrian fossils in the Conception Group of southeastern Avalon Peninsula, Newfoundland, 1968-70.
Includes a study of the fossils, the way in which they were fossilized, their distribution and environment of deposition. See Criteria for recognizing Precambrian Fossils, Nature, v. 223, p. 1076, 1969.

860. Bartlett, G.A., Queen's Univ.:
Ecology and paleoecology of benthonic microorganisms, 1962-.
An environmental analysis of shallow water environments in the tropic, subtropic, temperate and boreal environments. Information provides a comprehensive assessment of both lateral and temporal microfaunal distributions. "Factor-vector" and "analysis of variance" computer programs are an integrate part of this program.
Ecostratigraphy and biostratigraphy of waters and sediments adjoining the Mid-Atlantic Ridge, 1966-.
Microfaunal analyses, test microstructure, coiling directions, and fauna-watermass relationships are being investigated to interpret the paleoclimatology and paleo-oceanography of the North Atlantic.

861. Bartlett, G.A., Stevenson, Sandra, Queen's University:
Ultramicrostructure of microorganisms, 1967-.
The interpretation of the detailed ultramicrostructure of microorganisms utilizing scanning electron microscopes and microprobe analyzers. The relationship of morphology to specific, generic, familial and environmental associations. See Planktonic Foraminifera - new Dimensions with the Scanning Electron Microscope, Can. Jour. Earth Science, 1968.

862. Mamet, Bernard, Université de Montréal:
Zonation biostratigraphique du Carbonifère par Foraminifères, 1965-.

863. Conroy, Nels, Kramer, J.R., McMaster Univ.:
Biological production and geological setting, 1969-71; M.Sc. thesis (Conroy).

864. Greiner, H.R., Univ. of New Brunswick:
Biocoenose to thanatocoenose on a tropical coral reef, 1967-70.

865. Greiner, H.R., Yoon, T.N., Univ. of New Brunswick:
Facies, paleoecology and faunal zonation of the Cambrian of the Atlantic Provinces, 1967-70; M.Sc. thesis (Yoon).

866. Hooper, K., Carleton Univ.:
Holocene microfaunas of the Eastern Canadian Shelf, 1960-70.
See Modern benthonic foraminiferal depth assemblages of the Eastern Canadian Continental Shelf, A.O.L. Bedford Institute Report, 1969.
Microfossils of the Precambrian, 1968-.
Microfaunas of the Canadian Atlantic Continental Margin, 1970-.

867. Hofmann, H.J., Univ. of Montreal:
Precambrian paleontology, 1966-.
See Precambrian (Aphebian) microfossils from Belcher Islands, Hudson Bay. Can. J. Earth Sci., v. 6 no. 5 p. 1137-1144.

868. Karrow, P.F., Anderson, T., Univ. of Waterloo:
Flora, fauna, and age of Lake Algonquin deposits near Kincardine and Alliston, Ontario, 1964-70.

A study of diatoms, pollen, plant macrofossils, molluscs, and ostracods and radiocarbon dating of Lake Algonquim sediments and associated bogs near Alliston and Kincardine, Ontario.

869. Nelville, R.S.W., Memorial Univ. of Newfoundland:
Reconnaissance study of HF-resistant microfossils in the sedimentary formations of Newfoundland.
A large number of promising samples have been collected from numerous sedimentary, and some low grade metamorphic, formations in the Western, Central and Eastern structural belts of the island of Newfoundland. They will be subjected to HF and other chemical treatment and a preliminary identification of the microfossils identified by these methods (acritarchs, chitinozoa, scolecodonts, spores, etc.) will be attempted.

870. Noble, J.P.A., Univ. of New Brunswick:
Lower and Middle Devonian Faunas: Controlling factors in their evolution and distribution, 1967-72.
An attempt to construct a dynamic model showing the controlling factors in the space-time distribution of population, communities and other ecologic units; and the relationship between these units and their taxonomic components.

871. Norford, B.S., Geol. Surv. of Canada:
Faunal study of Late Ordovician and Silurian rocks of southeast British Columbia and adjacent Alberta, 1960-.
See Ordovician and Silurian stratigraphy of the southern Rocky Mountains, Geol. Survey Canada, Bull. 176.

872. Scrivastava, P.N., Stearn, C.W., McGill Univ.:
Paleoecology and sedimentary petrography of the megabreccia bed on the south flank of the Ancient Wall carbonate Complex, Alberta, 1968-69; M.Sc. thesis (Scrivastava).

## PETROLOGY AND PETROGRAPHY

### British Columbia

873. Eastwood, G.E.P., British Columbia Dept. of Mines and Petroleum Resources:
Granite Mountain stock. Cariboo District, British Columbia, 1969.
A petrographic and structural study of the stock was made in relation to widespread low-grade Cu-Mo mineralization.

874. Froese, E., Geol. Surv. Canada:
Pelitic gneisses and migmatites from the Thor-Odin gneiss dome, British Columbia, 1965-69.
This study deals with gneisses and migmatites characterized by the mineral assemblage quartz + plagioclase + K-feldspar + biotite + garnet + sillimanite. Phase

equilibria among these silicates are used to deduce the quench conditions of metamorphism. See Geol. Surv. Can., Paper 66-2, p. 46-48, 1966.

875. Ghent, E.D., Univ. of Calgary:
Petrology and geochemistry of metamorphic rocks in eastern British Columbia, 1968-.

876. McMillan, W.J., B.C. Dept. of Mines and Petroleum Resources:
West flank, Frenchman's Cap gneiss dome, Shuswap Terrane, British Columbia, 1965-69; Ph.D. thesis.
The history of deformation in the core gneisses and mantling matasedimentary rocks were studied and compared. Variations in metamorphic grade and the origin of concordant feldspathoidal gneisses and carbonatites in the metasedimentary rocks were studied. See West Flank, Frenchman's Cap Gneiss Dome, near Revelstoke, British Columbia, in Geol. Assoc. Can. Special v. 6, (in press).
Guichon Creek batholith, British Columbia, 1969-71.
It is proposed to map the Guichon batholith at scale one inch to 1000 feet. Emphasis will be placed on the structural history of the batholith and the relationships between ore deposits and structural features.

877. Morton, Ron, McGill Univ.:
Hydrothermal rock alteration studies near Princeton, British Columbia, 1968-70; M.Sc. thesis.

878. Wanless, R.K., Souther, J.G., Stevens, R.D., Geol. Surv. of Canada:
The development of K/Ar dating techniques and their applications to very young continental basalts from British Columbia, 1969-.
To precisely establish the chronological order of stratigraphically controlled samples of the Mt. Edziza lava pile, British Columbia.

## Manitoba

879. Bailes, A.H., Manitoba Mines Branch:
Petrology and structure of high grade gneisses north of Snow Lake, Manitoba, 1968-72; Ph.D. thesis.
See Manitoba Mines Branch preliminary maps 1969 B-1, 2 and 3 and Summary of Field Work, 1969.

880. Church, B.N., Univ. of Manitoba:
Petrology of the Rice Lake volcanic rocks in the Wanipigow area, Manitoba, 1968-69.
The composition of the Rice Lake volcanic rocks in the Wanipogow area shows a distinct trimodal division; dacite, basalt, and basaltic andesite. This frequency distribution appears to be the result of partial melting of silicic crustal and gabbroic subcrustal rocks. Basaltic magma rising through the continental crust is partially blocked by high level dacitic magma. Limited mixing of basaltic and dacitic liquids accounts for the presence of basaltic andesite.

881. Scoates, R.F.J., Manitoba Mines Branch:
Ultramafic rocks of Manitoba, 1969-71.
A general survey and classification (petrographic, chemical) of ultramafic rocks of Manitoba with emphasis on their economic potential. See Manitoba Mines Branch, Prel. map 1969-A.

## New Brunswick

882. Davies, J.J., New Brunswick Dept. of Natural Resources:
Geology and geochemistry of the volcanic rocks of the Tetagouche Group, New Brunswick, 1964-70.

883. McAllister, A.L., de Carle, A.L., Univ. of New Brunswick:
Rocks of the Mascarene Group, Charlotte County, New Brunswick, 1964-70; M.Sc. thesis (de Carle).

884. McAllister, A.L., Pajari, G.E., Soong, K., Univ. of New Brunswick:
Petrochemistry of Carboniferous volcanic rocks, New Brunswick, 1968-; M.Sc. thesis (Soong).
See Carboniferous volcanic and sedimentary rocks of the Mount Pleasant Area, New Brunswick, Mineral Resources Branch, Dept. of Natural Resources, New Brunswick, *Report of Investigation No. 3, 1967.*

885. Pajari, G.E., Trembath, L.T., Fyffe, L.R., Univ. of New Brunswick:
The St. George calc-alkaline complex, 1966-69; M.Sc. thesis (Fyffe).

## Newfoundland and Labrador

886. Clark, A.M.S., Kennedy, M.J., Memorial Univ. of Newfoundland:
Structural and petrologic investigations between Makkovik Bay and Kaipokok Bay, Labrador, 1969-; M.Sc. thesis (Clark).
Work on the Aillik Series has revealed a complex structural history involving at least three phases of intense deformation accompanied by amphibolite facies metamorphism.

887. Emslie, R.L., Wynne-Edwards, H.R., Wares, R., Queen's Univ.:
Mineralogical variation in part of the Michikamaw anorthosite mass, Labrador, 1966-70; M.Sc. thesis (Wares).
A study of variations in olivine and plagioclase using the electron microprobe, and hence of the cryptic layering in the Michikamaw anorthosite mass.

888. Neale, E.R.W., Memorial Univ. of Newfoundland:
Relationship of King's Point - Mic Mac Lake prophyry body to Silurian (?) lavas of Western Notre Dame Bay, 1969-71.
A study of the petrology and structural history of the porphyry, associated granitic rocks and its related "rafts" to silicic volcanic rocks and a comparison with the silicic lavas of the Springdale, Mic Mac and Cape

St. John Groups. See Relationship of the Fleur de Lys Group to Lower Paleozoic Rocks of Burlington Peninsula, Newfoundland; Geol. Assoc. Canada, Spec. Paper IV, p. 139-169, 1967.

889. Sayeed, U.A., Neale, E.R.W., Memorial Univ. of Newfoundland:
Petrology and structural setting of the Colchester Granodiorite intrusions, Southwest Arm, Green Bay, Newfoundland, 1969-70; M.Sc. thesis (Sayeed).
The Colchester intrusions have previously been grouped with the Burlington granodiorite. As the Ordovician (?) Baie Verte Group reputedly contains pebbles of the Burlington granodiorite, there is reason to suspect that the Colchester granodiorite may be older than the surrounding Ordovician Lush's Bight group. The 1969 field shows that the Colchester granodiorite intrudes the Lush's Bight rocks. It also shows that the Colchester granodiorite occurs as two separate bodies, one of which grades outward from granodiorite in the core to mafic diorite at the margins. Burlington granodiorite and quartz monzonite appear to be intrusive into the granodiorite-diorite complex. The regional implications are being investigated.

890. Singh, A.K., Univ. of Ottawa:
Agpaites near Seal Lake, Labrador, 1969-71; Ph.D. thesis.
The mineralogy, geochemistry and genesis of the Joan Lake and Redwine plutons.

891. Sutton, I.S., Memorial Univ. of Newfoundland:
Structural and metamorphic investigations of the southern part of the Nain Province, Labrador, 1969-.
Investigation will lay particular emphasis on the problem of recognition and the significance of basement reactivation in orogenic belts.

## Northwest Territories

892. Baragar, W.R.A., Geol. Surv. Canada:
Studies in the Seal Lake volcanic province, Northwest Territories, 1968-.
An investigation of the nature and type of volcanism that characterizes each of the Seal Lake, Croteau, and Letitia Groups, to determine the volcanic history of each in relation to the history of the groups; and to determine, if possible, the relationship of the volcanism to the associated mineral deposits. This is part of a large investigation of volcanic rocks of the Canadian Shield that to date includes studies of the Yellowknife, Noranda, Coppermine, and Kaladar (Grenville) volcanic assemblages. See Volcanic studies in the Seal Lake area, Labrador; Geol. Surv. Can., Paper 69-1, 1969.
Studies of Copper River volcanic rocks, Northwest Territories, 1966-72.
Investigations to date show an interesting variation in the composition and petrography of the flows from the base to the top of the main lava division (about 10,000

feet). Silica, magnesia, and potash decrease whereas iron, manganese, and, less consistently, titania all increase upward in the sequence. Similarly copper, vanadium, scandium, and zinc generally increase and nickel and chronium decrease upwards. The quantity of devitrified glass in the lavas also decreases upward in the succession. Mapping of the two sheets (86-O, 86-N) containing most of the flows was completed in 1969 and further studies of the lavas are planned.

893. Clarke, D.B., O'Nions, R.K., Univ. of Alberta:
Isotopic investigation of Tertiary basalts from Baffin Bay, Northwest Territory, 1969-70.

894. Choudari, K., Univ. of Ottawa:
Petrology of metamorphic rocks near Yellowknife, Northwest Territories, 1969-71; Ph.D. thesis.

895. Davidson, A., Geol. Surv. of Canada:
Granite studies in the Ennadai-Rankin Inlet Region, Northwest Territories, 1966-71.
See Geol. Surv. Canada, Paper 70-1, Pt. A, 1970.

896. Reinhardt, E.W., Geol. Surv. Canada:
Petrological and structural study of the McDonald fault system, Great Slave Lake, Northwest Territories, 1965-69.
A study of the paragenetic and structural history of metamorphic, migmatitic, and mylonitic gneisses along the boundary of the Slave and Churchill Structural Province in the vicinity of Great Slave Lake. See Geology of Precambrian Rocks of Thubun Lakes map-area in relationship to the McDonald fault system; Geol. Surv. Canada, Paper 69-2.

## Nova Scotia

897. Amos, J., Acadia Univ.:
Fabric and crystallization of a thick sheet of Triassic basalt, near Port Lorne, Nova Scotia, 1967-70; M.Sc. thesis.
A detailed study of the fabric and style of crystallization within a single, thick basalt sheet, as related to other petrographic and structural data.

898. Tsai, Ching-Lang, Acadia Univ.:
Petrography and structure of vent structures in Triassic basalt, Digby Neck and Long Island, Fundy Coast, Nova Scotia, 1969-70; M.Sc. thesis.

899. Colwell, J.A., Acadia Univ.:
Petrology and geochemistry of Triassic basalt, Nova Scotia, 1969-71.
The objective is to determine the mineral and chemical variation within and between the flows of the North Mountain basalt with particular attention to copper occurrences in particular flows.

900. Rao, I.R., Acadia Univ.:
Petrography and origin of volcanics in the White Rock formation of Tornbrook,Nictuax area, Nova Scotia, 1969-70; M.Sc. thesis.
Stratigraphic relations of volcanism,petrogenesis and the petrochemistry of pyroclastics.

901. Sinha, R.P., Dalhousie Univ.:
Volcanic rocks of North Mountains, Nova Scotia, 1966-70; Ph.D. thesis.
See Petrology of Volcanic rocks of North Mountain, Nova Scotia, Canad. Mineralogist, v. 10, 1969, p. 146-147 (abstract).

902. Stevens, G.R., Acadia Univ.:
Flow directions, microstructures, and fabric of Triassic basalts, Bay of Fundy, Nova Scotia, 1967-70.
The field part of study is virtually complete; laboratory studies are continuing (microscopic and X-ray). Intent of project is to define and better understand emplacement of Triassic basalts, Nova Scotia.

903. Wightman, J., Acadia Univ.:
Fabric and paragenesis of silica veins in Triassic basalts, Digby Neck, Fundy Shore, Nova Scotia, 1968-70; M.Sc. thesis.

## Ontario

904. Annells, R.N., Geol. Surv. of Canada:
Petrology of Keweenawan volcanics of Michipicoten Island and the Sault Ste. Marie Area, Ontario, 1969-.
See Geol. Surv. Canada, Paper 70-1A, 1970.

905. Appleyard, E.C., Univ. of Waterloo:
Mineralogy, petrology and geochemistry of nepheline gneisses of the Wolfe Belt, Ontario, 1958-70.
See nepheline gneisses of the Wolfe Belt, Lyndoch township Ontario. Pt. II. Textures and Mineral Paragenesis. Can. Jour. Earth Sciences, v. 6, 1969, no. 4, p. 689-717.

906. Appleyard, E.C., Univ. of Waterloo:
Syn-orogenic alkaline rocks of eastern Ontario; their petrography, mineralogy, geochemistry, structural setting, age and genesis, and their relation to the Grenville orogeny in time and space, 1966-.

907. Ayres, L.D., Ont. Dept. of Mines:
Gamitagama Lake Complex, Ontario, 1961-72.
A petrographic and geochemical study of a differentiated calc-alkaline stock. See Ontario Dept. Mines, Geol. Rept. 69, p. 26-35, 1969.
Early Precambrian volcanism and sedimentation, Lake Superior Provincial Park, Ontario, 1961-70.
A stratigraphic, sedimentologic, and geochemical study. See Early Precambrian metasandstone from Lake Superior Park,

Ontario, Canada, and implications for the origin of the Superior Province; Geol. Soc. Am., Program with abstracts for 1969, pt. 7, p. 5.

908. Breaks, F.W., Shaw, D.M., McMaster Univ.:
Origin of the Silent Lake granite, Ontario, 1968-; M.Sc. thesis (Breaks).
Study of a granite containing abundant sillimanitic nodules.

909. Card, K.D., Ontario Dept. of Mines:
Nipissing diabases of the Gowganda-Sudbury area, Ontario.

910. Fabbri, A., Univ. of Ottawa:
Structure and fabric of some gneisses of the Muskoka Region, Ontario, 1968-71; Ph.D. thesis.

911. Griep, J.L., Shaw, D.M., McMaster Univ.:
Tallan Lake-Duck Lake metagabbro complex, Ontario, 1968-; M.Sc. thesis (Griep).
A geochemical-petrological study of a possible inverted stratiform differentiated sheet.

912. James, R.S., Univ. of Toronto:
Geochemistry of the cordierite-anthophyllite rocks at Manitouwadge, Ontario, 1969-.
Detailed petrography and microprobe analyses of samples of the individual phases are planned.

913. Jennings, D.S., Shaw, D.M., McMaster Univ.:
Stratigraphy and metamorphic history of the Hermon Formation, Southeastern Ontario, 1964-69; Ph.D. thesis (Jennings).
A study of mineral equilibria, metamorphic history and original rock composition in a well-defined belt of Grenville metasedimentary and metavolcanic rocks.

914. Naldrett, A.J., Bray, J.G., Gasparrini, E., Rucklidge, J.C., Podolsky, T., Univ. of Toronto:
Detailed petrographic and electron-probe studies are being made of samples from 4 traverses across the Nickel Irruptive in order to determine whether cryptic variation is present in the body and hence throw light on the nature of this intrusion.

915. Pacesova, M., Shaw, D.M., McMaster Univ.:
Thallium-rubidium-potassium partition in some intrusive contact zones in Southeastern Ontario, 1968-; M.Sc. thesis (Pacesova).

916. Rambaldi, E., Univ. of Ottawa:
Geochemistry of some gneisses of the Bancroft Region, Ontario, 1966-70.

917. Reeve, E.J., Anderson, G.M., Univ. of Toronto:
Geochemistry of the nepheline bearing rocks, York River District, Ontario, 1968-71; Ph.D. thesis (Reeve)

918. Shaw, D.M., McMaster Univ.:
Metamorphic history of the Apsley paragneiss, Southeastern Ontario, 1958-.
A study of the original composition of the Apsley gneiss and its geochemical response to intrusion of the Loon Lake pluton.

919. Vankateswaran, G., Edgar, A.D., Univ. of Western Ontario, Moyd, L., National Museum of Natural Sciences:
Accessory minerals in alkaline rocks of Ontario I-Corundum, 1969-71; M.Sc. thesis (Vankateswaran)

920. Wynne-Edwards, H.R., Shaw, C.M.E. (Mrs.), Queen's Univ.:
The Leo Lake Gabbro, 1961-70; M.Sc. thesis (Mrs. Shaw).
A petrographic and structural study of an annular gabbro body in the Frontenac Axis of the Grenville Province. See Gananoque map-area, Ontario, Geol. Surv. Can., Map 27-1962 with descriptive notes; 1962

921. Wynne-Edwards, H.R., Krause, J.B., Queen's Univ.:
The assemblage di-plag-iron oxide in the Frontenac Axis - a study of co-existing metamorphic minerals, 1967-70; Ph.D. thesis (Krause).
A study of a particular but common mineral assemblage at different metamorphic grades. See Westport map-area, Ontario, Geol. Surv. Canada, Mem. 346, 142 p., 1967.

922. Wynne-Edwards, H.R., Wallach, J.L., Queen's Univ.:
Structures in Guy Gneiss at Parham, Ontario, 1967-70; Ph.D. thesis (Wallach).
The structure and petrology of a grey gneiss complex near Parham is to be compared to those surrounding rocks of the Grenville Group to assess the relative ages of the two categories of rocks, and test the hypothesis that the grey gneiss represents basement. See Geology of Tichborne (East Half) Map-Area, Ontario, Geol. Surv. Can. Paper 64-56, 1965.

923. Wynne-Edwards, H.R., Hasan, Z.U., Queen's Univ.:
Metamorphic zones in the Frontenac Axis, Ontario, 1968-70.
A compilation of work to date on metamorphic assemblages in the Frontenac Axis. See The Frontenac Axis, in Guidebook, Geology of parts of Eastern Ontario and Western Quebec, Geol. Assoc. Can. p. 73-86, 1967.

## Quebec

924. Béland, René, Biron, Serge, Université Laval:
Reaction phenomena in basalts of the Manitounuk series, Hudson Bay, 1969-71; M.Sc. thesis (Biron).

925. Bonardi, M., Univ. of Ottawa:
Pegmatites in the Wakefield Lake-Dodds Lake region, Quebec, 1969-71; Ph.D. thesis.
Mineralogy, geochemistry and genesis of the three types of pegmatites (Li-Be, Ce, Y) in the region.

926. Campiglio, C., Quebec Dept. of Natural Resources:
Petrography and geochemistry of the Bourlamaque batholith, Val d'Or district, Quebec, 1969-70; Ph.D. thesis, Ecole Polytechnique.
The main purpose is to define the possibilities of mineral concentrations associated with this pluton and history of the magmatic crystallization and postmagmatic alteration, in relation to the formation of gold deposits and concentration of copper and molybdenite.

927. Currie, K.L., Geol. Surv. Canda:
Geology of the Manicouagan structure, Quebec, 1963-69.
See A preliminary report on the Manicouagan structure; Geol. Surv. Can., Paper 67-70, 1969.

928. Darling, Richard; Gélinas Léopold; Campiglio, Carlo; Darling, Richard; Guha, Jayanta; Ecole Polytechnique:
La pétrologie et la géochimie du Batholithe Bourlamaque: Développement d'une méthode de prospection, 1969-71; thèse de doctorate (Campiglio).
Le batholithe de Bourlamaque est composé d'un gabbro quartzique en partie altéré par des processus post-magmatiques. Il contient, dans quelques endroits, de sulfures (Cu, Mo) disséminés. Il y a aussi plusieurs mines d'or dans les bordures du batholithe. Le but principal de ce project sera d'étudier la pétrographie et la géochimie du batholithe, de préciser l'histoire de sa cristallisation magmatique et de son altération postmagmatique, de relier à cetter histoire la formation des gisements d'or et des concentrations de Cu, Mo. On espère que ce travail pourra donner des indications pétrographiques, minéralogiques, ou géochimiques utiles à la prospection de ces métaux.

929. Eakins, P.R., Bliss, Neil, McGill Univ.:
Significance of Mg and Ni rich olivine basalts in northwestern Quebec, 1968-71; Ph.D. thesis (Bliss).

930. Eakins, P.R., Williams, F.M.G., McGill Univ.:
A structural metamorphic and petrological study of the Naskaupi and older fold belts of the Grenville and Nain Provinces, 1966-70; Ph.D. thesis (Williams).

931. Frith, A., McGill Univ.:
Rb-Sr isotopic and petrologic study of Grenville Province rocks, along a section from Chibougamau to the Gulf of St. Lawrence, 1968-71; Ph.D. thesis.

932. Gélinas, Léopold; Darling, Richard; Hardy, Richard; Ecole Polytechnique:
La pétrologie et la géochimie des roches ultramafiques et de des gisements de nickel associés de la région de Cape Smith, Québec, 1969-71; thèse de doctorat (Hardy).
L'étude de la pétrographie et de la distribution des éléments majeurs et oligo éléments choisis dans les roches ultramafiques et des gisements associés. Le but de cette recherche est: a) d'expliquer l'histoire de la cristallisation magmatique et métamorphique de ces minerais et de ces roches et le comportement des oligo éléments lors de ces

processus et b) de trouver des indices chimiques qui seront utiles en prospection pour des gisements de Ni dans un milieu géologique semblable.

933. Gittins, J., Univ. of Toronto:
Mineralogy and petrology of the Sheffield Lake alkaline complex, Quebec, 1965-.
A study of minerals in the wöhlerite group and of other rare earth and zirconium minerals.

934. Kehlenbec, M.M., Quebec Dept. of Natural Resources and Univ. of New Brunswick:
Recrystallization and deformation textures in the Pipmuacan anorthosite, Quebec, 1968-70.

935. Larson, L.R., Clark, L.A., Webber, G.R., McGill Univ.:
Geochemical and petrographic characterization to enable stratigraphic subdivision of Noranda District rhyolites, 1969-71; M.Sc. thesis (Larson).

936. Hocq, Michel, Quebec Dept. of Natural Resources:
Geology of the Eastern Region of Reservoir Pipmuacan, 1967-1972; Ph.D. thesis, Univ. of Montreal:
A study of anorthositic and syenitic (granitic) masses based on petrography, mineralogy and structure. This "anorthosite" is differentiated and on the basis of field, mineralogie and petrologic data, and geochemistry; an attempt will be made to solve the problem of the polarity and of the stratigraphy in these anorthosites, with tectonic implications in mind.

937. Pouliot, G., Hocq, Michel, Ecole Polytechnique:
Pétrologie et tectonique des roches Grenville de la région Pipmuacan (est), 1968-71; thèse de doctorat (Hocq).
La cartographie de la partie orientale du massif anorthositique du Réservoir Pipmuacan avec sa couverture gneissique de le massif du Lac Gouin a été achevée au cours de l'été dernier. Les grands traits tectoniques ont déjà été dégagés; tandis qu'au laboratoire, 90 plagioclases de l'anorthosite ont été séparées et 35 d'entre elles montrent une variation de la teneur en forsterite de 65 à 85%; les feldspaths ont été séparés sur 110 échantillons de granite du Lac Gouin, pour analyses partielles. L'interprétation actuelle de la tectonique et de la stratigraphie de l'anorthosite sera revue en fonction des travaux de laboratoire et des implica-géochimiques tirées d'analyses partielles et totales.

938. Pouliot, G., Woussen, G., Ecole Polytechnique:
Pétrologie de pétrochimie de l'intrusion de la Montagne de Brome, Québec, 1968-71; thèse de doctorat (Woussen).
Le travail effectué sur Brome peut être schématisé ainsi: quelque 95 échantillons représentant les principaux types de roches ont été recueillis. Les données se rapport tant aux échantillons ont été emmagasinées sur des cartes perforées IBM à l'aide d'un programme Fortran prévu pur un ordinateur du type CDC 6400. (Ces données pourront être traitées ultérieurement par l'ordinateur). L'étude pétrographique de 5 des principaux types de roches a été

faite à date. Ceci afin de déterminer l'ordre de cristallisation des divers minéraux et aussi, afin de sélectionner les roches les plus propices à une analyse minéralogique et chimique détaillée.

939. Siemiatkowska, Drystyna, McGill University:
Contact metamorphism of aluminous sediments on the southern contact of the Brome intrusion, Quebec, 1969-70; M.Sc. thesis.

940. Skippen, G.B., Hoy, Trygve, Carleton Univ.:
Origin of brucite at Wakefield, Quebec, 1968-70; M.Sc. thesis (Hoy).
A study of the mineralogy and petrology of marble within a 20 square-mile area centered about Wakefield, Quebec. The development of brucite in roof pendants within the Wakefield syenite is of particular interest.

941. Valiquette, Guy, Ecole Polytechnique:
Etude des conditions de stabilité de la kaersutite dans la monzodiorite de Brome, 1968-70.
Les monzodiorites à néphéline de la colline de Brome contiennent une quantité importante de kaersutite dont nous avons fait quelques analyses préliminaires à la microsonde. Ces monzodiorites, qui affleurent sur d'autres collines montérégiennes, en particulier sur Shefford et le Mont-Royal, possèdent une composition particulière qui les rend difficiles à situer correctement dans l'axe d'évolution du magma. Nous avons entrepris d'étudier la stabilité des kaersutites naturelles dans des conditions hydrothermales à des $P_{H_2O}$ de 500, 100 et 2000 bars en utilisant la technique des tampons (buffers) pour contrôler la fugacité d'oxygène. Nous étudierons également en parallèle la stabilité de cristallisation de la roche elle-même sous des conditions de $Po_2$ contrôlée par les mêmes techniques.

942. Webb, A., McGill Univ.:
Direct measurement of oxygen fugacities in Monteregian rocks, 1969-70; M.Sc. thesis.

943. Wong, A.S., Univ. of Ottawa:
Mineralogy of marble, Gatineau Park, Quebec, 1969-70; M.Sc. thesis.
Study of dolomite-calcite-Ca, Mg silicate assemblages, their stability and the environmental conditions in their development.

944. Wynne-Edwards, H.R., Bourne, J., Queen's Univ.:
Migmatites in the Gatineau valley, Quebec, along the intracrustal-supracrustal boundary, 1969-71; Ph.D. thesis (Bourne).
See Tectonic overprinting in the Grenville province southwestern Quebec, Geol. Soc. Can. Spec. Paper 5, p. 163-182, 1969.

945. Wynne-Edwards, Kehlenbeck, M.M., Queen's Univ.:
Textures in the Pipmuacan Anorthosite, Quebec - a study of recrystallization and deformation, 1966-70; Ph.D. thesis (Kehlenbeck).

A study of the igneous and tectonic history of part of the Lac St. Jean anorthosite complex, to trace the sequence of post-crystalline deformation.

## Yukon Territory

946. Findlay, D.C., Geol. Surv. of Canada:
Study of ultramafic and related rocks, Yukon Territory, 1967-70.
The project is designed to collect sufficient field and laboratory data to allow petrologic and chemical classification of Yukon ultramafic rocks, with particular emphasis on their associated mineral deposits. See Geol. Surv. Canada, Paper 68-68, p. 18-19, 1968.

## General

947. Appleyard, E.C., Univ. of Waterloo:
Alkaline rocks of syn-orogenic origin in west Finnmark, Norway, 1963-.
See The genesis of syn-orogenic alkaline rocks, Geol. Assoc. Can. Annual Meeting, Montreal, 1969.

948. Aumento, F., Geol. Surv. of Canada:
Study of serpentine group minerals, 1966-69:
See Serpentine mineralogy of ultramafic intrusions in Canada and on the Mid-Atlantic Ridge, Geol. Surv. Canada, Paper 69-53, 1969.

949. Baadsgaard, H., Univ. of Alberta:
Thermally-induced migration of Rb and Sr, 1964-.
The research is beginning to give some information on the mechanism and nature of certain metamorphic reactions.

950. Beswick, A.E., Laurentian Univ.:
Transition metal distributions between olivines, pyroxenes, spinels, 1968-72.
The aim is to obtain transition metal partition coefficients over a range of temperatures and pressure. The results will be applied to the Sudbury Nickel Irruptive in order to elucidate genetic history of these rocks and their associated ores.
Alkali metal distributions between sanidine, leucite, phlogopite and granitic glass, 1965-70.
The aim is to allow quantitative evaluation of alkali metal distributions during late stages of magmatic evolution.

951. Burwash, R.A., Krupicka, J., Univ. of Alberta:
Correlation of petrologic, geochemical and geophysical data for the subsurface Precambrian of Western Canada.
See Cratonic reactivation in the Precambrian Basement of Western Canada, Part 1: Deformation and Chemistry, Can. Jour. Earth Sci., v. 6, no. 6, 1969.

952. Caner, B., Victoria Magnetic Observatory, Dominion Observatories:
Petrological interpretation of electrical conductivity structure in Western Canada, 1967-70.
The electrical conductivity structures derived for the lower crust and upper mantle in Western Canada are being interpreted in terms of composition, temperature and degree of hydration. Preliminary results were presented at Upper Mantle Symposium, IUGG Assembly, Madrid, 1969. Further results will be published in J. Geomag. Geoelectr., 1970.

953. Clark, A.H., Queen's Univ.: McNutt, R.H., McMaster Univ.:
Mineralogy, chemistry, and stable isotope distribution of Jurassic-Pleistocene andesitic and rhyolitic volcanics, Copiapo region, northern Chile, 1969-72.
Representative, radiometrically-dated specimens of andesitic and rhyolitic lavas and pyroclastics are under study, in an attempt to clarify the evolution of these dominant magma types during the orogenic and post-orogenic stages of the Andean mobile belt. In part, this work is directed towards the distinction of mineralized and barren extrusive units.

954. Clarke, D.B., Dalhousie Univ.:
Pacific Coast spilites, Baffin Bay basalts and experimental problems in igneous petrology, 1964-.
See The basalts of Svartenhuk peninsula, Progress Report; Greenland Geological Survey (G.G.U.) Report 15, p. 15-17, 1967.

955. Clifford, P.M., Cuddy, R.G., Smith, D., McMaster Univ.:
Evolution of Archean volcanic belts, 1963; Ph.D. thesis (Cuddy), M.Sc. thesis (Smith).
See Geology of the West Lake St. Joseph area Ontario, Ont. Dept. Mines Geol. Report 70, 1969.

956. Clifford, P.M., Smith, D., McMaster Univ.:
Archean physical volcanology, 1966-; M.Sc. thesis (Smith).

957. Currie, K.L., Geol. Surv. of Canada:
Alkaline rocks in Canada, 1968-73.
The objective is to compile an annotated list of alkaline rock occurrences in Canada, to establish the petrographic types of alkaline rocks, to map type bodies in detail, and to conduct petrologic experiments to investigate problems of petrology of alkaline rocks. See Carbonatite and alkaline igneous rocks in the Brent Crater, Ontario; Nature, v. 215, no. 5102, p. 125, 1967 and An hypothesis on the origin of alkaline igneous rocks suggested by the tectonic setting of the Monteregian Hills; Can. Min. (in press).

958. Dence, M.R., Robertson, P.B., Observatories Branch, Dept. of Energy, Mines & Resources:
Shock metamorphism in Canadian craters, 1962-.
Detailed studies of shock zoning at the Brent crater, Ontario by M.R. Dence, and of shock deformation in alkali feldspars by P.B. Robertson have been the principal areas of investigation in 1969. A detailed scheme of shock

deformation in rocks of different lithologies is in preparation. See Contr. Dom. Obs. v. 8, no. 23 and 24, 1968.

959. Doig, Ronald, McGill Univ.:
Isotopic studies of alkaline rocks, 1966-70.
See An Alkaline rock province linking Europe and North America. Canadian Journal of Earth Sciences, v. 7, no. 1, 1970.

960. Douglas, J.A.V., Geol. Surv. Canada:
Meteorite studies, 1965-.
The investigation of the mineralogy and petrology of Canadian meteorites. See Amphibole: first occurrence in an enstate chondrite; Abstract, 31st Annual Meeting of Meteoritical Society, 1968.

961. Douglas, J.A.V., Currie, K.L., Dence, M.R., Plant, A.G., Traill, R.J., Geological Surv. of Canada:
Petrological - mineralogical investigation of some lunar samples from Apollo 11, 1969-1970.

962. Duke, M., McGill Univ.:
Experimental determination of partition coefficients of the major oxides between ferro-magnesian silicates in basaltic magmas, 1969-70.

963. Edgar, A.D., Hutchinson, R.W., Armstrong, C.W., Marshall, P., Univ. of Western Ontario:
Genesis of Li-Bearing pegmatites, 1966-71; Ph.D. thesis (Armstrong), M.Sc. thesis (Marshall).

964. Edgar, A.D., MacRae, N.D. Univ. of Western Ontario; Mottana, A., Univ. of Milan:
Geochemistry of eclogites and their minerals, 1966-71.
See the chemistry and cell parameters of omphacites and related pyroxenes, Mineral. Mag. v. 37, p. 61-74, 1969.

965. Fahrig, W.F., Geol. Surv. of Canada:
Diabase dykes of the Canadian Shield, 1961-70.
See paleomagnetic evidence for the extent of Mackenzie igneous events, Can. Jour. E. Sciences, no. 4, 1969, p. 679-688.

966. Geldselzer, Helmut, Queen's Univ.:
Volcanic cyclicity in the Pacific Northwest Late Cenozoic and tectonic implications, 1965-70; Ph.D. thesis.
Radiometric and stratigraphic data indicate recurring cycles from mafic to silicic volcanism during the Late Cenozoic in the Pacific Northwest interior. Gross compositional changes coincide with regional unconformities. This interrelationship probably reflects periodic stresses generated during underthrusting of oceanic crust below continental crust.

967. Ghent, E.D., Univ. of Calgary:
Granite rocks and associated intrusions, Lower Taylor Valley, south Victoria Land, Antarctica.
See Geology of the Mt. Falconer Pluton, lower Taylor

Valley, south Victoria Land, Antarctica: N.Z. Jour. Geol. Geophys., v. 11, p. 851-880, 1968.

968. Gittins, J., Univ. of Toronto:
Mineralogy and petrology of selected carbonatite complexes, 1966-.
Chemical petrological study with present emphasis on amphiboles, micas and carbonates of certain carbonatite complexes.

969. Goodwin, A.M., Geol. Surv. of Canada and Univ. of Toronto:
Archean greenstone belts, 1961-.
Stratigraphy, geochemistry, petrology and geochronology of Archean volcanic-rich belts of the Canadian Shield.
Volcanic studies in the Timmins-Kirkland Lake-Noranda region as part of the program of volcanic studies in Canada, 1965-69.
See Volcanic studies in the Timmins-Kirkland Lake Noranda region of Ontario and Quebec; Geol. Surv. Can., Paper 68-1, Pt. A., p. 135-137, 1968.

970. Grieve, R.A.F., Sampson, G.A., Bird, G., Fawcett, J.J., Univ. of Toronto:
Mineralogical reactions in the greenschist facies, 1967-; Ph.D. theses (Grieve, Sampson, Bird).
Includes experimental studies on chloritoid stability and on the muscovite-chlorite assemblage respectively and a field and chemical study based in the Hastings basin of southern Ontario.

971. Gunn, B.M., Université de Montréal:
Geochemistry of Subantarctic Islands, 1969-70.
Alkali basalt-hawaiite-trachyte series from Kerguelen and Crozet Id. show a unique positive correlation of Al and Ti. This has been suggested by Green and Ringwood to be the result of different pressure conditions during fusion and has not been before reported from natural rocks. This phenomena has not yet been examined in terms of mineralogy. Dredged samples from the nearby McQuarie Rise include enstatite peridotites and tholeiites, but no alkali basalts.

972. Gunn, B.M., Gast, P., Watkins, N.D., Université de Montréal:
Alkaline volcanic islands of the Atlantic, 1969-70.
This work, undertaken in conjunction with Columbia and Florida State Universities includes analysis for major and trace elements, rare earths, and Pb and Sr/Rb isotope ratios as part of a study on the evolution of volcanic rocks removed from the mid-Atlantic Rise. Many of the samples have also been K/Ar dated. A computer data file is being built up of all existing published analyses.

973. Hill, Robin; Roeder, Peter; Queen's Univ.:
Stability of spinel in basaltic melts, 1965-69; Ph.D. thesis, (Hill).

974. Jen, L.S., Univ. of Ottawa:
Petrology of some metamorphic rocks of the Adirondacks, 1969-71; Ph.D. thesis.

975. Kretz, Ralph, Univ. of Ottawa:
Studies of pegmatite bodies and metamorphic rocks.
Study of chemical composition of muscovite and albite in a pegmatite dyke near Yellowknife. See On the spatial distribution of crystals in rocks. Lithos 2, p. 39-65, 1969.

976. Lavoie, J.S., Nicholls, I., Fawcett, J.J., Univ. of Toronto:
Petrology of basic magmas, 1968-71; M.Sc. thesis (Lavoie).
Includes study of tertiary basalts from the Kamloops areas of British Columbia and a series of melting experiments on Tertiary lavas from western North America. See Chemistry of some basaltic rock from East Greenland. (Abstract) Can. Mineral., v. 9, p. 572, 1968.

977. Maxwell, J.A., Geol. Surv. of Canada:
Study of field sampling errors, 1967-70.
The project is intended to evaluate the magnitude of the error involved when three composite samples of a selected small igneous intrusion were prepared in the field by three different geologists, using chemical analysis to determine differences in the composition of each sample. Analytical data have been obtained and it is hoped that evaluation will be completed before 31 March, 1970.

978. MacRae, N.D., Univ. of Western Ontario:
Silicate-oxide-sulfide relations in ultramafic-mafic rocks, 1965-.

979. McNutt, R.H., Mummery, R., McMaster Univ.:
Petrologic studies on a contact auroeole surrounding an anorthosite, 1969-72; Ph.D. thesis (Mummery).

980. Medford, G., McGill Univ.:
Measurement of diffusion coefficients in basaltic magmas, 1969-70; M.Sc. thesis.

981. Mitchell, Roger, Univ. of Alberta:
Lead, sulphur and strontium isotopic investigation of carbonatites and kimberlites (Canada, Norway and Africa); 1966
See The isotopic composition of strontium in some African kimberlites, Trans. Amer. Geophys. Union, v. 50, p. 349, 1969 (abstract).

982. Money, P.L., Carleton Univ.:
Metasomatism of the Ballachulish "Limestone" by a phase of the Ben Nevis granite, Scotland, 1968-.

983. Morton, R.D., Univ. of Alberta:
A study of nickeliferous pyrrhotite ores from southern Norway.
Nickel ores from Vissestad, Norway exhibiting liquid immiscibility textures are being described and the various coexisting phases analysed. See Geological investigations in the Bamble sector of the Fennoscandian Shield. 1. The geology of Eastern Bamble, Norges Geol. Under., in press.

984. Morton, R.D., Smith, D.G.W., Univ. of Alberta:
The differentiation of an albite diabase sill in the Teign Valley, Devon, England, 1969-70.
The albite diabase sill shows strong gravity differentiation and contains unusual enclaves in its upper portion. The petrogenesis of the body may provide important clues as to the evolution of spilitic magmas and to the origin of quartz keratophyres. The individual mineral phases are being analyzed with the electron probe, augmenting the sparce information on the chemistry of spilite-suite minerals.

985. Naldrett, A.J., Brown, G.M., Univ. of Toronto:
Study of chemical equilibria between Fe-Mg Pyroxenes and Fe sulphides, 1967-70.
By studying tie-line relations between sulphides and pyroxenes as a function of oxygen fugacity and temperature it will be possible to establish the extent to which sulphides have equilibrated with their host rocks and hence determine whether they are magmatic or hydrothermal. See Reaction between pyrrhotite and enstatite-ferrosilite solid solutions. Ann. Rept. Director Geophysical Laboratory, Carnegie Institution of Washington, Year Book 1966, p. 427-429.

986. Naldrett, A.J., Mainwaring, P., Univ. of Toronto:
Study of relations between sulphides and silicates in a portion of the Duluth Gabbro, 1968-71; Ph.D. thesis (Mainwaring, P.).

987. O'Nions, R.K., Morton, R.D., Univ. of Alberta:
Geochronological, petrological and structural investigations in the Bamble Sector of the Fennoscandian Shield, S. Norway, 1966-73.
Present investigations have included K-Ar, Rb-Sn and U-Th-Pb dating of the Bamble sector of the Shield. Currently further whole rock Rb-Sr studies are being carried out on cataclastic and other metasedimentary rocks. An electron probe study of coronite gabbros within the region is also planned for the coming year. See Potassium argon ages from the Bamble sector of the Fennoscandian Shield in S. Norway. Norsk Geol. Tidss., 49, p. 171-190, 1969.

988. Pajari, G.E., Trembath, L.T., Pringle, G.J., Univ. of New Brunswick:
Petrochemistry and mineralogy of the Triassic volcanics in the Bay of Fundy region, 1964-70; M.Sc. thesis (Pringle).

989. Parker, Lynda, Sood, M.K., Edgar, A.D., Univ. of Western Ontario; Piotrowski, J.M., Southern Connecticut State College:
The melting relationships of ten volcanic undersaturated volcanic rocks ranging in composition from trachibasanite→plagioclase phonolite→phonolite have been investigated at 1 atm. pressure. Presently research is being conducted on these rocks under hydrothermal conditions. Also the pyroxene phases obtained experimentally are being studied by electron probe to observe compositional changes in the pyroxenes with decreasing temperature of

crystallization. See Melting relations of undersaturated alkaline rocks from Ilmansiaq and Gromedal Ika,Greenland under controlled water vapor and oxygen pressures, Medd om Gron Bd. 181, Nr. 12, 40 p., 1970.

990. Philpotts, A.R., McGill Univ.:
Experimental investigation of liquid immiscibility in alkaline magmas, 1967-.
See Liquid immiscibility between Syenitic and Gabbroic Magmas, Program geol. Soc. of Amer. Annual Meeting, 1969, abstract.

991. Pouliot, G., Valiquette, G., Coulomb, J.J., Ecole Polytechnique:
Mineralogy and paragenesis of feldspars in some economically important granites, 1968-70; M.Sc. thesis (Coulomb).
Tertiary granitic rocks with which are associated major Mo deposits have been collected from B.C., Montana, Colorado and New Mexico. Several sub-projects will originate from this broader project. The research involves principally the systematic mineralogical and chemical study of each of these occurrences, in trying to determine similarities and/or differences in their origin.

992. Reinhardt, E.W., Geol. Surv. of Canada; Skippen, G., Carleton Univ.:
Petrochemical study of selected Grenville granulites, 1969-71.
To accurately define the equilibrium conditions of granulite facies metamorphism for selected localities in the Grenville Province of the Precambrian Shield.

993. Roeder, Peter, Queen's Univ.:
The distribution of magnesium and iron between olivine and basaltic liquid, 1966-70.

994. Schafer, C.T., Irving, T., Marlowe, J.I., Bedford Institute, Nova Scotia:
Geology of mid-Atlantic Ridge mountain tops, 1969-.
Study involves paleomagnetic, paleontologic, petrologic, and stratigraphic analysis of rock cores collected on the crest of the mid-Atlantic Ridge near 45° north.

995. Schwerdtner, W.M., Waddington, D., Univ. of Toronto:
Mineral lineation and schistosity in metamorphic rocks, 1960-.
Correlation of directions and degree of preferred mineral orientation with (deduced) parameters of strain. Regional strain analysis.

996. Shaw, D.M., Jordan, D., McMaster Univ.:
Graphical and statistical methods for compositional discrimination of similar rock types.
The value of conventional graphical methods in petrology and trace element geochemistry is being tested using all available high quality data, recorded in a form for computer handling.

997. Smith, D.G.W., Morton, R.D., Fritz, P., Ohnoto, H., Clarke, D.B. Univ. of Alberta:
A geochemical and mineralogical investmation of spilites, 1969-.
A new attempt to elucidate the genesis of these enigmatic rocks which will combine stable isotope (deuterium, oxygen and carbon) and electron microprobe studies with classical petrochemistry and petrography. Initial work will be mainly on specimens collected from the Canadian West Coast and the Olympic Peninsula of the U.S.A.

998. Smith, F.G., Univ. of Toronto:
Grain growth in metamorphic rocks, 1964-72.
The literature on recrystallization and grain growth is being searched, and data on metallic systems are being put into computer-accessible form for retrieval and analysis relative to solid-state processes in multicomponent silicate, oxide, and sulphide systems.

999. Sood, M.K., Platt, R.G., Pearce, T.H., Edgar, A.D., Univ. of Western Ontario:
Phase relations in portions of the system $CaMgSi_2O_6$-$Mg_2SiO_4$-$NaAlSiO_4$-$KAlSiO_4$-$SiO_2$, 1968-71.
See Phase relations in portions of the system Diopside-Nepheline-Kalsilite-Silica and their importance in the genesis of alkaline rocks. Canad. Mineral. (in press).

1000. Tanner, J.G., Observatories Branch, Dept. of Energy, Mines & Resources:
A gravity study of anorthositic gabbro intrusions in the eastern Grenville, 1967-.
One of the major difficulties is the lack of regional geological information in the vicinity of these basic intrusions. Detailed geological mapping is a time consuming task because these intrusions may be as much as 100 km in diameter. Preliminary interpretation of the gravity data indicates that these intrusions have maximum thicknesses in the order of tens of kilometres.

1001. Valiquette, Guy; Pouliot, Gaston; Ecole Polytechnique:
Pétrologie des granites à molybène, 1969-72.
Les séparations minéralogiques sont faites sur plus de 200 échantillons de granites à molybdène de plusieurs localités de l'ouest américain et canadien. Nous nous proposons de faire une étude minéralogique et pétrologique comparative des différents intrusifs comprenant: l'analyse modale pétrographique, la composition et l'état structural des feldspaths, l'analyse chimique and les étapes de la cristallisation. La même étude sera faite sur les porphyres qui accompagnent les granites à molybdène de Ste-Cécile dans les Cantons de l'Est, province de Québec.

1002. Watkinson, D.H., Univ. of Toronto:
Experimental studies and the petrology and mineralization in alkalic rock - carbonatite complexes, 1967-73.
Studies have been carried out and the results are in press on experimental investigations in the joins $NaAlSiO_4$-$CaC_3$-$H_2O$ and $CaO$-$Nb_2O_5$-$CO_2$-$H_2O$ at 1 kbar pressure, and the implications for the genesis and niobium mineralization of carbonatites. See Phase equilibrium studies bearing

on the limestone-assimilation hypothesis. Bull. Geol. Soc. America, v. 80, p. 1565-1576, 1969.

Petrology and experimental study of partial melting of marbles, 1968-71.

A field study has been carried out on the nature of marble in the Haliburton area with special emphasis on the occurrence of coarse-grained, pegmatitic-looking marbles. Melting experiments have been started on natural marble in the presence of water at high pressure and these data plus the field relations suggest that partial melting of marble is possible under high grade metamorphic conditions.

1003. Winkler, H.C., Wynne-Edwards, H.R., Pirie, J., Queen's Univ.:
Anatexis in a grey gneiss, 1967-70; Ph.D. thesis (Pirie).

A detailed study of a single outcrop to determine the nature of the granitic (mobilisate) fraction in a quartzo-feldspathic gneiss, using mineralogical and chemical analyses, electronprobe studies, and experimental work.

1004. Wynne-Edwards, H.R., Westoll, N.D.S., Queen's Univ.:
Anorthosites and calc-alkaline plutonism, 1968-70.

## QUATERNARY GEOLOGY AND GROUNDWATER

### Alberta

1005. Bayrock, L.A., Research Council of Alberta:
Surficial geology of the Edmonton area, N.T.S. Sheet 83H, Alberta, 1958-70.

Mapping and map compilation, most of which is completed, has been done to a scale of 1:50,000. Extensive drilling and sampling has been performed in the area northeast of Edmonton in order to delineate the location and character of the preglacial and interglacial river systems buried under glacial deposits. In this connection, geophysical surveys have been conducted by the Geological Survey of Canada, on holes drilled by the Research Council. The results to date indicate the presence of deep valleys filled with gravel and sand and covered by till, which may prove to be good aquifers. A final report on the area together with a map on a scale of 1:250,000 will be completed by spring, 1970.

Surficial geology of Bitumount and Ft. Chipewyan areas, N.T.S. Sheets 74E,L, Alberta, 1969-.

In 1969, a helicopter survey of surficial deposits of the eastern portions of the areas was completed. The area has been glaciated by continental glaciers which advanced from the northeast or from the Canadian Shield and Athabasca Sandstone areas. Consequently, most of the surficial deposits are composed of sand and gravel, normal till being rare. Impressive end moraines in the form of kame moraines form belts across the area. Following the recession most of the outwash sand deposits have been subjected to severe aeolian action with production of very large sand dunes. At present active dunes are limited, and muskeg occupies most low areas.

1006. Bayrock, L.A., Berg, T.E. Research Council of Alberta:
Glacial deposits of the City of Edmonton and vicinity, Alberta, 1965-.
See Res. Council Report 66-1.
Sedimentation of glacial lakes, 1968-.
Two papers were presented at the 1969 INQUA congress on glacio-lacustrine sedimentation in front of advancing glaciers, Alberta, Canada, and till-like glacio-lacustrine deposits of Alberta, Canada.

1007. Berg, T.E., Research Council of Alberta:
Periglacial phenomena in Alberta, 1965-.
Automatic recording of ground temperatures will begin at Plateau Mt. (Elev. 8200), Alberta in 1969. See Res. Scienc. Alberta, Paper 398.
Surficial geology of the Medicine Hat area, N.T.S. Sheet 72L, Alberta, 1965-69.
Surficial geology of the Oyen area, N.T.S. Sheet 72M, Alberta, 1968-.
Twenty-two holes were drilled in the contorted bedrock of the Mud Buttes in the northeast part of the sheet. Preliminary results indicate that the source of the contorted bedrock was in a depression immediately to the east of the Mud Buttes.

1008. Bik, M.J.J., Geol. Surv. of Canada:
Geomorphology of Cypress Hills and adjoining parts of southern Alberta, 1965-71.
Reconstruction of gradients of meltwater channel terraces indicates that crustal movements other than isostatic rebound occurred in southern Alberta since deglaciation; surface information on such movements is being compared with structural data derived from oil and gas wells. See Geol. Surv. Can., Paper 69-1, Pt. A, p. 59-60, 1969 and The origin and age of the prairie mounds of southern Alberta, Canada; Biul. Perygl., v. 19.

1009. Borneuf, D., Research Council of Alberta:
Alberta Hydrogeological Reconnaissance Map Series, M=1:250,000 Drumheller, N.T.S. 82P, 1966-70.

1010. Le Breton, E.G., Research Council of Alberta:
Alberta Hydrological Information Map Series, M=1:50,000; Lethbridge, N.T.S. 82H, 1969; Calgary, Kananaskis Lakes, Fernie, N.T.S. 820, J. and G., 1969-70.
Alberta Hydrogeological Reconnaissance Map Series, M=1:250,000; Red Deer, N.T.S. 83A, 1966-70.
Potential groundwater supply for town of Colinton, 1969.
Effect of water production for injection wells on farm water supplies, Hamilton Lake area, 1969.

1011. Carlson, V.A., Research Council of Alberta:
Central Data File (formerly: "CARDEX" data storage system), 1956-.
"HYDRODAT", data storage and retrieval system, 1967-.
Bedrock topography of the Drumheller area, 1966-69.
Bedrock topography of the Medicine Hap map-area, 1967-69.
Bedrock topography of the Oyen map-area, 1968-69.
Bedrock topography of Wabamun Lake map-area, 1969-70.

Extent and thickness of a buried gravel deposit in the Bassano-Wolf Lake area, 1966-69.
See A gravel and sand aquifer in the Bassano-Gem region, Alberta; Res. Council of Alberta, Report 69-4, 1969.

1012. Currie, D.V., Research Council of Alberta:
An evaluation of the groundwater budget for the Tri Creek watershed, Alberta, 1967-70.
Chevron Standard 13-1; field test of water-source well, Alberta, 1968.
Alberta Hydrogeological Information Map Series, M=1:50,000 Gleichen, N.T.S., 1969.

1013. Gabert, G.M., Research Council of Alberta:
Provincial observation-well network, 1956-.
Alberta hydrogeological information map series M=1:50,000: N.T.S. 83B; Rocky Mountain House sheet, 1968-69; N.T.S. 83H Edmonton, 1969-70.
Investigations for groundwater in the Red Deer area, central Alberta, 1965-70.

1014. Kahil, A., Toth, J., Research Council of Alberta:
Investigation of the dewatering possibilities of the tar sand's overburden near Ft. McMurray, Alberta, 1968-70.

1015. Krishtalka, Leonard, Univ. of Alberta:
Paleocene mammals from Cypress Hills, Alberta, 1969-71; M.Sc. thesis.

1016. Ozoray, G.F., Research Council of Alberta:
Alberta hydrogeological information map series M=1:50,000: N.T.S. 83G; Wabamun Lake sheet, 1968-69.

1017. Quist, L.G., Queen's Univ.:
Groundwater Resources in the Red Deer Area, Alberta, 1967-69; M.Sc. thesis.
The continuation of an industrial groundwater exploration project initiated by the Groundwater Division of the Research Council of Alberta involving test drilling to interpret groundwater movement, quantity, and quality based on topography, geology, climate, and chemistry of the groundwater.

1018. Quist, L.G., Gabert, G.M., Research Council of Alberta:
Hydrogeological investigations at Red Deer, 1968-70; M.Sc. thesis (Quist).

1019. Ramsden, John, Westgate, J.A., Univ. of Alberta:
Till fabric studies in the Edmonton area, Alberta, 1967-; M.Sc. thesis (Ramsden).
In addition to determining the movement directions of the glaciers that deposited the two tills in the area, problems studied include (1) use of pebble-axis fabrics to differentiate the tills, (2) origin and recognition of fabrics reoriented by overriding ice. Project includes development of procedures and FORTRAN IV programs for (1) producing stereographic projections of pole density, and (2) representing fabrics numerically to permit precise

comparison of fabrics. See Evidence for reorientation of a till fabric: Geol. Soc. Amer. Symposium on till, Columbus, Ohio, May, 1969 (in press).

1020. Reimchen, T., Research Council of Alberta:
Surficial geology of Rocky Mountain House area, N.T.S. Sheet 83B, Alberta, 1 inch to 1 mile, 1969-.

1021. Rutter, N.W., Geol. Surv. of Canada:
Quaternary geology, Bow River Valley, Alberta, 1967-69.
See Successful application of borehole stratigraphic techniques in an area of Mountain glacial drift; Geol. Surv. Can., Paper (in press).
Quaternary geology, Pine Pass-Jasper, British Columbia and Alberta, 1969-73.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1022. Stalker, A.M., Geol. Surv. of Canada:
Quaternary of southern Alberta, 1965-.
Project comprises stratigraphic and chronologic studies of Quaternary deposits including vertebrate paleontology under C.S. Churcher, Univ. of Toronto, archaeology studies by members of Dept. of Archaeology, Univ. of Calgary, botanical studies b. deVries, of Fort Qu'Appelle and geophysical studies by J.E. Wyder, G.S.C. See Geol. Surv. Can., Paper 69-26, 1969 and Paper 70-1, Pt. A, 1970.

1023. Steinhauer, R.A., Research Council of Alberta:
Alberta Hydrogeological Information Map Series, M=1:50,000 N.T.S. 72M; Oyen, 1968-69.

1024. Stevenson, D.R., Research Council of Alberta:
An evaluation of the groundwater budget and its significance within the hydrologic balance for the Marmot Creek Basin, Alberta, 1964-70.
An evaluation of the groundwater budget and its significance within hydrologic balance for the Deer Creek Basin, 1966-70.
An evaluation of the groundwater budget and its significance within the hydrologic balance for the Streeter Basin, Alberta, 1964-67.
An evaluation of the groundwater budget of the Cache Percotte and Whiskeyjack basins near Hinton, Alberta, 1965-70.

1025. St-Onge, D.A., Geol. Surv. of Canada:
Quaternary geology and geomorphology of Whitecourt area, Alberta, 1966-70.
See Swan Hills, Alberta (Geomorphology); Geol. Surv. Can., Map 1206A, 1969.
Quaternary geology and geomorphology of Tawatinaw area, Alberta, 1968-72.
Geological mapping of Quaternary deposits, stratigraphy and bedrock topography. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1026. Tokarsky, O., Research Council of Alberta:
Alberta Hydrogeological Map Series, M=1:250,000, Grimshaw-Cardinal Lake, N.T.S. 84C-4,5; Bison Lake, N.T.S. 84F,

1967-70; Mount Watt, N.T.S. 84K, 1967-70; Rocky Mountain House, N.T.S. 83B, 1969-70.

1027. Vanden Berg, A., Research Council of Alberta:
Groundwater hydrology and chemistry of the Waterton Lake-Cochrane Valley Aquifer-Belly River System, Alberta, 1963-70.
Includes investigation of the influence of the construction of Waterton Reservoir on the chemistry of groundwater in the immediate area; determination of the hydrologic response of the Cochrane buried valley aquifer to the construction of Waterton Reservoir, to which it is connected hydrologically; determination of the volume of water passed from Waterton Reservoir through the Cochrane valley aquifer and discharged into the Belly River valley.

1028. Westgate, J.A., Univ. of Alberta:
Quaternary stratigraphy of the Cypress Hills area, Alberta, 1961-.
See Surficial geology of the Foremost-Cypress Hills area, Alberta; Research Council of Alberta Bulletin 22, 1968.
Quaternary stratigraphy of the Edmonton area, Alberta, 1965-.
See Notes on the Quaternary geology of the Edmonton area, Alberta. Proc. Symp. on Pedology and Quaternary Research, Edmonton, in press.

1029. Westgate, J.A., Aario, R., Green, R., Matthews, J. Jr., Fritz, P., University of Alberta:
Stratigraphy and paleocology of Pleistocene-preglacial sediments in the Peace River country, Alberta, 1966-70.

1030. Zacharko, N., Research Council of Alberta:
Alberta Hydrogeological Information Map Series, M=1:50,000 N.T.S. 831; Tawatinaw, Alberta, 1969.

## British Columbia

1031. Achard, R.A., Geol. Surv. of Canada:
Landslides in southern British Columbia, 1969.
The purpose is to assess the current needs for geological investigation of past and potential landslides.
See Geol. Surv. Can., Paper 70-1, Pt. A., 1970.
Quaternary Geology, Big Bend-Canoe River areas, British Columbia, 1969-72.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1032. Danner, W.R., Univ. of British Columbia:
Pleistocene stratigraphy of Point Roberts, Washington and Point Grey, British Columbia, 1968-.
A study of the Pleistocene sediments, mostly interglacial, and their primary and secondary sedimentary structures.

1033. Heginbottom, J.A., Geol. Surv. of Canada:
Quaternary geology, Taseko Lakes, British Columbia, 1968-70.

Quaternary mapping with emphasis on less mountainous parts of area of interest for forestry and ARDA programs. See Geol. Surv. Can., Paper 70-1, Pt. A., 1970.

1034. Mathews, W.H., Univ. of British Columbia:
Snow creep, southern British Columbia, 1958-.
See Observations on pressures exerted by creeping snow, Mount Seymour, British Columbia, Canada, Physics of Snow and Ice, Proc. Int. Conf. on Low Temp. Science, 1966, Japan, p. 1185-97, 1967.

1035. Rutter, N.W., Geol. Surv. of Canada:
Quaternary geology of Peace River Reservoir area, British Columbia, 1966-69.
See Summary of preliminary work on the Quaternary geology of the Lake Williston area, B.C.; Edmonton Geol. Soc., Guidebook, 1969.
Quaternary geology, Pine Pass-Jasper, British Columbia and Alberta, 1969-73.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1036. Sly, P.G., Thomas, R.L., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Quaternary studies of Lakes Osoyoos, Skaha, Vaseux, Okanagan, Woods, and Kalamalka; Okanagan Valley, British Columbia, 1970-73.
A program to provide basic information as to the geological (recent and present) environment of the lake system.

## Manitoba

1037. Burwasser, George, Univ. of Saskatchewan:
Glacial geology of Duck Mountain area, Manitoba-Saskatchewan, 1968-70; M.A. thesis.

1038. Klassen, R.W., Geol. Surv. of Canada:
Quaternary geology and geomorphology of the Assiniboine River Valley and its tributaries, 1966-71.
Includes studies of bedrock surface topography with special reference to the buried "Missouri" Valley and its tributaries, stratigraphy, and glacial, interglacial and preglacial history.
Bedrock topography and quaternary stratigraphy, Virden, Manitoba, 1967-70.
See Bedrock topography and character of the drift in Manitoba part of the Virden map-area; Geol. Surv. Can., Paper (in press).
Quaternary geology, Duck Mountain, Manitoba-Saskatchewan, 1968-71.
Quaternary geology, Duck Mountain, Manitoba-Saskatchewan, 1968-71.
Distribution and stratigraphy of Quaternary deposits and investigation of buried bedrock topography including major buried valleys. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1039. McPherson, R.A., Westgate, J.A., Univ. of Alberta:
The effect of underlying bedrock and glacial materials on the lithology of a till sheet in southeastern Manitoba, 1969-.
The problem concerns the relative importance of the numerous factors and processes at play in determining the physical character of a till deposit. An attempt will be made to document and explain lateral (i.e. in the direction of ice movement) and vertical changes in lithology of a till bed.

1040. Wyder, J.E., Geol. Surv. of Canada:
Buried Missouri and Red River Valleys in Manitoba, 1969-71.
The project consists of using a combination of geophysical, geological, and drilling techniques to delineate and determine the drift stratigraphy of the buried Missouri and Red River valleys in southern Manitoba. See Geol. Surv. Can., Paper 70-1, Part A, 1970.

## New Brunswick

1041. Brown, D.D., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Seawater intrusion at Shippegan, Taylor Island, New Brunswick, 1967-70; Ph.D. thesis.
An investigation of intrusion due to overpumping and of the effects of geology and production rates on the subsurface distribution of fresh, brackish and salt groundwaters.

1042. Gadd, N.R., Geol. Surv. of Canada:
Quaternary geology, southwest New Brunswick, 1967-70.
The study has provided 1/50,000 maps of St. George (21 G/2) and St. Stephen (21 G/3) map-areas and field work has been completed for a 1/250,000 map of Fredericton (21G, Canadian part). In addition to providing background information for groundwater investigations by the New Brunswick Department of Natural Resources, the project is a source of information for studies in glacial dispersion, availability of construction materials, and in the fields of agriculture and forestry. See Geol. Surv. Can., Paper 70-1, Pt. A., 1970.

## Newfoundland and Labrador

1043. Brueckner, W.D., Anderson, M.M., Memorial Univ. of Newfoundland:
Geomorphic problems of Newfoundland, 1959-67.
This project is not restricted to any particular geomorphic aspect; in the near future however, emphasis will be given to studies of shoreline features related to changes of sea level, and of glacial drift and its post-glacial fate. See Post-glacial geomorphic features in Newfoundland, eastern Canada. Eclogae geol. Helvetiae, vol. 62, No. 2, 1969, 25p.

1044. Fulton, R.J., Geol. Surv. of Canada:
Quaternary geology inventory, southern Labrador, 1969-72.
A helicopter supported, ARDA sparked, surficial geology mapping project aimed at covering Labrador south of 56° Lat. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1045. Grant, D.R., Geol. Surv. of Canada:
Quaternary geology St. Anthony-Blanc Sablon, Newfoundland, 1969-70.
Although basically a survey of landforms and materials for resource development, the study produced evidence of several regionally significant Quaternary events and processes, notably that glaciers from Labrador impinged on Newfoundland leaving a till of marine derivation, and that, as in the Maritime Provinces, glaciers both retreated to and readvanced from upland areas. See Geol. Surv. Canada, Paper 70-1, Pt. A., 1970.

## Nova Scotia and Prince Edward Island

1046. Carr, P.A., van der Kamp, G., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Sea-water intrusion study in the Pennsylvanian and Permian Rocks of New Brunswick and Prince Edward Island, 1967-70.
The purpose is to establish a method of determining the hydraulic conductivity and specific storage of an aquifer which is situated close to the sea. See Determining aquifer characteristics by the tidal method. Water Resources Research, v. 5, no. 5, 1969.

1047. Grant, D.R., Geol. Surv. of Canada:
Recent coastal submergence, Nova Scotia and Prince Edward Island, 1966-71.
An investigation of submergence phenomena, shoreline forms and deposits, and shallow-water sediments to determine extent, age and rate of recent coastal submergence and its effects on coastal configuration and roads, docks, etc. See Recent coastal submergence of the Maritime Provinces, Canada; Can. J. Earth Sci. (in press).

1048. King, L.H., MacLean, Brian, Kranck, Kate, (Miss), Bedford Institute, Nova Scotia:
Regional geology of the Scotian Shelf, 1964-.
A program to map the near surface structure and stratigraphy of the bedrock underlying the entire Scotian Shelf and Bay of Fundy is being conducted utilizing continuous seismic-reflection profiles and sample data obtained through dredging operations. Profiles representing some 8,000 miles of traverse have been accumulated, and are being interpreted utilizing differences in acoustical characteristics and unconformable relationships to delineate rock units. Interpretation of the surficial geology is based upon a detailed study of echograms, examination of bottom samples, continuous seismic-reflection profiles, radiogenic ages and paleontological data. Work currently in progress will provide surficial geological coverage for the whole

of the Scotian Shelf, and Northumberland Strait and Georges Bay and Bay of Fundy.

1049. MacNeill, R.H., Acadia Univ.:
Pleistocene geology of Nova Scotia (mapping of deposits), 1951-69.

1050. MacNeill, R.H., Dalton, G.N., Rafuse, Ted, Acadia Univ.:
Till fabric analysis, 1961-71.

1051. Tang, Patrick, Acadia Univ.:
Quaternary stratigraphy of Mullach Brook Area, Cape Breton, Nova Scotia, 1969-70; M.Sc. thesis.

1052. Terasmae, J., Brock Univ.; Mott, R.J., Geol. Surv. of Canada:
Postglacial history and palynological studies of Sable Island, Nova Scotia, 1967-70.
Includes radiocarbon dating and palynological studies of buried peat and soils, pond and lagoon sediments, and a study of present pollen deposition on the island. Radiocarbon dates obtained range from about 11,000 years to 200 years B.P. The study has confirmed the presence of large exposed areas on the Scotian Shelf during the last glaciation and in early postglacial time.

1053. Vagners, U.J., Acadia Univ.:
Study of Quaternary sediments in the Maritime Provinces, 1968-.

## Northwest Territories

1054. Barnett, D.M., Geol. Surv. of Canada:
Proglacial geomorphology, Generator Lake, Baffin Island, 1965-71; Ph.D. thesis, Univ. of Western Ontario.
Model study of the proglacial lacustrine environment related landforms and deposits associated with former and present levels of Generator Lake. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1055. Bird, J.B., McGill Univ.:
The evolution of limestone landscapes in a periglacial environment, 1966-70.
A quantitative examination of postglacial changes on the limestone lowlands of Southampton Island, N.W.T.

1056. Blake, W., Jr., Geol. Surv. of Canada:
Quaternary reconnaissance, southern Ellesmere Island, Northwest Territories, 1969-.
Reconnaissance of glacial geology and geomorphology with special emphasis on chronology of Pleistocene events and determination of regional pattern of postglacial uplift. See Geol. Surv. Can., Paper 69-1, Pt. A, 1969.
Pumice on raised beaches, eastern Arctic Canada, 1968-73.
A study of the elevation, age, and origin of pumice to aid in investigation of pattern of isostatic readjustment and correlation of raised marine features in Arctic Canada and elsewhere around North Atlantic Ocean. See Studies of

glacial history in Arctic Canada, I: Pumice, Radiocarbon dates and differential postglacial uplift in the eastern Queen Elizabeth Islands; Can. J. Earth Sci. (in press).

1057. Hodgson, D.A., Geol. Surv. of Canada:
Submarine morphology off the northeast Baffin Island coast, 1967-70.
A project designed to extend knowledge of erosional and depositional landforms to areas below present sea level by continuous profiling with an echo sounder - in conjunction with Dr. O.H. Løken, Glaciology Subdivision, Inland Waters Branch.
Quaternary reconnaissance, northeastern Baffin Island, 1968-70.

1058. Hughes, O.L., Geol. Surv. of Canada:
Quaternary Reconnaissance, Northwest District of Mackenzie, Stage II, 1969-71.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1059. Kuc, M., Geol. Surv. of Canada:
Fossil mosses in the Arctic, 1969-70.
Investigations of stratigraphy, paleobotanical characteristics of fossil floras (vascular plants, bryophytes, lichens, etc.) of interglacial and postglacial deposits in the Canadian Arctic Archipelago. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1060. Levinson, A.A., Dewis, F.J., Univ. of Calgary:
Hydrogeochemistry of the Mackenzie Drainage Basin, 1969-72; thesis project (Dewis).
See Major element composition of the Mackenzie River at Norman Wells, N.W.T., Canada, Geochem. Cosmochem, Acta, 33, p. 133-138, 1969
Study of boron deduced paleosalinity in the Mackenzie Delta, 1970-72; thesis project (Dewis).

1061. Lewis, C.P., Geol. Surv. of Canada:
Geomorphology of delta lakes, Mackenzie Delta, Northwest Territories, 1967-70; Ph.D. thesis, Univ. of British Columbia.
To determine the mechanisms and stages of development involved in the division of delta lakes by reversing-flow channels. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1062. Mackay, J.R., Geol. Surv. of Canada and Univ. of British Columbia:
Geomorphic processes, Mackenzie Valley-Arctic Coast.
Multi-faceted study of geomorphic features and processes related to permafrost and to fluvial, lacustrine, coastal, eolian and mass wasting activity in a permafrost environment involving ice-shove boulder pavements, ground temperature gradients in bore-holes, wind abrasion, pingos, soil freezing pressures, heat budget studies, and glacial and postglacial history. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1063. Rampton, V., Geol. Surv. of Canada:
Quaternary Geology, Beaufort-Mackenzie, Northwest

Territories, 1969-72.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

## Ontario

1064. Ambrose, J.W., Fitzpatrick, M., Watt, W.E., Queen's Univ.:
Study of the groundwater regimen in Prince Edward County, Ontario, 1967-.
A joint research project involving the Departments of Civil Engineering and Geological Sciences. Current studies include investigation of groundwater in Pleistocene deposits, and geophysical studies designed to locate faults in Ordovician limestones.

1065. Anderson, T., Univ. of Waterloo:
Late glacial and postglacial pollen from lakes and bogs in southwestern Ontario, 1967-70; Ph.D. thesis.

1066. Berti, A.A., Univ. of Western Ontario:
Paleobotanic investigation of Mid-Wisconsin interstadial deposits in the Lake Erie and Ontario basins, 1966-70; Ph.D. thesis.
Palynologic and macrofossil studies have been done or are in progress from the following sites: Port Talbot-Plum Point area, and Scarborough Bluffs in Ontario, Garfield Heights in Ohio, Titusville, Penn.

1067. Bik, M.J.J., Geol. Surv. of Canada:
Surficial deposits and geomorphology, Central Research Forest, Ontario, 1968-70.
Includes detailed stratigraphy to a depth of 16 feet across the project area and 1/2,400 mapping of surficial deposits. The Inland Waters Branch, E.M.R., and the Forest Management Research Institute will gradually increase their contribution as the G.S.C. effort approaches completion. A detailed study of groundwater table behaviour relative to precipitation and microstratigraphy has been initiated.
See Geol. Surv. Can., Paper 69-1, Pt. A, p. 187-188, 1969.

1068. Charron, J.E., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Hydrogeological study of Russell County, Ontario, 1968-69.
The chemical aspects of the groundwater, as related to the geological and hydrological environment, to determine the direction of groundwater flow in Russell County.

1069. Coakly, J.P., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Nearshore sediment transport in the Great Lakes, Ontario, Huron and Erie, 1968-71.
A statistical study of the distribution of heavy mineral assemblages in certain nearshore areas of Lakes Ontario, Erie and Huron, to be applied to problems of sediment provenance and dispersal.

1070. Cowan, W.R., Ontario Dept. of Mines:
Pleistocene geology of the Brantford Area, 1968-69.

See Ont. Dept. Mines, Map P 516.
Pleistocene geology of the Woodstock area, Ontario, 1969-71.

1071. Dreimanis, A., Univ. of Western Ontario and Geol. Surv. of Canada:
Stratigraphy of the last ice age in the eastern Great Lakes Region, 1958-.
See Late Pleistocene lakes in the Ontario and Erie Basins. Proceedings, 12th Conference on Great Lakes Research, p. 170-180, 1969.
Surficial geology, Port Stanley map-area, Ontario, 1968-71.
See Geol. Surv. Canada, Paper 69-1, Pt. A, p. 111-112.
Wisconsin stratigraphy, north shore of Lake Erie, 1969-71.
To re-evaluate and complement existing information on age, nature and stratigraphic relationships of Wisconsin glacial and interstadial deposits. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1072. Duthie, H.C., Rani, R.G.M., Univ. of Waterloo:
Diatoms of the Toronto interglacial, 1963-70.
See Stratigraphic studies in the Toronto Pleistocene; Geol. Assoc. Can. Proc., v. 20, p. 4-16, 1969.

1073. Feenstra, B.H., Univ. of Western Ontario:
Late Wisconsin stratigraphy between the Milverton and Elmira moraines, southwestern Ontario, 1967-70; M.Sc. thesis.

1074. Haefeli, C.J., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Groundwater flow into Lake Ontario, 1968-70.
Investigations are carried out simultaneously on three different levels: (1) groundwater inlet - surface flow and its relation to soil, overburden and bedrock; (2) groundwater bearing media - hydrogeological investigations in overburden and bedrock; (3) groundwater outlet - temperature survey along the shore to verify major groundwater outlets.

1075. Harrison, J.E., Geol. Surv. of Canada:
Quaternary geology, North Bay-Mattawa, Ontario, 1968-70; Ph.D. thesis, Univ. of Syracuse.
Quaternary mapping with special emphasis on the sequence of events and environments relating to outlets of the Great Lakes. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1076. Henderson, E.P., Geol. Surv. of Canada:
Quaternary geology, Kingston, North Half, 1968-70.
Includes study of position of ice-dam shorelines of Lake Iroquois in eastern Ontario at the time of its maximum extent and the relationship of meltwater drainage to later lake levels in the Ontario basin. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1077. Hore, R.C., Fleischer, F.C., Barouch, M., Logan, L.A., Mufti, I., Fligg, E.K., Jaffray, B.R., Ontario Water Resources Commission:
Bowmanville, Soper and Wilmot Creeks IHD Representative Basin Study, 1965-74.

A study of the hydrologic characteristics in river basins representative of moraine, till and clay areas in southern Ontario; research into all aspects of water balance studies under these conditions. See Snow survey report Wilmot Creek Basin, 1966-67, OWRC Preliminary Data Report No. 67-1, 1967.

Wilton Creek IHD Representative Basin Study, 1965-74.

A study of the hydrologic characteristics in a river basin representative of limestone plain conditions in southern Ontario. Research into all aspects of water balance studies under these conditions.

Venison Creek IHD Representative Basin Study, 1965-74.

A study of the hydrologic conditions in a river basin representative of sand plain conditions in southern Ontario. Research into all aspects of water balance studies under these conditions.

East and Middle Oakville Creeks IHD Representative Basin Study, 1965-74.

A study of the hydrologic characteristics in a river basin representative of clay and clay-till plains in southern Ontario; research into all aspects of water balance studies under these conditions including geophysical surveys to study overburden characteristics.

Blue Springs Creek IHD Representative Basin Study, 1965-74.

A study of the hydrologic characteristics in a river basin representative of kame, till and bedrock conditions in southern Ontario, in cooperation with the Univ. of Guelph.

1078. Hore, R.C., Ostry, R.C., Ontario Water Resources Commission:
IHD - Internatonnal field year on the Great Lakes, 1968-72.

The study of the movement of groundwater in representative areas of the Lake Ontario drainage basin in order to assess the total groundwater contributions to the lake. Representative basins presently under study are the Wilmot Creek basin, Forty Mile Creek basin and the Moira River basin.

1079. Hui, H.T., Fernando, C.H., Karrow, P.F., Univ. of Waterloo:
Molluscs of the Toronto interglacial, 1967-70.

See Stratigraphic studies in the Toronto Pleistocene; Geol. Assoc. Can., Proc. v, 20, p. 4-16, 1969.

1080. Karrow, P.F., Univ. of Waterloo:
Pleistocene geology, Stratford Conestogo area, 1965-71

See Surficial Geology, Stratford-Conestogo area; Geol. Surv. Can. Paper 68-1A, p. 169-171, 1968.

1081. Karrow, P.F., Anderson, T., Univ. of Waterloo:
Flora, fauna, and age of Lake Algonquin deposits near Kincardine and Alliston, Ontario, 1964-70.

A study of diatoms, pollen, plant macrofossils, molluscs, and ostracods and radiocarbon dating of Lake Algonquin sediments and associated bogs near Alliston and Kincardine, Ontario.

1082. Lewis, C.F.M., Geol. Surv. of Canada:
Post-glacial uplift of Huron Basin, 1965-71.

Detailed mapping and investigation of past and present shoreline forms and deposits to assess changes in lake level and evidence of tilt of basin during past 6,000 years. The relative tilting is upwards in the north at 2.2 mm/year (Manitoulin Island relative to the outlet St. Clair River). This estimate is based on study of sediments in small, recently-emerged lake basins along the northern shore of Lake Huron. Geomorphological study of the Nipissing shoreline on Manitoulin Island is underway to detect local anomalies in the regional uplift and to isolate the responsible factors. See Late Holocene uplift of Manitoulin Island, Ontario; Can. J. Earth Sci. (in press), and Geol. Surv. Canada, Paper 70-1, Pt. A, 1970.

Post-glacial uplift of Huron Basin, Ontario, 1965-72.

Detailed mapping and investigation of past and present shoreline forms and deposits to assess changes in lake level and evidence of tilt of basin during past 6000 years.

Quaternary geology, Great Lakes, Ontario, Erie and Huron, 1968-.

Systematic investigation of unconsolidated deposits to determine Quaternary stratigraphy, history, and paleoecology, and to identify processes active in the lakes during the Quaternary.

1083. Lissey, A., Brock Univ.:
Hydrogeology of the Niagara Peninsula, 1969-72.

1084. May, R.W., Univ. of Western Ontario:
Chemical investigation of tills of southern Ontario, 1968-71; Ph.D. thesis.

The purpose is to find out the principal chemical differences between tills of various lobes in S. Ontario, and to develop rapid methods for correlation of tills, using small samples. Application to mineral exploration will be considered.

1085. McAndrews, J.H., Berti, A.A., Norris, Geof., Royal Ontario Museum:
Illustrated key to the common fossil pollen and spores of the Great Lakes region, 1968-69.

Manuscript of 100 taxa nearing completion; to be published in the Occasional Papers of the Royal Ontario Museum.

1086. McAndrews, J.H., Royal Ontario Museum, Calkin, Parker, Univ. of Buffalo:
Relation of geology to biostratigraphy of glacial Great Lakes, 1968-70.

Pollen and macrofossil analysis completed; mollusk analysis in progress, radiocarbon dates completed.

1087. McAndrews, J.H., Royal Ontario Museum, Ross, Karen, Univ. of Toronto:
Vegetation and climatic history of northwestern Ontario, 1969-71; M.Sc. thesis (Ross).

Two 8-meter cores have been collected; pollen analysis to be done. See Paleobotany of a Wild Rice lake in Minnesota, Can. J. Bot. (in press).

1088. McAndrews, J.H., Tovell, W.M., Royal Ontario Museum, Lewis, C.F.M., Geol. Surv. of Canada:
Pollen stratigraphy of Great Lakes sediment, 1968-70.
Pollen analysis has been completed on 65 surface samples from Lake Ontario; computer analysis of results is in progress. Pollen diagrams have been completed from cores taken from Georgian Bay, Lake Ontario and Lake Erie.

1089. Mellary, A.A., Ontario Water Resources Commission:
Aquifer characteristics of the overburden and bedrock in the Township of Wainfleet, Ontario, 1968-70.
The determination of the hydraulic characteristics of the sands and gravels in the lower part of the overburden and those of the Salina and Guelph rock formations with special regard to water quality and the establishment of the local and regional flow pattern.
Aquifer characteristics of the overburden and bedrock in the Township of Albion, Ontario, 1969-70.
The determination of the hydraulic characteristics of the sands and gravels in the middle and lower parts of the overburden and those of the Meaford-Dundas bedrock formation with special regard to water quality and the establishment of the local and regional flow pattern.

1090. Minning, G., Geol. Surv. of Canada:
Quaternary geology, Arnprior, Ontario, 1969-71.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1091. Mirynech, E., Brock Univ.:
Mineralogical and sedimentological analysis of the surficial deposits of the Belleville-Picton-Kingston-Tweed area, Ontario, 1960-.
Particle analysis of surficial deposits of Trenton-Campbellford-Belleville Area, Ontario, 1960-.

1092. Owen, E.B., Geol. Surv. of Canada:
Engineering geology and mapping, Welland Canal, 1962-73.
See Stratigraphy and engineering description of soils on a section of the Welland Canal By-Pass project; Geol. Surv. Can., Paper 69-31, 1969.

1093. Parsons, M.L., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Groundwater flow in the clay belt of Northern Ontario, 1966-69; Ph.D. thesis, Univ. of Michigan, 1969.
Natural groundwater flow in an eskerine sand-lacustrine clay-till complex was measured by piezometer installations and simulated by a numerical digital model. Subsurface temperatures were measured in the piezometers and temperature variations were related to differences in surface cover, thermal conductivity of strata and groundwater flow systems.

1094. Pikula, R.J., Wang, K.T., Roy, A.C., Ontario Water Resources Commission:
Water resources survey of the Winisk River basin, 1969-70.
An inventory of water resources in the drainage basin in terms of quantity, quality, and use.

1095. Poplawski, S., Karrow, P.F., Univ. of Waterloo:
Ostracods of the Toronto interglacial, 1969-70.
See Stratigraphic studies in the Toronto Pleistocene; Proc. Geol. Assoc. Can. v. 20, p. 4-16, 1969.

1096. Sibul, U., Choo-Ying, A., Ontario Water Resources Commission:
Water resources survey of the Moira River Basin, 1969-71.
An inventory of water resources in the basin in terms of quantity, quality and use.

1097. Sibul, U., Choo-Ying, A., Kendrick, G., Ontario Water Resources Commission:
Water resources survey of the Upper Nottawasaga river basin, 1968-70.
An inventory of the water resources in the drainage basin in terms of quantity, quality, and use.

1098. Sibul, U., Fleischer, F.C., Morrison, W.D., Ontario Water Resources Commission:
Water resources survey of the Big Otter Creek drainage basin, 1965-69.
The collection and interpretation of data on the occurrence, availability and quality of surface waters and groundwaters, present a hydrologic budget and prepare a detailed account of water use in the basin. See Water resources of the Big Otter Creek drainage basin, OWRG Water Resources Report 1, 1969.

1099. Skinner, R.G., Geol. Surv. of Canada:
Glacial-interglacial stratigraphy, James Bay Lowland, Ontario, 1969-71; Ph.D. thesis, Univ. of Washington.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1100. Spiers, D., Fitzpatrick, M., Queen's Univ.:
Determination of the depth to the Paleozoic-Precambrian interface in the Kingston area by resistivity surveying, 1969; M.Sc. thesis (Spiers).

1101. Terasmae, J., Brock Univ.:
Postglacial history and paleoecology in the Algonquin Park area, 1969-70.
The objectives are: (1) to determine time of deglaciation and outline postglacial history (geological) of the area; (2) to study postglacial history of vegetation and climatic changes (palynological study); (3) to study the tree-ring record (dendroclimatology) of hemlock and pine; and (4) to study environmental changes caused by human activities.
Postglacial geochronology and palynology of the Hamilton area, Ontario, 1969-70.
The objective is to establish the geochronological sequence of deglaciation and the following postglacial events. This study is a continuation of, and will be integrated with, the completed mapping of surficial deposits in the Hamilton area by P.F. Karrow and the drilling project undertaken by Terasmae and related to stratigraphy of Quaternary deposits in, and history of, the buried valley extending from Dundas to Lake Ontario.

1102. Warwick, W., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Chironomidae of Lake Ontario, 1968-.
This faunal group can be used to relate, on a very precise basis, present and past environmental conditions, trends and changes. Both as individuals and as groups they are excellent indicators of eutrophication.

1103. Yakutchik, T.J., Lammers, W., Sibul, U., Singh, B.A., Ontario Water Resources Commission:
Water resources survey of the Big Creek drainage basin, 1964-70.
An inventory of the water resources in the drainage basin in terms of quantity, quality, and use.

## Quebec

1104. Personnel professionnel du service de l'Hydrogéologie, Ministère des Richesses naturelles du Québec.
Levés hydrogéologiques ponctuels, 1969-70.
Il s'agit de quelques études ponctuelles dans les municipalités rurales aux prises avec un problème d'alimentation en eau potable.

1105. Buckley, J.T., Geol. Surv. of Canada:
Geomorphological map, Gatineau Park, Quebec, 1967-70.
To provide a map and description of landforms and surface deposits of the park area and environs on request of the National Capital Commission.

1106. Carson, M.A., Smith, P.A.W., McGill Univ.:
Hydraulic geometry of alluvial stream channels, 1968-71; Ph.D. thesis (Smith).
An attempt to relate cross-sectional shape of alluvial channels to bed material character, distribution of boundary stress and stability of confining bank material.

1107. Carson, M.A., Sutton, E.A., McGill Univ.:
Hydrologic response of the Eaton Catchment, eastern Quebec, 1968-70; M.Sc. thesis (Sutton).
Study of hydrologic response (direct runoff: precipitation ratio) for 39 storms during 1950-1966 in Eaton catchment, East Angus and attempt to relate response to underlying controls of antecedent soil moisture, precipitation intensity and others.

1108. Carson, M.A., Taylor, C.H., McGill Univ.:
Sediment discharge of the Eaton Catchment, eastern Quebec, 1968-72; Ph.D. thesis (Taylor).
An attempt to measure and predict suspended sediment and bed load discharge in the Eaton River. So far work has been geared to determination of suspended sediment load during spring melt period. It is hoped to extend the study to cover suspended load in "flashy" summer storms and measurement of bed load.

1109. Croteau, Denis, Ministère des Richesses naturelles du Québec:
Lacs Aylmer - St-François, 1966-70.
Le project consiste à localiser et à mesurer une certaine quantité d'eau souterraine qui s'écoulerait du lac St-François vers le lac Aylmer.

1110. Dessureault, Raynald, Ministère des Richesses naturelles du Québec:
Inventaire des eaux souterraines dans la région du Lac St-Jean, Saguenay, project ARDA no. 1017, 1967-71.
En 1969, nous avons effectué des forages et installé des puits d'essai et d'observation. Des épreuves de pompage de longue durée ont été conduites dans le but de déterminer des caractéristiques aquifères des formations de gravier. Un levé géophysique est en cours et a pour but de compléter la carte du substratum. Il est prévu d'installer un réseau de piézomètres en 1970.

1111. Grenier, Claude; Gélinas, Pierre; Ministère des Richesses naturelles du Québec:
Ile d'Orléans et région nord de Québec, 1968-70.
Mise en carte de l'information hydrogéologique montrant l'épaisseur des morts-terrains et la topographie de la roche de fond.

1112. Grenier, Claude; Prévôt, Jean-Michel; Ministère des Richesses naturelles du Québec:
Etude de synthèse des Basses-Terres du Saint-Laurent et mise en mémoire de l'information hydrogéologique, 1969-72.
Cette étude en est une d'envergure et c'est pourquoi nous avons jugé bon de former une banque de données hydrogéologiques en utilisant l'informatique. Cette mise en mémoire est en cours et devrait être mise à l'essai en 1970.

1113. Haselton, G.M., Geol. Surv. of Canada and Clemson Univ., U.S.A.:
Late Quaternary uplift, southeast Hudson Bay, 1969-70.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1114. LaSalle, Pierre, Quebec Dept. Natural Resources:
Pleistocene stratigraphy of the Quebec City area, 1968-.
Mineralogy (heavy minerals) and geochemistry of eskers in the Abitibi area, Quebec, 1968-.

1115. Lebuis, Jacques, Université de Montréal:
La géologie des dunes de sable de la région du Lac St-Jean, 1968-70; thèse de maîtrise.
L'étude est concentrée sur la morphologie, la minéralogie, la structure et la chronologie des dunes localisées dans la partie nort-ouest de la région du Lac St-Jean, Québec.

1116. McDonald, B.C., Geol. Surv. of Canada:
Quaternary geology, Sherbrooke, Quebec, 1966-70.
See Surficial geology of La Patrie-Sherbrooke area, Quebec, including Eaton River watershed; Geol. Surv. Can., Paper 67-52, 1969.

1117. Pearce, A.J., McGill Univ.:
Post-glacial denudation of Mont St. Hilaire, Quebec, 1969-71; M.Sc. thesis.
Movement of colluvium across relict shore line and other features of known age are measured to obtain average rates of denudation by physical processes since the region emerged from the Champlain Sea.

1118. Prévôt, Jean-Michel, Ministère des Richesses naturelles au Québec:
Inventaire des eaux souterraines dans les comtés de St-Hyacinthe-Rouville (étape 2 de la phase II du project ARDA no. 1053), 1967-70.
Cette étude tant qualitative que quantitative ses eaux souterraines a permis grâce à des méthodes de prospection diverses (géophysique, hydrogéologie, géochimie, forage) de mettre en évidence une zone fortement minéralisés (eau dite salée) dans St-Hyacinthe et de délimiter plusieurs nappes dans Rouville. Actuellement le bilan de chacune des ces nappes est sous étude.
Inventaire des ressources hydriques de bassin de la rivière Yamaska, 1970-73.
L'étude consistera en un inventaire des eaux souterraines du bassin.

1119. Rochette, François, Ministère des Richesses naturelles du Québec:
Bassin du ruisseau des Eaux Volées, Forêt Montmorency (DHI), 1967-74.
Au cours de 1969, il s'est fait des forages dans le mort-terrain (353 pieds) et dans le roc (716 pieds), suivis de l'implantation de 18 piézomètres ajoutés aux 11 de 1968, ce qui fait un tatal de 30 piézomètres depuis le début des travaux. Chaque mois on fait un relevé des niveau d'eau afin de voir l'importance de la fluctuation annuelle des nappes.

1120. Shilts, W.W., Geol. Surv. of Canada:
Quaternary geology, Sherbrooke, Quebec, 1967-69; Ph.D. thesis, Syracuse Univ.:
Subjects of investigation include (1) Quaternary stratigraphy and till petrology (with emphasis on prevenance) in upper Chaudière Valley, southeastern Québec, and (2) deglaciation of southeastern Québec. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1121. Simard, Georges, Ministère des Richesses naturelles du Québec:
Bassin de la rivière Eaton (DHI), 1965-74.
Le bassin de la rivière Eaton a une superficie de 250 milles carrés et est considéré comme bassin représentatif. Une campagne de forages a été suivi de l'installation d'un réseau de piézomètres et de la construction de quelques puits d'essai en vue de faire des épreuves de pompage.

1122. Thom, B.G., Dredge, Lynda, McGill Univ.:
Post-glacial shoreline development in the vicinity of Sept Iles, Quebec, 1964-71; M.Sc. thesis (Miss Dredge).
There has been little attempt to delineate morphologic and stratigraphic units in the terraced topography along the

North Shore of the St. Lawrence. Urban development in the vicinity of Sept Iles has facilitated access to stratigraphic data. Emphasis has been placed on terrace relationships, landform types, stratigraphic units and soil characteristics. Shell samples have been collected for $C_{14}$ dating from upper (+340 ft.) and lower (+10 ft.) terraces. Field work during 1970 will place more emphasis on geometry of terrace deposits and determining the pattern of shoreline sedimentation during the postglacial interval.

1123. Tremblay, Germain, Université Laval:
Cartographie des formations superficielles de la région du Lac-Saint-Jean pour le Ministère des Richesses naturelles du Québec, 1965-75; thèse de doctorate.

1124. Villard, D.J., McGill Univ.:
Chemical denudation of Mont St. Hilaire, Québec, 1969-71; M.Sc. thesis.
Chemical character of water as precipitation, soil water, and stream runoff and its relation to mineralogical changes during weathering and soil formation. Special consideration is given to the effects if any of air pollution by the city of Montreal on the weathering process.

## Saskatchewan

1125. Burwasser, George, Univ. of Saskatchewan:
Glacial geology of Duck Mountain area, Manitoba-Saskatchewan, 1968-70; M.A. thesis.

1126. Dyck, J.H., Saskatchewan Research Council:
Geophysical prospecting for groundwater in southern Saskatchewan - principally by electrical methods, 1964-69.
Current research is an ARDA supported program undertaken in 1964 to determine physical properties of glacial drift which could be used to detect and evaluate water bearing formations. Both surface and borehole electrical data has been correlated with geological data from a regional test drilling program. See Electrical logging and D.C. resistivity applied to groundwater in a glacial environment in Saskatchewan; preprint presented at S.E.G. convention in Oklahoma, 1967.

1127. Gendzwill, D.J., Dyck, J.H., Pepper, T.P., Saskatchewan Research, Council:
Geophysical prospecting for groundwater in southern Saskatchewan, 1963-70.
Evaluation and development of geophysical methods, particularly electrical, gravity, seismic, and well logging techniques in their application to groundwater problems. See Geophysical methods for hydrologic search, 1966 Encyclopedia of Earth Sciences, Reinhold Publications (in press).

1128. Klassen, R.W., Geol. Surv. of Canada:
Quaternary geology, Duck Mountain, Manitoba-Saskatchewan, 1968-71.
Distribution and stratigraphy of Quaternary deposits and investigation of buried bedrock topography including major buried valleys. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1129. Klassen, Henry, Univ. of Saskatchewan:
Recent sedimentation, Lac La Ronge, Saskatchewan, 1969-70; M.A. thesis.

1130. Langford, F.F., Univ. of Saskatchewan:
Geology of the Wapawekka Hills, Saskatchewan, 1966-70.

1131. Mott, R.J., Geol. Surv. of Canada:
Palynological studies, central Saskatchewan, 1965-69.
See Palynological studies in central Saskatchewan: Part I, Contemporary pollen spectra from surface samples: Geol. Surv. Can., Paper (in press).

1132. Vonhof, J.A., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Effect of brine ponds near Esterhazy, Saskatchewan, on the groundwater regime, 1967-72.
The objectives are (1) to study the effect of brine disposal ponds near the potash mines on the local groundwater regime; (2) to evaluate the long-term effects of the brine ponds on the surface water regime in the area; and (3) to recommend possible alternative solutions to the brine disposal problem around potash mines based on the outcome of the above study.

## Yukon Territory

1133. Harington, C.R., Univ. of Alberta:
Pleistocene mammals of the Yukon Territory, 1966-71; Ph.D. thesis.

1134. Hughes, O.L., Geol. Surv. of Canada:
Surficial geology, Aishihik Lake and southwestern Yukon, 1965-70.
See Geol. Surv. Can., Paper 68-1, Pt. A, 1968, p. 168.
Quaternary stratigraphy of Old Crow Basin and Porcupine River Valley, Yukon Territory, 1968-70.
The palynology of samples from Old Crow Basin is currently being studied by Dr. S. Lichti Federovich, Quaternary Research and Geomorphology Division, Ottawa.

1135. Lerbekmo, J.F., Univ. of Alberta:
Composition and fall distribution characteristics of the White River Ash, Yukon Territory, 1963-70.
See Distribution, composition and source of the White River Ash, Yukon Territory; Can. Jour. Earth Sci., v. 6, no. 1, p. 109-116, 1969.

1136. Lissey, A., Brock Univ.:
Hydrogeology of permafrost areas, 1968-70.
An investigation limited to hydrology of open-system pingos in the Yukon.

1137. Rampton, V., Geol. Surv. of Canada:
Quaternary geology, Snag-Kluane Lake, 1965-.
Vegetational and climatic history of area from pollen analysis. See Geol. Surv. Can., Paper 68-1, Pt. A, 1968, p. 179-180.

## General

1138. Bartlett, G.A., Queen's Univ.:
History of the Gulf of St. Lawrence, 1968-.
A microfaunal and sedimentological analysis of the Gulf of St. Lawrence. These investigations are primarily concerned with the paleoclimatology and paleogeography of the area during and after Pleistocene glaciation. See Post Wisconsin features of the Gulf of St. Lawrence VIII INQUA Conference, Paris, France, 1969.
Ecostratigraphy and biostratigraphy of waters and sediments adjoining the Mid-Atlantic Ridge, 1966-.
See Microfaunal analyses, test microstructure, coiling directions, and fauna-watermass relationships are being investigated to interpret the paleoclimatology and paleo-oceanography of the North Atlantic.

1139. Burke, K.B.S., Univ. of New Brunswick:
Study of the physical properties of surficial deposits, 1969-.

1140. Carson, M.A., McGill Univ:
The long-term stability of natural hillslopes, 1967-71.
Study of threshold slopes (angles of limiting stability) in a variety of climatic and lithologic environments as a basis for explaining actual frequency distribution of slope angles in nature. See Models of hillslope development under mass failure, Geographical Analysis, 1 (1), p. 76-100.

1141. Churcher, C.S., Royal Ont. Museum:
Pleistocene mammals of the Canadian prairies, 1965-.
The investigation of the pleistocene mammals of the Canadian prairies is in cooperation with Dr. A. Mac S. Stalker, Geological Survey of Canada.

1142. Coward, J.C., Ford, D.C., McMaster Univ.:
Digital analog models of groundwater flow in karst aquifers, 1969-71; Ph.D. thesis (Coward).
The models investigate the nature and decay of flood pulses passing through limestone groundwater systems. The purposes are to further knowledge of the dynamics of groundwater flow and associated cavern genesis and contribute to predictive reservoir budgeting. The models are based upon field data being measured in West Virginia (low relief sites), and the Rocky Mountains of Alberta (high relief sites).

1143. Craft, J.L., Univ. of Western Ontario:
Late-Wisconsin glaciation in the Adirondack Mountains, New York, 1965-70; Ph.D. thesis.

1144. Crossley, D., Classen, D., Clarke, G.K.C., Univ. of British Columbia:
Earth mechanics, Ph.D. thesis (Crossley), M.Sc. thesis (Classen).
Mr. Crossley's map of ice thickness shows the Fox Glacier to be shallow; this would account for the consistent failure of seismic reflection surveys on this glacier. A bulge in the accumulation area appears to be a bedrock high and this in no way precludes the possibility of a future surge. In 1969, D. Classen and G.K.C. Clarke obtained deep ice temperature measurements on the Fox Glacier. The glacier was found to be shallow (all holes were less than 60m. from the surface to the base. Preliminary surface temperatures were of the order of -6°C and the basal temperature close to the pressure melting point which suggests the possibility of a surge due to regelation at the glacier bed resulting in sliding and increased surface flow rates.

1145. David, P.P., Université de Montréal:
Study of selected sand dune occurrences in Canada, 1965-71.
The project has been subdivided into a number of units of which the following sub-projects are dealt with in detail: (1) eolian sediments of the Empress Sections of southwestern Saskatchewan; (2) radiocarbon chronology of the Brandon dune area, Manitoba; (3) dune migration studies in southwestern Saskatchewan.
Map of sand dune occurrences of Canada, 1967-71.

1146. Dreimanis, A., Univ. of Western Ontario:
Till wedges as indicators of direction of glacial movement, 1962-69.
Till wedges, injected from the base of a till layer in the underlying sediments may serve as rapidly measureable indicators of the direction of glacial movement: they trend transverse to the glacial movement, and dip mostly down-glacier. See Geol. Soc. America, Program, Ann. Meeting, 1969, p. 52-53 (abstract).

1147. Dreimanis, A., Stankowski, W., Matheson, G.M., Univ. of Western Ontario:
Variability of lithology, texture and fabric in a till layer, 1968-.

1148. Dreimanis, A., Vagners, U.J., Univ. of Western Ontario:
Relationship of lithologic and granulometric composition of till to bedrock, and to the comminution of drift during glacial transport, 1962-70; Ph.D. thesis (Vagners).
The abstract cited below summarizes the rules of bimodal distribution of rocks and their constituent minerals, that govern the composition of tills that are composed principally of clastic particles. See Characteristics of the composition of till derived from the basal and the englacial drift: Abstracts with Programs for 1969, Part 6, North-Central Section, Geol. Soc. Amer. p. 12.

1149. Edmund, A.G., Royal Ontario Museum:
Osteology and evolutionary history of giant ground sloths, 1961-.
See A late Pleistocene fauna from the Santa Elena Peninsula of Ecuador, Royal Ontario Mus., Life Sci. Contrib. 63, 1965.

1150. Elson, J.A., McGill Univ.:
Glacial Lake Agassiz, 1964-70.
The overall history of Lake Agassiz is being revised by studies of basin sediments, moraines, and strandline features. Present efforts are aimed at recognizing certain strandlines by their pebble shapes and roundnesses, and apportioning the time range determined by radiocarbon dating to the various water levels. See Geology of Glacial Lake Agassiz in W.J. Mayer-Oakes, ed., Life, Land and Water. Univ. Manitoba Press, p. 37-95, 1967.

1151. Elson, J.A., graduate students, McGill Univ.:
Late Quaternary denudation processes, 1965-.
Observation of present processes and geological studies to determine past rates of denudation by both physical and chemical processes provide a basis for a history of erosion and weathering processes, and possibly for prediction of future changes promoted by human activities. See Radiocarbon dates, Mya arenaria phase of the Champlain Sea, Can. Jour. Earth Sciences, v. 6, p. 367-372, 1969.

1152. Foscolos, A.E., Rutter, N.W., Geol. Surv. of Canada:
Soils in glaciated and unglaciated terrains, 1969-70.
To classify the Quaternary soils, to develop a technique for differentiating in situ soil development from soils developed on transported material and to elucidate if the depth of soil horizon is a function of only time (or time dominant).

1153. Garrett, R.G., Geol. Surv. of Canada:
Geochemical study of economic elements in glacial till, 1968-69.
Surveys to study the geochemistry of tills around ore deposits have been carried out at Manitouwadge, Ontario (summer 1968) and Val d'Or, Quebec (January 1969). In addition soils and stream sediments ere collected at Manitouwadge. Results indicate both the usefulness and limitations of exploration geochemistry in a glaciated environment. The results are being prepared for publication.

1154. Gray, J.T., Geol. Surv. of Canada:
Mass wasting forms and processes in a mountain environment, 1967-70; Ph.D. thesis, McGill Univ.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1155. Grice, R.H., Sein, M., McGill Univ.:
Weathering susceptibility of Utica shale, 1966-; M.Sc. thesis (Sein).
See Effect of temperature-humidity on the disingration of non-expandible shales, Bull. Assoc. Eng. Geol., v. 5, no. 2, p. 69-77, 1968.

1156. Grice, R.H., Ward, A.R. and others, McGill Univ.:
Quantitative analysis of multiaquifer groundwater system - computer analysis and field instrumentation; 1961-; M.Sc. thesis (Ward).

1157. Gwyn, H.J., Univ. of Western Ontario:
Investigation of heavy minerals in tills along the south edge of the Canadian Shield, 1969-71; Ph.D. thesis.
The purpose is to establish a standard for deciphering the regional directions of movement of glacial flows and lobes moving into the area south of the Shield, between Lake Superior and Montreal.

1158. Heginbottom, J.A., Geol. Surv. of Canada:
Erosion in a permafrost environment, 1969-.
A study towards developing an understanding of the nature, extent and rate of erosion in permafrost areas disturbed by man. In 1969 investigations were largely confined to the area of the 1968 Inuvik fire. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1159. Hitchon, Brian, Research Council of Alberta:
Geochemistry of formation waters, oils and gases in Western Canada, and surface waters of Mackenzie River drainage basin.
See Geochemistry and origin of formation waters in the Western Canada Sedimentary Basin, II. Alkali metals. Chem. Geol. v. 4, p. 211-223, 1969.

1160. Koulomzine, Théodore, Ecole Polytechnique:
Systematic study of the geophysical properties of the unconsolidated rocks of the St. Lawrence Lowlands, 1966-70.

1161. Lazreg, Habib, Inland Waters Branch, Dept. Energy, Mines & Resources:
Geophysical methods applied to study of seawater intrusion, 1969-71.
A study aiming to delineate the deformation, width, and horizontal extension of the diffusion zone between seawater and freshwater, using the principle of electrical conductivity as a criteron revealing horizontal and vertical change in groundwater quality has been carried out in the Maritimes (N.B. & P.E.I.) during the summer of 1969. An attempt to develop a digital computing technique of interpretation for resistivity measurements is underway.

1162. Lennox, D.H., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Doublet well experiments, 1969-71.
An investigation of the proposed "doublet well" technique for stabilizing the interface or transition zone between fresh and salt waters while simultaneously pumping fresh and salt waters from above and below the transition zone. The initial stages of the project involve locating a suitable test site.

1163. Lewis, C.F.M., Geol. Surv. of Canada:
Quaternary geology, Great Lakes, 1968-.

Systematic investigation of unconsolidated deposits to determine Quaternary stratigraphy, history, and paleoecology, and to identify processes active in the lakes during the Quaternary. Studies are closely integrated with related projects of the limnogeology group of the Canada Centre for Inland Waters. Stratigraphic and qualitative surface sediment information are extracted from echograms and seismic profiling records. Core and surface samples are analysed for particle size distribution, mineralogical composition, water and organic contents. Radiocarbon, palynological, and microfossil analyses of selected materials will be attempted. See Late Quaternary history of lake levels in the Huron and Erie Basins; Proceedings 12th Conference on Great Lakes Research, Intern. Assoc. for Gt. Lakes Research, 1969.

1164. Matthews, J. Jr., Univ. of Alberta:
A palaeoenvironmental analysis of Pleistocene deposits at Deering, northwestern Alaska, 1967-70; Ph.D. thesis.

1165. Mayr, Franz, Université de Montréal:
Counting and contouring - critical study of statistics as applied in geology, 1969-70.
Stratigraphy and palaeogeography of Wuerm (Wisconsin) in the Alps, 1965-75.
The aim is to improve correlation of the North American and European stratigraphy of the youngest part of the Quaternary. See Ueber den Beginn der Wuermeiszeit im Inntal bei Innsbruck. Eine palaeogeographische Skizze. Annals of Geomorphology (Berlin), N.F. 12, p. 256-295, 1968.

1166. McAndrews, J.H., Royal Ontario Museum:
Scanning electron microscopy of modern and fossil seeds and pollen, 1969-71.

1167. McAndrews, J.H., Tovell, W.M., Norris, Geof., Royal Ontario Museum:
Pollen analysis and paleoecology of lakes in southern Ontario, 1968-70.
See Pollen evidence for the protohistoric development of the "Big Woods" in Minnesota, U.S.A., Rev. of Paleobotany and Palynology 7, 1969.

1168. McDonald, B.C., Geol. Surv. of Canada:
Sedimentology and morphology of eskers, 1968-72.
Investigation of eskers and associated features involving their classification form, sedimentology, and origin. By documenting the sedimentation history of eskers, an attempt will be made to interrelate morphology, sedimentary transport and sediment types, and to contribute to an understanding of esker origin. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1169. Minning, G., Geol. Surv. of Canada:
Bibliography of Quaternary publications, 1969-70.
To provide a bibliography of reports and maps dealing with Quaternary geology and geomorphology which have been published by officers of the Geological Survey between 1874 and 1967.

1170. Mott, R.J., Lichti-Fedrovich, S., Geol. Surv. of Canada:
Quaternary palynology, 1969-.
See A palynological study and postglacial geochronology in the St. John River valley, New Brunswick; Geol. Surv. Can., Paper (in press).

1171. Parker, M.L., Geol. Surv. of Canada:
Dendrochronological investigations, 1968-70.
Study of the tree-ring record in various parts of Canada to provide chronological and climatological data in order to date postglacial events and to relate available weather data to other kinds of evidence for reconstruction of past environments. See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1172. Parry, J.T., Turner, H., Hutchinson, I., McGill Univ.
Terrain evaluation project; M.Sc. theses (Turner, Hutchinson).
See Soil studies with color photos, photogrammatic engineering, v. 35, no. 1, 1969, p. 44-56.

1173. Parsons, M.L., Inland Waters Branch, Dept. Energy, Mines and Resources:
Regional groundwater flow and subsurface temperatures in a Maritime Province coastal environment, 1969-71.
The objectives are to investigate the groundwater flow and heat transfer in fractured media in a coastal environment, to assess the effect of groundwater withdrawal on the regional groundwater hydrodynamics, particularly on the fresh-saline groundwater transition zone, and to explore the application of geothermal measurements to the evaluation of groundwater flow.

1174. Pouliot, G., Ecole Polytechnique:
La mesure de la structure des argiles glaciaires par méthodes de diffraction-X, 1969-72.
Ce travail vise à développer et à utiliser un appareil de type goniomètre universel pour la mesure de l'orientation des minéraux argileux au sein des argiles. Le travail effectué à date comprend: (1) une revue bibliographique (2) quelques essais d'imprégnation au carbowax 6000 ainsi des mesures d'intensité des pics (001) de l'illite dans diverses coupes sur un même échantillon.

1175. Pouliot, G., Loiselle, A., Ballivy, G., Ecole Polytechnique:
Minéralogie et propriétés géotechniques des argiles de la Baie James, 1968-70; thèse de maîtrise (Ballivy).
Ce travail a pour but d'établir un parallèle entre certaines caractéristiques géologiques et géotechniques des dépôts d'argile d'une même région mais d'origines différentes. Les caractéristiques géologiques étudiées sont le fabrique, la granulométrie, la composition chimique et minéralogique. Lies études géotechniques portent essentiellement sur la résistance au cisaillement et la compressibilité de ces matériaux non remaniés. Les résultats sont utilisés pour mettre en évidence la présence d'argile lacustre (Lac Barlow-Ojibway) à la base du dépôt d'argile marine (mer Tyrrel) à l'embouchure de la rivière Rupert dans la baie James.

1176. Rust, B.R., Univ. of Ottawa:
Sedimentary studies of braided rivers, 1967-70.
Sedimentary structures and facies are studied in relation to conditions of flow: depth, velocity and directional properties. Particular attention is being given to the formation and migration of gravel bars and attendant sand veneers, and to the paleogeographic significance of all these features. See The sedimentology of a braided river, J. Sedimentary Petrology, v. 39, p. 649-679, 1969.
Fluvial and marine Pleistocene deposits of the Ottawa-Hull area, 1969-72.
Bedded Pleistocene deposits ranging in size from clay to gravel show a large variety of sedimentary structures, predominantly fluvial in aspect. Primary structures and lithological association are being studied in order to interpret microenvironments, and some light may be shed on the Pleistocene history of the area. Varieties of sedimentary deformation are also being investigated.

1177. Rutter, N.W., Geol. Surv. of Canada:
Soils in glaciated and unglaciated terrain, 1969-71.
See Geol. Surv. Can., Paper 70-1, Pt. A, 1970.

1178. Schweger, C.E., Univ. of Alberta:
The palaeoecology of the Onion Portage site, northwestern Alaska, 1967-71; Ph.D. thesis.

1179. Scott, W.J., Geol. Surv. of Canada:
Geophysical investigations, 1967-70; Ph.D. thesis, McGill Univ.
This project involves studies of the electrical parameter characteristics in overburden, over an aquifer and sulphide mineralized zones. See Geol. Surv. Canada Papers 68-1 Pt. A, p. 87-88, 1968 and Paper 69-1, Pt. A, p. 99, 1969.

1180. Sly, P.G., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Insitu, submersible assisted studies, Lakes Ontario, Erie and Huron, 1970-71.
By using a submersible it is hoped to undertake in situ observations of physiographic lake bed features, to elucidate geological structures, to obtain specific samples, and to undertake equipment trials using various sensors, in a variety of different locations and environments.

1181. Tamplin, M., Univ. of Manitoba; Zoltai, S., Dept. of Fisheries and Forestry; Bannatyne, B., Manitoba Mines Branch:
Annotated bibliography of Lake Aggassiz studies, 1968-70.

1182. Tanguay, M.G., Ecole Polytechnique:
Optical processing of aerial photo patterns by coherent light, 1969-71.
Information acquired through remote sensing generally yields a great number of two-dimensional patterns in the form of photographs or imagery film strips. The quantity of available data is often too large for direct study by visual means alone. It is highly desirable and necessary to employ automatic pattern recognition and data-handling techniques in order to quantify the information. The goal

is to classify these two-dimensional patterns by means of the diffraction pattern obtained by shining a beam of coherent light on each pattern. The result would allow to (1) enhance through spatial filtering the reconstructed image and (2) to classify photo patterns on the basis of similar diffraction diagrams.

1183. Terasmae, J., Brock Univ.:
Quaternary stratigraphic palynology of Canada, 1952-.
Palynological, paleobotanical, dendrochronological, limnological and sedimentological investigations of Quaternary deposits in order to (1) provide a stratigraphic correlation and chronology of Quaternary deposits and events in various parts of Canada; (2) to reconstruct and determine the history of postglacial and sub-recent environments; (3) to establish standard pollen stratigraphic sequences for different regions in Canada, and (4) to improve existing palynological methods and techniques. See Quaternary palynology in Quebec: a review and future prospects - Rev. Geogr. Montreal, v. 23, no. 3, p. 281-288, 1969.

1184. Toth, J., Research Council of Alberta:
Development of principles and methods for the hydrogeological evaluation of extensive areas, 1966-.
Relation between groundwater movement and hydrocarbon accumulation, 1968-.
Genetic relation between various morphologic and geologic phenomena, 1968-69.

1185. Vonhof, J.A., Inland Waters Branch, Dept. of Energy, Mines & Resources:
Fractured tills, 1968-.
To investigate the origin of fractured tills; to determine the significance of fracture patterns; to determine the effect of fractured till on groundwater flow.

1186. Westgate, J.A., Smith, D.G.W., Tomlinson, M., Univ. of Alberta:
Quaternary tephrochronology of Western Canada, 1966-.
See Late Quaternary pyroclastic layers in the Edmonton area, Alberta; Proc. Symp. on Pedology and Quaternary Research, Univ. of Alberta, in press.

1187. Williams, G.D., Univ. of Alberta:
Recent fluvial and related sediments in Western Canada, 1966-71.
See Origin of shale - pebble conglomerate; Bull. Amer. Assoc. Petroleum Geol., v. 50, no. 3, p. 573, 1966.

1188. Wyder, J.E., Geol. Surv. of Canada:
Borehole and related geophysical techniques, 1968-.
Evaluation of potential use of borehole geophysical techniques as tools for studying Quaternary deposits and low grade metamorphosed Precambrian sediments near Kimberley, B.C., See Geol. Surv. Aan., Paper 70-1, Pt. A, 1970.

## SEDIMENTOLOGY AND SEDIMENTARY PETROLOGY

### Recent and Unconsolidated Sediments

1189. Asad, Ali, McGill Univ.:
Distribution and hydrodynamic concentration of heavy minerals in beach placers, 1967-70; M.Sc. thesis.

1190. Bartlett, G.A., Queen's Univ.:
Ecology and paleoecology of benthonic microorganisms, 1962-.
An environmental analysis of shallow water environments in the tropic, subtropic, temperate and boreal environments. Information provides a comprehensive assessment of both lateral and temporal microfaunal distributions. "Factor-vector" and "analysis of variance" computer programs are an integrate part of this program.
Geology of the Canadian Atlantic Continental Margins, 1966-.
A detailed interpretation of the biotos and paleoenvironments of the Continental Margins of the world. See Cretaceous biostratigraphy of the Grand Bank of Newfoundland, Maritime Sediments, v. 5, no. 1, p. 4-14.
Ecostratigraphy and biostratigraphy of waters and sediments adjoining the Mid-Atlantic Ridge, 1966-.
Microfaunal analyses, test microstructure, coiling directions, and fauna-watermass relationships are being investigated to interpret the paleoclimatology and paleooceanography of the North Atlantic.

1191. Bartlett, G.A., Greggs, R.G., Queen's Univ.:
Oceanic ridges and seamounts in the North Atlantic, 1966-.
Various aspects of deep sea oozes from ocean basins and ridges are being investigated. These studies have a direct bearing on sea-floor spreading rates, complex fracture systems and deep sea carbonate diagenesis. See Carbonate sediments: oriented lithified samples from the North Atlantic, Science v. 166, 3906 p. 740-741, 1969.

1192. Bartlett, G.A., Vilks, G., Ramsay, A.T.S., Queen's Univ.:
Ecostratigraphy of the North Atlantic, 1968-.
The interrelationship of the biomass and watermass in the North Atlantic and Caribbean Sea. The utilization of this information as a climatic and paleoclimatic index for the Mesozoic and Cenozoic Periods. See Planktonic foraminifera in watermass and bottom sediments from the Grand Banks to the Caribbean Sea, Maritime Sediments, v. 3, no. 4, 1968.

1193. Bayrock, L.A., Berg, T.E., Research Council of Alberta:
Sedimentation of glacial lakes, 1968-.
Two papers were presented at the 1969 INQUA Congress on glacio-lacustrine sedimentation in front of advancing glaciers, Alberta, Canada and till-like glacio-lacustrine deposits of Alberta, Canada.

1194. Bond, J.I., Queen's Univ.:
Present day distribution and controls of carbonate deposition in the littoral and sub-littoral environment

of Carriacou - volcanic island in the Caribbean arc system, 1969-70; M.Sc. thesis.

1195. Buckley, D.E., Bedford Institute, Nova Scotia:
Chemical reactivity of inorganic particulate matter in the marine environment, 1967-69.
This project involves studies of diagenetic alteration of clay minerals in the marine environment. Detailed examination of the trace element and major element partition between the solid silicates and the aqueous environment are being undertaken in order to better understand the processes of elemental equilibrium in the oceans. See Clay-inorganic and organic-inorganic associations in aquatic environments - particulate organic-inorganic geochemistry of a glacial fiord. U.S. Atomic Energy Commission Report, AEC. Contract AT-(04-3)-310 PA No. 3, 1968.

1196. Carson, M.A., Smith, P.A.W., McGill Univ.:
Hydraulic geometry of alluvial stream channels, 1968-71; Ph.D. thesis (Smith).
An attempt to relate cross-sectional shape of alluvial channels to bed materials character, distribution of boundary stress and stability of confining bank material.

1197. Carson, M.A., Taylor, C.H., McGill Univ.:
Sediment discharge of the Eaton Catchment, eastern Quebec, 1968-72; Ph.D. thesis (Taylor).
An attempt to measure and predict suspended sediment and bed load discharge in the Eaton River. So far work has been geared to determination of suspended sediment load during spring melt period. It is hoped to extend the study to cover suspended load in "flashy" summer storms and measurement of bed load.

1198. Chase, R.L.; Barr, Sandra; Thomlinson, Arnold; Univ. of British Columbia:
Geology of continental slope and adjoining areas of the Northeast Pacific Ocean west of British Columbia, 1969-74; Ph.D. theses (Barr and Thomlinson).
Techniques used are seismic reflections profiling, echo sounding, dredging, coring, underwater photography and magnetometry. Canadian government vessels of the Defence Research Establishment (Pacific) and Department of Energy, Mines and Resources are used. Studies include the effects in the upper crust of interactions of the Pacific, Americas, and Juande Fuca lithospheric plates.

1199. Clack, W.J., McGill Univ.:
Recent carbonate reef sedimentation, Carriacou Island, West Indies, 1966-69; Ph.D. thesis.
A study of carbonate sedimentation on the east coast of Carriacou to investigate rates of sedimentation, transportation, and the usefulness of statistical parameters in relation to sedimentary environments.

1200. Coakley, J.P., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Nearshore sediment transport in the Great Lakes, Ontario, Huron and Erie, 1968-71.

A statistical study of the distribution of heavy mineral assemblages in certain nearshore areas of Lakes Ontario, Erie and Huron, to be applied to problems of sediment provenance and dispersal.

Evaluation of underwater techniques in direct examination of in situ bottom sediments and structures, Lakes Erie, Ontario and Georgian Bay, 1969-70.

Research in the use of underwater techniques in direct observation and recording of in situ bottom materials and structures.

1201. Cronan, D.S., Univ. of Ottawa:

The geochemistry and mineralogy of ferromanganese deposits from World Oceans, 1964-.

See the geochemistry of manganese nodules and associated pelagic deposits from the Pacific and Indian Oceans. Deep-Sea Research, v. 16, p. 335-359.

A statistical analysis of the geochemistry of pelagic sediments from the Pacific and Indian Oceans, 1966-.

A continuing study of the geochemistry of pelagic sediments from the Pacific and Indian Oceans using computerized statistical techniques. See Inter-element relationships in some pelagic deposits. Chem. Geol. v. 5, 1969.

The geochemistry of deep-sea sediments from the northeastern Atlantic Ocean, 1969-70.

Seven sediment cores from different topographic locations in the North Atlantic have been collected. The geochemistry of these sediments is being investigated in relation to their environment of formation and their location relative to potential sources of elements.

1202. Cronan, D.S., Univ. of Ottawa; Thomas, R., Canada Centre for Inland Waters:

An investigation into the nature and origin of ferromanganese deposits in Lake Ontario, and their effect on the chemical balance of the lake.

1203. Danner, W.R., Univ. of British Columbia:

Pleistocene stratigraphy of Point Roberts, Washington and Point Grey, British Columbia, 1968-.

A study of the Pleistocene sediments, mostly interglacial, and their primary and secondary sedimentary structures.

1204. Drapeau, Georges, Bedford Institute, Nova Scotia:

Sedimentology on the Scotian Shelf and the Strait of Belle Isle, 1967-.

Includes mapping, bottom sampling, underwater photography, underwater television, observations from submersibles, correlation with bottom current data; interaction between bottom currents and unconsolidated sediments. See Submerged terraces on the Nova Scotian Shelf, Zeitschrift fur Geomorphologie, Supp. 7, p. 85-94, 1968.

1205. Drapeau, Georges, Marlowe, J.I., Asthana, Virendra, Bedford Institute, Nova Scotia:

Coastal geodynamics, 1968-70.

Investigations in selected areas of Maritime Coasts on a year-round basis, making observations on shoreline

features, measuring dynamic forces operating in the near-shore environment and their effect on processes of erosion, sediment transport and deposition.

1206. Gees, R.A., Cok, A., Drapeau, G., Wilson, R., Grant, A.C., Stewart, J.M., Dalhousie Univ.
Marine geology of the eastern seaboard of Canada with special emphasis on the continental slope and rise, 1969-72; Ph.D. theses (Cok, Grant, Drapeau); M.Sc. theses (Wilson, Stewart).
During the first phase of the project the bottom topography and the subbottom structures will be investigated. The second phase will be concerned with the surficial sediments. The sediments will be investigated as to their structural and textural features, as well as their geochemistry. Large box cores will be required for these studies. It is hoped that these studies will lead to a better understanding of the diagenesis of fine grained sediments. See Surface textures of beach and dune sands. An investigation with the scanning electron microscope. Beitrage zur Elektr. mikrosk. Direktabbildung. Bd. 2., 1969.

1207. Halferdahl, L.B., Research Council of Alberta:
Stream deposits, Alberta, 1957-69.
See Alluvial quartzite pebbles as a source of industrial silica; Res. Coun. Alberta, Prelim. Rept. 69-2, 1969.

1208. Hamilton-Smith, Terence, New Brunswick Dept. of Natural Resources:
Near-shore transport of sand on the New Brunswick east coast, 1969-75.

1209. Hobson, G.D., Geol. Surv. of Canada:
Marine seismic - Great Lakes, 1966-.
The application of shallow seismic techniques and high resolution repetitive sources to the definition of stratification and materials within the unconsolidated sediments overlying bedrock. A side-scan sonar device was also used during 1969 in Lake Huron to identify bottom materials. See High resolution reflection seismic survey in western Lake Erie: in Proc. 12th Conf. Great Lakes Res. 1969 and Transit sonar measurements in Lake Ontario off the mouth of the Niagara River; in Proc. 11th Conf. Great Lakes Res. 1968, p. 179-187, 1969.

1210. Hodgson, D.A., Geol. Surv. of Canada:
Submarine morphology off the northeast Baffin Island coast, 1967-70.
A project designed to extend knowledge of erosional and depositional landforms to areas below present sea level by continuous profiling with an echo sounder - in conjunction with O.H. Løken, Glaciology Subdivision, Inland Waters Branch.

1211. James, N.P., McGill Univ.:
Diagenesis and paleoecology of the uplifted Pleistocene reef tracts, Northern Barbados, West Indies, 1968-71; Ph.D. thesis.
The younger Pleistocene limestones of northern Barbados offer an excellent opportunity to study the

changes a carbonate body undergoes in transformation from unconsolidated sediment to limestone. The resulting limestone is a function both of the original ecology of the reef complex and the diagenetic processes, past and present. The processes of diagenesis and the use of specific textures to characterize varied diagenetic environments are being investigated.

1212. Keen, M.J., Dalhousie Univ.:
Sediment distribution on the Mid-Atlantic Ridge at 45°N, 1968-69.
See The Mid-Atlantic Ridge at 45°N. Sediment distribution from seismic profiling. Can. J. Earth Sci. 1970 (in press).

1213. Kemp, A.L.W., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Great Lakes sediment organic program, Lakes Erie and Ontario, 1967-.
Chemical studies are being made to determine the nature and distribution of organic materials present in the recent sediments of Lakes Ontario, Erie and Huron, and to relate the results to modern diagenesis of organic matter in lacustrine environments.

1214. Klassen, Henry, Univ. of Saskatchewan:
Recent sedimentation, Lac La Ronge, Saskatchewan, 1969-70; M.A. thesis.

1215. Kuo, H.Y., Crocket, J.H., McMaster Univ.:
Au, Pd and Ir in deep sea sediments, 1968-70; M.Sc. thesis (Kuo).
A neutron activation method is used for the determination of Au, Pd and Ir in several deep sea cores. The scope of this work is to study the behavior of these elements in different types of deep sea sediments. The possibility of extraterrestiral contribution in the deep sea sediments will also be studied.

1216. Levinson, A.A., Bayliss, P., Univ. of Calgary:
Clay mineralogy of Hudson Bay sediments, 1969-70.

1217. Levinson, A.A., Dewis, F.J., Univ. of Calgary:
Study of boron deduced paleosalinity in the Mackenzie Delta, 1970-72; thesis project (Dewis).

1218. Marlowe, J.I., Bedford Institute, Nova Scotia:
Marine geology of the Grenada Basin and Aves Swell, Caribbean Sea, 1968-70.
See Petrologia de Rocas Carbonaticas de la Prominencia de Aves: Un Informe Preliminar: Boletin Informativo de la Asociación Venezolana de Geologiá, Mineriá y Petroleo, in press.

1219. Morris, D.W., Univ. of New Brunswick:
Sedimentology (Pleistocene geology, sediment transport and budget problems), 1962-70.

1220. Mountjoy, E.W., graduate students, McGill Univ.:
Recent sediments west coast of Barbados and Carriacou, 1964-.
Includes the study of sea floor morphology, distribution of marine flora and fauna, reefs and associated sediments. The origin and processes controlling distribution of the various types of calcareous and terrigenous sediments and their relationship to organisms are being investigated as well as their geochemistry; comparison of present and Pleistocene reefs; carbonate cementation processes and beach rock.

1221. Pelletier, B.R., Bedford Institute, Nova Scotia:
Arctic sedimentation, 1960-72.
Sediments are being classified according to aqueous environments such as lacustrine, fluvial, deltaic, channel, continental shelf. Principles of sedimentary transport are being discussed. See Sedimentation in Arctic waters of the western Queen Elizabeth Island, District of Franklin, Maritime Sediments, v. 3, no. 4, 1967
Sediments and models of sedimentary transport in Hudson Bay, 1961-71.
Approximatly 500 samples have been texturally analysed and about 200 have been chemically analysed for organic carbon and carbonate. Study of the physiography has been made and tentative models of sedimentary transport described. See Submarine physiography, bottom sediments and models of sediment transport in Hudson Bay, Earth Sciences Symposium on Hudson Bay. Geol. Surv. Canada, Paper 68-53, p. 100-135, 1969.

1222. Pendlebury, G., McGill Univ.:
Patch reef sedimentation, Eastern Carriacou, West Indies, 1967-70; M.Sc. thesis.
Study of patch reef sedimentation to determine sediment contributed by patch reefs and whether sedimentation affects distribution of patch reefs.

1223. Rashid, M.A., Bedford Institute, Nova Scotia:
Metal holding capacity of humic acids associated with marine sediments, 1969.
The phenomenon of migration and accumulation of various metals in all natural environments is associated with organic substances. Many trace and major elements occur in coals, shales, crude oils and marine sediments in concentrations appreciably higher than their average content in earth's crust. A study is, therefore, initiated to ascertain the metal holding capacity of humic acids associated with marine sediments. The metals included in this study are Al, Fe, Cu, Co, Ni, Zn, and Mg. See Molecular weight distribution measurements on humic and fulvic acid fractions from marine clays on the Scotian Shelf, Geochim Cosmochim Acta 33: 147-151.
Chemical characteristics of humic compounds associated with marine sediments - degree of aromaticity and alphaticity, 1969-70.
The geochemical investigations are aimed to characterize the chemical and physical nature of humic substances associated with marine sediments to correlate the structural details of these substances with depositional environment

and to follow the geological development of organic matter as it is subjected to diagenetic and metamorphic changes. See Molecular weight distribution measurements on humic and fulvic acid fractions from marine clays on the Scotian Shelf, Geochem. Cosmochim, Acta 33: 147-151.

1224. Rukavina, N.A., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Great Lakes sedimentology programme, 1967-.
A program of sedimentological studies in the nearshore zone (0-20 metres) of the Canadian Great Lakes. To identify and classify the materials, processes and morphology of the zone, and to develop a comprehensive model of the mechanics of nearshore sedimentation.

1225. Rust, B.R., Univ. of Ottawa:
Sedimentary studies of braided rivers, 1967-70.
Sedimentary structures and facies are studied in relation to conditions of flow: depth, velocity and directional properties. Particular attention is being given to the formation and migration of gravel bars and attendant sand veneers, and to the paleogeographic significance of all these features. See The sedimentology of a braided river, J. Sedimentary Petrology v. 39, p. 649-679, 1969.

1226. Schafer, C.T., Bedford Institute, Nova Scotia:
Ecology of nearshore benthonic foraminifera along the east coast of Canada and Northeast United States, 1967-.
Distribution of benthonic foraminifera is being investigated with particular emphasis on areas contaminated by sewage and industrial pollutants. See Current transport and deposition of foraminiferal tests, planktonic organisms and lithogenic particles in Bedford Basin, Nova Scotia, Maritime Sediments, v. 4, no. 3, p. 100-103, 1968.

1227. Schafer, C.T., Irving, T., Marlowe, J.I., Bedford Institute, Nova Scotia:
Geology of Mid-Atlantic Ridge mountain tops, 1969.
Study involves paleomagnetic, paleontologic, petrologic, and stratigraphic analysis of rock cores collected on the crest of the Mid-Atlantic Ridge near 45° north.

1228. Sherwood, H.G., and graduate student, Nova Scotia Technical College:
Mineralogical study of seaflow minerals, 1970-.
Compositional and mineralogical studies of nodular and pavement materials from the Pacific, Atlantic and Great Lakes areas is proposed. The distribution of the metallic elements in these deposits will be studied using the electron probe and electron microscope.

1229. Sly, P.G., Inland Waters Branch, Dept. of Energy, Mines and Resources:
Insitu, submersible assisted studies, Lakes Ontario, Erie and Huron, 1970-71.
By using a submersible it is hoped to undertake in situ observations of the physiographic lake bed features, to elucidate geological structures, to obtain specific

samples, and to undertake equipment trials using various sensors in a variety of different locations and environments.
Lake bottom studies, eastern end of Lake Ontario (Kingston Basin), 1970-71.
The parameters under study include sedimentological, ecological, organic and inorganic geochemical, mineralogical, geophysical and stratigraphical characteristics. This study is designed to show just how much variation there is, vertically and horizontally, in different lake environments.

1230. Sly, P.G., Thomas, R.L., Inland Waters Branch, Dept. Energy, Mines and Resources:
Quaternary studies of Lakes Osoyoos, Skaha, Vaseux, Okanagan, Woods, and Kalamalka; Okanagan Valley, British Columbia, 1970-73.
A program to provide basic information as to the geological (recent and present) environment of the lake system.

1231. Smith, Leigh, Queen's Univ.:
Interrelations of carbonate and terrigenous sediments, east coast of Grenada, West Indies, 1968-70.
Two adjacent areas on the east coast of Grenada have totally different environments. Grenville Harbour has patch reefs and Conference Beach is of terrigenous sediment. Geologic relations are being studied.

1232. Swift, D.J., Old Dominion College, Virginia, Pelletier, B.R., Bedford Institute, Nova Scotia:
Preliminary marine geological survey of the Bay of Fundy, New Brunswick and Nova Scotia, 1965-70.
Bedrock features, morphology and bottom sediments are being examined, illustrated with bottom photos taken recently from the research submersible Shelf Diver.

1233. Thomas, R.L., Inland Waters Branch, Dept. of Energy, Mines and Resources:
The inorganic geochemistry of the Great Lakes sediments, 1969-.
A detailed examination on the spatial distribution of major and trace elements in the surface sediments of the Great Lakes to determine the basic geochemistry of the lake sediments.
Occurrence and origin of Lake Ontario manganese deposits, 1969-70.
The study is designed to provide an understanding of the processes involved in the formation of one of the various manganese deposits, located in different parts of the Great Lakes.

1234. Thomas, R.L., Lewis, C.F.M., Inland Waters Branch, Dept. Energy, Mines & Resources:
The sediments and geochemistry of the Kingston Basin, Lake Ontario, 1970-.
A detailed sediment sampling program is to be undertaken in the Kingston Basin and St. Lawrence River outlet of Lake Ontario. It is designed to provide detailed information, particularly with regard to the geochemical paramaters, of the outflow environment of Lake Ontario.

1235. Thomas, R.L., Sly, P.G., Inland Waters Branch, Dept. of Energy, Mines and Resources:
The aim of this programme is to quantify the physical chemical and mineralogical parameters of the particulate suspended load of Lake Ontario and to relate input, throughput, and output loadings thus providing an estimate of the "sink effect" of the lake bed, and the major sources and dispersal of sediment.

1236. Vagners, U.J., Acadia Univ.:
Study of Quaternary sediments in the Maritime Provinces, 1968-.

1237. Walker, R.G., Costello, W.R., McMaster Univ.:
Sedimentology of Pleistocene outwash channels, 1968-70; M.Sc. thesis (Costello).
The use of sedimentary structures in distinguishing paleoflow conditions and deducing the Pleistocene evolution of outwash channels. See morphology and origin of ripple-drift cross-lamination, with examples from the Pleistocene of Massachusetts. Jour. Sediment. Petrol., v. 38, p. 971-984, 1968.

1238. Tovell, W.M., Royal Ontario Museum:
Topography and bottom deposits at southern end of Georgian Bay, Ontario, 1965-.
Work includes exploration using short gravity corer and echo-sounding. See Geol. Assoc. Canada, Annual Meeting, Montreal, 1969, p. 52-53 (abstract).

## Sedimentary Rocks

1239. Akhtar, K., Univ. of Ottawa:
Sedimentary environments of the Hull Formation in the Ottawa valley, 1969-72; thesis project.
The cross-stratified bioclastic arenites of the Upper Hull Formation and the finer laminated lithologies of the Lower Hull Formation give evidence of contrasting sedimentary environments, which will be investigated in detail. Other topics will include paleoecological associations, and silicification.

1240. Ayres, L.D., Ontario Dept. Mines:
Early Precambrian volcanism and sedimentation, Lake Superior Provincial Park, Ontario, 1961-70.
A stratigraphic, sedimentologic, and geochemical study. See Early Precambrian metasandstone from Lake Superior Park, Ontario, Canada, and implications for the origin of the Superior Province; Geol. Soc. Am., Program with abstracts for 1969, pt. 7, p. 5.

1241. Beales, F.W., Univ. of Toronto:
Limestone petrography and paleoecology, a continuing project.
Main research emphasis at present is on the stratigraphic habitat of Mississippi Valley type lead-zinc mineralization in carbonate rocks. This is involving a study of porosity ranging from open cavern to sub-microscopic

inter-crystalline voids, cementation of primary and subsequent permeable trends, and the relation of these features to the paleoecology of the limestones.

1242. Bidgood, D.E.T., Howells, K., Nova Scotia Research Foundation:
Geophysical investigation of evaporites in Nova Scotia 1956-.
Gravity, magnetic, seismic, bore hole geophysical and geological logs, provide data on the distribution and mode of occurrence of salt and related evaporite minerals in Nova Scotia.

1243. Bottrill, T.J., Geological Surv. of Canada:
Study of conglomeratic uranium deposits in Canada, 1969-.
Studies of the mineralogy and elemental distribution in the ore-bearing horizons of the Matinenda formation, the true geological form of the quartz pebble conglomerate and its environment of sedimentation; trace elements in sulphides as indicative of the provenance of the Elliot Lake quartz pebble conglomerates; mineralogical investigation of the two-phase uranium-titanium compound, referred to as "Brannerite"; and sedimentology and stratigraphy of the Huronian to determine features of significance to uranium occurrences. See. Geol. Surv. Canada, Paper 70-1A, 1970.

1244. Boulay, R.A., Geol. Surv. of Canada:
Sedimentological study of the Papaskwasati Basin, Quebec, 1968-.
A joint study with the Quebec Department of Natural Resources to investigate the sedimentology and geochemistry of the Basin north of Lake Mistassini, Quebec. Information obtained from 32,000 feet of core is being used to outline the stratigraphy, sedimentology and possible geochemical trends in the Basin.

1245. Campbell, F.A., Univ. of Calgary:
Carbonates and evaporites in the Rainbow area, Alberta, 1966-70.

1246. Campbell, F.H.A., Manitoba Mines Branch:
Sickle-Wasekwan unconformity in northern Manitoba, 1969-70.
Stratigraphy and sedimentation of the Rice Lake group (Precambrian) of Manitoba, 1967-71; Ph.D. thesis, Univ. of Manitoba.

1247. Carrigy, M.A., Research Council of Alberta:
Petrology of nonmarine Upper Cretaceous-Tertiary sandstones, 1961-70.
See Res. Coun. Bulletin 27 (in press).
Deltaic sedimentation in the Athabasca Tar Sands, 1969-70.
A contribution to A.A.P.G. Research Committee Symposium on deltaic sedimentation and petroleum occurrences, Calgary, 1970.

1248. Clifford, P.M., Hsu, M.Y., McMaster Univ.:
Provenance and deformation of the Seine conglomerate, 1968-70; Ph.D. thesis (Hsu).

1249. Collins, J.A., Queen's Univ.:
Carbonate lithostratigraphy and diagenesis of the Upper St. George and Lower Table Head Formations - west coast of Newfoundland, 1969-71; M.Sc. thesis.
The zinc deposits near Daniel's Harbour, Newfoundland occur in the upper part of the St. George dolomite. It is hoped that a combined field and laboratory of the carbonate rocks hosting the ore will contribute to a better understanding of the deposits.

1250. Danner, W.R., Univ. of British Columbia:
Origin of primary cherts and jaspers, 1966-.
The study indicates that most of the bedded cherts commonly cited as precipitates are actually organic accumulations of radiolarian debris.
Limestone and chert microfacies of the Western Cordillera, 1968-72.
See Limestone of the Western Cordilleran eugeosyncline of southwestern British Columbia, western Washington and northern Oregon in Dr. D.N. Wadia Commemorative Volume, Mining and Metallurgical Institute of India, 1965, p. 114-125.

1251. Day, M.J., Univ. of Alberta:
Sedimentology and stratigraphy of the Notikewin Formation, 1969-70; M.Sc. thesis.

1252. Dodson, Peter, Univ. of Alberta:
Sedimentology and biostratonomy of the dinosaur beds of the Oldman Formation, Steveville, Alberta, 1968-70; M.Sc. thesis.

1253. Fletcher, W.K., Univ. of British Columbia:
Trace elements in sedimentary rocks, 1959- .
Wide variations have been found in the copper, zinc, lead, molybdenum, and selenium contents of sedimentary rocks and a paper reporting on the results so far obtained should be available in 1970.

1254. Fuller, J.G.C.M., Amerada Hess Corporation:
Evaporite deposition, 1968-69.
Several aspects of this phenomenon are being investigated. See Evaporites and carbonates; two Devonian basins of Western Canada, Bull. Canadian Petroleum Geology, v. 17, no. 2, p. 182-194.

1255. Gibson, D.W., Geol. Surv. of Canada:
Triassic stratigraphy and petrology in the Foothills and Front Ranges of Western Canada, 1962-.
A detailed study of the stratigraphy and petrology of the Triassic rocks in the Foothills and eastern Rocky Mountains of Alberta and British Columbia, to provide data on the character, structure, distribution, age, stratigraphic relationships, origin of the bedrock, and other geological data that are required to evaluate the oil, gas, and mineral potentialities of the region. See Triassic stratigraphy of the Bow River-Crowsnest Pass Region, Rocky Mountains of Alberta and British Columbia; Geol. Surv. Canada, Paper 68-29, 1968.

1256. Giles, Peter, Univ. of Western Ontario:
Petrology of the Lower Ordovician carbonates, Ottawa-Cornwall area, Ontario, 1968-71; Ph.D. thesis.

1257. Gordon, A., Patel, I., Univ. of New Brunswick:
Provenance of basal Cambrian and Carboniferous conglomerates of the Saint John, N.B. region, 1968-70.
The basal conglomerates are of continental origin and were deposited in a number of basins whose average trend seems to have been northeast. Both of the polymict glomerates appear to be derived from local sources, remanence of these assumed source rocks are exposed as structurally bounded inliers.

1258. Hamilton-Smith, Terence, New Brunswick Dept. of Natural Resources:
Geochemical aspects of the origin of the Carys Mills formation, New Brunswick, 1969-72.
Major and trace element determination in limestone and slate samples closely related to bed-by-bed descriptions of stratigraphic sequences and gross lateral facies changes to characterize the depositional environment of an argillaceous calcilutite.

1259. Hoffman, P.F., Geol. Surv. of Canada:
Sedimentology and stratigraphy of the Great Slave and Et-then Groups, East Arm fold beld, Great Slave Lake, Northwest Territories, 1966-71.
See Proterozoic paleocurrents and depositional history of the East Arm fold belt, Great Slave Lake, Northwest Territories: Can. J. Earth Sci., v. 6, p. 441-462, 1969.
Stratigraphy, sedimentology and paleontology of the Epworth Group, Coppermine River area, Northwest Territories, 1969-73.
Part of a regional study of the stratigraphy, paleocurrents, sedimentology and tectonics of an Aphebian geosyncline. Special studies on the sedimentology of Precambrian carbonate rocks and the biostratigraphy and paleo-ecology of stromatolites. See Geol. Surv. Canada, Paper 70-1A, 1970.

1260. Hopkins, J.C., McGill Univ.:
Reef-margin to basin sedimentation, Miette and Ancient Wall Reef Complexes, Jasper National Park, Alberta, 1968-71; Ph.D. thesis.
Investigation is aimed at firstly establishing the nature and variation of the "off-reef" sediments as exposed in the Colin Thrust sheet at the Ancient Wall Complex and the Miette Thrust Sheet at the Miette Complex. Secondary topics include dolomitization and silicification of off-reef sediments, mineralogical variations towards the reef complex in the off-reef shales; and sedimentological controls of the reef margin.

1261. Houston, W., Kramer, J.R., McMaster Univ.:
Bacterial action and formation of dolomite, 1969-71; M.Sc. thesis (Houston).

1262. Henderson, J.B., Geol. Surv. of Canada:
Sedimentology of the Yellowknife Supergroup at Yellowknife, Northwest Territories, 1967-70; Ph.D. thesis, Johns Hopkins Univ.

The objectives are to provide a paleoenvironmental interpretation of the Yellowknife Supergroup sediments at Yellowknife; to increase the understanding of the depositional mechanism of turbidites and associated sediments; to study the transition from volcanism to sedimentation in Archean times and to provide criteria for future regional studies of the Yellowknife Supergroup. See Stratigraphy of the Archean Yellowknife Supergroup, Yellowknife Bay-Prosperous Lake area. Geol. Surv. of Canada, Paper 70, 1970.

1263. Hubert, Claude, Beisebois, Daniel, Université de Montreal:
Deep sea fans in the Quebec Group, 1968-70; M.Sc. thesis (Beisebois).
See Deep sea fans in the Quebec Group, Geol. Assoc. Canada, Spec. Publication No. 7 (in press).

1264. Hubert, Claude, Héroux, Yvon, Université de Montréal:
Lithofacies and physical properties of Silurian reefs in Redemption area, Quebec, 1968-70; Ph.D. thesis (Héroux).
Lithological and petrographic characteristics of the Redemption Reef in Gaspé Peninsula, 1969-70; Ph.D. thesis (Héroux).

1265. Hughes, Marie, Univ. of Western Ontario:
Petrology of the Gasport Member of the Lockport (Silurian) Queenston, Ontario, 1969-71; M.Sc. thesis.
This rock is used as a building stone. The distribution of the desirable rock has a restricted distribution in the quarry. Problems in discolouration have developed.

1266. Jamieson, E.R. (Miss), Saskatchewan Dept. of Mineral Resources:
Stratigraphy and sedimentation of the Interlake Group (Silurian) in southern Saskatchewan, 1967-70.

1267. Jansa, L.F., Geol. Surv. of Canada:
Depositional history of the Ordovician at the Pine Pass area, northeastern British Columbia, 1969-70.

1268. Kent, D.M., Saskatchewan Dept. of Mineral Resources:
Stratigraphy of the Mississippian Madison Group in southwestern Saskatchewan, 1968-70.

1269. Kent, D.M., Saskatchewan Dept. of Mineral Resources:
Stratigraphy of the Mississippian Madison Group in southwestern Saskatchewan, 1968-70.
The project is concerned with stratigraphy primarily, but will include sedimentation and diagenetic effects on the carbonate rocks.

1270. Lajoie, Jean, Université de Montréal:
Sedimentology of some flysch deposits in the Appalachians of Quebec, 1965-.
See Turbidites sans matrice: produits de diagenese; Naturaliste Can., vol. 95, p. 1243-1255.

1271. Lerbekmo, J.F., Univ. of Alberta:
Sedimentation models for lower Edmonton Formation fluvio-deltaic sediments, 1968-72.

1272. Long, D.F., Univ. of Western Ontario:
Sedimentological investigation of the Chibougamau Group in the vicinity of Chibougamau, Quebec, 1969-71; graduate thesis.

1273. Lumsden, David, Memphis State Univ.; Pelletier, B.R., Bedford Institute, Nova Scotia:
Petrology of the Grimsby Sandstone, Niagara Peninsula, Ontario and New York State, 1967-69.
From textural and stratigraphic field studies an ancient deltaic environment of deposition was reconstructed. See Petrology of the Grimsby Sandstone (Lower Silurian) of Ontario and New York. Jour. Sed. Petrology, v. 39, no. 2, p. 521-530.

1274. Macqueen, R.W., Geol. Surv. of Canada:
Lower Paleozoic stratigraphy, Lower Mackenzie River area, (Operation Norman), 1968-71.
Includes stratigraphy, sedimentology, and correlation of Lower Paleozoic rocks of the area. See. Surv. Canada, Paper 70-1A, 1970.

1275. Macqueen, R.W., Bamber, E.W., and others, Geol. Surv. of Canada:
Mississippian stratigraphy, sedimentology and correlation, Rocky Mountains and Foothills, 1963.
A continuing study of the stratigraphy, sedimentology, and correlation of Mississippian Strata from the Crowsnest Pass area of southern Alberta to the Jasper area of west central Alberta. The study has been confined to surface exposures in the Rocky mountain Foothills and Front Ranges, and has involved four seasons of field fork. General findings of the work have been published; more detailed aspects are in preparation for publication. See Foraminiferal zonation, Rundle Group and Uppermost Banff Formation (Lower Carboniferous), southwestern Alberta; Bull. Can. Petrol. Geology, v. 18, no. 1, 1970.

1276. Macqueen, R.W., Price, L.L., Geol. Surv. of Canada:
Carbonate-evaporite cycles in the Souris River Formation, Saskatchewan, 1967-70.
The purpose is to compare the Devonian carbonate-evaporite cycles with modern supratidal carbonate-evaporite cycles from the Persian Gulf and Caribbean area. Data has been obtained from cores, and from observations made on anhydrite-dolomite relationships as seen on the walls of a potash mine shaft. Major findings will be published in 1970. See. Geol. Surv. Canada, Paper 68-1A, 1967, p. 202-203.

1277. Maiklem, W.R., Bebout, D.G., Imperial Oil Limited:
Evaporite-carbonate relationships, 1968-70.
The main objectives are: to develop a descriptive classification of evaporites; to interpret the geologic history of the Upper Elk Point including the evironment of deposition, the sequence, timing and pattern of basin

filling and diagenesis; and to determine the source potential of evaporites. See Classification of Anhydrite - a practical approach: Bull. Can. Petroleum Geol., v. 17, no. 2, p. 194-233, 1969.

1278. Mason, D., Quebec Dept. of Natural Resources:
Lower Devonian stratigraphic and sedimentologic study, Eastern Gaspe, 1967-; Ph.D. thesis (Carleton Univ.).
An evaluation of petroleum possibilities of the Lower Devonian rocks of eastern Gaspe Peninsula.

1279. MacIlreath, I., Queen's Univ.:
An investigation of primary dip in the Black River limestones of the Kingston area, 1969-70; M.Sc. thesis.

1280. McGlynn, J.C., Geol. Surv. Canada:
Stratigraphy and sedimentology of Nonacho Group, Northwest Territories and study of its relations to surrounding granitic gneisses, 1969-70.

1281. McIlwaine, W.H., Ontario Dept. of Mines:
Sedimentology of the Sibley Group, District of Thunder Bay, Ontario, 1970-; Ph.D. thesis.

1282. Mountjoy, E.W., McGill Univ.:
Upper Devonian Miette and Ancient Wall Reef Complexes, 1960-.
Includes gross stratigraphic relationships, petrology and detailed examination of reef margins in order to determine depositional history and environments. Work is being carried out in conjunction with Dr. C.W. Stearn's paleoecology studies on stromatoporoids of the Ancient Wall complex. See Upper Devonian Algae and Foraminifera from the Ancient Wall carbonate complex Jasper National Park, Can. Jour. Earth Sci. in press.

1283. Nelson, H.W., Imperial Oil Enterprises Ltd.:
Sandstone diagenesis, 1968-70.
Objective of the present work is to achieve better insight into the origin, distribution and time of emplacement of chemical cements, plugging the porosity. The Mitsue field has been selected as a model for this project.

1284. Nowak, R.L., Univ. of Alberta:
Petrographic study of subsurface Lower Cretaceous sediments, Yukon Territory, 1969-70; M.Sc. thesis.

1285. Oldershaw, A.E., Univ. of Toronto:
Genesis and diagenesis of carbonate rocks and textural evolution of bedded cherts, 1967-.
Both projects reflect a continuing research interest in the relationship between genesis and post-depositional modification of sedimentary rocks. Textural evolution and microporosity studies of carbonate rocks, in particular, have been stimulated by the installation of a scanning electron-microscope. See Electron-microscopic examination of Namurian bedded cherts, North Wales, Great Britain: Sedimentology, v. 10, p. 255-272, 1968.

1286. Ollerenshaw, N.C., Geol. Surv. of Canada:
Cretaceous and Tertiary conglomerates and sandstones of the Eastern Cordillera, 1969-72.
The main objective is to determine the tectonic environment during the Cretaceous and Tertiary.

1287. Parviainen, E.A.U., Univ. of Western Ontario:
Investigation of polymictic conglomerates of the Ramsay Lake and Bruce Formation , north shore of Lake Huron, Ontario, 1968-71; graduate thesis.

1288. Paterson, D.F., Saskatchewan Dept. of Mineral Resources:
The Winnipeg Formation (Ordovician) of Saskatchewan, 1968-70.
The emphasis is on stratigraphy, sedimentation and economic geology.

1289. Pounder, D.A., Chevron Standard Limited, Calgary:
Sedimentology, diagenesis and stratigraphy of carbonate rocks, 1959-

1290. Schenk, P.E., and students, Dalhousie Univ.:
Sedimentology of the Meguma formation, Nova Scotia, 1963-.
Cyctic sedimentation and palaeogeography of the Windsorian stage from Bermuda analogues, 1963-.
See Carbonate-sulfate red bed facies and cyctic sedimentation of the Windsorian stage (middle Carboniferous) Maritime Provinces, Can. J. Earth Sci., v. 6, p. 1037-1066, 1969.

1291. Schultheis, N.H., McGill Univ.:
Source and origin of the Cadomin conglomerate between the Athabasca and north Saskatchewan Rivers, 1968-70; M.Sc. thesis.
A petrographic, size and shape study of the conglomerate.

1292. Scrivastava, P.N., Stearn, C.W., McGill Univ.:
Paleoecology and sedimentary petrography of the megabreccia bed on the south flank of the Ancient Wall carbonate Complex, Alberta, 1968-69, M.Sc. thesis (Scrivastava).

1293. Simpson, Frank, Saskatchewan Dept. of Mineral Resources:
Lower Colorado Group, south-central saskatchewan, part I, 1969-71.
This is the first of three integrated sedimentological-paleoecological studies.

1294. Skipper, K., Middleton, G.V., McMaster Univ.:
Detailed study of a part of the Cloridorme Formation (Ordovician) near Grand Etang, Gaspé Nord, Quebec, 1968-70; M.Sc. thesis (Skipper).
Bed by bed correlations for up to 7 miles along the coast have been established. Special attention is being paid to the variation in sedimentary structures in thick beds of sandstone (Type 3 Graywackes - of Enos, 1969). Several examples of antidune structures have been discovered.

1295. Steiner, Johan, Univ. of Alberta:
Environment of deposition of the Devonian rocks of the Eden-Merrimbula area, New South Wales, Australia, 1963-70.

1296. Thusu, B., Univ. of Bristol, England:
Deposition environment and microbiostratigraphy of Rochester Formation, southern Ontario, 1968-71; Ph.D. thesis.
A detailed depositional history based on lithology, paleontology and sedimentary structures; ostracods and phytoplankton (Acritarchs) are studied for intracontinental and intercontinental correlation.

1297. Trettin, H.P., Geol. Surv. of Canada:
Geology of the Franklinian "eugeosyncline" in northern Axel Heiberg and Ellesmere Islands, Northwest Territories, 1961-.
A project concerned with the stratigraphy, sedimentology and tectonic history of the region. The relationships between northern Ellesmere Island and the Arctic Ocean Basin are also investigated. See A Paleozoic-Tertiary fold belt in northernmost Ellesmere Island aligned with the Lomonosov Ridge; Geol. Soc. Amer. Bull., v. 80, p. 143-148, 1969, and Pre-Mississippian geology of northern Axel Heiberg and northwestern Ellesmere Islands, Arctic Archipelago; Geol. Surv. Can., Bull. 171, 1969.

1298. van de Poll, H.W., New Brunswick Dept. of Natural Resources:
Sedimentation and palaeocurrents in the Carboniferous basins of New Brunswick, 1965-70.
Palaeocurrent directions and maturity indices are used to assist in the mapping of Pennsylvanian strata of New Brunswick. See Pennsylvanian sedimentation in the Central Basin of New Brunswick, Mineral Resources Branch, Department of Natural Resources, Information Circular 68-1, 1968.

1299. Walker, R.G., McMaster Univ.:
Establishment of the Catskill delta transition from turbidite to deltaic sedimentation in the Upper Devonian, 1964-70.
The Upper Devonian turbidite sequence passes very abruptly into deltaic sediments, with very little record of 'slope' or 'shelf' environments. The lower Catskill sediments consist of marine-non-marine oscillations with no shoreline sandbodies, suggesting a basin with very little tidal activity.

1300. Walker, R.G., Pettijohn, F.J., McMaster Univ.:
Sedimentology of Archaean Basins, 1969-72.
Use of sedimentological techniques to investigate basin evolution and the early development of parts of the Canadian Shield.

1301. Wardlaw, N.C., Univ. of Saskatchewan:
Petrology and geochemistry of Devonian carbonates, Norman Wells-Fort Good Hope area, Northwest Territories, 1967-70.
Geochemical investigations are being made on major and trace elements in whole rock samples, as well as on specific types of fossil materials, matrices and cements, in an attempt to account for chemical variations in terms of observable constituents which can be related to environmental controls. Few analyses have been made previously on specific constituents in ancient limestones and such data provide the

key to understanding variations in whole rock chemistry. The chemical investigations are being undertaken in conjunction with petrographic and stratigraphic studies. The reservoir properties of these rocks, in relation to lithology and reconstructed environments are also being studied.

1302. Wardlaw, N.C., Martonhegyi, F., Univ. of Saskatchewan:
Geochemistry and petrology of Mississippian carbonates in Saskatchewan, 1969-72; Ph.D. thesis (Martonhegyi).

1303. Wardlaw, N.C., Reinson, G., Streeton, G., Univ. of Saskatchewan:
Petrology and structure of anhydrite-carbonate rocks on Winnipegosis/Prairie Evaporite Formations, Saskatchewan, 1968-70; M.Sc. theses (Reinson and Streeton).
The objective is to determine the relationship between the basal evaporite beds of the Prairie Evaporite and the underlying carbonates of the Winnipegosis formation. Beds in the upper part of the Winnipegosis contain fragmented algal mats and "caliche" horizons indicative of exposure. Such structures suggest that the seas regressed following deposition of the Winnipegosis carbonates and subsequently transgressed to form the Prairie Evaporite. Subaerial exposure of Winnipegosis carbonate banks in an evaporitic environment may have been the cause of unusual anhydrite and halite replacement and pore-filling processes which have apparently affected these rocks. See Carnallite-Sylvite relationships in the Middle Devonian Prairie Evaporite Formation, Saskatchewan: Bull. Geol. Soc. Amer., v. 79, p. 1273-1294.

1304. Wood, John, Univ. of Western Ontario:
Stratigraphic and sedimentological investigation of the Upper Huronian Formations in the Rawhide Lake-Flack Lake Area, Ontario, 1967-70; graduate thesis.
See Diaspore in Early Proterozoic quartzites (Lorrain Formation) of Ontario. Can. J. Earth Sciences, v. 6, p. 337-340, 1969.

1305. Young, G.M., Univ. of Western Ontario:
Stratigraphy, sedimentology, geochemistry and paleoclimatology of Early Proterozoic rocks, 1965-.
See Geochemistry of Early Proterozoic Tillites and Argillites of the Gowganda Formation, Ontario, Canada. Geochim et Cosmochim, Acta. v. 33, pp. 483-492, 1969.

## General

1306. Foscolos, A.E., Geol. Surv. of Canada:
Clay mineral investigation, 1968-.
Includes investigation of clay synthesis, clay diagenesis, halmyrolysis, equilibria, clay mineral separation from marine sediments and transformation of fresh water clays on contact with sea water. See Equilibrium constants between both freshly prepared and aged $H^+$ montmorillonite and chloride salt solutions, Soil Science Soc. of Amer. Proc., March-April, 1969.

1307. Fritz, P., Univ. of Alberta:
Investigation in the formation of dolomites and experimental determination of the protodolomite water isotopes fractionation, 1968-70.
See Oxygen isotope fractionation between protodolomite and water. Geol. Soc. Amer. Annual Meeting, Mexico City, 1968, (abstract).

1308. King, L.H., MacLean, Brian, Kranck, Kate (Miss), Bedford Institute, Nova Scotia:
Regional geology of the Scotian Shelf, 1964-.
A program to map the near surface structure and stratigraphy of the bedrock underlying the entire Scotian Shelf and Bay of Fundy is being conducted utilizing continuous seismic-reflection profiles and sample data obtained through dredging operations. Profiles representing some 8,000 miles of traverse have been accumulated, and are being interpreted utilizing differences in acoustical characteristics and unconformable relationships to delineate rock units. Interpretation of the surficial geology is based upon a detailed study of echograms, examination of bottom samples, continuous seismic-reflection profiles, radiogenic ages and paleontological data. Work currently in progress will provide surficial geological coverage for the whole of the Scotian Shelf, and Northumberland Strait and Georges Bay and Bay of Fundy. See Submarine end moraines and associated deposits on the Scotian Shelf: Geol. Soc. Amer. Bull., v. 80, p. 83-96, 1969.

1309. Kramer, J.R., Conroy, N., and other agencies, McMaster Univ.:
Lake Erie time study, 1969-70.

1310. Maccarone, Umberto, Clark, L.A., McGill Univ.:
Turbidite tank studies on materials of extremely different densities, 1968-70; M.Sc. thesis.

1311. Middleton, G.V., Neal, W.J., McMaster Univ.:
Experimental study of bed thickness and grading characteristics in turbidites, 1968-70.
See Experiments on density and turbidity currents. III. Deposition of sediment. Canadian Journal Earth Sci., 4, p. 475-505, 1967.

1312. Pelletier, B.R., Bedford Institute, Nova Scotia:
Formulation of principles of sedimentary transport and accompanying decrease in grain size.
Decrease in grain size in a down-current direction has been noted for sediments undergoing transportation. This decrease is exponential over linear distances and can be followed through geologic time from sediments deposited in a single temporal plane to those deposited over long and short intervals of geologic time while the sediments were prograding at the depositional site.

1313. Sozanski, Andrew, Univ. of Ottawa:
Geochemistry of lacustrine ferromanganese concretions in Eastern Canada, 1969-71; M.Sc. thesis.

1314. Walker, R.G., Bhattacharjee, S.B., McMaster Univ.:
Ripple-drift cross-lamination in turbidites, 1968-70; M.Sc. thesis (Bhattacharjee).
Lateral and vertical changes in ripple-drift cross-lamination are being investigated (1) to make comparative judgments on the rate of deposition from turbidity currents and (2) to investigate the general turbidite environment in which ripple-drift is found.

1315. Walker, R.G., Pett, J., McMaster Univ.:
Relationship between scouring and deposition in turbidity currents, 1968-70; M.Sc. thesis (Pett).
The morphology of flute casts is being measured and different shapes of flutes being compared with the internal sedimentary structures of the beds, in order to relate depositional flow regime to the type of scouring preceding deposition.

1316. Williams, G.D., Univ. of Alberta:
Geochemical differentiation of depositional environments 1966-71.
See Chemical composition of shales of the Mannville Group (Lower Cretaceous) of central Alberta, Canada; Bull. Amer. Assoc. Petroleum Geol., v. 49, n. 1, p. 81, 1965.

## STRATIGRAPHY AND PALEONTOLOGY

### Precambrian

1317. Boulay, R.A., Geol. Surv. of Canada:
Sedimentological study of the Papaskwasati Basin, Quebec, 1968-.
A joint study with the Quebec Department of Natural Resources to investigate the sedimentology and geochemistry of the Basin, north of Lake Mistassini, Quebec. Information obtained from 32,000 feet of core is being used to outline the stratigraphy, sedimentology and possible geochemical trends in the Basin.

1318. Card, K.D., Robertson, J.A., Ontario Dept. of Mines; Frarey, M.J., Geol. Surv. Canada:
Federal-Provincial Committee on Huronian stratigraphy.
See Federal-Provincial Committee on Huronian stratigraphy and progress report, Canadian Jour. Earth Sciences, v. 6, no. 2, p. 335-336.

1319. Christie, R.L., Geol. Surv. of Canada:
Stratigraphy and age of Precambrian sedimentary rocks and contained dykes and sills, east coast of Canadian Arctic Islands and north and northwest Greenland, 1967-.

1320. Henderson, J.B., Geol. Surv. of Canada:
Sedimentology of the Yellowknife Supergroup at Yellowknife, Northwest Territories, 1967-70; Ph.D. thesis, Johns Hopkins Univ.

The objectives are to provide a paleoenvironmental interpretation of the Yellowknife Supergroup sediments at Yellowknife; to increase the understanding of the depositional mechanism of turbidites and associated sediments; to study the transition from volcanism to sedimentation in Archean times and to provide criteria for future regional studies of the Yellowknife Supergroup. See Stratigraphy of the Archean Yellowknife Supergroup, Yellowknife Bay-Prosperous Lake area. Geol. Surv. of Canada, Paper 70, 1970.

1321. Hoffman, P.F., Geol. Surv. of Canada:
Sedimentology and stratigraphy of the Great Slave and Et-then Groups, East Arm fold belt, Great Slave Lake, Northwest Territories, 1966-71.
See Proterozoic paleocurrents and depositional history of the East Arm fold belt, Great Slave Lake, Northwest Territories: Can. J. Earth Sci., v. 6, p. 441-462, 1969.
Stratigraphy, sedimentology and paleontology of the Epworth Group, Coppermine River area, Northwest Territories, 1969-73.
Part of a regional study of the stratigraphy, paleocurrents, sedimentology and tectonics of an Aphebian geosyncline. Special studies on the sedimentology of Precambrian carbonate rocks and the biostratigraphy and paleo-ecology of stromatolites. See Geol. Surv. Canada, Paper 70-1A, 1970.

1322. McGlynn, J.C., Geol. Surv. of Canada:
Stratigraphy and sedimentology of Nonacho Group, Northwest Territories and study of its relations to surrounding granitic gneisses, 1969-70.

1323. Usher, J.L., Queen's Univ.:
Proterozoic stratigraphy of the Northwest Territories, 1969-.

1324. Young, G.M., Univ. of Western Ontario:
Stratigraphy, sedimentology, geochemistry and paleoclimatology of Early Proterozoic rocks, 1965-.
See Geochemistry of Early Proterozoic Tillites and Argillites of the Gowganda Formation, Ontario, Canada. Geochim et Cosmochim. Acta. v. 33, p. 483-492, 1969.

## Cambrian to Silurian

1325. Barnes, C.R., Munro, Ildi, Univ. of Waterloo:
Conodont biostratigraphy of the Middle Ordovician of New York, Ontario and Quebec, 1965-72; M.Sc. thesis (Munro).
A detailed survey of the conodont biostratigraphy of the Black River and Lower Trenton Groups including the Ordovician conodonts of the Lake Timiskaming outlier. See North American Middle and Upper Ordovician conodont faunas; Geol. Soc. Amer. Memoir, Conodont Biostratigraphy, in press.

1326. Bolton, T.E., Geol. Surv. of Canada:
Silurian and Ordovician macro-biostratigraphy, Anticosti Island, Quebec, 1957-70.
Systematic investigation of trilobite and echinoderm faunas.

1327. Bolton, T.E., Copeland, M.J., Geol. Surv. Canada:
Silurian-Ordovician macro- and micro-biostratigraphy, Lake Timiskaming and Lake Nipissing, Ontario, 1968-70.
Description of important faunal elements and correlation with similar eastern Canada assemblages.

1328. Bourque, P.A., Quebec Dept. of Natural Resources:
Eastern half, Saint-John river anticline, Gaspé Peninsula, 1969-71; Ph.D. thesis, University of Montreal.
The main purpose is to establish the stratigraphic sequence of the Silurian in the eastern part of the Gaspé peninsula.

1329. Dean, W.T., Geol. Surv. of Canada:
Ordovician biostratigraphy and trilobites in eastern Canada, 1969-.
Present research is on the trilobites and stratigraphy of the Philipsburg Series and Mystic Conglomerate of southern Quebec, and their relationship to corresponding strata in Newfoundland and the U.S.A.

1330. Dixon, O.A., Univ. of Ottawa:
Ordovician-Silurian paleoecological studies, Anticosti Island, 1968-.
Study of Ordovician-Silurian transition sequence on Anticosti Island, with particular emphasis on successive fossil populations, and the progressive change of sedimentary environments.

1331. Dixon, James, Univ. of Ottawa:
Ordovician-Silurian carbonates of Somerset and Prince of Wales Islands, District of Franklin, 1969-72; M.Sc. thesis.
A detailed study of the carbonates and invertebrate fossils ascribed to the Allen Bay Formation in the Boothia Arch region, with the aim of defining its age limits and equivalence in the region, and of explaining its depositional and post-depositional history.

1332. Fritz, W.H., Geol. Surv. of Canada:
Cambrian biostratigraphy of the eastern Cordillera, 1964-.
Present research is on the Lower Cambrian trilobites of the type Sekwi formation, Mackenzie Mts., N.W.T. When this is completed, research will be directed toward describing the trilobites form the Burgess Shale and adjacent strata.

1333. Greene, B.A., Williams, H., Memorial Univ. of Newfoundland:
Stratigraphy, sedimentology, and age of the Random Formation, Newfoundland, 1969-72; Ph.D. thesis (Greene).
The Random Formation, a white quartzite, separates late Precambrian rocks and overlying fossiliferous Cambrian strata. The Precambrian rocks are mainly terrestrial and the

overlying Cambrian rocks are shallow water marine. Present data suggest the Random Formation is a beach deposit and is time transgressive, formed by an encroaching Cambrian sea.

1334. Greggs, R., Queen's Univ.:
Upper Cambrian biostratigraphy, 1960-.

1335. Hamilton-Smith, Terence, New Brunswick Dept. of Natural Resources:
Structure and stratigraphy of Silurian rocks of Woodstock area, New Brunswick, 1969-70.

1336. Hofmann, H.J., Univ. de Montréal:
Litho and biostratigraphic analysis of Ordovician sedimentary rocks in southern Quebec and adjoining regions, 1959-.
See Ordovician paleocurrents near Cincinnati, Ohio. Jour. Geol., v. 74, no. 6, p. 868-890, 1966.

1337. Hubert, C., Vallières, A., Granger, B., Brisebois, D., Univ. de Montréal:
Stratigraphy and structure of the Quebec Group, Quebec, 1969-70; M.Sc. theses (Vallières, Granger, Brisebois),
See Deep-Sea Fans in the Quebec Group, Geol. Ass. Can., Sp. Publ. 7, 1970.

1338. Jamieson, E.R. (Miss), Saskatchewan Dept. of Mineral Resources:
Stratigraphy and sedimentation of the Interlake Group (Silurian) in southern Saskatchewan, 1967-70.

1339. Kluyver, H.M., Queen's Univ.:
Ordovician erosional hiatuses in Northeast North America and Northwest Europe, 1968-71; Ph.D. thesis.

1340. Macqueen, R.W., Geol. Surv. Canada:
Lower Paleozoic stratigraphy, Lower Mackenzie River area (Operation Norman), 1968-71.
Includes stratigraphy, sedimentology, and correlation of Lower Paleozoic socks of the region. See Geol. Surv. Canada, Paper 70-1A, 1970.

1341. Marten, B.E., Kennedy, M.J., Memorial Univ. of Newfoundland:
The structure and stratigraphy of the Lush's Bight Group (Ordovician) at Western Arm, Green Bay, Newfoundland, 1969-70; M.Sc. thesis (Marten).
Basic intrusives appear to be comagmatic with the basic volcanism, and the rocks have been subjected to a single penetrative deformation. Further work in adjoining areas may result in a better understanding of Lush's Bight stratigraphy and structure which could prove useful in exploration for mineral deposits.

1342. Mountjoy, E.W., McGill Univ. and Geol. Surv. of Canada:
Cambrian stratigraphy and petrology of northern Jasper Park, Alberta, 1960-.
A regional study to determine distribution, thickness and petrography of various units; includes Ordovician strata and the pre-Devonian unconformity.

1343. Norford, B.S., Geol. Surv. of Canada:
Middle Ordovician stratigraphic and faunal study, southern Alberta and southwest British Columbia, 1962-70.
Study of the stratigraphy of the Owen Creek and Skoki Formations and description of their faunas. See Ordovician and Silurian stratigraphy of the southern Rocky Mountains; Geol. Survey Canada, Bull. 176.
Operation Winisk - Silurian stratigraphy of the Hudson Bay and James Bay Lowlands, 1967-70.
Includes field mapping, surface and subsurface stratigraphic studies and biostratigraphy. See Ordovician and Silurian biostratigraphy of the Sogpet-Aquitaine Kaskattama No. 1 Well, northern Manitoba; Geol. Surv. Canada, Paper 69-8, 1969.

1344. Paterson, D.F., Saskatchewan Dept. of Mineral Resources:
The Winnipeg Formation (Ordovician) of Saskatchewan, 1968-70.
The emphasis is on stratigraphy, sedimentation and economic geology.

1345. Pugh, D.C., Geol. Surv. of Canada:
Subsurface Cambrian stratigraphy in southern and central Alberta, 1967-69.
All Cambrian units are extended eastwards from the foothills to erosional or depositional limits or to stratigraphically equivalent units continuing into Saskatchewan. The extent of pre-Devonian erosion of Cambrian strata has been established, and the influence of this topography on Middle Devonian deposition discussed.

1346. Riva, J., Mehrotra, Pratrap, Université Laval:
Middle Ordovician rocks and faunas, 1969-; graduate thesis (Mehrotra).
See Graptolite faunas of the St. Lawrence Lowlands and Anticosti. Amer. Assoc. Pet. Geol. Memoir 12, 1969.

1347. Sanford, B.V., Geol. Surv. of Canada:
Geology of Southampton, Coats and Mansel Islands, Northwest Territories, 1968-70.
Much new information concerning the stratigraphy and sedimentation of the Ordovician and Silurian succession was obtained. In addition, Paleozoic deformation, hitherto unreported will help to shed new light on the tectonic history of the northern Hudson Bay Basin and adjacent areas of the Canadian Shield. See Paleozoic stratigraphy of Southampton, Coats, and Mansel Islands, Northern Hudson Bay; Geol. Surv. Canada, Paper 70-1, 1970.

1348. Sargent, W., Queen's Univ.:
Paleoecology of an algal bioherm in the Black River limestones of the Kingston area, 1968-70; M.Sc. thesis.

1349. Shaikh, Z.M., Memorial Univ. of Newfoundland:
Stratigraphy and palaeontology of the Long Point Formation southwest of Black Duck Brook, Port au Port Peninsula, Newfoundland, 1969-70; M.Sc. thesis.
With special emphasis on the study of the trilobites and bryozoa.

1350. Stabbins, Richard, Sask. Dept. of Mineral Resources:
The Middle Devonian Dawson Bay Formation of southeastern Saskatchewan, 1969-71.
The study will emphasize stratigraphy, paleoecology and economic geology.

1351. Thusu, B., Univ. of Bristol, England:
Depositional environment and microbiostratigraphy of Rochester Formation, southern Ontario, 1968-71; Ph.D. thesis.
A detailed depositional history based on lithology, paleontology and sedimentary structures is under investigation. Ostracods and phytoplankton (Acritarchs) are studied for intracontinental and intercontinental correlation.

1352. Usher, J.L., Queen's Univ.:
Lower Paleozoic lithostratigraphy of Ontario, Quebec and adjoining New York State, 1967-70.
The research has led to the conclusions that: (1) lower Ordovician rocks were deposited in the Kingston area, south of the Frontenac Axis, and were removed by erosion prior to Black River "time" during a late Early Ordovician to early Mid-Ordovician uplift of the area and (2) either the geosynclinal concept of mio- and eu-geosynclinal facies does not exist in the Gaspé region or the Gaspé miogeosynclinal facies are deeply buried beneath eugeosynclinal klippes.

1353. Uyeno, T.T., Geol. Surv. of Canada:
Conodont biostratigraphy of the Hull Member, Ottawa Formation, Ottawa-Hull district, 1961-70.

1354. Weerasinghe, Asoka, Memorial Univ. of Newfoundland:
Stratigraphy and palaeontology of the Long Point Formation, northeast of Black Duck Brook, Port au Port Peninsula, Newfoundland, 1969-70; M.Sc. thesis.
An investigation of the fauna with particular emphasis on the trilobites and brachiopods.

1355. Williams, H., Memorial Univ. of Newfoundland:
Age and relationships of Long Harbour Group to nearby groups, Fortune Bay, Newfoundland, 1969-70.
The Long Harbour Group, assigned to the Ordovician and/or Silurian by previous workers and interpreted to unconformably overlie Cambrian strata, is everywhere faulted against late Cambrian rocks.

1356. Williams, S.R., Univ. of Ottawa:
Faunal studies in the Silurian rocks of the Boothia Arch region, 1967-70; Ph.D. thesis.
A stratigraphic, faunal and paleoecological investigation of the highest Silurian strata (Read Bay Formation) in the Boothia Arch region, as a means of establishing the local and regional correlates, and the paleographic development of the region.

1357. Winder, C.G., Univ. of Western Ontario:
Stratigraphy of the Middle Ordovician, southwestern Ontario - micropaleontology, carbonate petrology and macropaleontology, 1951-.

## Devonian to Permian

1358. Bamber, W., Geol. Surv. of Canada; Waterhouse, J.B., Univ. of Toronto:
Permian stratigraphy and faunal zones of the northern Yukon, 1962-69.
See Permian Strophalosiidae of the Canadian Arctic Archipelago. J. Pal. 44(1): 28-40.

1359. Belyea, Helen R., Geol. Surv. of Canada:
Documentation of Middle Chinchaga unconformity, 1969-70.

1360. Belyea, Helen R., Norris, A.W., Geol. Surv. of Canada:
Devonian correlations, Northwest Territories to Manitoba, 1964-71.

1361. Bourque, P.A., Université de Montréal:
Stratigraphie pré-dévonienne, anticlinical de la rivière St-Jean, Gaspésie, Québec; thèse de doctorat.

1362. Danner, W.R., Univ. of British Columbia:
Stratigraphy, paleontology, petrography and structure of the Cache Creek Group and correlated sequences in southern and central British Columbia, 1961-.
A study of the Upper Paleozoic regional geology to determine the sequence and age of the beds, their composition and characteristics and regional structure; fusulinids are the main fossil group being studied. See Carboniferous system of the Western Cordillera of southwestern British Columbia and northwestern Washington, Rept. of VIth International Congress of Carboniferous Stratigraphy and Geology, 1967, v. II, 1969.

1363. Davies, G.R., Geol. Surv. of Canada:
Reef-offreef relationships, Zama area, Alberta, 1969-70.

1364. Fuzesy, L.M., Saskatchewan Dept of Mineral Resources:
Geology of the Ratcliffe Beds (Mississippian) in south-central Saskatchewan, 1969-71.
Special emphasis will be given to the geological aspects related to the possibility of oil accumulation.

1365. Geldsetzer, Helmut, Queen's Univ.:
Devonian sedimentary and tectonic patterns in the north-eastern region of North America, 1967-70; Ph.D. thesis.
The objective is: (1) to trace pronounced faunal and lithic breaks throughout the above area; (2) to establish the facies relationships for each depositional episode; and (3) to estimate the amount of erosional removal prior to a new depositional episode.

1366. Howie, R.D., Geol. Surv. of Canada; Tait, D.B., Atlantic Richfield Co.:
Facies of the Albert Formation in New Brunswick, 1968-70.

1367. Kent, D.M., Saskatchewan Dept. of Mineral Resources:
Stratigraphy of the Mississippian Madison Group in southwestern Saskatchewan, 1968-70.
The project is concerned with stratigraphy primarily, but will include sedimentation and diagenetic effects on the carbonate rocks.

1368. Kliske, A.E., Chevron Standard Limited:
Leduc Formation biostratigraphy - Rocky Mountain surface exposures, 1969.

1369. Lenz, A.C., Univ. of Western Ontario:
Late Silurian and Early Devonian biostratigraphy and brachiopods of the Road River and Prongs Creek Formation, northern Yukon, 1966-71.
The objectives are to study biostratigraphic zonation of the rich brachiopod faunas of northern Yukon, to work up the taxonomy of a group of brachiopods very poorly known in Western Canada, and contribute to early Devonian brachiopod paleogeography. See Late Silurian brachiopods of Prongs Creek, northern Yukon: Jour. Paleontology (in press).

1370. Mason, David, Chevron Standard Limited:
Lower and Middle Devonian conodont biostratigraphy, Western Canada, 1966-.
Lower Devonian stratigraphic and sedimentologic study, Eastern Gaspé, 1967-; Ph.D thesis (Carleton Univ.).
An evaluation of petroleum possibilities of the Lower Devonian rocks of eastern Gaspé Peninsula.

1371. MacKenzie, W.S., Geol. Surv. Canada:
Devonian stratigraphy, Lower Mackenzie River area (Operation Norman), 1968-1971.
Stratigraphy, sedimentology, and correlation of Lower Paleozoic rocks of the area. See Geol. Surv. Canada, Paper 70-1A, 1970.

1372. Macqueen, R.W., Bamber, E.W., and others, Geol. Surv. of Canada:
Mississippian stratigraphy, sedimentology, and correlation, Rocky Mountains and Foothills, 1963-.
A continuing study of the stratigraphy, sedimentology, and correlation of Mississippian Strata from the Crowsnest Pass area of southern Alberta to the Jasper area of west central Alberta. The study has been confined to surface exposures in the Rocky Mountain Foothills and Front Ranges, and has involved four seasons of field work. General findings of the work have been published; more detailed aspects are in preparation for publication. See Foraminiferal zonation, Rundle Group and Uppermost Banff Formation, southwestern Alberta; Bull. Can. Petrol. Geology, v. 18, no. 1, 1970.

1373. Monger, J.W.H., Geol. Surv. of Canada:
Upper Paleozoic rocks of the Atlin Horst and Stikine Arch, northwestern British Columbia and south-central Yukon 1966-71.
The immediate object is to provide reference sections for Upper Paleozoic eugeosynclinal rocks of this region. The ultimate object is to determine the total environment-

depositional, tectonic, etc. during what appears to be the earliest stages of the latest orogenic cycle in the Cordillera. See Geol. Surv. Canada Paper 68-48, 1968 and Paper 70-1, 1970.

1374. Moore, R.G., Acadia Univ.:
Biostratigraphy of the Windsor Group, Nova Scotia, 1962-72.
See Lithostratigraphic units in the upper part of the Windsor Group, Minas Sub-Basin, Nova Scotia, Geol. Assoc. Can. Spec. Paper No. 4, 1967, p. 245-266.

1375. Mountjoy, E.W., McGill Univ. and Geol. Surv. of Canada:
Carboniferous stratigraphy and petrology of northern Jasper Park, 1959-.
See The Permo-Carboniferous succession of Mount Greenock and northern Jasper Park, Bull. Can. Petrol. v. 13, p. 340-45, 1965.

1376. Nassichuk, W.W., Geol. Surv. of Canada:
Carboniferous and Permian stratigraphy on Ellesmere and Axel Heiberg Islands, 1967-.

1377. Nautiyal, A.C., Univ. of Saskatchewan:
Biostratigraphy and acritarch faunas of Upper Devonian Formations of Western Canada, 1967-70; Ph.D. thesis.

1378. Norris, A.W., Geol. Surv. of Canada:
Devonian biostratigraphy of Lake Manitoba-Lake Winnipegosis region, Manitoba, 1964-71.
A study of the Devonian rocks and megafossils of the Manitoba outcrop belt to establish more precise correlations of the Manitoba sequence with other areas, and the subsurface. See Geol. Surv. Canada, Paper 66-1, 1966, p. 143.
Paleobiogeography of the Devonian period in the Western Hemisphere, 1968-69.
The paper describes distribution of Devonian sedimentary rocks in the western hemisphere and presents a brief yet comprehensive discussion of main fossil invertebrate faunas of the period with emphasis on the marine realm. It includes also references to terrestrial and fresh water invertebrates where appropriate. The paper will form part of the introductory volume (Part A) of the Treatise on Invertebrate Paleontology, edited by R.C. Moore and C. Teichert.

1379. Norris, A.W., Sanford, B.V., Geol. Surv. of Canada:
Devonian biostratigraphy of the Hudson Bay Lowlands, 1967-71.
Lower, Middle and Upper Devonian sedimentary rocks in the Moose River and Hudson Bay Basins will be described and the distribution of faunas discussed. See Paleozoic and Mesozoic Geology of the Hudson Bay Lowlands, Geol. Surv. Canada, Paper 68-53, 1969, p. 169-205.

1380. Sanford, B.V., Geol. Surv. of Canada:
Operation Winisk, Hudson Bay Lowlands, 1967-70.
A lithological and biostratigraphical study of the Devonian System of the Hudson Bay Lowlands (Quebec, Ontario, and Manitoba) is a joint project initiated during the course of Operation Winisk, 1967. Close correlation has been

established with Devonian sequences of Williston, Michigan, and Allegheny Basins to the south. Detailed facies studies of Devonian strata provide new information pertaining to the dating of the tectonic uplift of Precambrian rocks along the southern margins of the Moose River Basin. See Geology of the Hudson Bay Lowlands (Operation Winisk); Geol. Surv. Can., Paper 67-60, 1967.

1381. Trettin, H.P., Geol. Surv. of Canada:
Geology of the Marble Canyon Formation (Upper Permian) in the Marble Range, Clinton area, British Columbia, 1964-70.
See Geol. Surv. Canada, Paper 68-1, Pt. A, 1968, p. 220.

1382. Uyeno, T.T., Geol. Surv. of Canada:
Conodont biostratigraphy of the Waterways Formation, northeastern and central Alberta, 1964-70.
See Geol. Surv. Canada, Paper 67-30, 1967.
Conodont biostratigraphy of Middle and Upper Devonian strata of southern and central Manitoba, 1967-71.

1383. Young, Harvey, Brandon Univ.:
Stratigraphy of Virden member, Lodgepole Formation Manitoba, 1967-70; Ph.D. thesis (Queen's Univ.).

## Mesozoic

1384. Binda, P., Univ. of Alberta:
Studies of the Black Mud-White Mud beds, Western Canadian Cretaceous, 1950-; Ph.D. thesis.
See Province of the Kneehills Tuffs, southern Alberta. Can. Journ. of Earth Science, v. 6, no. 3, p. 510-513, 1969.

1385. Brooke, M.M., Univ. of Saskatchewan:
Jurassic microfaunas and biostratigraphy of Saskatchewan and Montana, 1967-70; M.Sc. thesis.

1386. Caldwell, W.G.E., McLean, J.R., North, B.R., Univ. of Saskatchewan:
Stratigraphic studies in Cretaceous rocks, 1960-; Ph.D. thesis (McLean).
See Late Cretaceous Bearpaw Formation in the south Saskatchewan River valley: Sask. Research Council, Geology Division, Rept. 8, 89 p., 16 text-figs., 1969.

1387. Christopher, J.E., Saskatchewan Dept. of Mineral Resources:
Basal Cretaceous-Upper Jurassic Formations (Cantuar and Vanguard) of southwestern Saskatchewan, 1966-70.
The study will emphasize stratigraphy, sedimentation and economic geology of the formations.

1388. Day, M.J., Univ. of Alberta:
Sedimentology and stratigraphy of the Nitikewin Formation, 1969-70; M.Sc. thesis.

1389. Dodson, Peter, Univ. of Alberta:
Vertical and lateral distribution of dinosaurian taxa, Oldman formation, Alberta, 1968-70; M.Sc. thesis.

1390. Foscolos, A.E., Procter, R.M., Stott, D.F., Geol. Surv. of Canada:
Clay mineralogy of Lower Cretaceous shales of northeastern British Columbia, 1968-70.
To identify and examine the distribution of clay mineral facies geographically and stratigraphically and investigate the relationship between clay distribution and other stratigraphic parameters with the objective of integrated paleoecological and paleogeographical studies.

1391. Frebold, Hans, Geol. Surv. of Canada:
The Jurassic System of Canada.
See Status of the Jurassic in the Canadian Cordillera of British Columbia, Alberta and southern Yukon, Can. Jour. Earth Sciences, v. 7, 1970 (in press).

1392. Gibson, D.W., Geol. Surv. of Canada:
Traissic stratigraphy and petrology in the Foothills and Front Ranges of Western Canada, 1962-.
A detailed study of the stratigraphy and petrology of the Triassic rocks in the Foothills and eastern Rocky Mountains of Alberta and British Columbia, to provide data on the character, structure, distribution, age, stratigraphic relationships, origin of the bedrock, and other geological data that are required to evaluate the oil, gas and mineral potentialities of the region. See Triassic stratigraphy of the Bow River-Crowsnest Pass Region, Rocky Mountains of Alberta and British Columbia; Geol. Surv. Canada, Paper 68-29, 1968.

1393. Havard, C.J., Geol. Surv. of Canada:
Lithostratigraphic studies of Upper Cretaceous Formations encountered in C.P.O.G. Strathmore well, 1969.
A continuous core was obtained from the Belly River to the Edmonton Formation. Insofar as the well is in an area of little continuous outcrop the core contains valuable information on the stratigraphy and lithology of these formations.
Stratigraphy and structure of Lower Cretaceous sedimentary rocks of the Waterton-Castle River area, Alberta, 1967-69.
A detailed study of the stratigraphy of Lower Cretaceous formations encountered in selected gas wells in the area to effect precise correlations with the outcrop and to define the habit of thrust faulting at this stratigraphic level.

1394. Jeletzky, J.A., Geol. Surv. of Canada:
Mesozoic and Tertiary on the east coast of Vancouver Island and in Quatsino Sound, 1949-72.
A stratigraphical-palaeontological study with special attention to the Lower Cretaceous-Jurassic contact. See Geol. Surv. Canada, Paper 69-1A, 1969, p. 126-134.
History of marine Cretaceous biotic provinces of Western and Arctic Canada, 1967-69.

To summarize the data available on the biotic provinces and palaeogeography of the Cretaceous of Western and Arctic Canada and to organize them into a concise paper illustrated by several palaeogeographical maps. See Journ. Palaeont., v. 43(3), p. 889-890, 1969 (abstract).

Cretaceous and uppermost Jurassic biostratigraphy of Western Cordillera, 1967-.

A detailed palaeontological-stratigraphical study of the Cretaceous and late Upper Jurassic rocks of the Canadian Western Cordillera including description of their faunas. See Lower Cretaceous and late Upper Jurassic biochronology and facies of Manning Park area and Mesozoic stratigraphy of Northern and eastern parts of Vancouver Island, Geol. Surv. Canada, Paper 70-1A, 1970.

1395. Lerbekmo, J.F., Univ. of Alberta:

Correlation of bentonites in Upper Cretaceous continental sediments of Alberta, 1966-71.

See Chemical and modal analyses of some Upper Cretaceous and Paleocene bentonites from Western Alberta. Can. Jour. Earth Sci., v. 5, no. 6, p. 1505-1511, 1968.

1396. Mountjoy, E.W., McGill Univ. and Geol. Surv. of Canada:

Mesozoic stratigraphy of northern Yukon, 1961-.

A regional study of the Mesozoic stratigraphy of northern Yukon as a part of Operation Porcupine of the Geological Survey. Includes determination of gross stratigraphic relationships, petrography and depositional history of these rocks. See Yukon Albian Stratigraphy and foraminiferal subdivisions, Peel and Snake Rivers, Yukon Territory, Geol. Surv. Canada, Paper 68-26, 1969.

1397. Ollerenshaw, N.C., Geol. Surv. of Canada:

Stratigraphy of the Blairmore Group and Kootenay Formation, Southern Foothills of Alberta, Bow River to Clearwater River, 1966-70.

See Mesozoic and Cenozoic Rocks between Bow and Brazeau Rivers, Alberta, ASPG, Guidebook, 16th Annual Field Conference, 1968, p. 67-105.

1398. Russell, L.S., Royal Ontario Museum:

Correlation of Upper Cretaceous formations in Montana and southern Alberta, 1963-70.

The transgressive nature of many formational boundaries in the Upper Cretaceous of Alberta and Montana has made time correlation difficult. In this study all available criteria are being used to establish time boundaries, which will permit a better reconstruction of the physical history of this region in Late Cretaceous time. This project is in collaboration with W.A. Cobban and J.R. Gill, United States Geological Survey. See Cretaceous non-marine faunas of northwestern North America, Royal Ontario Mus., Life Sci. Contribution 61, 24 p., 1964.

Faunas and correlation of the early Tertiary formations of Saskatchewan and Montana, 1967-71.

Involves stratigraphic studies of the Ravenscrag Formation of Saskatchewan and the Fort Union Group of Montana, together with a search for additional faunas. Final report will be a synthesis of stratigraphical and

palaeontological data to achieve a system fo both rock and time correlation.

1399. Simpson, Frank, Saskatchewan Dept. of Mineral Resources:
Lower Colorado Group, south-central Saskatchewan, Part I, 1969-71.
This is the first of three integrated sedimentological-paleoecological studies.

1400. Stelck, C.R., Warren, P.S., Patterson, T., and Sutherland, G., Univ. of Alberta:
Mid-Cretaceous biostratigraphy - a continuing project, 1950-; M.Sc. theses (Patterson, Sutherland).
A continuing investigation of the relationships of the dermic Neogastroplitan biozones with the cosmopolitan Cenomanian Albian biozones by ammonite, foraminferal and palynological studies. See Early Neogastroplites form Fort St. John Group, Western Canada. Bull. Can. Petrol. Geol. v. 17, no. 4, 1969.

1401. Stott, D.F., Geol. Surv. of Canada:
Cretaceous stratigraphy, Peace River to 60°, British Columbia, 1961-69.
Detailed stratigraphic investigation of mainly Lower Cretaceous rocks in Foothills and Plains of northeastern British Columbia. This study will establish the relationships with equivalent successions studied between Peace and Smoky Rivers and in the region of Liard and Mackenzie Rivers. It also provides data for surface mapping of Trutch (94G), Fort Nelson (94J), Maxhamish Lake (94), Toad River (94N), Tuchodi Lake (94K). See The Gething Formation at Peace River canyon, British Columbia; Geol. Surv. Can., Paper 68-28, 1968.
Cretaceous subsurface studies in northeastern British Columbia, 1962-.
Studies of samples, cores, and logs of wells in northeastern British Columbia are being carried on in conjunction with surface investigations of Cretaceous strata. See Lower Cretaceous Bullhead and Fort St. John Groups, between Smoky and Peace Rivers, Rocky Mountain Foothills, Alberta and British Columbia: Geol. Surv. Can., Bull. 152.
Jurassic and Cretaceous stratigraphy, Sikanni Chief River to 53°30', British Columbia and Alberta, 1968-71.
Detailed stratigraphic studies are being made of the Jurassic Fernie Formation and Lower Cretaceous Minnes Groups and equivalent strata of the Foothills. Cretaceous and Jurassic rocks will also be mapped in Dawson Creek (93P), Monkman (93I), Wapiti (83L), and Mount Robson (83D)

1402. Tozer, E.T., Geol. Surv. of Canada:
Triassic Ammonoidea and Bivalvia, 1960-72.
A morphological, taxonomic, biostratigraphic investigation with the object of refining Triassic biostratigraphic investigation with the object of refining Triassic biochronology, 1960-72. See A Standard for Triassic time, Geol. Surv., Canada, Bulletin 156.

1403. White, W.I., Saskatchewan Dept. of Mineral Resources:
Geology and petroleum accumulations of the North Hoosier Area, west central Saskatchewan, 1968-70.
Involves study of the stratigraphy and structure of the sediments from the base of the Bakken Formation to the top of the Viking Formation in an area including and contiguous with the North Hoasier Bakken sand and basal Blairmore sand pools. The history of oil and gas production will be described and a prognosis of future development attempted.

1404. Williams, G.D., Playford, G.F., Univ. of Alberta:
Cretaceous stratigraphy of Western Canada, 1967-.

1405. Yorath, C.J., Geol. Surv. of Canada:
Mezozoic stratigraphy - Mackenzie Plains region, Northwest Territories, 1969-70.
One inch to four mile maps are presently being compiled and micropaleontological studies have begun.

## Cenozoic

1406. Storer, J.E., Royal Ontario Museum:
Fauna and correlation of the Wood Mountain gravel, Miocene of Saskatchewan, 1967-70.
All available collections are being studied and new material collected. This study should not only provide a adequate knowledge of an important vertebrate fauna, but should contribute to the working out of the physical history of the northern plains in Tertiary time. See An Upper Pliocene neohipparion from the Flaxville Gravels, northern Montana. Can. Jour. Earth Sci., v. 6, no. 4, p. 791-794, fig. 1, 1969.

## General

1407. Aitken, J.D., Geol. Surv. Canada and Univ. of Calgary:
Pre-Devonian stratigraphy, southern Rocky Mountains, Alberta and British Columbia, 1961-.
See Documentation of the sub-Cambrian unconformity, Rocky Mountains Main Ranges, Alberta; Can. Jour. Earth Sci., v. 6, no. 2, 1969, p. 193-200.

1408. Aitken, J.D., Balkwill, H.R., Cook, D.G., Geol. Surv. of Canada:
Operation Norman: to complete reconnaissance geological mapping, western District of Mackenzie, northwest Territories, 1967-72.
The purposes are to conduct stratigraphic and structural studies, and to evaluate the economic potential of the bedrock in the Great Bear, Horton, Anderson, and Mackenzie Plains, and in the Colville Hills, the Franklin Mountains, and part of the northern Mackenzie Mountains. See Geol. Surv. Canada, Paper 70-1, Pt. A, 1970.

1409. Bartlett, G.A., Queen's Univ.:
Geology of the Canadian Atlantic Continental Margins, 1966-.

A detailed interpretation of the biotos and paleon-environments of the Continental Margins of the world. See Cretaceous Biostratigraphy of the Grand Banks of Newfoundland, Maritime Sediments v. 5, no. 1, p. 4-14.

1410. Bartlett, G.A., Vilks, G., Ramsay, A.T.S., Queen's Univ.:
Ecostratigraphy of the North Atlantic, 1968-.
The interrelationship of the biomass and watermass in the North Atlantic and Caribbean Sea. The utilization of this information as a climatic and paleoclimatic index for the Mesozoic and Cenozoic Periods. See Planktonic Foraminifera in watermasses and bottom sediments from the Grand Banks to the Caribbean sea, Maritime Sediments, v. 3, no. 4, 1968.

1411. Beales, F.W., Univ. of Toronto:
Limestone petrography and paleoecology, a continuing project.
Main research emphasis at present is on the stratigraphic habitat of Mississippi Valley type lead-zinc mineralization in carbonate rocks. This is involving a study of porosity ranging from open cavern to sub-microscopic inter-crystalline voids, cementation of primary and subsequent permeable trends, and the relation of these features to the paleoecology of the limestones. See Cementation by White Sparry Dolomite and cementation in ancient pelletted limestones in Symposium on Carbonate Cements, Bermuda Biological Station and Johns Hopkins University Special Publication (in press).

1412. Calcutt, M.J., Williams, H., Memorial Univ. of Newfoundland:
Stratigraphy and relations of Cinq Isles Group to nearby groups, Belle Bay, Newfoundland, 1969-70; M.Sc. thesis (Calcutt).
The Cinq Isle Group of unknown age and previously interpreted to be cut by the Baie du Nord granite, has been recently found to unconformably overlie the granite.

1413. Christie, R.L., Geol. Surv. of Canada:
Geological reconnaissance of eastern Devon Island with additional stratigraphic studies on southeastern Ellesmere Island, 1968-71.
Reconnaissance study of Precambrian rocks and of lower Palaeozoic sections.

1414. Hobson, G.D., Overton, A., Geol. Surv. of Canada:
Marine seismic - Gulf of St. Lawrence, 1964-69.
Two-ship marine seismic refraction experiments to investigate the thickness, nature and attitude of the sedimentary rocks underlying the Gulf of St. Lawrence to the depth of the crystalline basement.

1415. Hubert, Claude, Vallières, André, Université de Montréal:
Stratigraphy and structure of St. Malachie area, Quebec, 1969-70; M.Sc. thesis (Vallières).

1416. Jansonius, J., Craig, J., Imperial Oil Limited, Calgary:
Stratigraphic application of scolecodonts, 1967-71.

A synthesis of all published data has been completed; current emphasis is on stratigraphic occurrence. See Lectotypes and new names for scolecodonts with an index of genera and species, Neues Jahrb. (in press).

1417. Kerr, J.Wm., Geol. Surv. of Canada:
Stratigraphy of central and eastern Ellesmere Island, Northwest Territories, 1961-70.
See Geol. Surv. Canada, Paper 67-27, Pt. II, 1967.
Stratigraphy and structure of Bathurst Island, Northwest Territories, 1963-69.
See Tectonic history of the Boothia Uplift and Cornwallis Fold Belt, Arctic Canada; Bull. Amer. Assoc. Petrol. Geol., v. 49, p. 901-926.

1418. McCabe, H.R., Manitoba Mines Branch:
Structure and isopach features of Palaeozoic formations, southwestern Manitoba, 1965-.
See Tectonic framework of Palaeozoic formations in Manitoba, Can. Inst. Min. and Metall., Transactions v. LXX, 1967.

1419. McGregor, D.C., Geol. Surv. of Canada:
Biostratigraphic study of Paleozoic palynomorphs of the Arctic Islands, 1968-72.
The objectives are to set up zonal standards for Paleozoic palynomorphs for the Arctic Islands, to correlate palynomorph zones with conodont zones in measured sections (in joint study with T.T. Uyeno), and to obtain fossil data of use to those engaged in geologic exploration of the Arctic. Collections were obtained from four Silurian-Devonian sections in the summer of 1968. See Geol. Surv. Canada, Paper 69-1A, p. 134-135, 1969 and Paper 70-1A, 1970.

1420. O'Brien, F.H.C. (Mrs.), Memorial Univ. of Newfoundland:
Stratigraphy and palaeontology of the Clam Bank and Long Point Formations on the west coast of Newfoundland, 1968-70; M.Sc. thesis.

1421. Pounder, D.A., Chevron Standard Limited:
Sedimentology, diagenesis and stratigraphy of carbonate rocks, 1959-.

1422. Sanford, B.V., Geol. Surv. of Canada:
Subsurface studies of the Paleozoic systems of southwestern Ontario (Cambrian, Ordovician, Silurian and Devonian), 1958-1970.
Present emphasis is placed on the Devonian System to establish a detailed classification of the rock-stratigraphic succession, and to determine correlation with adjoining areas of Michigan, Ohio, Pennsylvania and New York States, and the Hudson Bay Lowlands of northern Ontario. Included also is a subsurface basinal analysis, and a study of tectonic structures that are related to the removal by solution of underlying Upper Silurian salts. See The Silurian of southwestern Ontario; Proceedings, Ontario Petroleum Institute, v. 8, 44 p., 1969.

1423. Winder, C.G., Univ. of Western Ontario:
Stratigraphic nomenclature of the Paleozoic in southern Ontario, 1965-.
The Ontario Stratigraphic Committee of which Dr. Winder is Chairman has defined formations in the subsurface in wells spread across southern Ontario using both lithologic and geophysical criteria. Proposed formation names are suggested primarily to establish consistent usage and definition.

1424. Smith, Leigh, Queen's Univ.:
Mesozoic and Tertiary sequences on the Newfoundland Grand Banks, 1968-69.
Lithic data, combined with micropaleontologic information, has lead to a sequence breakdown of the sections present in the Grant Banks wells. These sequences closely parallel those in western North America.
Erosional aspects of the tectonic history in the Peace River Arch area, 1969-71.
Interpretations of the tectonics of the Peace River Arch has come from studies which assumed little erosional removal of the sediments involved and, thus, a long-time land mass. This study has begun to reveal very different distribution of land and sea in space-time.

1425. Stanton, M.S., Chevron Standard Limited, Calgary:
Arctic stratigraphy.
See Summary of geology and operating conditions, Canadian Arctic, World Oil, May, 1969.
Marine geology.
See Summary of geology and operating conditions, Canadian Westcoast Offshore and Canadian Eastcoast Offshore, World Oil, July 1969.
Petroleum chemistry.

1426. Taylor, G.C., Stott, D.F., Gibson, D.W., Bamber, E.W., Rutter, N.W., Geol. Surv. Canada, 1968-1970.
Operation Smoky - a study to establish the independant relationships of the structure and stratigraphic successession between the southern and northern Rocky Mountains, 1968-70.
See Geol. Surv. Canada, Paper 69-1, Pt. A, 1969, p. 246.

1427. Thorsteinsson, R., Tozer, E.T., Trettin, H.P., Kerr, J.W., Geol. Surv. of Canada:
Mapping of post-Precambrian bedrock formations of Axel Heiberg and Ellesmere Islands, Northwest Territories 1961-70.

1428. Trettin, H.P., Geol. Surv. of Canada:
Geology of the Franklinian "eugeosyncline" in northern Axel Heiberg and Ellesmere Islands, Northwest Territories, 1961-.
A project concerned with the stratigraphy, sedimentology and tectonic history of the region. The relationships between northern Ellesmere Island and the Arctic Ocean Basin are also investigated. See A Paleozoic-Tertiary fold belt in northernmost Ellesmere Island aligned with the Lomonosov

Ridge; Geol. Soc. Amer., Bull., v. 80, p. 143-148, 1969 and Pre-Mississippian geology of northern Axel Heiberg and northwestern Ellesmere Islands, Arctic Archipelago; Geol. Surv. Can., Bull. 171, 1969.

1429. Uyeno, T.T., Geol. Surv. of Canada:
Conodont biostratigraphy of Paleozoic rocks of the Arctic Islands, Northwest Territories, 1968-.
Silurian and Devonian sections were sampled in five localities on Prince Patrick, Bathurst, Cornwallis, Devon, and Ellesmere Islands, in 1969. See Geol. Surv. Canada, Paper 69-1A, p. 134-135, 1969.

1430. van Hinte, J.E., Imperial Oil Limited, Calgary:
Mesozoic-Tertiary foram-ostracod biostratigraphy of Canadian Arctic Slope, North Atlantic and North Pacific, 1969-72.

## STRUCTURAL GEOLOGY AND TECTONICS

### Alberta

1431. Bielenstein, H.U., Queen's Univ.:
The Rundle Thrust Sheet, Banff, Alberta, 1965-70; Ph.D. thesis.

1432. Dickie, G.J., Williams, G.D., Univ. of Alberta:
Characteristics of oil and gas pools relative to the structure and stratigraphy of Alberta, 1967-71; Ph.D. thesis (Dickie).

1433. Havard, C.J., Geol. Surv. of Canada:
Stratigraphy and structure of Lower Cretaceous sedimentary rocks of the Waterton-Castle River area, Alberta, 1967-69.
A detailed study of the stratigraphy of Lower Cretaceous formations encountered in selected gas wells in the area to effect precise correlations with the outcrop and to define the habit of thrust faulting at this stratigraphic level.

1434. Jones, P.B., Amerada Hess Corporation, Canadian Division:
Structural geology, Rocky Mountains of southern Alberta, 1967-.
See Tectonic windows in the Lewis Thrust, southeastern British Columbia, Bull. Canadian Petroleum Geology, v. 17, no. 2, p. 247-252.

1435. Mountjoy, E.W., McGill Univ. and Geol. Surv. of Canada:
Structure of Front and Main Ranges, northern Jasper Park, Alberta, 1967-.
Extent, geometry and development of fold and thrust structures, relationships of folds with abrupt termination of thrusts, interrelations of hanging-wall and foot-wall structures. See Geologic structure of the Canadian Rockies

between Bow and Athabasca Rivers. Geol. Assoc. Can., Sp. Paper 6, 1970.

## British Columbia

1436. Cook, D.G., Geol. Surv. of Canada:
Strain analysis in the cleaved Middle and Upper Cambrian rocks of the western Main Ranges of the southern Rocky Mountains, British Columbia, 1969-71.
A Cambrian facies change and its effect on structure, Mount Stephen-Mount Dennis area, Alberta-British Columbia; Geol. Assoc. Canada special paper no. 6 (in press).

1437. Eisbacher, G.H., Geol. Surv. of Canada:
Tectonic framework of Sustut and Sifton Basins, British Columbia, 1969-72.
See Geol. Surv. Canada, Paper 70-1A, 1970.

1438. Fyles, J.T., British Columbia Dept. of Mines and Petroleum Resources:
Rossland Project - a restudy of the geology of the Camp Rossland mining camp with special emphasis on the structure and molybdenite mineralization, 1968-70.

1439. Fyson, W.K., Univ. of Ottawa:
Structural and stratigraphic relations in metamorphic rocks, Shuswap area, British Columbia; 1965-70.
See Structural relations in metamorphic rocks, Shuswap Lake area, British Columbia. in Wheeler, J.O. (edit.). Symposium on the structural cross-section of the southern cordillera. Geol. Assoc. Canada, special paper no. 6 (in press).

1440. Simony, P.S., Baer, H.J., deVries, C.N., Poulton, T.P., Univ. of Calgary:
Geology of the Rocky Mountain Trench, 1969-73; M.Sc. theses (Baer, deVries, Poulton).
Several aspects of the geology of the Rocky Mountain Trench are being investigated in the general vicinity of Golden and minor structures and their relationship to metamorphism.

## Manitoba

1441. Bailes, A.H., Manitoba Mines Branch:
Petrology and structure of high grade gneisses north of Snow Lake, Manitoba, 1968-72; Ph.D. thesis.
See Manitoba Mines Branch preliminary maps 1969 B-1, 2 and 3 and Summary of Field Work, 1969.

1442. Campbell, F.H.A., Manitoba Mines Branch:
Sickle-Wasekwan unconformity in northern Manitoba, 1969-70.

1443. McCabe, H.R., Manitoba Mines Branch:
Structure of isopach features of Palaeozoic formations, southwestern Manitoba, 1965-.
See Tectonic framework of Palaeozoic formations in Manitoba, Can. Inst. Min. and Metall., Transactions v. LXX, 1967.

1444. McCabe, H.R., Bannatyne, B., Manitoba Mines Branch:
The Gypsumville-Lake St. Martin circular structure, Manitoba, 1969.
Preliminary results of outcrop studies and of core from 12 drill holes in the Lake St. Martin area indicate the presence of a crater structure; chemical analysis and petrographic studies are being made.

1445. Schledewitz, Dave, Manitoba Mines Branch:
Southern Indian Lake area, Manitoba, 1969-71; M.Sc. thesis, Univ. of Manitoba.
The main interest is the structural aspect of the Rat Lake area.

1446. Weber, W., McRitchie, W.D., Manitoba Mines Branch:
Project Pioneer - a structural and geochemical reinvestigation of the Rice Lake Greenstone belt and associated gneisses and granites, Manitoba, 1966-71.
See Preliminary maps of Manigotagan gneissic belt, Manitoba Mines Branch 1969-1-A, and Paper 1-69.

## New Brunswick

1447. Helmstaedt, Hewart, Geol. Surv. of Canada:
Structural evolution of rocks of the Bathurst-Newcastle District, New Brunswick, 1969-71.
The objective is to establish the style and sequence of deformation, age of structures, and their relationship to base-metal sulphide deposits of the district. See Structural geology of the Head of Middle River and Wildcat Brook; Mines Division, New Brunswick Dept. of Natural Resources (in press).

1448. Ruitenberg, A.A., New Brunswick Dept. of Natural Resources:
Geology and mineral deposits of southern New Brunswick, 1967-70.
A long term project to examine in detail and evaluate the mineral potential of this part of the Province. Special emphasis will be placed on the structural control for base metal occurrences in this area. See Mineral deposits in granitic intrusions and related metamorphic aureoles in parts of the Welsford, Loch Alva, Musquash and Pennfield areas; Mineral Resources Branch, New Brunswick Dept. of Natural Resources, Report of Investigation No. 9, 1969.

## Newfoundland and Labrador

1449. Currie, K.L., Geol. Surv. Canada:
Geology of the Mistastin Lake structure, Labrador, 1968-69.

Mistastin Lake is an elliptical crater containing a shock metamorphosed central uplift of Precambrian rocks, and a marginal belt of Jurassic andesitic rocks, fed by a well exposed ring dike. See A paleomagnetic study of volcanic rocks from Mistastin Lake, Labrador; Earth and Planetary Science Letters, vol. 6, p. 309-315, 1969.

1450. Kennedy, M.J., Smyth, W.R., Memorial Univ. of Newfoundland:
Structural relations within the Appalachians of northwestern Newfoundland, 1969-72; M.Sc. thesis (Smyth).
Involves mapping of the area south of Hare Bay as far as Canada Harbour, recognition of allocthonous rocks which had been metamorphosed and deformed several times before emplacement as a klippe, and study of post-emplacement structures. Involves also structural studies of the Grey Islands and relations of the metasediments of these islands with the Fleur de Lys Supergroup on the eastern side of White Bay.

1451. Sutton, J.S., Memorial Univ. of Newfoundland:
Structural and metamorphic investigations of the southern part of the Nain Province, Labrador, 1969-.
Investigation will lay particular emphasis on the problems of recognition and the significance of basement reactivation in orogenic belts.

## Northwest Territories

1452. Aitken, J.D., Balkwell, H.R., Cook, D.G., Geol. Surv. of Canada:
Operation Norman: to complete reconnaissance geological mapping, western District of Mackenzie, Northwest Territories, 1967-72.
The purposes are to conduct stratigraphic and structural studies, and to evaluate the economic potential of the bedrock in the Great Bear, Horton, Anderson, and Mackenzie Plains, and in the Colville Hills, the Franklin Mountains, and part of the northern Mackenzie Mountains. See Geol. Surv. Canada, Paper 70-1, Pt. A, 1970.

1453. Clarke, Barry, Univ. of Alberta; Wilson, J.T., Univ. of Toronto:
Opening of Baffin Bay and relative movements of Canadian Arctic islands, 1964-70; Ph.D. thesis (Clarke).
An expedition in the summer of 1964 started Dr. Clarke on the investigation of Paleocene lava flows on the coast of Baffin Island and West Greenland. The major part of Clarke's work consists of studies of the petrology, age and interrelated floras of these flows. See Geological expedition to Capes Dyer and Searle, Baffin Island, Canada. Nature, v. 205, no. 4969, p. 349-350, January 23, 1965.

1454. Kerr, J.Wm., Geol. Surv. of Canada:
Stratigraphy and structure of Bathurst Island, Northwest Territories, 1963-69.
See Tectonic history of the Boothia uplift and Cornwallis Fold Belt, Arctic Canada; Bull. Amer. Assoc. Petrol. Geol., v. 49, p. 901-926.

1455. Reinhardt, E.W., Geol. Surv. of Canada:
Petrological and structural study of the McDonald fault system, Great Slave Lake, Northwest Territories, 1965-69.
A study of the paragenetic and structural history of metamorphic, migmatitic, and mylonitic gneisses along the boundary of the Slave and Churchill Structural Provinces in the vicinity of Great Slave Lake. See Geology of Precambrian Rocks of Thubun Lakes map-area in relationship to the McDonald fault system; Geol. Surv. Canada, paper 69-2.

1456. Sobczak, L.W., Weber, J.R., Roots, E.F., Observatories Branch, Dept. of Energy, Mines & Resources:
Rock densities in the Queen Elizabeth Islands, Northwest Territories, 1965-69.
Results of 1900 density measurements of crystalline, carbonate and clastic rocks from the Queen Elizabeth Islands are presented graphically and in tables. The data were compiled directly from sampling of surface rocks and rock material from drillholes, and indirectly by relating densities to seismic velocities and from detailed gravity profiles across topographic features. The weighted mean densities of the Precambrian crystalline rocks, and of the Paleozoic carbonate rocks of the Franklinian miogeosyncline and Arctic Lowlands are each 2.76 /cm$^3$. The Paleozoic evaporite rocks, sampled mainly in the Bathurst Island are but common throughout the Franklinian miogeosyncline, have a weighted mean density of 2.56 g/cm$^3$. The Franklinian clastic rocks exhibit a range of density, in part apparently related to age and/or depth of burial; the Silurian clastics have a weighted mean density of 2.62 g/cm$^3$ and the Devonian clastic formation 2.51 g/cm$^3$. In contrast, the Mesozoic clastic rocks of the Sverdrup basin have a weighted mean density of 2.32 g/cm$^3$.
Crustal structure of the Queen Elizabeth Islands and Polar Continental Margin, Northwest Territories, 1965-70.
Gravity and seismic measurements made during the period 1960 to 1966 are correlated with geological information along two regional profiles which cross the Queen Elizabeth Islands and adjacent polar continental margin. These anomalies vary in length from 150 km to 320 km and have amplitudes of over 100 mgal and are explained by the combined effects of variable thickening of clastic sediments (maximum thickness 10 km) and uniform thinning of the continental crust to 20 km.

1457. Trettin, H.P., Geol. Surv. of Canada:
Geology of the Franklinian "eugeosyncline" in northern Axel Heiberg and Ellesmere Islands, Northwest Territories, 1961-.
A project concerned with the stratigraphy, sedimentology and tectonic history of the region. The relationships between northern Ellesmere Island and the Arctic Ocean Basin are also investigated. See A Paleozoic-Tertiary fold belt in northernmost Ellesmere Island aligned with the Lomonosov Ridge; Geol. Soc. Amer., Bull. v. 80, p. 143-148, 1969, and Pre-Mississippian geology of northern Axel Heiberg

and northwestern Ellesmere Islands, Arctic Archipelago; Geol. Surv. Can., Bull. 171, 1969.

## Ontario

1458. Ambrose, J.W., Queen's Univ.:
Detailed study of folds in the Buck Lake-Devil's Lake area north of Kingston, 1968-.
A study of the geometry and kinematics of folds in rocks of the Grenville Group.

1459. Brigham, R.J., Univ. of Western Ontario:
Structural geology of Paleozoic sediments in southwestern Ontario, 1964-70; Ph.D. thesis.
The flat-lying sediments are crossed by the Algonquin arch and the Chatham sag. A regional study with consideration of the complete section will provide insight to the tectonic history.

1460. Clifford, P.M., Hsu, M.Y., McMaster Univ.:
Provenance and deformation of the Seine conglomerate, 1968-70; Ph.D. thesis (Hsu).

1461. Eisbacher, G.H., Geol. Surv. of Canada:
Regional structural study in the Elliot Lake area, Ontario, 1968-70.
Cooperative investigation by Geological Survey and Mines Branch of crustal stresses around mines. See Contemporaneous faulting and clastic intrusions near Elliot Lake; Can. Jour. Earth Sci. (in press).

1462. Fyson, W.K., Divi, R., Univ. of Ottawa:
Structural analysis of Grenville rocks, Madoc-Bancroft area, Ontario, 1967-71; Ph.D. thesis (Divi).

1463. Gibb, R.A., Observatories Branch, Dept. Energy, Mines & Resources:
Interpretation of the gravity anomaly field in northern Ontario, 1969-.
A study of gravity, aeromagnetic anomalies and geology in northern Ontario is in progress. The geophysical results suggest that large scale crustal faults may have been active during Proterozoic time in this area.

1464. Jacoby, W.R., Observatories Branch, Dept. Energy, Mines and Resources:
Gravity study of the Bancroft area, Ontario, 1967-69.
A detailed study of the Bancroft area is nearing completion. The mechanics of granite emplacement are considered with some quantitative estimates.

1465. MacIlreath, I., Queen's Univ.:
An investigation of primary dip in the Black River limestones of the Kingston area, 1969-70, M.Sc. thesis.

1466. Newson, R., Queen's Univ.:
Structural study of the Perth Road Syncline, 1966-70; M.Sc. thesis.

A synthesis of structural elements associated with the syncline.

1467. Norris, D.K., Geol. Surv. of Canada:
Structural prototypes in Canada, 1964-.
A kinematic and dynamic analysis of homoclines, faults and folds in Canada and U.S.A., in order to explain their deformational characteristics and their significance in the local and regional tectonic framework. See Structural analysis of the Queensway Folds, Ottawa, Canada; Can. Jour. Earth Sciences, v. 4, p. 229-321, 1967.

1468. Pyke, D.R., Ontario Dept. of Mines:
Structural geology of the Timmins area, 1969-71.

1469. Sobczak, L.W., Observatories Branch, Dept. of Energy, Mines and Resources:
Gravity surveys in the Alexandria area, eastern Ontario, 1960-69.
The results of 1700 gravity observations completed by the Dominion Observatory from 1945 to 1964 are presented in the form of a Bouguer anomaly map. Seven profiles are analyzed. The Bouguer anomalies are correlated with magnetic and geological information and the interpretation of the gravity data is based on rock density measurements. Two maps showing the computed first and second vertical derivatives of gravity are also presented. Negative Bouguer anomalies are correlated with the Chatham-Grenville syenite stock and a similar intrusion at Mount Rigaud on the southern border of the Grenville-A subprovince. It is postulated that the negative anomaly near Plaisance indicates the presence of a similar intrusion below the Palaeozoic cover. The Alexandria High, a positive residual Bouguer anomaly which extends from Lunenburgh to Pointe-au-Chêne, may be explained by the presence of a basic lenticular body of thickness varying from 6,000 to 9,000 feet and width of 50,000 feet at a depth varying from 3,000 to 5,000 feet. The approximate thickness of the Grenville Series is 11,000 to 12,000 feet along the crest of the Alexandria High. The regional gravity gradient which increased from -30 milligals in the northwest to +10 milligals in the southeast of the area is correlated with a rise of over 3 kilometres (10,000 feet) of the Mohorovicic discontinuity. See Gravity surveys in the Alexandria area, eastern Ontario; Pub. Dom. Obs. v. XXXIX, no. 6, 1969.

1470. Wynne-Edwards, H.R., Fong, D., Ambrose, J.W., Queen's Univ.:
Structure of the Potspoon Lake Syncline, Frontenac Axis, Ontario, 1965-70; M.Sc. thesis (Fong).
A detailed structural analysis of a syncline in the Frontenac Axis. See Geology of Tichborne (east half) map-area, Ontario, Geol. Surv. Can. Paper 64-56 1965.

1471. Wynne-Edwards, H.R., Wallach, J.L., Queen's Univ.:
Structures in a grey gneiss at Parham, Ontario, 1967-70; Ph.D. thesis (Wallach).
The structure and petrology of a grey gneiss complex near Parham is to be compared to those surrounding rocks of the Grenville Group to assess the relative ages of the two

categories of rocks, and test the hypothesis that the grey gneiss represents basement. See Geology of Tichborne (east half) map-area, Ontario, Geol. Surv. Can. Paper 64-56, 1965.

## Quebec

1472. Bourne, James, Quebec Dept. of Natural Resources:
Relationship between basement and cover in the Lac Cayamant area, Grenville Province, Québec, 1969-72; Ph.D. thesis, Queen's Univ.
In the eastern half of the area the geology is dominated by rocks of the Grenville Group (garnet-sillimanite gneisses, marble..) and in the west by an extremely varied assemblage of hornblende and biotite gneisses; it is thought the latter have served as basement to the former. This hypothesis is being tested.

1473. Charre, Roger, Ministère des Richesses Naturelles du Québec:
Etude du "front du Grenville" au Nord-Ouest du Réservoir Gouin-Comté d'Abitibi, 1969-73; thèse de doctorat.
Etude pétrographique et structurale des formations de la province du Grenville et de leur relation avec les formations de la province du Supérieur dans la région des lacs Lagacé, Megiscane et Berthelot.

1474. Currie, K.L., Geol. Surv. of Canada:
Geology of the Manicouagan structure, Quebec, 1963-69.
See A preliminary report on the Manicouagan structure; Geol. Surv. Can., Paper 67-70, 1969.

1475. Eakins, P.R., Williams, M., McGill Univ.:
Structural studies in southern Québec, 1965-; M.Sc. thesis (Williams).
A continuing study of an active quarry in complexly deformed slates and limestones of Ordovician age.

1476. Kutina, J., Geol. Surv. of Canada:
Relationship of structural lineaments and mineral occurrences in the Abitibi area of the Canadian Shield, Québec, 1969-70.

1477. Martignole, Jaques, Université de Montréal et Ministère des Richesses Naturelles du Québec:
Etude de la partie sud de la Province tectonique de Grenville, au Nord de Montréal, 1965-72.
Voir Relations chronologiques et structurales entre la Série de Grenville et la Série de Morin dans le Sud du Québec, Geol. Assoc. of Canada, Sp. Paper No. 5, 1969.

1478. St-Julien, Pierre, Université Laval:
Etude structurale de la région de la ville de Québec, 1967-70.
Voir "Les Argiles - à - Blocs" du sud-ouest des Appalaches du Québec. Nat. Can. v. 95, no. 6, Nov. Déc. 1968, p. 1345-1356.

1479. Tanner, J.G., Observatories Branch, Dept. Energy, Mines and Resources:
A geophysical study of structural boundaries in northern Quebec, 1964-70.
In recent years structural boundaries within the Canadian Shield generally have been the subject of progressively more intense geological and geophysical studies. It is planned to combine this study of the gravity data over structural boundaries in northern Quebec with studies of structural boundaries outside Quebec and thus carry out a much more comprehensive investigation of these features than has been hitherto possible.

1480. Wynne-Edwards, H.R., Sharma, K.N.M., Nandi, A., Queen's Univ.:
Application of tectonic data processing to geological mapping in Quebec, 1968-72.
A co-operative project with the Quebec Department of National Resources, using field data co-ordinated by Dr. A. Laurin. See Les applications des ordinateurs à la géologie régionale dans la province Grenville, Québec; Annales de l'Assoc. Canadienne-Française pour l'Avancement des Sciences, v. 36, p. 119-120, 1969.

1481. Wynne-Edwards, Fuh, Tsu-Min, Queen's Univ.:
Geochemical correlation of rocks on either side of the Grenville Front at Val D'or, Quebec, 1967-70; Ph.D. thesis (Fuh).
A test by geochemical correlation using five sample areas, of the hypothesis that the Archaean rocks near Val D'or including the Abitibi greenstone belt, continue eastward in the Grenville Province. See Tectonic overprinting in the Grenville Province, southwestern Quebec; Geol. Assoc. Can. Sp. Pap 5, p. 163-182; 1969.

## Saskatchewan

1482. Ahuja, S., Univ. of Saskatchewan:
Structural analysis of the Missi Group on the North Side of Amisk Lake, Saskatchewan, 1968-69; M.Sc. thesis.

1483. Cargill, D.G., Queen's Univ.:
Structural study of an area northeast of Eldorado Mine, Saskatchewan, 1967-70; M.Sc. thesis.
An area on the northeastern extension of the St. Louis fault, Beaverlodge, Saskatchewan.

1484. Mukherjee, A.C., Univ. of Saskatchewan:
Structural analysis of the region between Flin Flon and Amisk Lake, Saskatchewan, 1968-71; Ph.D. thesis.

1485. Stauffer, M.R., Univ. of Saskatchewan:
Structural evolution of the Precambrian rocks in northern Saskatchewan, 1967-.
A long-term project that will involve numerous graduate students over the years. The project involves primarily structural analysis, but also includes geochemistry and age-dating.

## General

1486. Aumento, F., Geol. Surv. of Canada and Dalhousie Univ.:
Geology of the Mid-Atlantic Ridge near 45°N., 1966-70.
See Diorites from the Mid-Atlantic Ridge at 45°N., Science, v. 165, 1969, p. 1112-1113.

1487. Becker, A., Geol. Surv. of Canada:
VLF mapping, 1967-71.
The Geonics EM-16 VLF unit using NAA Cutler, Maine (17.8 KHz) has shown that the Gloucester Fault, southwest of Leitrim, Ontario, can be outlined. Another test carried out during 1969 tested the recently patented Radiohm method. In a manner quite analogous to the magneto-telluric method, Radiohm yields a measurement of ground conductivity from a comparison of the horizontal electric field along the direction of wave propagation and horizontal orthogonal magnetic field vector. The equipment was designed and fabricated for the Geological Survey of Canada by the Geoscience Division of Westinghouse. The result of the Radiohm test shows the method is effective for locating the fault. See Geol. Surv. Canada Paper 67-1, Pt. A, 1968, p. 130-131 and Radiohm method for earth resistivity mapping Canadian Patent No. 795, 919, Oct. 1, 1968.

1488. Bell, K., Crawford, A.R., Grasty, R.L., Wilson, J.T., Univ. of Toronto:
Diabase intrusive and flood basalts of the world's ocean coasts, 1967-70.
In 1967 Grasty dated some diabase cores obtained in Labrador and from oil wells in the Florida basement. It was thought that these cores might be related to the opening of the Atlantic Ocean. The other workers have been accumulating information and ages of other coastal intrusives and lava flows. These are common along many coasts and seem to be connected with the initial rifting of ocean basins. They therefore place an upper limit on the age of opening whereas information from magnetic anomalies and sea floor spreading generally place a minimum age. So far the data indicates that Laurasia as represented by North America, and Gondwanaland as represented by Africa, began to separate in Triassic or Jurassic time, whereas the separation within Gondwanaland of Africa and South America did not occur until mid-Cretaceous time and the breakup of the North Atlantic only began in Upper Cretaceous and to Eocene time.

1489. Brown, R.L., Carleton Univ.:
Structural studies in Northern Appalachians, 1965-72.

1490. Burwash, R.A., Krupicka, J., Univ. of Alberta:
Correlation of petrologic, geochemical and geophysical data for the subsurface Precambrian of Western Canada, 1968-.
See Cratonic reactivation in the Precambrian basement of Western Canada, Part 1: Deformation and Chemistry. Can. Jour. Earth Sci., v. 6, no. 6, 1969.

1491. Clifford, P.M., Cuddy, R.G., Smith, D., McMaster Univ.:
Evolution of Archaean volcanic belts, 1963-; Ph.D. thesis (Cuddy), M.Sc. thesis (Smith).
See Geology of the West Lake St. Joseph area, Ontario Dept. of Mines Geol. Report 70, 1969.

1492. Collett, L.S., Becker, A., Geol. Surv. of Canada:
AFMAG/VLF surveys, 1968-73.
An AFMAG survey was flown in 1968 in the Upper Nelson River of Manitoba (3500 line miles) and in the Uranium City Area of Saskatchewan (660 line miles) to test the usefulness of the method to detect faults and shear zones where they are known and to check if other unknown lithological features are detected especially beneath the overburden and sedimentary cover. A small VLF survey was flown as a test area northwest of Wabowden, Manitoba, to check its relative response in relation to AFMAG data. In 1969 an AFMAG survey was flown over the St. Mary's graben area in Nova Scotia (11 E/6E, 7, 8, 11 F/5). The AFMAG method is proving to be a valuable technique for mapping and tracing conductive faults, shear zones and peridotites. Improvements are needed in the apparatus and interpretive methods. See resistivity mapping by electromagnetic methods: Proc. of Can. Centennial Conf. on Mining and Groundwater Geophysics, Niagara Falls, Oct. 22-26, 1967, Geol. Surv. Canada; Econ. Geol. Rept. No. 26, 1970 and Geol. Surv. Canada Paper 69-1, Pt. A., p. 79, 1969.

1493. Currie, J.B., Univ. of Toronto:
Experimental study of deformation features as indicators of conditions of rock fracturing, 1967-72.
A series of rock deformation experiments, at low to medium pressures and temperatures, in which deformation features induced in samples from several rock types are examined with a view to their use as indicators of deformational environment. See Fracture porosity in Alabaster: An experimental model of rock deformation; Bull. Can. Petrol. Geol. v. 17 no. 2, p. 117-132, 1969.

1494. Dence, M.R., Robertson, P.B., Innes, M.J.S., Popelar, J., Observatories Branch, Dept. of Energy, Mines & Resources:
Geological and geophysical studies of Canadian craters, 1953-.
Gravity and geologic surveys in the Sudbury area were carried out in 1969, and further geologic work was undertaken at the Mistastin Lake and Charlevoix structures. A detailed interpretation of the Sudbury data is in progress. See A probable meteorite origin for Mistastin Lake, Contr. Dom. Obs. No. 264, 1969.

1495. Dence, M.R., Robertson, P.B., Observatories Branch, Dept. of Energy, Mines & Resources:
Shock metamorphism in Canadian craters, 1962-.
Detailed studies of shock zoning at the Brent crater, Ontario by M.R. Dence, and of shock deformation in alkali feldspars by P.B. Robertson have been the principal areas of investigation in 1969. A detailed scheme of shock

deformation in rocks of different lithologies is in preparation. See Contr. Dom. Obs. v. 8, no. 23 and 26, 1968.

1496. Eisbacher, G.H., Geol. Surv. of Canada:
Regionalization of crustal stresses in Canada: assessment of technique, 1969-70.
See Tectonics and remanent elastic rockstrains; AGU Meeting, San Francisco, Dec. 1969 (abstract).

1497. Fyson, W.K., Carrara, A., Sikander, A.H., Univ. of Ottawa:
Relationship of small-scale to large-scale structures in Palaeozoic rocks, Nova Scotia and Gaspé Peninsula, 1962-; Ph.D. thesis (Carrara).
See Structural development of the Paleozoic rocks of western Gaspé, Quebec: Can. Jour. Earth Sci., v. 6, p. 1113-1127, 1969.

1498. Geldsetzer, Helmut, Queen's Univ.:
Volcanic cyclicity in the Pacific Northwest-late Cenozoic and tectonic implications, 1965-70; Ph.D. thesis.
Radiometric and stratigraphic data indicate recurring cycles from mafic to silicic volcanism during the Late Cenozoic in the Pacific Northwest interior. Gross compositional changes coincide with regional unconformities. This interrelationship probably reflects periodic stresses generated during underthrusting of oceanic crust below continental crust.
Devonian sedimentary and tectonic patterns in the northeastern region of North America, 1967-70; Ph.D. thesis.
The objective is: (1) to trace pronounced faunal and lithic breaks throughout the above area; (2) to establish the facies relationships for each depositional episode; (3) to estimate the amount of erosional removal prior to a new depositional episode.

1499. Gretener, P.E., Univ. of Calgary:
Thrust faulting - geometry, mechanics, kinematics, 1969-.
A continuation of the work of Hubbert and Rubey (1959); the rockies west of Calgary are ideal for such studies. See The significance of the corepressure in geology, Bull. Can. Petr. Geol., Sept., 1969.

1500. Hobson, G.D., Overton, A., Geol. Surv. of Canada:
Marine seismic - Gulf of St. Lawrence, 1964-69.
Two-ship marine seismic refraction experiments to investigate the thickness, nature and attitude of the sedimentary rocks underlying the Gulf of St. Lawrence to the depth of the crystalline basement.

1501. Hood, P.J., Sawatsky, P., Bower, M.E., Geol. Surv. of Canada; Godby, E.A., Baker, R.C., Davis, N., National Aeronautical Establishment:
Ocean aeromagnetics, 1962-.
The objectives of this project are: (1) to conduct high resolution aeromagnetic surveys over the Canadian continental shelves for purposes of delineating sedimentary basins and (2) to obtain and study magnetic data over the ocean basin in order to shed light on the theories of magnetic imprinting of oceanic rocks, ocean floor spreading

and continental drift. See Magnetic surveys in Hudson Bay: 1965 Oceanographic Project, in Earth Science Symposium on Hudson Bay, Geol. Surv. Canada, Paper 68-53, p. 272-291, 1969.

1502. Jacoby, W.R., Observatories Branch, Dept. of Energy, Mines & Resources:
Seismic - gravity correlation, 1967-69.
A model of the crust and upper mantle along a N-S section of Canada derived by Wickens by the use of Love wave dispersion was combined with gravity. A density structure for this model was calculated. Similar results were obtained for the model from topographical load and the assumption of (local) isostasy.

1503. Kerr, J.Wm., Geol. Surv. of Canada:
Studies in Continental Drift, 1965-.
See Nares Submarine Rift Valley and the relative rotation of North Greenland; Bull. Can. Petrol. Geol. v. 15, no. 4, p. 483-520.

1504. Norris, D.K., Geol. Surv. of Canada:
Structural and stratigraphic studies, Blow River Area (117 A E/2, 107 B), Yukon Territory and western District of Mackenzie, 1962-71.
A study of the structural style and stratigraphic framework of part of the Arctic Plateau and Coastal Plain to document the physical history of the area and to evaluate its potential in natural hydrocarbons and other minerals. See Geol. Surv. Canada, Paper 70-1, Pt. A, 1970.
Mesoscopic structural fabrics in the East-Central Cordillera, 1964-.
An analysis of the geological significance of statistically meaningful samples of mesoscopic fabric data, primarily from underground coal mines, in relation to regional and local structure. See The Mesoscopic fabric of rock masses about some Canadian Coal Mines; First Congress, Int. Soc. Rock Mechanics, v. 1, p. 191-198, 1966.

1505. Ollerenshaw, N.C., Geol. Surv. of Canada:
Compilation of geological map and cross-section of the Rocky Mountain Foothills, Phase I, 1969-70.
A cooperative project with the Alberta Society of Petroleum Geologists.
Cretaceous and Tertiary conglomerates and sandstones of the Eastern Cordillera, 1969-72.
The main objective is to determine the Tectonic environment during the Cretaceous and Tertiary.

1506. Rector, R.J., Underhill, D.H., Clifford, P.M., McMaster Univ.:
Role of fabric in deformational behaviour of sandstones, 1966-; Ph.D. theses (Underhill, Rector).

1507. Reik, G.A., Currie, J.B., Univ. of Toronto:
Development of fractures in sedimentary strata, 1968-70; Ph.D. thesis (Reik).
A field-laboratory investigation of conditions and timing of fracture development in sedimentary rock and an

appraisal of the possible role of residual strain energy in fracturing. See Stages in fracture porosity development (Abstract) Amer. Asso. Pet. Geol., v. 53, no. 3, p. 714, 1969.

1508. Roscoe, Wm. E., McGill Univ.:
Experimental sulphide mineral deformation under controlled conditions, 1969-72; Ph.D. thesis.

1509. Schwerdtner, W.M., Oldershaw, M.A., Univ. of Toronto:
Transformation of igneous (plutonic) fabrics to metamorphic fabrics near Bancroft, Ontario, 1967-70.
Study of the effect of primary anisotropies (fluidal textures) on the development of schistosity and metamorphic mineral elongation.

1510. Schwerdtner, W.M., Siragusa, G., Univ. of Toronto:
Reconstruction of strain directions in mylonites, 1968-; M.Sc. thesis (Siragusa).
Three-dimensional geometric analysis of mylonite fabrics. Mechanics of mylonitization, and regional strain analysis.

1511. Schwerdtner, W.M., Waddington, D., Univ. of Toronto:
Mineral lineation and schistosity in metamorphic rocks, 1960.
Correlation of directions and degree of preferred mineral orientation with (deduced) parameters of strain; regional strain analysis.

1512. Smith, Leigh, Queen's Univ.:
Erosional aspects of the tectonic history in the Peace River Arch area, 1969-71.
Interpretations of the tectonics of the Peace River Arch have come from studies which assumed little erosional removal of the sediments involved and, thus, a long-time land mass. This study has begun to reveal very different distribution of land and sea in space-time.

1513. Steiner, J., Univ. of Alberta:
Continental drift and an expanding earth, 1966-70.
An attempt will be made to show that the computer fitting of the continents of Africa and South America is improved when it is carried out on a smaller earth, say of 10 percent reduced radius. See The sequence of Geological events and the dynamics of the Milky Way Galaxy. Jour. of the Geological Society of Australia; v. 14, pt. 1, p. 99-132, 1967.

1514. Strangway, D.W., Univ. of Toronto, Vogt, P.R., U.S. Navy:
Continental Drift.
Compilation of airborne magnetic data from West Africa and north-eastern South America is now essentially complete and a preliminary paper has been submitted showing magnetic similarities in the basement from the two sides of the Atlantic Ocean. High-altitude magnetic profiles that supplement this work have been obtained in cooperation with Project Magnet of the U.S. Navy. Preliminary results will be published in Earth and Planetary Science Letters.

1515. Tanguay, M.G., Ecole Polytechnique:
Optical processing of aerial photo patterns by coherent light, 1969-71.
Information acquired through remote sensing generally yields a great number of two-dimensional patterns in the form of photographs or imagery film strips. The quantity of available data is often too large for direct study by visual means alone. It is highly desirable and necessary to employ automatic pattern recognition and data-handling techniques in order to quantify the information. The goal s is to classify these two-dimensional patterns by means of the diffraction pattern obtained by shining a beam of coherent light on each pattern. The result would help (1) enhance through spatial filtering the reconstructed image and (2) to classify photo patterns on the basis of similar diffraction diagrams.

1516. Taylor, G.C., Stott, D.F., Gibson, D.W., Bamber, E.W., Rutter, N.W., Geol. Surv. of Canada:
Operation Smoky - a study to establish the interdependant relationships of the structure and stratigraphic successession between the southern and northern Rocky Mountains, 1968-70.
See Geol. Surv. Canada, Paper 69-1, Pt. A, 1969, p. 246.

1517. Wheeler, J.O., Geol. Surv. of Canada:
Southern Cordilleran structure project, 1963-.
Structural studies across the southern Canadian Cordillera to obtain an integrated picture of the form of the structures and the relationships in space and time between the individual structures and between structural belts, thus leading to an understanding of the structural development of the southern Cordillera. See A structural section across the southern Canadian Cordillera; Geol. Assoc. Can., Spec. Paper No. 6, 1970.

1518. Wilson, J.T., Univ. of Toronto:
Global tectonics, 1963-.
The discovery of the mid-ocean ridge and sea-floor spreading and the concept of plate tectonics has profoundly altered concepts about the behaviour of the earth. If there are only six large plates of the lithosphere at the present time and a few smaller ones as Morgan and Le Pichon suggest, then relative movements of any pair of plates are likely to have world-wide effect on other unions of plates. During the course of rewriting some chapters of Jacobs, Russell and Wilson's book on physics and geology an attempt has been made to review what is so far known about the new global tectonics and relative movement of continents, particularly during Tertiary and Cretaceous time. See Static or Mobile Earth: The Current Scientific Revolution, Proceedings of the American Philosophical Society, v. 112, no. 5, October 1968.
Large strike slip faults of the world, 1968-.
A search of literature shows that many authors in different countries have suggested that large faults exist with tremendous horizontal displacements. A total of twenty-two faults have been found for which at least one

author has suggested displacement offset of 100 km or more. A much larger number of faults have been found for which the displacement is several tens of kilometers of unknown extent. Since in nearly all these cases the authors are different it seems likely that some of these faults really do have the postulated offsets and an attempt is being made to accumulate this information and analyze it for its bearing on continental drift. See J.T. Wilson report on tectonics in Report No. 6 of the International Council of Scientific Unions Upper Mantle Committee, p. 32-56, May, 1969.

Overriding of the East Pacific Rise by North America, 1969-70.

The publication by H.W. Menard of the magnetic map of the North Eastern Pacific provides data bearing on the overriding of the East Pacific Rise by North America. It is assumed, following Menard's proposal, that the East Pacific Rise underlies the Western United States. A reconstruction of the manner in which the East Pacific Rise was overriden throws much light on the relative vertical movements and also on the volcanism of the Western United States. Since the East Pacific Rise is offset by large fracture zones various sections have been overriden at different times which may account for the different displacements in different parts of the San Andreas fault system. See Submarine fracture zones, aseismic ridges and the International Council of Scientific Unions Line: Proposed Western Margin of the East Pacific Ridge, Nature, v. 207, no. 5000, p. 907-911, August 28, 1965.

1519. Wynne-Edwards, H.R., Hasan, Z.U., Bourne, J.H., Queen's Univ.:
Regional tectonics of the Grenville Province, 1960-; M.Sc. thesis (Bourne).

A continuing examination of the Grenville province and the tectonic and age relations of the rocks within it.

## Addendum

1520. Picklyk, D.D., Price, R.A., Queen's Univ.:
Mathematical modeling of geologic structures, 1969-72.

To simulate the geologic characteristics of structures studied in the field using finite element methods.

1521. Price, R.A., Queen's Univ.:
Geometry and mechanics of folds in the southern Canadian Rockies, 1961-69.

An investigation of the nature and variation of the form of folds and the mesoscopic and microscopic subfabrics of the folded beds as a basis for interpreting the mechanisms of folding. See Flexural-slip folds in the Rocky Mountains, Southern Alberta and British Columbia; Seminars in Tectonics IV, Dept. Geological Sciences, Queen's University, p. 6-21, 1964.

The significance of fabrics imposed on indurated rocks under non-metamorphic conditions, 1964-.

An investigation of the character and kinematic and dynamic significance of small-scale (mesoscopic and microscopic) fabric elements imposed upon indurated rocks deformed

under non-metamorphic conditions. See The tectonic significance of mesoscopic subfabrics in the southern Rocky Mountains of Alberta and British Columbia, Can. Jour. Earth Sciences, v. 4, p. 39-70, 1967.

Tectonic evolution of the southeastern Canadian Cordillera and the nature and significance of variations in tectonic style, 1968-.

See The southern Canadian Rockies and the role of gravity in low-angle thrusting, foreland folding and the evolution of migrating foredeeps; Program and Abstracts, 1969 Ann. Meeting, Geol. Soc. Amer., p. 283-286.

1522. Price, R.A., Queen's Univ., Mountjoy, E.W., McGill Univ., Aitken, J.D., Univ. of Calgary:

Operation Bow-Athabasca, Alberta and British Columbia, 1965-.

A reconnaissance of 12,000 square miles of the Rocky Mountains south from Jasper leading to the publication of a series of geological maps of scales of 1:50,000 and 1:250,000 and an analysis of the structural evolution of the southern Canadian Rockies. See Operation Bow-Athabasca, Alberta and British Columbia; Geol. Surv. Canada, Paper 67-1, Part A, p. 106-112; 1967.

1523. Rychener, L.M., Price, R.A., Queen's Univ.:

Structure and paleotectonic significance of roof pendants in south-central Idaho batholith, 1966-72.

Sedimentary facies, structural geometry, and deformational and metamorphic history of a series of roof pendants in the south-central Idaho batholith and their implications for regional tectonic evolutions.

1524. Thompson, R.I., Price, R.A., Queen's Univ.:

Structural stratigraphic and petrologic studies in eastern margin of the Shuswap complex, Revelstoke, British Columbia, 1969-71.

To establish the interrelation between deformation and metamorphism in the tectonic evolution of the eastern margin of the Shuswap metamorphic complex southeast of Revelstoke, British Columbia.

Addendum

## ORGANIZATIONS REPORTING

Acadia University, Dept. of Geology, Wolfville, Nova Scotia
Alberta, Research Council of, 87th and 114th Street, Edmonton, Alberta
Alberta, Univ. of, Depts. of Geology and Geophysics, Edmonton, Alberta
Amerada Petroleum Corp., 703-6th Ave., S.W., Calgary, Alberta

Bedford Institute, Dept. Energy Mines and Resources, Dartmouth, Nova Scotia
British Columbia Dept. Mines and Petroleum Resources, Victoria, British Columbia
British Columbia, Univ. of, Depts. of Geology and Geophysics and Geography, Vancouver, British Columbia
Brock University, Dept. of Geological Sciences, St. Catherines, Ontario

Calgary, Univ. of, Dept. of Geology, Calgary, Alberta
Carleton University, Dept. of Geology, Ottawa, Ontario
Chevron Standard Ltd., 400 Fifth Ave., S.W., Calgary, Alberta

Dalhousie University, Dept. of Geology, Halifax, Nova Scotia
Defence Research Board, Dept. of National Defence, Ottawa, Ontario

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Geological Survey of Canada, Dept. Energy, Mines and Resources, Ottawa, Ontario

Imperial Oil Ltd., 500 Sixth Ave., S.W., Calgary, Alberta
Inland Waters Branch, Dept. Energy, Mines and Resources, Ottawa, Ontario

Laurentian University, Dept. of Geology, Sudbury, Ontario
Laval, Université, Département de géologie, Québec, P.Q.
Loyola College, Dept. of Geotechnical Sciences, Montreal, Quebec.

Manitoba Mines Branch, Dept. of Mines and Natural Resources, Winnipeg, Manitoba
Manitoba, Univ. of, Dept. of Earth Sciences, Winnipeg, Manitoba
McGill University, Depts. of Geological Sciences and Geography, Montreal, Quebec
McMaster University, Dept. of Geology, Hamilton, Ontario
Memorial University of Newfoundland, Dept. of Geology, St. John's, Newfoundland
Mines Branch, Dept. of Energy, Mines and Resources, Ottawa, Ontario
Montréal, Université de, Département de géologie, Montréal, Québec
Mount Allison University, Dept. of Geology, Sackville, New Brunswick

National Research Council, Division of Building Research, Ottawa, Ontario
New Brunswick Dept. of Natural Resources, Fredericton, New Brunswick
New Brunswick, Univ. of, Dept. of Geology, Fredericton, New Brunswick
Newfoundland Dept. of Mines, Agriculture and Resources, St. John's, Newfoundland
Nova Scotia Dept. of Mines, Halifax, Nova Scotia
Nova Scotia Research Foundation, P.O. Box 790, Dartmouth, Nova Scotia
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Ontario Water Resources Commission, 135 St. Clair Ave., W., Toronto, Ontario
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Quebec Dept. of Natural Resources (Ministère des Richesses Naturelles du Québec), Quebec, P.Q.
Queen's University, Dept. of Geological Sciences, Kingston, Ontario

Royal Ontario Museum, 100 Queen's Park, Toronto 5, Ontario

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Waterloo, Univ. of, Dept. of Earth Sciences, Waterloo, Ontario
Western Ontario, Univ. of, Depts. of Geology and Geophysics, London, Ontario