BAFFIN ISLAND QUATERNARY ENVIRONMENTS

An Annotated Bibliography

Martha Andrews
and
John T. Andrews

Occasional Paper
No. 33
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INSTITUTE OF ARCTIC AND ALPINE RESEARCH • UNIVERSITY OF COLORADO

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Cover picture: Baffinland (Baffin Island) from an embossed print by Mukta Webber

PREFACE

This annotated bibliography, compiled by Martha and John Andrews, will be useful not only for students of Quaternary history but also for everyone concerned with arctic environmental sciences. Martha Andrews is an independent consulting bibliographer; John Andrews is a Professor in the Institute of Arctic and Alpine Research and the Department of Geological Sciences, University of Colorado. Many of the members of the Institute of Arctic and Alpine Research have been intimately involved with research on Baffin Island for over a decade. This research has contributed greatly to the understanding of the Quaternary of North America and the Northern Hemisphere. Baffin Island has proven to be a gold mine of information for all those who have studied there. This bibliography is intended to cause us to stop, take stock, and then plan the next round of research. Good planning may indicate a need to search for new gold mines or even that the old mine has more to yield.

Patrick J. Webber
Director
Institute of Arctic and Alpine Research
9 January 1980

ABSTRACT

Over four hundred and sixty references, the majority of which include abstracts from secondary sources, are presented. Covering the broad subject area of the Quaternary environment of Baffin Island, Canada, they are arranged according to thirteen more specific subject categories. An author index follows the bibliography. Two figures and some introductory remarks give the user a reference framework.

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Figures

INTRODUCTION TO THE BIBLIOGRAPHY

Baffin Island forms the northeastern perimeter of the Canadian Shield. On the east it faces Baffin Bay and Davis Strait, on the south it is bounded by Hudson Strait, and the western margin is formed by Foxe Basin (Figures 1 and 2). The area of the island is about 430,000 km^2 making it the fourth largest island in the world, and equivalent in size to the combined area of Norway, Sweden and Finland.

Research on Quaternary environments of Baffin Island started in the late 19th century (see Watson, 1897) but few studies were undertaken prior to World War II. The major impetus for Quaternary research on Baffin Island came from the Arctic Institute of North America which organized two expeditions in 1950 and 1953. Several major research reports were published by the expedition members, which are found within this bibliography.

In the three decades since these expeditions, our knowledge of the Quaternary environment of Baffin Island has grown significantly, stimulated in the 1960s by the investigations undertaken by the Geographical Branch of the Government of Canada. During the 1970s research interest in Baffin Island has spread throughout several universities as well as various arms of the Canadian government. In particular, our knowledge of the chronology of Quaternary events on this large island has been increased by a major dating program. This emphasis on dating and on the delimitation of a series of glacial, sea level and climatic events is evident in this bibliography. What is also evident in this survey of the existing literature is the relative paucity of process oriented studies. Perhaps this area will be concentrated upon in the future.

This bibliography attempts to serve as a useful tool for further research into the Quaternary environment of Baffin Island. Much information is contained in the abstracts included. A look at the author index gives a ready impression of which scientists have contributed significantly to the research effort of the past thirty years. The classification by subject shows what fields have been covered, and, by omission, where the gaps still exist.

The references have been divided into thirteen subject categories. Arrangement within categories is alphabetical by first author, then alphabetical

FIGURE 1
Location of Baffin Island. The insert of the island (lower middle) indicates the area of the island compared to the region of the Great Lakes.

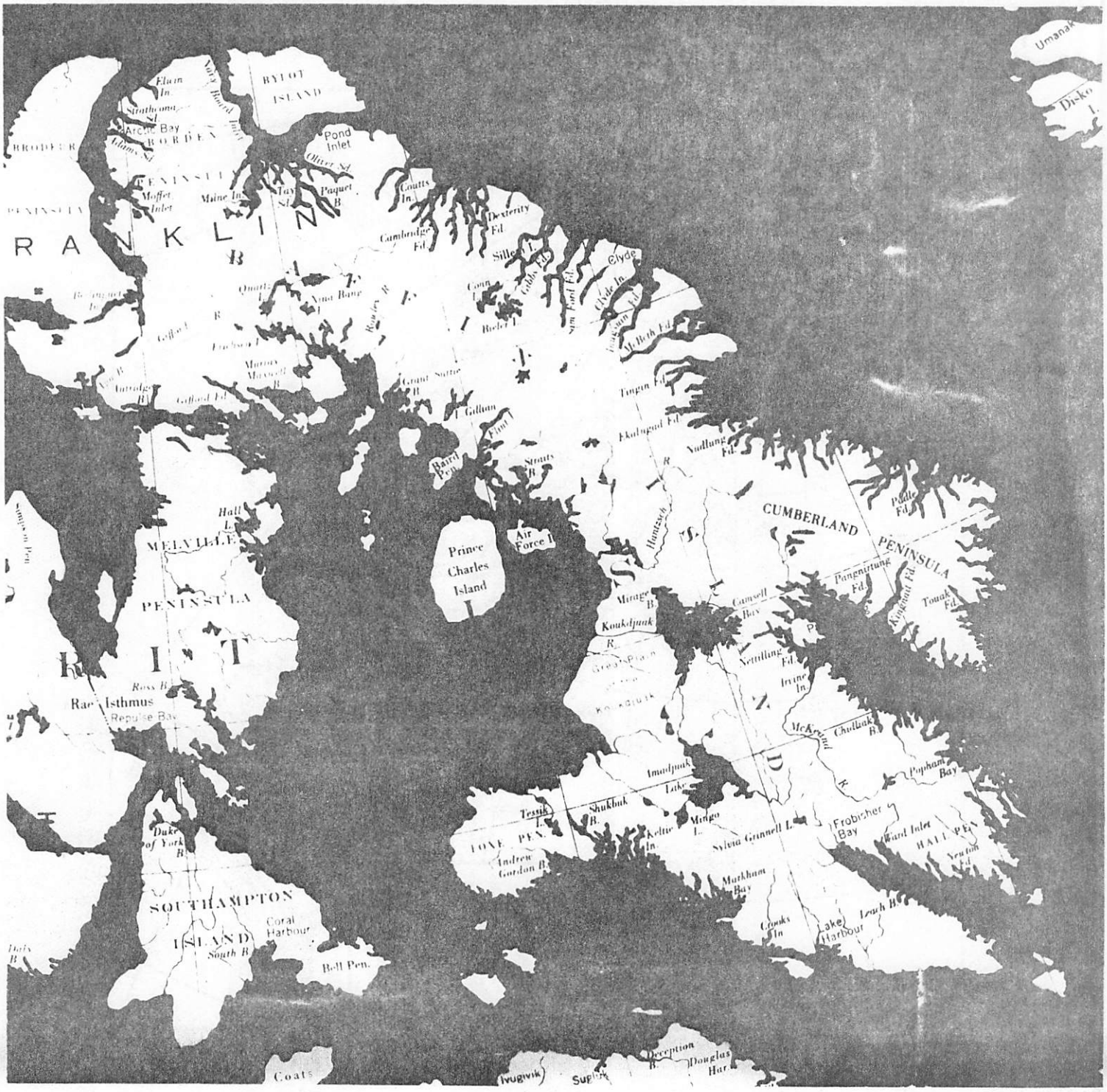

FIGURE 2
Place names for Baffin Island and surrounding features (from J.B. Bird, The Physiography of Arctic Canada. Johns Hopkins Univ. Press, 1967).

by title. A complete index to all authors begins on page 114. Reference from the author's name is to the number of the item for which he/she is an author.

Subject classification with no subject cross-indexing carries an implication that each item concerns one subject exclusively. This is of course not the case, and some care has gone into an effort to place each item in the most appropriate subject area.

The abstracts quoted herein come from a variety of sources (see below for full citations of these sources), indicated at the end of each abstract. These sources represent the most productive in our searching efforts, which included several libraries and both manual and computerized data bases. The following is a key to identifying sources of abstracts:

AB = Arctic Bibliography.

Auth. = author's own abstract with published paper.

Diss. Abs. = computerized data base.

Ecol. = Ecology of the Canadian Arctic...

G.A. = Geo Abstracts A, Landforms and the Quaternary.

Gsg 1-22 (etc.) = Bibliography...Auyuittuq National Park.

GeoRef = computerized data base.

Hill = Hill, P.,...

Many items cited are themselves abstracts, and it was decided not to publish these abstracts. Other items are short papers, notes, correspondence, etc., and are so indicated. Most thesis abstracts were excluded due to length; a few from secondary services are included. Items with no abstract/note are ones for which no abstract was available to us.

SOURCES

Andrews, M. and J.T. Andrews, 1979: Bibliography of Baffin Island environments over the last 1000 years. In: McCartney, A.P. (ed.), Thule Eskimo culture: an anthropological retrospective. National Museum of Man Mercury Series. Archaeological Survey of Canada, Paper No. 88: 555-569.

Arctic Bibliography. Prepared by the Arctic Institute of North America. Washington, D.C., Dept. of Defense (v. 1, 1953-v. 11, 1963); Superintendent of Documents (v. 12, 1965); Montreal, McGill University Press (v. 13, 1967); Montreal and London, McGill - Queen's University Press (v. 14, 1968-v. 16, 1975).

A Bibliography of the Literature Pertaining to Auyuittuq National Park on Baffin Island. Belleville, Ontario, A.D. Revill Associates, 1975. 3 v. mimeo.

Comprehensive Dissertation Abstracts Data Base. University Microfilms International. 1861 to present.

Ecology of the Canadian Arctic Archipelago: Selected References. V. 1-4, annotated by N.M. Peterson. Ottawa, Information Canada, 1974-1976.

GeoAbstracts A, Landforms and the Quaternary. Norwich, England, GeoAbstracts Ltd., 1972-present.

GeoRef Data Base. American Geological Institute. 1961 to date.

Hill, P., 1962? Unpublished manuscript. Canada. Geographical Branch.

List of Publications of the Institute of Arctic and Alpine Research 1967-1974. Comp. by Martha Andrews, 1974. 45 p. mimeo.

List of Theses and Dissertations on Canadian Geography. Comp. by J.K. Fraser and M.C. Hynes. Canada. Dept. Environment. Lands Directorate. Geogr. Paper No. 51. 1972. (Supplement, 1973).

Polar Continental Shelf Project. Titles and abstracts of scientific papers, no. 1. Comp. by G.D. Hobson and J. Voyce. Energy, Mines and Resources Canada. 1974. 76 p.

ACKNOWLEDGMENTS

This bibliography has been developed through funding from the National Science Foundation (Geology Program), grants EAR-74-01857 and EAR-77-24555. These grants were in support of field and laboratory studies on the Quaternary glacial and climatic history of Baffin Island.

We would like to acknowledge the assistance of Ann Brennan, of the World Data Center A, Glaciology, in searching the computerized reference data bases, and Laura Koch of INSTAAR for a fine typing job. Dr. Mukta Webber kindly provided a copy of her print "Baffinland" from which the cover has been designed.

EXPEDITIONS, FIELD REPORTS AND RECONNAISSANCE REPORTS

1. Andrews, J.T., 1970: University of Colorado: 1969 summer field season in east Baffin Island. Arctic 23(1): 61-63.

The results of mass and energy balance studies on the Boas Glacier are presented for two contrasting years. For 1969-70 the net winter balance (b_w) was 0.4m H_2O and the net balance for the year (b_n) was +0.37m H_2O. For 1970-71 the corresponding figures were 0.26m H_2O and -0.2m H_2O. Meteorological data for summer 1970 show that net radiation provides 60% of the energy input. Evaporation apparently made a significant contribution to the heat loss. The contrast between the two ablation seasons is analyzed on the basis of synoptic circulation types and climatological parameters. Auth.

2. Andrews, J.T. and R.G. Barry, 1971: University of Colorado: 1970 summer field season in east Baffin Island. Arctic 24(2): 144-145. Short paper.

3. Andrews, J.T. and R.G. Barry, 1972: University of Colorado: 1971 summer field season in east Baffin Island. Arctic 25(1): 64-65. Short paper.

4. Andrews, J.T., R.G. Barry, and J.D. Jacobs, 1973: University of Colorado: 1972 field season on east Baffin Island. Arctic 26(2): 171-172. Short paper.

5. Andrews, J.T. and J.D. Jacobs, 1974: University of Colorado: 1973 field season in eastern Baffin Island. Arctic 27(3): 243-244. Short paper.

6. Andrews, J.T., R.G. Barry, and R.L. Weaver, 1975: University of Colorado: 1974 field season in eastern Baffin Island. Arctic 28(2): 145. Short paper.

7. Andrews, J.T., 1976: University of Colorado: 1975 field season on Baffin Island. Arctic 29(3): 168. Short paper.

8. Anonymous, 1953: Baffin Expedition 1953. Arctic 6(2): 163-164.

Contains a preliminary note on the Arctic Institute of North America expedition (in cooperation with the Swiss Foundation for Alpine Research) to the Cumberland Peninsula of Baffin Island. Glaciological and geomorphological work on the Penny Highland icecap and the Pangnirtung Pass area, botanical and zoological work in the Pass area, and ornithological studies around the coast of the Cumberland Peninsula were carried out, starting in May, by 13 scientists led by P.D. Baird. A preceding note reports the death, while in the field, of the expedition's glaciologist, W.R.B. Battle. AB27833.

9. Baird, P.D., 1951: Baffin Expedition 1950. Can. Geogr. Jour. 42: 212-223.

Narative of the Baffin Island Expedition to the Clyde Inlet region (roughly the area 69°60'-70°45' N. 68°-74°W.); notes on preparation, the twenty members, air transportation, the camps, and the kind of research carried out during May-Aug., 1950. Map, scale 1:1,000,000, shows camps and position of the Barnes Ice Cap. AB20411.

10. Baird, P.D., 1953: Baffin Island Expedition, a preliminary field report. Arctic 6(4): 227-251.

Contains description and brief summaries of results of the second Baffin Island Expedition of the Arctic Institute of North America, May-Sept. 1953. The 13-man party carried out a program in the Penny Highland region of Cumberland Peninsula, centering on Pangnirtung Pass. Glaciological work on the Penny Icecap and Highway Glacier included studies of glacier physics, seismic work, and meteorological observations. Geological traverses were made across the peninsula and observations on bedrock geology and structure are given. Corrie formation and the geomorphology of Pangnirtung Pass were studied. Specimens of local fauna were collected and biological studies of some species were made. Comparisons of the vegetation of Penny Highland and East and North Greenland were made through extensive plant collections. Eight peaks were climbed and their altitudes determined. A list of 17 new names approved by the Canadian Board on Geographical Names is appended. AB27932.

11. Baird, P.D., 1952: The Baffin Island Expedition, 1950. Geogr. Jour. 118: 267-279.

Contains a paper read before the Geographical Society, Feb. 25, 1952, in which the expedition's leader describes its organization, program and general activities, mentioning some results of the biological, geologic and glaciological work; also discusses some problems in present-day expeditionary planning. Includes discussion, p. 277-279. AB20412.

12. Baird, P.D. and others, 1950: Baffin Island Expedition, 1950: a preliminary report. Arctic 3: 131-149.

Brief resumé by the leader, of the personnel, itinerary, camps, transportation and program of an expedition sponsored by Arctic Institute of North America, Royal Canadian Air Force, Geological Survey of Canada, Swiss Foundation for Alpine Research and the Canadian Geographical Society, to the east coast of Baffin Island at Clyde settlement, May-Aug. 1950; with short "initial reports on progress" of the scientific studies:

Eade, K.E. and G.C. Riley. Geological reconnaissance.
KRANCK, E.H. Bedrock geology.
GOLDTHWAITE, R.P. Geomorphology.
WARD, W.H. Glaciology.
Orvig, S. Meteorology.
MONTGOMERY, M.R. Climate.
Dansereau, P. Ecological study of the vegetation.
Hale, M.E. Lichens.

New names (13) adopted by the Canadian Board on Geographical Names, shown on map, p. 132-133.

The reports by Kranck, Goldthwaite, Ward and Montgomery appear in this Bibliography under their respective author's names. AB20413.

13. Baird, P.D., H. Röthlisberger, J. Marmet, and F.H. Schwarzenbach, 1954: Baffin Island Expedition, 1953. In: The mountain world. London, Allen and Unwin: New York, Harper, p. 147-168. Also pub. in German as: Die Baffin-Island-Expedition 1953. In: Berge der Welt, 1953. Bd. 9, p. 145-165.

Introduction by P.D. Baird describes preparation and program of the 1953 Arctic Institute of North America expedition to Cumberland Peninsula.

Four Swiss members participated in it during May 27-July 7 and July 29-Aug. 9; their equipment, program and seismic methods are described in general terms by H. Röthlisberger. Chief task was taking soundings on the large Highway Glacier. Mountains on Cumberland Peninsula and the ascent of Tête Blanche (7,074 ft.), Mount Asgard (6,598 ft.), and Mount Queen (7,014 ft.) described by J. Marmet. Characteristics of arctic plants and the work of a botanist in the Arctic are briefly discussed by F.H. Schwarzenbach. AB33423.

14. Baird, P.D., 1972: Basic background data on the area of Baffin Island National Park. Report to: Dept. Indian Affairs and Northern Development, Government of Canada.

15. Baird, P.D., 1952: Canadian expedition to Baffin Island, 1950. Polar Record 6(43): 372-375.

Contains a brief report on the expedition May-Aug. 1950, composed of eight Canadian, three British, three Swiss, four American, one Norwegian and one Finnish member, led by P.D. Baird, glaciologist, and sponsored by the Arctic Institute of North America, Canadian institutions and the Swiss Foundation for Alpine Research. The expedition centered at Clyde (ca. 70°25'N., 68°40'W.) and established glaciological, biological and mountaineer camps, interconnected by radio. Investigations included: glaciology of the Barnes Ice Cap (located at the center of the island); weather observations; biological survey of Clyde Inlet and surroundings; plant collecting; breeding of passerine birds; collecting of small mammals, birds, insects, and fresh-water organisms; mountaineering. AB20414.

16. Baird, P.D. and H.R. Thompson, 1954: Canadian expedition to Baffin Island, 1953. Polar Record 7(48): 152-153.

Contains brief summary of work done by the 13-man party (led by P.D. Baird), May-Sept., on Cumberland Peninsula. Studies were made in glaciology, geophysics, meteorology, geology, geomorphology, zoology, and botany. Eight peaks were climbed. AB33424.

17. Baird, P.D., 1954: Cumberland Peninsula of Baffin Island. Can. Geogr. Jour. 48(3): 88-97.

Contains general chronological account of the Baffin Island Expedition of the Arctic Institute of North America, May-Sept. 1953. Thirteen men, led by the writer, carried out glaciological, geomorphological, geological, geophysical, meteorological, botanical, and zoological work on and southeast of the Penny Icecap in the region 66°30'-67° N. 64°30'-65°30' W. Several mountains were climbed during the expedition. AB33425.

18. Bird, J.B., 1958: A report on the physical environment of southern Baffin Island, Northwest Territories, Canada, with special reference to accessibility and trafficability in the area as they affect site location. Montreal, McGill University. Dept. of Geography, 375 p. (U.S. Air Force. Project RAND Res. Mem. 2362. Revised 1963 as RAND Res. Mem. 2362-1PR.)

Fourth of a series of studies on the terrain, climate, and accessibility of selected areas in northern Canada to determine their suitability for U.S. Air Force activities. This study covers three physiographic regions south of

68° N.: Foxe Basin Lowlands, Baffin Uplands, and Eastern Baffin Highlands. Some 30 subregions are established for intensive investigations of terrain, ease of movement, and potential large construction sites. Eleven major terrain types are recognized, and for each the drainage, permafrost characteristics, etc. are examined. The climate is arctic; summers cloudy, foggy, cold; winters, snowy and relatively mild. Access is normally by sea from east-coast ports, ice-bound from late Oct.-early Nov. to early July. The Hudson Strait coast is usually clear of ice by the middle or end of July, but the Foxe Basin coast is sometimes closed year round. AB63431.

19. Bissett, D., 1967: Northern Baffin Island. An area economic survey. Vol. 1 of the northern Baffin Island Report. A.E.S.R. 67/1. Dept. Indian Affairs and Northern Development, Ottawa, 209 p.

20. Blackadar, R.G., 1959: Field activities of the Geological Survey of Canada in the Arctic. Arctic Circular 13(1): 5-9.

Reports four reconnaissance projects, mapping 200,000 sq. mi. The area between Great Bear Lake and the arctic coast (65,000 sq. mi.) was covered during Operation Coppermine by J.A. Fraser et al.; and Banks, Victoria, and Stefansson Islands by R. Thorsteinsson et al. Mapping begun in 1958 was continued on southern Baffin Island by R.G. Blackadar and R. Addison, and completed on the Belcher Islands by G.D. Jackson. Paleontological studies in Mackenzie District and Yukon Territory by P.J.M.J. Sartenaer and J.A. Jeletzky are noted, also C.H. Smith's study of the ultra-basic Muskox Complex in the Big Bend of the Coppermine River. AB63462.

21. Blackadar, R.G., 1962: Field activities of the Geological Survey of Canada in the Arctic. Arctic Circular 14(4): 62-68. 1961, pub. 1962.

Reviews some dozen projects: reconnaissance by R. Thorsteinsson's four-man party of the bedrock geology of Axel Heiberg and Ellesmere Islands; J.G. Fyles' work on the surficial deposits of western Ellesmere and eastern Axel Heiberg Islands; R.L. Christie and N.E. Haimila on the geology of eastern Ellesmere; R.G. Blackadar and A.J. Jenik on the mapping of southern Baffin Island; and B.R. Pelletier on the submarine geology of the western Queen Elizabeth Islands, in connection with this Project is noted, also three, with the Division of Oceanographic Research, in the Hudson Bay area. In Mackenzie District, pegmatites, Precambrian rocks, and the ultrabasic Muskox Complex near Coppermine River were investigated. AB70237.

22. Buerger, M.J., 1938: Spectacular Frobisher Bay. Can. Geogr. Jour. 17. 18 p.

23. Corbel, J., 1959: Les alpes innuitiennes. Cah. de geogr. de Québec 3(6): 417-455. Text in French. Title tr.: The Innuitian alps. Contribution to a "Canadian geographic miscellany" offered to Raoul Blanchard.

These ranges extend more than 3000 km. from the Torngats in northern Labrador to the northern point of Ellesmere Island; their width varies: less than 100 km. in the Torngats, about 600 km. in Ellesmere and Axel Heiberg Island. Their total area 800,000 sq. km., includes 150,000 sq. km. in glaciers, and has less than 5,000 permanent inhabitants. Two structural regions are described (map): the uplifted zone of the Canadian Shield in the south; and the zone of folded sediments, in the north. Climate and vegetation are sketched, with tables and maps; glaciers descend to sea level on Ellesmere; to 400 m. in the Torngats; ablation increases southward. Relief features

resemble those of Scandinavia; influence of glaciation is noted in some detail. Eskimo settlement is described, also the impact of "the white invasion" during and after World War II. Under-populated (0.05/sq. km.) and relatively unknown, these mountains may have economic possibilities. In some respects they resemble the Alps of Europe. AB57454.

24. Corbellini, G. and E. Valentino, 1977: Geomorphological notes on the areas explored by the 2nd Italian Alpine Scientific Expedition to Baffin Island, Cumberland Peninsula. Note geomorfologiche sulle aree esplorazion dalla II Spedizione Alpinistico-Scientifica Italiana nella Terra di Baffin (Penisola di Cumberland). Natura (ITA) (NTRMAP) 68(3-4): 181-196.

25. Elliott, R.C., 1973: A report on the reconnaissance of the National Park on Baffin Island, 1972. (Contract 72-54). To: Applied Research Division, Parks Canada, Dept. Indian and Northern Affairs, Gov't of Canada. 210 p.

An account of field observations in the Park during 1972 accompanied by some background information. The report deals with the physical geography, including geology, weather, and snow hydrology; and with biologic studies. Some discussion of archaeological and historic sites is also included as well as a section on park logistics. Gsg 1-50.

26. Langford, R.E., 1962: The Cambridge Arctic Canada Expedition, 1961 to Cumberland Peninsula, Baffin Island. Arctic Circular 1961, pub. Apr. 1962, 14(3): 49-52.

Recounts experiences of his six-man mountaineering party in July-Aug. It crossed Cumberland Peninsula by the Pangnirtung Pass, climbed five virgin peaks, surveyed Rundle Glacier, and found a change in the direction of flow of Glacier Lake. Some geological specimens were collected, and physiological observations made. AB73299.

27. Langford, R.E., 1965: Cambridge Arctic Canada Expedition 1961 to Cumberland Peninsula, Baffin Island. Unpublished report. To: Geographical Branch, Dept. Mines and Technical Surveys, Gov't of Canada.

Describes a mountaineering/scientific expedition by six Cambridge students to the mountains located between Pangnirtung and Kingnait passes. In addition to climbing seven virgin peaks, the party conducted work on physiology, geology, and surveying. Included are accounts of the local history, a terrain description, weather and biological observations and a brief account of life in an eskimo village at Pangnirtung. On Rundle Glacier the short equilibrium line, ice thickness and cross-profiles were surveyed and some strain rates measured. Horizontally bedded lavas at Cape Dyer were described and some palaeo-magnetic samples taken. Observations were made of rock weathering at various altitudes. Gb 1-3.

28. Løken, O.H. and others, 1964: Field report, north-central Baffin Island. Ottawa, Dept. Mines and Technical Surveys. 96 p.

Presents a preliminary report of Canadian Geographical Branch field work 10 May-27 Aug. 1964, at the northwest end of the Barnes Ice Cap on western Baffin Island, and from a base camp at the head of Inugsuin Fiord on the east coast. The project initiated in 1961 and continuing, is to achieve an understanding of the landscape, terrain conditions, and geomorphic processes of the broader areas of eastern arctic and subarctic Canada. Studies in glacial geomorphology and meteorology, hydrology, and botany were carried out by seven small field parties. A summary of investigations, and notes on weather, travel,

ice conditions, and equipment are included, as are the reports by the party leaders, viz:

Geomorphology at Inugsuin and Sam Ford Fiords, by O.H. Løken, p. 26-29.
Geomorphology at Base Camp, by D.M. Barnett, p. 30-34.
McBeth Fiord geomorphology, by D.A. Harrison, p. 35-47.
Sam Ford geomorphology, by J.E. Smith, p. 35-47.
Barnes Ice Cap glacial meteorology, by R.B. Sagar and C.W. Bridge, p. 54-58.
Lewis River hydrology, by M.A. Church, p. 59-74.
Isortoq Valley botany, by P.J. Webber, p. 75-96. AB89382.

29. Løken, O.H. and others, 1966: Field report north-central Baffin Island 1965. Ottawa, Dept. Mines and Technical Surveys. 93 p.

Presents a synopsis of the Geographical Branch operations on Baffin Island during the summer of 1965, including a detailed itinerary and personnel list. Reports by party leaders are as follows:

Geomorphological observations along the east coast, by O.H. Løken, p. 11-20.
Field studies in the outer Clyde - "Ayr Uplands" areas, by J.E. Smith, p. 21-26.
Clyde River - Generator Lake, by D.M. Barnett, p. 27-32.
Preliminary report on field work in the Flint Lake - Piling Lake - Piling Bay area of west Baffin Island, by J.T. Andrews, p. 33-39.
Geomorphological studies in the Eqe Bay - Gillian Lake area, by C.A.M. King, p. 40-47.
Mass balance studies, Barnes Ice Cap, by R.B. Sagar and O.H. Løken, p. 48-53.
Lewis River studies, by M. Church, p. 54-61.
"Decade Glacier," by C.W. Bridge, p. 62-66.
"Decade River," by W. Rannie, p. 67-73.
Geological studies in central Baffin Island, by N.H. Gray, p. 74-78.
Botany of Inugsuin Fiord area, by R. Hainault, p. 79-87.
Weather records: Inugsuin Fiord, p. 88-90; Lewis River, p. 91-93.

30. Løken, O.H. and others, 1966 (i.e., 1967): Field report north-central Baffin Island, 1966. Ottawa, Dept. Mines and Technical Surveys. 96 p.

Contains a synopsis of the 1966 Baffin Island operation of the Geographical Branch and short field reports from the leaders of the field parties, based on a preliminary examination of field notes.

Ekalugad Fiord-Cape Hooper area, by J.T. Andrews, p. 6.
Ekalugad-Kangok Fiord area and around Remote Lake, by J.T. Buckley, p. 14.
Generator Lake-Dewar Lakes area, by D.M. Barnett, p. 22.
Clastic sedimentation in Ekalugad Fiord, by M. Church, p. 28.
The Clyde Foreland, by R.W. Feyling-Hanssen, p. 35.
Maximum vertical extent of glacierization, by J.D. Ives, p. 56.
Submarine geomorphology along east coast, Baffin Island, by O.H. Løken, p. 59.
Alluvial fans in eastern Baffin Island, by J.M. Ryder, p. 64.
Barnes Ice Cap, by O.H. Løken and R.B. Sagar, p. 72.
Decade and Inugsuin Rivers, by W. Rannie, p. 78.
Mass balance studies of Decade Glacier, by K.G. Simpson, p. 87.
Geological studies Baffin Island, by W. Forester and N. Gray, p. 93.

31. Løken, O.H. and others, 1968: North-central Baffin Island field report 1967. Canada. Inland Waters Branch, Report Series 2.

Contains a synopsis of the 1967 Baffin Island operation of the Geographical Branch and short field reports from the leaders of the field parties, based on a preliminary examination of field notes. Sixteen individual field projects are included. Five reports (by Andrews, England, King, Hodgson, and Hodgson) are concerned with glacial geology and geomorphology; Church and Ryder discuss clastic sedimentation and alluvial fans respectively; there are seven notes on glaciology and meteorology (by Stanley and Hodgson, Stanley and Land, Løken, Clough and Løken, Løken et al., Barry and Christian); and finally there are reports on fungi (Parmelee) and bedrock geology (Bailes, Barron, and Gray).

32. Løken, O.H., 1966: Science on Baffin Island: field research in physical geography. Can. Geogr. Jour. 72(2): 38-47.

Reviews studies in glaciology, geomorphology and physical geography on this island from 1961, in particular research on the Barnes Icecap. The overall findings are summarized and the post-glacial chronology of the region outlined. Raised shore features, fiord morphology, and an amibitious program in hydrology are also mentioned and illustrated. The role of students in field studies is briefly evaluated. AB97610.

33. McGill University Dept. of Geography, 1963: A report of the physical environment of northern Baffin Island and adjacent areas, Northwest Territories, Canada. xvii, 303 p. U.S. Air Force Project Rand. Memorandum RM-2706-1-PR.

Deals with an area of about 140,000 sq. mi., approx. 68°-74° N. 80°-96° W. including northwest Baffin, Somerset Island, Boothia, Simpson and Melville Peninsulas. To the south lies the Quoich River area, described in the first report in this series. Somerset Island-Boothia Peninsula divides the Eastern and Western Canadian Arctic because of the obstacle it presents to east-west through navigation. The report is based on air-photo interpretation amplified and checked by field study in the two least-known areas: Baffin Island north of Fury and Hecla Strait, and parts of Somerset Island and Brodeur Peninsula. Lack of resources, isolation, a population of about 1500, severe climate, and permafrost are factors tending to limit development. Twelve significant terrain types are recognized in the two main physiographic divisions; the Boothia-Somerset, and the Melville-Brodeur-Borden Peninsula. The properties and permafrost characteristics of these terrain types are discussed and illustrated; each physiographic region is analyzed for its relief, permafrost, and terrain conditions. Most suitable sites for construction purposes are in northern Somerset Island and along the Lancaster Sound coast of Baffin Island. Deteriorating ice conditions, absence of natural harbors, cliffed coasts, and rugged terrain tend to increase operating costs in the central and southern parts of the map area. Surface deposits are mapped on a scale of about 1 in.:28 mi. Annotations are included facing 41 of the oblique aerial photographs. AB80928.

34. McGill University Dept. of Geography, 1963: A report of physiographic conditions of central Baffin Island and adjacent areas, Northwest Territories, Canada. U.S. Air Force Project Rand. Memorandum RM-2837-1-PR. 270 p.

Deals with Baffin Island north of 68° N. and east of 80°W., together with Bylot Island and the islands in northern Foxe Basin. The terrain is described

from air-photo interpretation supplemented by field observations and from the literature. Little of the interior of Baffin has been traversed, but preliminary exploration of the coast was completed about 1950. Its conditions of difficult access by sea, few resources, and small native population, do not foster development of trading posts. Two east-coast settlements, Pond Inlet and Clyde, supply the needs of about 500 natives. The climate is characterized by short, cloudy, cool summers and long, cold winters, with significant local variations in the fiords and on the larger glaciers. Glacier ice covers about 15% of the land area; permafrost is found everywhere, but its potential effect on construction is variable, being least significant in some limestone lowlands. Precambrian crystalline rocks of the Canadian Shield form the basement, overlain in places by younger sedimentary rocks. The three physiographic provinces of southern Baffin Island (cf. No. 63431) continue northward into this area. The Barnes Icecap, rising to 3700 ft., lies upon the central Baffin uplands, while a fourth physiographic province, a belt of plateaus, hills and drift-covered lowlands, is found near the east coast. This coast is open to shipping from late July or early August until October. Navigation along the Foxe Basin coasts is more difficult, because of pack ice and shallow water. Potential construction sites abound in the central uplands, though access overland is difficult. Considering both terrain and accessibility, the most suitable sites are located within the hills and plateaus of the east coast, and very locally near Foxe Basin. AB80926.

35. Millward, A.E., 1930: Southern Baffin Island. Canada. Dept. of Interior, Northwest Territories and Yukon Branch. 130 p.

36. Oughton, J.G., 1940: A visit to the Arctic of eastern Canada. Nautilus 54(1): 1-6.

Reports on a collecting trip in Canadian Eastern Arctic aboard the Nescopie July-Sept. 1939. At Hebron in Labrador and Port Burwell some sea (no land) shells were collected. Across Hudson Strait on Baffin Island the author stayed three weeks at Lake Harbour collecting land shells and dredging marine species. He sailed again aboard the Nascopie to Craig Harbour on southern Ellesmere then to Fort Ross on northern Boothia Peninsula. The return trip was to Arctic Bay on northwest Baffin, Pond Inlet and down the east Baffin coast to Cumberland Sound where some land and marine shells were collected. The ship continued southward to Hebron and home. AB60719.

37. Röthlisberger, H. and F.H. Schwarzenbach, 1956: Mitteilungen uber die geographisch-naturwissenschaftliche Expedition 1953 nach Baffin Island. Geogr. Helvetica 11(4): 263. Text in German. Title tr.: Communication on the geographical-natural science expedition, 1953, to Baffin Island.

Note on Arctic Institute of North America Baffin Island Expedition (led by P.D. Baird) to Penny Highland Icecap, Cumberland Peninsula. Swiss participants were the writers, J. Marmet and J.R. Weber. They carried out seismic work as a group in connection with glaciological and morphological studies, also research in various other scientific fields. AB47640.

38. Stewart, R.A., 1960: Mapping the Foxe Peninsula from aerial electronic control. Photogram. Engin. 26(1): 119-122.

Outlines procedures used by the Canadian Topographical Survey to produce 1:250,000 maps of the Foxe Peninsula (65°N. 76°W., Baffin Island). Shoran-controlled photography supplied the horizontal, and the Airborne Profile Recorder the vertical control. Shoran photography lines were flown at 20,000 ft. altitude in an east-west direction, each 20 min. of latitude. A.P.R. control lines were flown from 8,000-10,000 ft. altitude, mapping photography at 30,000 ft. in a north-south direction. Data-processing equipment and procedures are described. AB68509.

39. Thompson, H.R., 1953: Baffin Island Expedition 1953 of the Arctic Institute of North America: transcribed field notes of H.R. Thompson. Unpublished manuscript. 173 p.

An exploratory account of the regional geomorphology of Pangnirtung Pass. It comprises comprehensive and detailed, but primarily descriptive, notes on geologic and geomorphic phenomena at the head of Pangnirtung Fiord, in the Weasel River Valley, and around Pangnirtung Pass, with many accompanying photos and maps (not included) and diagrams. Also included are slope and elevation determinations, bathymmetric soundings, tidal height records, air and ice temperature measurements, and vegetation descriptions. Gsg 1-78.

40. Ward, W.H., 1951: Baffin bivouac. C.I.L. Oval 20(2): 14-16.

Popular account by one of the glaciologists, of P.D. Baird's Baffin Island Expedition 1950 for the Arctic Institute of North America; noting its flight to Clyde Inlet May 15-20, work of its various parties, glaciologists and meteorologists, biologists, mountaineers, geologists; and (especially) contribution of modern scientific-industrial products to equipment and facilities of the expedition. AB27259.

41. Wordie, J.M., 1935: An expedition to Melville Bay and north-east Baffin land. Geogr. Jour. 56: 297-313.

BEDROCK GEOLOGY

42. Andrews, J.T., G.K. Guennell, J.L. Wray, and J.D. Ives, 1972: An early Tertiary outcrop in north-central Baffin Island, N.W.T., Canada: environment and significance. Can. Jour. Earth Sci. 9(3): 233-238.

A thin, impure limestone was found in situ on Precambrian bedrock at latitude 70°36.6'N and longitude 75°20'W some 26 km northwest of the Barnes Ice Cap. The unit consists of undulating laminations composed of alternating fine- and coarse-grained sediment, which are interpreted as a series of algal mats or algal-laminated sediments. An analysis of enclosed palynomorphs indicates the presence of Ulmus, Taxodium, Liriodendron, Carpinus, and Engelhardtia plus other genera. On the basis of the microflora a Paleogene age is assigned to the unit. The climate at that time was warm-temperate and the environment suggested is a freshwater marsh or swamp. The outcrop is restricted to a single hill summit and its location suggests considerable Neogene geomorphological activity, primarily river-cutting associated with vertical movements along the western margin of the Davis Strait/Baffin Bay rift. Auth.

43. Blackadar, R.G., 1963: Fury and Hecla Strait, Foxe Basin north, District of Franklin, Northwest Territories. Ottawa, Surveys and Mapping Branch 1958. 2 map sheets, 25 x 31 in. and 30 x 23 in., both at scale 1 in.:4 mi. Can. Geol. Surv. Preliminary series, map 3-1958, and 4-1958. Additional notes to accompany map 3-1958: Fury and Hecla Strait map-area, and map 4-1958: Foxe Basin North map-area. 24 p. (Canada. Geological Survey. Paper 62-35.)

Presents results of 1956 and 1957 field work on Melville Peninsula and Baffin Island. The rugged Southampton, Melville, and Baffin uplands stand in marked contrast to the pond-strewn lowlands bordering northern Foxe Basin. Some half-dozen geological map-units on each sheet are treated in the notes provided. They range from Archean to Quaternary in age. The entire area was probably glaciated. Post-glacial marine submergence appears to decrease from south to north. AB77501.

44. Blackadar, R.G., 1956: Geological reconnaissance of Admiralty Inlet, Baffin Island, Arctic Archipelago, Northwest Territories: report, map, and stratigraphic sections. Can. Geol. Surv. Pap. 55-6. 25 p.

Contains results of field work in May-Aug. 1954 by the author and R.R.H. Lemon in the region 71°30'-73°30' N. 83°-87° W., northern Baffin. Some 1000 mi. were covered by dog sled, and a detailed study was made of the Arctic Bay settlement vicinity. History of discovery, accessibility, population, climate, vegetation and game, and topography are briefly described. Bedrock is Archean, Proterozoic and/or Early Cambrian, and Late Ordovician; it includes sedimentary rocks, volcanic flows, highly contorted gneisses, basic dike rocks, and granitic and pegmatitic dike rocks. Except for widespread block faulting (the dominant structural feature) and gentle warping, no orogenic deformation has occurred since the Archean. Quaternary glacial and marine deposits are briefly described. Traces of mineralized rock are widespread in certain areas. AB44043.

45. Blackadar, R.G., 1967: Geological reconnaissance, southern Baffin Island, District of Franklin. Can. Geol. Surv. Paper 66-47. 32 p.

Reports on Operation Amadjuak, planned in 1963 and completed in 1965, for investigation of Baffin Island south of 66°N. The southwesterly inclined Hall and Frobisher Uplands dominate the region, which is bordered on the west by the southeastern part of Foxe Lowland, developed mostly on Paleozoic carbonates and shales with some crystalline rocks. The Precambrian rocks comprise a complexly folded succession of granite, migmatite and quartz-feldspar gneissic rocks and, especially southwest of Frobisher Bay, are interbedded with belts and bands of crystalline limestone, graphitic schist, quartzite and mafic schists and gneisses. Age determinations indicate an Aphebian age for the metamorphism of the gneissic complex, thus placing the region in the Churchill Structural Province. Fauna is reported from some 40 localities in sections of sedimentary rock outcrops along rivers and lakeshores in the Foxe Lowland. The enclosing rocks are tentatively assigned to the Middle Ordovician. Geologic maps of Foxe Peninsula, Cumberland Sound, and Frobisher Bay, no. 16-18, 1966, at 8 mi.:1 in. accompany the report. AB102342.

46. Blackadar, R.G., 1962: Geology, Andrew Gordon Bay - Cory Bay, Baffin Island, District of Franklin. Map sheet 25.5 x 32 in. with descriptive notes. Can. Geol. Surv. Map 5-1962, preliminary series, base map sheet 36B and 36G, south half.

Describes briefly, and maps at 1 in.:4 mi. the geologic features in this area 64°-65°30'N. 74°-76°W., immediately west of the Mingo Lake area. Predominant rocks are some form of quartz-feldspar gneiss complex; main structural trend is northwest, although circular dome and basin structures may be included. Deposits of magnetite are present west of Chorkbak Inlet, 64°30'N. 74°30'W. and elsewhere. AB70239.

47. Blackadar, R.G., 1961: Geology Mingo Lake, Baffin Island, District of Franklin, Northwest Territories. Map sheet 26 x 22.5 in. Can. Geol. Surv. Map 43-1960, preliminary series, base map sheet 36A.

Map at scale 1 in.:4 mi. with descriptive notes, shows distribution of ten types of Precambrian rocks and of Quaternary drift, also other geologic features, in the area 64°-65°N. 72°-74°W. AB70240.

48. Blackadar, R.G., 1967: Geology of Mingo Lake - Macdonald Island map-area, Baffin Island, District of Franklin. Can. Geol. Surv. Memoir 345. 54 p. Map 1185A, scale 1:253,400.

Describes, with accompanying map in color, the geology of a 3000 mi^2 area of southern Baffin Island and adjoining offshore islands. A K-Ar age determination (1700 MY) indicates an early Proterozoic age for the metamorphism, the rocks resembling those of Grenville Province. The petrologic characteristics of the various rocks are tabulated and described in detail. Abundant mafic bands and inclusions occur, while boudins and lenses of hornblende-pyroxene rock are widespread. A number of complex dome and basin structures are mapped, illustrated and discussed. A sedimentary origin for most of the presently metamorphosed rocks is postulated. A series of diabase dikes and some features of glacial geology are briefly described. The process of metamorphism is considered in a special chapter and the author concludes that all deformation took place when the rocks were in a plastic state. An iron-rich mineralized zone occurs in the area, but does not appear to be of economic value. The soapstone deposits are, however, of very great value to the Eskimo craft industry in Baffin Island. Several presently worked deposits of these are described and illustrated. AB94058.

49. Blackadar, R.G., 1960: Hobart Island, Baffin Island, District of Franklin, Northwest Territories. Fold map sheets 26 x 27 in. Can. Geol. Surv. Surveys and Mapping Branch. Preliminary series, map 55-1959, sheets 35P and 36A (parts of).

Shows a general distribution of six Precambrian rock types, also some structural and glacial features in this unsettled area facing Hudson Strait, 63°15'-64°30N. 72°-74°W. An extensive magnetite band winds northwestward from Amadjuak Bay to beyond Keltie Inlet (64°28'N. 73°28'W.). AB70241.

50. Clarke, D.B., 1967: Tertiary basalts from Baffin Island and West Greenland. Geol. Soc. London. Proc. 1965-1966, no. 1637, p. 50-52.

Considers seismic, aeromagnetic, paleomagnetic and stratigraphic evidence, also radioactive age-determination suggesting continental drift in the Baffin Bay area. It is supposed that Greenland and N. America began to split apart with associated volcanic activity along the rift at the beginning of the Tertiary. Evidence from Baffin Island shows this activity waning as the area

moved further away from the center of volcanism. Petrology of the Baffin Island volcanics in the order of crystallization is given briefly; eleven specimens from Baffin Island have been analyzed. AB94594.

51. Deer, W.A., 1949: Geological reconnaissance in northeast Baffin Island. Arctic Circular 2: 56-58.

Account, and brief notes on results, of investigations in the Coutts Inlet-Pond Inlet region, made by two Cambridge University geologists, summer 1948. AB3764.

52. Demenitskaia, R.M. and V.D. Dibner, 1965: Morphological structure and the earth's crust of the North Atlantic region. In: Symp. on Continental Margins, 1965. Proc. publ. 1966. p. 63-79.

Deals mainly with the Norway-Greenland basin, but includes the West Greenland shelf and Baffin Basin in the geomorphic diagram. The abyssal area of the Norway-Greenland Basin, here called Scandic, is bordered and crossed by huge neotectonic scarps, called morphodisjunctions. The Norway and East Greenland continental shelves consist of folded, Caledonian rocks and an overlying cover of sediments and plateau basalt. Both areas are crossed by the Britain-Norway and the East Greenland morphodisjunctions. The mid-oceanic ridge of Scandic is a rift zone, continuous with the mid-Atlantic rift and marked by modern volcanic activity, a rift fracture system, and epicenters of shallow-focus earthquakes. Outcrops of the metamorphic Caledonian (?) complex, found in two places in the rift zone, indicates that this complex forms the basement of the Mohn's Rise. The crust of Scandic is predominantly of transitional type; upper mantle velocities of 7.5 and 8.1 km/sec have been determined. AB94807.

53. Eade, K.E., 1953: Petrology of the gneisses of the Clyde area, Baffin Island. Ph.D. Thesis, McGill Univ., Montreal, Quebec, Canada. 175 p.

Contains results of reconnaissance geologic mapping in the area 69°31'-71° N. 68°-72° W. during the Baffin Island Expedition of the Arctic Institute of North America, summer 1950. Geomorphic and glacial features of the region are described. The area extending from the sea to the heads of Gibbs and Sam Ford Fiords, Clyde Inlet, and McBeth Fiord is characterized by gneisses and gneissic granites. Petrology and structural geology of each of the fiord areas and of the region near the south end of Barnes Icecap are described in some detail, followed by a theoretical discussion of the petrogenesis of the gneisses. A process of granitization, in place for the most part, appears to be the most acceptable theory of origin. Gneiss of the Clyde region is compared with that of southern Baffin, southwest and east Greenland, Ungava Peninsula, labrador, and parts of southern Canada. AB39633.

54. Fortier, Y.O., 1954: Activities of the Geological Survey of Canada in the Arctic Islands. Arctic Circular, 7(3): 25-34.

Eighteen seasonal projects were carried out in Baffin, Ellesmere, and other islands. These are listed chronologically with names of geologists participating, area studied, type of project, and subsequently described in detail as to itineraries, field work, geological and other results. AB34734.

55. Fortier, Y.O. and L.W. Morley, 1956: Geological unity of the Arctic Islands. Roy. Soc. Can. Trans. 50(ser. III): 3-12.

Introduces hypothesis on the origin of the Canadian Arctic Islands and suggests regional division of the archipelago and its relation to the geologic framework of the continent. Present surface of islands is believed to be the product of erosion, at first taking place on continuous land surface, without interruption by arms of the sea. Subsequent, successive uplift, downwarp, faulting, glaciation, submergence and emergence is postulated. This hypothesis agrees with the geological concept of a continental land mass, and presents a preliminary interrelation of the main physical features of the islands. Substantiating or dispelling this hypothesis as it relates to the sea floor among the islands is work of the hydrographer. AB50953.

56. Fortier, Y.O., R.G. Blackadar, H.R. Greiner, D.J. McLaren, N.F. McMillan, A.W. Norris, E.F. Roots, J.G. Souther, R. Thorsteinsson, and E.T. Tozer, 1963: Geology of the north-central part of the Arctic Archipelago, Northwest Territories (Operation Franklin). Geol. Surv. Canada, Ottawa. Memoir 320. 671 p.

The geology of a large area of the Canadian Arctic Archipelago was investigated in 1955 by a team of many geologists supported by helicopter - Operation Franklin. The area studied extends roughly from Axel Heiberg and Ellesmere Islands on the north to Somerset Island on the south, and from Melville and Ellef Ringnes Islands on the west to Devon Island on the east.

The area is predominantly underlain by sedimentary rocks ranging in age from Precambrian to Tertiary.

The Canadian Shield extends into the area through the Baffin-Ellesmere Belt and the Boothia Arch. On and along this craton is the non-folded part of a lower Palaeozoic miogeosyncline with up to 20,000 feet of marine strata. These rocks are commonly but gently inclined and form part of the stable region of the Arctic Lowlands and Plateau. North of this and beyond cratonic influence is the Innuitian Region, a region of recurrent tectonic activity, subjected to many geosynclinal developments. The Parry Islands and Central Ellesmere fold belts, of late Devonian to early Pennsylvanian orogeny, and the Cornwallis fold belt of late Silarian to early Devonian orogeny represent the folded parts of the large lower Palaeozoic miogeosyncline. The folded strata-largely marine except for the predominantly non-marine upper Devonian-may be more than 35,000 feet thick. North and west of the miogeosynclinal region is a younger geosynclinal, the Sverdrup Basin. It contains over 40,000 feet of marine and non-marine, Pennsylvanian to Cretaceous strata, minor volcanic Cretaceous rocks, and wholly non-marine Tertiary strata. The longitudinal axis of the basin coincides with a zone of gypsum piercement domes and diapir folds. The first tectonic deformation within the basin took place at the end of the Pennsylvanian, the last occurred during the Tertiary with marked folding in the eastern part of the basin. Auth.

57. Jackson, G.D., 1966: Geology and mineral possibilities of the Mary River region, northern Baffin Island. Can. Mining Jour. 87(6): 57-61.

Metamorphosed sedimentary and volcanic rocks occur over a wide area in the Mary River region, and may be extensions of rocks on the Melville Peninsula. The metamorphic grade is transitional between the hornblende hornfels facies and the almandine amphibolite facies. The rocks include an iron formation, some of it high grade. Sulfide prospects have also been found. AB96416.

58. Jackson, G.D., A. Davidson, and W.C. Morgan, 1975: Geology of the Pond Inlet map-area, Baffin Island, District of Franklin. Can. Geol. Surv. Pap. 74-25. 33 p.

The area was mapped in 1968 during a reconnaissance helicopter-supported field project. A crystalline complex containing rocks of Archean to late Archean to late Aphebian age underlies most of the map-area. Metamorphism within the complex is chiefly upper amphibolite to granulite facies. Structures are complex and outline a broad arcuate concave northward pattern. Folds are overturned predominantly to the south-southwest.

About 11,500 feet of Neohelikian strata are preserved in the Milne Inlet Trough of the North Baffin Rift Zone. Dolomite and shales predominate, with a few gypsum beds occurring in the middle of the succession. A shallow water shelf environment prevailed during deposition. Hadrynian diabase dykes intrude these strata and the crystalline rocks.

At least 3800 feet of Cretaceous shales, sandstones and mudstones are preserved in the Eclipse Trough and represent a thin molasse sequence deposited in a paralic environment in response to renewed faulting in the North Baffin Rift Zone.

The Neohelikian succession has attracted the interest of major exploration companies because Texasgulf Inc. has proven-up a large sphalerite-galena-silver deposit in Neohelikian strata about 100 miles to the west of the map area. Beds of subbituminous coal up to 5 feet thick occur mainly in the basalt unit of the Cretaceous-Eocene sequence, and major oil companies have shown interest in the oil potential of these strata. Auth.

59. Jackson, G.D., 1971: Operation Penny Highlands, south-central Baffin Island. Can. Geol. Surv. Pap. 71-1A: 138-140.

60. Jackson, G.D., 1969: Reconnaissance of north-central Baffin Island. Can. Geol. Surv. Pap. 69-1A: 171-176.

61. Jansa, L.F., 1976: Lower Paleozoic radiolaria-bearing limestones from the Baffin Island shelf. Can. Geol. Surv. Pap. 76-1A: 99-105.

62. Kerr, J.W., 1967: A submerged continental remnant beneath the Labrador Sea. Earth and Planetary Sci. Letters 2(4): 283-289.

In attempting to reconstruct the precontinental drift arrangement of continental blocks in the Labrador Sea-Baffin Bay region, using the 500 fm isobaths for juxtaposing, rather than the coastlines, there is still a gap of some 220 km between Greenland and Baffin Island and even more of a gap between the south Greenland and Labrador isobaths. It is suggested that a submerged continental remnant exists beneath the Labrador Sea. Three separate mechanisms are held to have been involved in the continental drift which separated Greenland and Canada: continental extension, simple continental rotation, and the isolation of a submerged continental remnant. AB96679.

63. Kerr, J.W., 1970: Today's topography and tectonics in northeastern Canada. Can. Jour. Earth Sci. 7(2, pt. 2): 570.

Distribution of glaciers on Baffin Island and Greenland is such that a narrow high coastal belt separates the glaciers from the seas. This is probably due to isostatic forces resulting from crustal thinning as Baffin

Island and Greenland drifted apart. It is suggested that Greenland is surrounded by high land and has an interior ice-filled basin, mainly because it is surrounded by rifted coasts on which this process of crustal thinning and isostatic compensation occurred. AB104618.

64. Kranck, E.H., 1950: Bedrock geology. In: Baird, P.D. and others, Baffin Island Expedition, pub. in: Arctic 3: 138-139.

Brief preliminary report on bedrock surveys, of parts of the eastern Baffin Island "coastal range with its fiord area and the interior plateau between the high mountains and the inland ice" from bases at the heads of Clyde Inlet, of Gibbs, Eglinton, Sam Ford, and McBeth Fiords, and at the southeast end of the Barnes Ice Cap (ca. 69°30'-70°35'N., 68°-72°30'W.). AB23430.

65. Kranck, E.H., 1955: The bedrock geology of Clyde area in northeastern Baffin Island. Acta Geogr. 15: 226-258.

Contains a study of bedrock geology of the area between Gibbs Fiord and McBeth Fiord (70°56' N.-69°40' N.) made by members of Baird's expedition during the summer 1950. Six localities are described in detail. The main part of the area consists of gneiss with metasediments only in the southwest and south, and pure granite only in the southernmost part. No volcanic rocks have been found. All these rocks appear to be of Precambrian age. The structure of the area is characterized by an easterly to southeasterly main trend of the schists. The structure of the Clyde gneisses and the geological position of the Clyde series are briefly summarized. AB40835.

66. Kranck, E.H., 1953: Interpretation of gneiss structures with special reference to Baffin Island. Geol. Assoc. Can. Proc. 6(pt. 1): 59-68.

Structures in the Clyde region of Baffin Island (70°20' N., 68°20' W.) were studied during the 1950 expedition of the Arctic Institute of North America. Dominant rock type is a migmatic gneiss whose structure is discussed in detail. The "characteristic tectonic style" of this region is common in ultrametamorphic rocks formed under similar conditions in other areas. Structures in East and South Greenland, the Hopedale gneisses of Labrador, and gneisses on the east coast of James Bay are mentioned as showing similarities but are not discussed. AB35701.

67. Lemon, R.R.H. and R.G. Blackadar, 1963: Admiralty Inlet area, Baffin Island, District of Franklin. Can. Geol. Surv. Memoir 328. 84 p.

This region 71°31'-73°30' N. 83°-87° W. has nearly flat-lying sedimentary and volcanic rocks overlying Archean granitic and gneissic rocks, exposed in towering, many-colored cliffs along Admiralty Inlet and its tributary water bodies on the east side. Detailed examination of the geology near Arctic Bay village was made in May-Aug. 1954. Three lithologic-stratigraphic groups were recognized and mapped on a scale of 1 in.:8 mi. The lower two, the Eqalulik and Uluksan, are considered to be of Proterozoic or lowermost Paleozoic age; the upper, Admiralty Group contains typical "Arctic Ordovician" fossils and is probably Upper Ordovician. No precious metal deposits were located, though an extensive pyrite-galena-sphalerite deposit of possible economic value was outlined on the south shore of Strathcona Sound. Similarity of sedimentation trends in late Precambrian and/or early Paleozoic time between

Admiralty Inlet and northwest Greenland is indicated, though no new evidence is presented as to exact age of the "Arctic Ordovician" fauna. Nine columnar sections and two panoramic profiles are included. Senior author's Ph.D. thesis to the Univ. of Toronto is based on certain aspects of the stratigraphy. AB80621.

68. MacLean, B. and R.K.H. Falconer, 1979: Geological/geophysical studies in Baffin Bay and Scott Inlet-Buchan Gulf and Cape Dyer-Cumberland Sound areas of the Baffin Island Shelf. Can. Geol. Surv. Pap. 79-1B: 231-244.

Marine geological and geophysical studies on the Baffin Island shelf in 1978 by the Atlantic Geoscience Centre were concentrated in the Scott Inlet oil seep area and in the Buchan Gulf area on the northeastern part of the shelf, and between Cape Dyer and Cumberland Sound on the southeastern part of the shelf.

Upper Cretaceous (Senonian) marine calcareous siltstones underlie central and inner Buchan Gulf Trough. These, and possibly older strata, probably underlie Tertiary rocks offshore from Scott Inlet and may locally outcrop. Pre-Tertiary strata flanking a structural high at the outer part of the south wall of Scott Trough are a probable source of hydrocarbon seepage. Gravity and magnetic data at Scott Inlet indicate a thick sedimentary section, whereas the Buchan Gulf section probably is thinner.

Earthquake activity in northern Baffin Island and Baffin Bay was monitored with three ocean bottom seismometers in the Bay and three temporary seismographs onshore. At least forty events were detected in ten days.

Studies of the shelf south of Cape Dyer further delineated the extent of various rock units and outlined a diapiric ridge structure that extends over a distance in excess of 80 km. Auth.

69. MacLean, B., L.F. Jansa, R.K.H. Falconer, and S.P. Sristava, 1977: Ordovician strata on the southeastern Baffin Island shelf revealed by shallow drilling. Can. Jour. Earth Sci. 14: 1925-1939.

Cores of the bedrock underlying the southeastern Baffin Island shelf were recovered by underwater electric rock core drill at four localities. Cores from three of the localities consist of olive gray to dark yellow-brown slightly dolomitic limestones, in part burrowed and containing flat pebble conglomerate and breccia. Fragments of trilobites, brachiopods, crinoids, and other fossils including coral are present. Radiolarian wackestone was found at one locality where the rock also contains finely disseminated organic material. The strata have been assigned an Ordovician age (Caradoc) based on identification of chitinozoa, scolecodonts, and coral material. Depositional environments included shallow intertidal-subtidal, open shelf, and outer littoral-epibathyal. Core from the fourth locality is Precambrian biotite gneiss.

Seismic reflection and magnetic profiles have been used for correlation of the corehole data and to outline the geology of part of the southeastern Baffin Island shelf.

70. Petryk, A.A., 1967: Some Silurian stromatoporoids from northwestern Baffin Island, District of Franklin. Can. Geol. Surv. Pap. 67-7. 51 p.

Stromatoporoid faunas from the Baillarge and Cape Crauford formations of the Brodeur Peninsula, differ enough to suggest a change in marine conditions, although lithofacies of these two members of the Brodeur Group (late middle Ordovician-middle Silurian) are stromatoporoid biosones, which range from upper Llandoverian to Wenlockian. The stratigraphic distribution of the species is indicated. Systematic descriptions include seven new species. AB98997.

71. Riley, G.C., 1957: The geology of the Cumberland Sound region, Baffin Island. Ph.D. Thesis, McGill Univ., Montreal, Quebec, Canada.

Not available from University Microfilms International.

72. Thompson, R. and J.A. Brewer, 1976: Geology at the head of Kingnait Fiord, Baffin Island, N.W.T., Canada. Oxford University Baffin Expedition 1976. 42 p. Unpublished manuscript, Oxford, U.K., University, Dept. of Geology and Mineralogy.

73. Weeks, L.J., 1928: Cumberland Sound area, Baffin Island. Canada, Geol. Surv. Sum. Rept. 1927, pt. C, p. 83c-95c.

74. Wilson, J.T., 1965: Geological expedition to Capes Dyer and Searle, Baffin Island Canada. Nature 205: 349-350.

Summarizes findings of a two-month field trip in 1964 by a three-man party, along the east coast at Cape Dyer and from Broughton Island to Cape Searle. The coast consists of a series of high exposed headlands separated by deep fiords and valleys. Outcrops of lava up to 1400 ft thick form prominent, vertical, seaward-facing cliffs. In several localities the base of the lavas rests on or is interbedded with sedimentary rocks up to 500 ft thick, which contain fossil plants probably Paleocene in age. AB93040.

WEATHERING AND SOILS

75. Andrews, J.T. and G.H. Miller, 1972: Chemical weathering of tills and surficial deposits in east Baffin Island, NWT, Canada. In: Adams, W.P. and F.M. Helleiner (eds.), International Geography 1972. Published for the 22nd International Geographical Congress, Montreal 1972. Toronto, University of Toronto Press, p. 5-7.

Although it operates at extremely slow rates in the Arctic, chemical weathering can be used to distinguish among ages of surficial deposits. Three weathering zones are delimited. Zone I mountain top tors with in situ weathering products, zone II weathered till, zone III fresh till (dated from 120,000 $\pm$ 10,000 to present). Statistical analysis of chemical contents of soil samples reveals that the molecular ratio of $Si\ 0_2/Al_2\ 0_3$ is the most useful variable for discriminating among weathering zones. The percent of free iron in soil horizons is tested for distinguishing among pleistocene moraines. Gsg 1-23.

76. Birkeland, P.W., 1978: Soil development as an indication of relative age of Quaternary deposits, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 10(4): 733-747.

Soils can aid in subdivision and correlation of Quaternary deposits in eastern Baffin Island. The most useful data consist of horizon thicknesses and the intensity of oxidation in horizons beneath the A horizon. For Polar Desert soils formed from tills under a sparse lichen cover, the following trends are noted: soils ca. 200 yr old exhibit very subtle Cox horizons no more than 5 cm thick; those ca. 700 yr old have subtle Cox colors, with a maximum thickness of 30 cm; soils considered to have formed since late Wisconsin (ca. 10,000 yr) have weak cambic B horizons that are less than 9 cm thick; and well-expressed cambic B horizons, up to 24 cm thick, characterizing early Wisconsin tills (ca. 100,000 yr old). Under a full vegetation cover, Arctic Brown soils form from marine deltaic deposits along the coast. Compared to the above Polar Desert soils, mostly located inland, the horizons in the Arctic Brown soils are thicker, some are more intensely oxidized, and development rates are perhaps ten times more rapid. In contrast to the success in using field soil data for age differentiation, laboratory data on particle-size distribution, organic matter, and pH were not consistently useful. Both the oldest Polar Desert soils and the Arctic Brown soils are Inceptisols, and for till sequences the progression is no soil (0 yr) → Pergelic Cryopsamments or Cryorthents (200 yr) → weak Pergelic Cryochrepts (10,000 yr) → strong Pergelic Cryochrepts (100,000 yr). Auth.

77. Bockheim, J.G., 1979: Properties and relative age of soils of southwestern Cumberland Peninsula, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 11(3): 289-306.

On southwestern Cumberland Peninsula, Baffin Island, Minimal Podzol (Pergelic Cryopsamments), Arctic Brown (P. Cororthents), and Tundra (P. Cryaquepts) soils occur along moist fiords and Polar Desert (P. Cryorthents) soils occur in the more xeric uplands. Polar Desert soils have undergone acid leaching but maintain some features of Polar Desert soils in the high arctic, above ca. 75°N latitude. Most of the soils are extremely to strongly acid and contain low amounts of organic matter, exchangeable bases, extractable phosphorus, and clay. Arctic Brown and Minimal Podzol soils contain the greatest amount of water-soluble salts. The order of abundance of cations in water extracts is Ca > Mg > Na > K > H, and thus are typical of well-drained soils of semiarid regions. Dominant textures are gravelly or cobbly sand and loamy sand. Silt increases markedly with soil depth, possibly due to vertical frost sorting. Kaolinite is prevalent in the clay fraction of Polar Desert soils; mica is most abundant in the other soils. Poor profile development, frost sorting, variable snow cover, and differences in vegetation and microclimate over short distances have affected soil properties, thereby limiting the use of soils in estimating relative age of moraines. Soil properties most related to age are depth of oxidation, maximum percent free iron, color of the surface mineral horizon, and kaolinite/mica ratio in the clay-size fraction. Auth.

78. Boyer, S.J. and D.R. Pheasant, 1974: Delimitation of weathering zones in the fiord area of eastern Baffin Island, Canada. Geol. Soc. Amer. Bull. 85(5): 805-810.

Three weathering zones have been delimited in the basis of data collected during field reconnaissance studies. A detailed sampling of weathering characteristics in Maktak Fiord and subsequent use of character analysis and discriminant analysis techniques supports the tri-zonal classification.

The best combination of weathering characteristics for future use in statistical delimitation of weathering zones was tested by multiple stepwise discriminant analysis procedures.

Weathering zones appear to have a regional distribution. The zones are stratigraphic units that can be used as a framework upon which a late Cenozoic history of the Cumberland Peninsula and perhaps eastern Baffin Island could be constructed. Key words: weathering zones, weathering characteristics, statistical delimitation, regional distribution. Auth.

79. Isherwood, D.J., 1975: Soil geochemistry and rock weathering in an arctic environment. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado. 173 p.

80. Ives, J.D., 1975: Delimitation of surface weathering zones in eastern Baffin Island, Northern Labrador and arctic Norway: a discussion. Geol. Soc. Amer. Bull. 86(8): 1096-1100.

The recognition by Boyer and Pheasant of three distinct weathering zones in the fiord region of southeastern Baffin Island has wide implications. Similar zones, some of which can be correlated with late Cenozoic glacial stades, have been noted in northeastern Baffin Island and northern Labrador; yet possible apparent counterparts in Arctic Norway cannot be chronologically correlated. The problem of whether or not the uppermost weathering zone indicates the persistence of ice-free areas throughout the late Cenozoic Glaciations is examined. While it is apparent that large areas remained ice-free throughout the past 100,000 years (Wisconsin equivalent), true glacial erratics, derived from a glacial episode in the much more distant past, probably exist on several high summits. Recognition of weathering zones over wide areas is a valuable tool for study of the glacial history of these regions. Key words: weathering zones, regional distribution, glacial erratics, pseudo-erratics. Auth.

81. Locke, W.W., III, 1976: Etching of hornblende as a dating criterion for arctic soils. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 86 p.

82. Locke, W.W., III, 1979: Etching of hornblende grains in arctic soils: an indicator of relative age and paleoclimate. Quat. Res. 11: 197-212.

The degree of etching of hornblende grains in soils is defined as the mean depth of maximum etching on 100 grains per sample and is a function of: (1) the depth in the profile; (2) the age of the deposit on which the soil is formed; and (3) the climate since deposition. In soils formed on moraines in the eastern Canadian Arctic, etching decreases logarithmically with increasing depth in the profile, and the rate of etching at a given depth decreases logarithmically with increasing age. The most important climatic parameter with respect to etching appears to be the effective precipitation. Equally important in terms of soil moisture regimen is the presence of unfrozen water. Both affect the rate of etching as a function of depth and age. The inferred climate of northern Cumberland Peninsula, Baffin Island, N.W.T., Canada, preceding, during, and following the last (Foxe) glaciation, is indicated by the degree of etching of hornblende grains in soil profiles of various ages as follows: pre-Foxe--warm/wet; early to middle Foxe--mild/moist; middle to late Foxe--cold/arid; Hypsithermal--mild/moist; Neoglacial--cool/dry. Auth.

83. Locke, W.W., III, 1979: Paleoclimatic gradients as indicated by soil development (hornblende etching) on tills in the eastern Canadian Arctic. Geol. Soc. Amer. Abstracts with Programs 11(7): 467.

84. Mabee, S.B., 1974: The use of magnetite alteration as a relative age dating technique: preliminary results. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 185 p.

85. Moore, T.R., 1978: Soil development in arctic and subarctic areas of Quebec and Baffin Island. In: Quaternary soils. Reprinted from the Third York Quaternary Symposium. Norwich, England, GeoAbstracts, p. 379-411.

Soil development has been examined at nine sites along a transect from the boreal forest to the subarctic and arctic zones. There are pronounced variations in climate, vegetation and period for soil development along the transect, but the parent materials are generally similar. Soil studies have been confined to sites relatively unaffected by frost heave activities.

Soils at the boreal forest and low subarctic sites (Sept Iles, Esker and Ross Bay Junction) show strong morphological and chemical evidence of podzolisation. Ae horizons are 5 to 15 cm thick and the profiles show translocation of iron, aluminum and organic carbon. Cemented subsoil horizons (Bfc) occur frequently in freely drained sites and are related to amphibole-rich parent materials and cementation by amorphous iron and aluminum compounds. Strong cementation requires about 5000 yr for development.

Soils at the high subarctic sites (Cambrian Lake and Fort Chimo) show less intensive podzolisation with the horizons 1 to 5 cm thick and smaller translocations of sesquioxides and organic carbon. Morphological evidence of podzolisation is weak in soils derived from iron-rich materials of the Labrador Trough (Schefferville), but chemical analyses reveal movement of large amounts of iron, aluminum and organic carbon...etc... Auth.

86. Sugden, D.E. and S.H. Watts, 1977: Tors, felsenmeer, and glaciation in northern Cumberland Peninsula, Baffin Island. Can. Jour. Earth Sci. 14: 2817-2823.

On the basis of two case studies in eastern Baffin Island it is suggested that tors and felsenmeer have survived beneath the Laurentide ice sheet. These features, therefore, need not be diagnostic of areas that escaped glaciation. Rather, the existence of tors and felsenmeer may reflect situations where the overlying Laurentide ice sheet was cold-based. Auth.

87. Watts, S.H., 1979: Some observations on rock weathering, Cumberland Peninsula, Baffin Island. Can. Jour. Earth Sci. 16(5): 977-983.

A variety of bedrock weathering features-both modern and remnant-including surface grus, polygonal cracks, siliceous glaze, tors, weathering pits, and tafoni typify upland outcrops on the Cumberland Peninsula. Tor ridges are particularly prevalent and at lower elevations they show significant modification and streamlining by flowing ice. On summit areas at elevations above 750 m, however, remnant corestones are preserved in situ, suggesting selective preservation of upland surfaces. Bedrock structure and composition, topographic position, and intensity of process strongly influence tor development. Weathering pits are common on high level, open summit surfaces where weathering

occurs in response to both climate and continued removal of derived debris. Pit enlargement through lateral undercutting has been favoured by accumulation of protective bottom residua, mechanical weathering, and the presence of exfoliation crusts. It is postulated that salt crystallization plays a role in outcrop microweathering under present upland arctic conditions. Auth.

GEOMORPHOLOGY

88. Andrews, J.T. and A.S. Dyke, 1974: A geomorphological - geological inventory and interpretation of Baffin Island National Park and surrounding area. Final Report. To: Applied Research Division, Parks Canada, Dept. Indian and Northern Affairs, Govt. of Canada. Various pagings.

A comprehensive account of the geologic and geomorphic phenomena, based on field research and previously published works. Physiographic regions are delimited; surficial geology and landforms mapped and described; quaternary history, glacial chronology, climatic change and crustal movements documented and explained. Geologically sensitive and/or hazardous phenomena are discussed and suggestions given for planning and research requirements. Gsg 1-8.

89. Andrews, J.T., A.S. Dyke, D. Isherwood, G.H. Miller, and R.L. Weaver, 1973: Geomorphological investigations of Baffin Island National Park - summary of field research and findings. To: Applied Research Division, Parks Canada, Dept. Indian and Northern Affairs, Govt. of Canada. 62 p.

An initial account of research program and results for the 1973 field season in Baffin Island National Park. The report deals with logistics of park visitation, transport to and within the Park, and gives a brief summary of research findings on glacial history, marine limits, soils, and glacier mass balance, in a series of reports by individual scientists. Gsg 1-17.

90. Barnett, D.M., 1967: Development, landforms and chronology of Generator Lake, Baffin Island, NWT. Geogr. Bull. 9(3): 169-188.

Describes this proglacial lake at the margin of the Barnes Icecap, ponded against the local watershed at the SE margin. The lake is the source of the eastward flowing Clyde River, which in preglacial time flowed SW into Foxe Basin. As the ice retreated SW 26 km, over a period of 1500 yr, the lake has generally increased in area and depth, at one time having an area of 120 km^2 and draining north into the Sam Ford River. The trend reversed when a lower col was uncovered to form a new overflow channel. The lake fell some 75 m when the present outlet opened. The most striking landforms in the lake basin are asymmetrical cross-valley moraines which may have a subglacial origin. Other features described are an abandoned shoreline, ice-pushed ridges, deltas, and what is provisionally considered a proglacial lake terrace, 2-4 m below the old shoreline on the south side of the former lake. No material suitable for radiocarbon dating have been found so far, lichenometry is used with reservations for dating the beginning of the higher lake 1500-1000 yr BP and the draining 950-750 yr BP. AB93807.

91. Barnett, D.M., 1966: Preliminary field investigations of movement on certain arctic slope forms. Geogr. Bull. 8(4): 377-382.

Describes observations at three sites at the head of Inugsuin Fiord, east Baffin Island. No movement was observed 1964-66 at Site 1, an embayment with interrelated slopes. Radial, non-uniform movement totalling 4.5-5.2 cm occurred at Site 2, on solifluction lobes along a river bank. Active development was noted at Site 3, on a 650 ft high scree cone. AB93808.

92. Barry, R.G., R.G. Crane, C.W. Locke, W.W. Locke, III, and G.H. Miller, 1977: The coastal environment of southern Baffin Island and northern Labrador-Ungava. Final Report. To: Imperial Oil Limited. Canada-Cities Service Ltd., Calgary, Alberta. Arctic Petroleum Operators Association (APOA) Project 138. 159 p.

93. Bird, J.B., 1977: Coastal morphology and terrain studies, Kivitoo Peninsula, Baffin Island. Can. Geol. Surv. Pap. 77-1C: 53-55.

A brief visit was made in 1975 to the Kivitoo Peninsula, on the east coast of Baffin Island (Fig. 10.1), to examine landform modification under periglacial conditions. Field studies were continued in summer 1976 and were concentrated on the geomorphic processes active along the coast and on the role of snow in terrain development. Auth.

94. Bradley, R.B., 1967: Patterned ground and related observations in east central Baffin Island. B.A. Thesis, Univ. Western Ontario, London, Ontario, Canada.

95. Cass, J.R., Jr., 1959: Subsurface explorations in permafrost areas. Amer. Soc. Civil Engineers. Soil Mechanics and Foundations Div. Jour. 85(SM5): 31-41.

Drilling techniques used in 1955 and 1957 at Frobisher Air Base to obtain information for building-foundation design and for expanding the runway, are described. The drill rig used in 1955 was a Bucyrus-Erie model 20-W churn drill, adapted for continuous drive sampling, and mounted on skids. A piston-type sample extruder was used to remove the samples from the core barrel. Satisfactory samples were obtained only in fine-grained sands and silts. In 1957 a skid-mounted Sullivan-12 core drill was used, equipped to take cores of 2-4 in. diam. and drive samples of 1.5-3 in. diam. Samples were knocked out of the sample spoon. The samples obtained in all types of soil by core drilling with compressed air were suitable for classification and testing, although core recovery was unreliable. Core drilling was found more satisfactory than churn drilling because of the mobility and versatility of the equipment, but the production rate was about half that with the churn drill. From SIPRE. AB57288.

96. Church, M., 1970: Baffin Island sandar: a study of arctic fluvial environments. Ph.D. Thesis, Univ. British Columbia, Vancouver, B.C., Canada. 3 V. Page 6024 in Vol. 36/12-B of Dissertation Abstracts International. Not available from Univ. Microfilms Int'l.

96a. Church, M., 1972: Baffin Island sandurs: a study of arctic fluvial processes. Can. Geol. Surv. Bull. 216. 208 p.

97. Church, M., 1967: Observations of turbulent diffusion in a natural channel. Can. Jour. Earth Sci. 4(5): 755-772.

Presents measurements of the diffusion coefficient K for longitudinal and lateral diffusion for the proglacial Lewis River on Baffin Island. The geomorphological consequences of diffusion include the phenomenon of momentum transfer in the channel and resultant shear stresses brought to bear on the walls, and the pattern of sediment transport. AB94584.

98. Church, M., 1974: On the quality of some waters on Baffin Island, Northwest Territories. Can. Jour. Earth Sci. 11: 1676-1688.

In glacierized and nonglacierized river basins in eastern and central Baffin Island, waters are generally very soft (total dissolved solids of order 5-50 mg/l). Diurnal and seasonal fluctuations in dissolved solids concentration are related to runoff characteristics and sources. Auth.

99. Church, M., 1978: Palaeohydrological reconstructions from a Holocene valley fill. In: Miall, A.D. (ed.), Fluvial sedimentology. Can. Soc. Petrol. Geol. Memoir 5: 743-772.

At the head of Ekalugad Fjord, eastern Baffin Island, outwash deposits preserve a 6,000 year history of Holocene fluvial activity. Four depositional phases occurred: 1) deposits of sublateral drainage under glacial ice prior to 6,000 years BP (referred to as T1); 2) major outwash deposits in front of retreating ice before 4,300 years BP (T2) followed by an erosional interval; 3) aggradation correlated with Neoglacial events at 2,500 years $\pm$ BP (T3) followed by an erosional interval; 4) aggradation associated with recent Neoglacial activity (300 to 100 years BP) (T4).

The T2 sediments are mainly foreset deltaic beds, deposited into the sea. Beds vary from cobbles with little matrix to fine, laminated sands. About 2,000 beds, comprising 30% of the total thickness, were sampled to determine grain size. These results form the basis for palaeoflow calculations using tractive force theory. The assumptions underlying the calculations are critically examined and several alternative calculations are made. The relative frequency distribution of the high flows is presented: discharges were about 10x larger than present-day ones, with a maximum of about 300 m^3s^{-1}, against an observed maximum of 200 m^3s^{-1}. Present knowledge of sediment transport mechanics constrains palaeohydrological reconstructions from sediment textural information to be at best an order-of-magnitude exercise.

100. Church, M. and J.M. Ryder, 1972: Paraglacial sedimentation; a consideration of fluvial processes conditioned by glaciation. Geol. Soc. Amer. Bull. 83(10): 3059-3072.

Glaciation is schematically considered as a perturbation of "normal" fluvial conditions. Drift is unstable in a proglacial or postglacial fluvial environment, resulting in heightened sediment movement that continues as long as drift material remains easily accessible for fluvial erosion and transportation. Sediment yield bears no relation to concurrent primary production of weathered debris.

Examples of such "paraglacial" denudation and sedimentation are reported

from two contrasting areas. Postglacial valley alluvial deposits are widespread in central Baffin Island where rapid sedimentation continues today; estimated denudation rates are an order of magnitude higher than in comparable unperturbed areas. In south-central British Columbia, rapid sedimentation during the paraglacial period contrasts sharply with present-day conditions. Auth.

101. Church, M., 1972: Studies of glacial-fluvial geomorphology in Maktak Fjord, Baffin Island, 1972: preliminary report. To: Parks Branch, Dept. Indian and Northern Affairs, Govt. of Canada.

Discusses fieldwork on the morphology and sedimentology of the Sandur at the head of Maktak Fjord. The work involved surveying, sonar profiling, streamflow and sediment transport measurements, sediment sampling and vegetation sampling - a phenological list of vascular plants is included. The sandur, unlike those elsewhere on Baffin Island has large volumes of sand and fine sediments apparently due to the erosional efficiency of the high-energy outlet glaciers descending from the Penny Ice Cap. Gsg 1-45.

102. Crompton, P., 1968: Scree development on Baffin Island. B.A. Thesis, Univ. Toronto, Toronto, Ontario, Canada.

103. Dyke, A.S., 1978: Qualitative rates of frost heaving in gneissic bedrock on southeastern Baffin Island, District of Franklin. Can. Geol. Surv. Pap. 78-1A: 501-502. Note.

104. Falconer, G., 1962: Patterned ground under ice fields. Jour. Glaciol. 4(32): 238-240.

Reviews, in brief, patterned ground emerging from small receding ice fields as observed on aerial photographs made in 1949 and 1958 in northern Baffin Island. Large high-centered tundra polygons with diameters about 50 m were identified. Similar polygons extend over much of the surrounding country and their size varies little with distance from the ice field. These polygons are actually melting out from under the glacier ice. AB71340.

105. Goldthwait, R.P., 1976: Frost sorted patterned ground: a review. Quat. Res. 6(1): 27-35.

Sorted circles, polygons, and stripes are reported from Alaska, Greenland, Baffin Island, Antarctica, and New Hampshire. From these studies and key references, all cases are found to have: (1) a mixed parent material, commonly till, composed of a wide range of clast sizes unsorted below frost table, (2) gutter depressions containing the largest stones and carrying summer drainage, and (3) tabular stones on edge in the gutters showing expansion-squeezing from the sides. The size of the unit cells, gutter to gutter, is a function of mean maximum clast size: smallest chips making forms 10 cm diameter across and largest forms 20 m across. The slope determines the shape: polygons, and nets form on slopes up to 2 or 4° depending upon amount of water and fines. Ellipses form on 3 to 6° slopes, and stripes form on 4 to 11° slopes. Clearly shape is an effect of solifluction. Lastly, time involves seasons of sporadic sorting until there is a stable end form with lichen-covered stone gutters and tundra-covered soil centers. The up-and-out mechanism, described by Corté, is the best known for the primary

sorting. Larger sorted forms (2-20 m in diameter) are reported almost exclusively where nearly continuous permafrost exists. They form where the mean annual temperature is below -4°C. Former permafrost is indicated where lichen and turf are dense and not overturned and where measured motion is nil. Small forms (under 1 m in diameter) are generated in a year or two where there is only deep annual freezing (0.1-2 m), but no permafrost. Auth.

106. Goldthwait, R.P., 1950: Geomorphology. In: Baird, P.D. and others, Baffin Island Expedition, 1950. Arctic 3: 139-141.

Brief preliminary report on studies of "the activity of the margin of the southern half of the Barnes Icecap as it related to the formation of moraines, and the glacial history of the area between the icecap and the coast" (about 69°20'-71°N. 68°-74°W.). AB22155.

107. Ives, J.D. and R.B. Sagar, 1963: Return to the Ice Age. Geographical Branch research in Baffin Island. Can. Geogr. Jour. 67(2): 38-47.

Describes the 1961 reconnaissance and 1962 studies, part of a long-term project. The glaciology of the Barnes Ice Cap and geomorphology of the icecap margins and the surrounding area were examined; a 900-lb ice sample was removed from a glacier moraine for radiocarbon dating. AB79717.

108. Joscelyn, W.D., 1966: Solifluction: a case study of a periglacial phenomenon. B.A. Thesis, Univ. Toronto, Toronto, Ontario, Canada.

109. King, C.A.M. and J.T. Buckley, 1969: Geomorphological investigations in west-central Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 1: 105-120.

The paper discusses a variety of glacial, glaciofluvial, and periglacial forms in western Baffin Island. Glacial forms, especially striations and crag-and-tail, reveal the effects of erosion by ice from the proto-Barnes Ice Cap, which reached the coast about 7,000 years ago. Moraine stones near its margin show a preferred orientation perpendicular to the moraine crests. Glaciofluvial forms include deltas, eskers, and kames, the latter occurring mainly in dead-ice areas. A relationship between delta slope and stone size is established. Esker-like ridges in the dead-ice areas are of two types; some are true eskers, showing evidence of flow, and others represent material collected in elongated hollows within the dead-ice areas. Kames and kame terraces are also described; the slope of the latter is found to indicate the ice-margin gradient. The effects of material size and shape on the nature of periglacial forms, including ice-wedge polygons, sorted features, and solifluction lobes, are considered. Ice-wedge polygons are best developed in well-sorted material and the sorted features in mixed material. Finally, a number of icings (Aufeisen) are described. These icings occur where spring water flows and subsequently freezes during the winter. Auth.

110. King, C.A.M., 1969: Some Arctic coastal features around Foxe Basin and in eastern Baffin Island, N.W.T., Canada. Geogr. Ann. 51A(4): 207-218.

Many Arctic beaches are characterized by low energy wave conditions and a falling sea level. Raised coastal features in west Baffin Island include

beach ridges of fairly well-rounded stones compared with the stones of the modern beach. Foley Island, off west Baffin Island in Foxe Basin, has two main series of beach ridges, covering height ranges from 93 m to 68 m and 65 m to 90 m, and time periods of 6,800 to 5,600 BP and 5,500 to 4,800 BP respectively. A hiatus between the two series, when sea level stood between 65 and 70 m, allowed a complex fan pattern of ridges to form. The modern sand beach was surveyed before and after the ice break-up to illustrate its character and the effect of weak wave action in modifying the influence of shore ice. Chevron beach ridges are discussed, mainly from the evidence of air photographs. Finally some of the beach features and sediment characteristics of the east coast of Baffin Island are compared with those of the west coast. The more rigorous wave environment on the east allows greater wave effectiveness in rounding and sorting beach material. Auth.

111. Østrem, G., C.W. Bridge, and W.F. Rannie, 1967: Glacio-hydrology, discharge and sediment transport in the Decade Glacier area, Baffin Island N.W.T. Geogr. Ann. 49A(2-4): 268-282.

Mass balance studies in 1965 showed averages for accumulation and ablation to be 25 cm and 21 cm respectively. Discharge measurements showed close connection between rainfall and high discharge; periods of high air temperature produced only small rises in discharge. A similar pattern was observed in nearby Inugsuin River, which drains a nearly glacier-free area. Sediment transport in Decade River showed huge variations, from a few kg/day to a maximum, on 29 July, of 1183 x 103 kg/day. On that day occurred 60% of the total silt transport of the entire observation period, 15 June to 19 August. In a final footnote, some comparisons are given with the 1966 season which was warmer and drier. AB106189.

112. Østrem, G., 1964: A method of measuring water discharge in turbulent streams. Geogr. Bull. (21): 21-43.

Describes first use in glaciological or geomorphic research of a simple method of measuring water discharge in turbulent rivers, developed in Norway about 30 yr ago. This so-called relative salt-dilution method was used in 1963 in studies of the Lewis River at the northeast corner of the Barnes Ice Cap in connection with the North-central Baffin Island Survey by the Geographical Branch of the Canadian Dept. of Mines and Technical Surveys. The theory and procedures of this method are given in detail and necessary field equipment is listed. Other methods are outlined, including the float, Pitot tube, current meter, colorimetric, etc. Complete mixing of the brine with the river water, also water temperature variations, are important factors, as is correct use of the pipette. AB90404.

113. Robitaille, B., 1959: Recherches sur la geomorphologie du S.E. de L'ile Cornwallis, Territoires du Nord-Ouest--Recherches sur certains problems de la Peninsule Foxe, Ile de Baffin, Territories du Nord-Ouest. Ph.D. Thesis, Université Laval, Quebec City, Quebec, Canada. Not available from University Microfilms Int'l.

114. Samson, L. and F. Tordon, 1969: Experience with engineering site investigations in northern Quebec and northern Baffin Island. Can. Nat. Res. Council. Assoc. Comm. on Geotech. Res. Tech. Mem. 96: 21-38. (Canadian Conference on Permafrost, Third, Jan. 14-15, 1969, Proc.)

Subsurface investigations were undertaken in permafrost areas in connection with the engineering design of two potential major mining developments in the eastern Canadian Arctic. These are the Asbestos Hill and the Baffinland Iron Projects (Figure 1).

Asbestos Hill is located in the northernmost part of the Province of Quebec, 30 miles from Hudson Strait in the continuous permafrost zone. The project is owned by Asbestos Corporation Limited treatment plant to produce 100,000 tons of asbestos fibre annually, a nearby townsite for an initial population of 500 people, a 40 mile gravel road from the Asbestos Hill plant site to Deception Bay, an inlet of Hudson Strait, where a wharf and storage facilities were proposed (Figure 2). Site investigations required for foundation design of the various buildings and facilities of this project took place intermittently between 1962 and 1964.

The Baffinland Iron Development is located at Mary River in northern Baffin Island, 300 miles north of the Arctic Circle, and is the property of Baffinland Iron Mines Limited. Engineering site investigations were carried out in the Spring of 1965 for a preliminary design and feasibility study. In its present layout, the project consists of mining and crushing facilities at Mary River for an initial production of 2,000,000 tons of high grade direct shipping ore per year, a townsite for 1,000 people, a 60 mile railroad, a wharf, extensive storage and reclamation installations at Milne Inlet (Figure 3). Auth.

115. Slaymaker, H.O. and M. Church, 1972: The use of trend surface analysis in the interpretation of Quaternary deposits. In: Yatsu, E. and A. Falconer (eds.), Research methods in Pleistocene geomorphology. Proc. Guelph Symp. Geomorphol. (2): 215-234.

116. Stock, R.J., 1968: Morphology and development of talus slopes at Ekalugad Fiord, Baffin Island, N.W.T. B.A. Thesis, Univ. Western Ontario, London, Ontario, Canada.

117. Taylor, R.B., 1973: Coastal environments and processes in the Canadian Arctic Archipelago. M.Sc. Thesis, McMaster Univ., Hamilton, Ontario, Canada. 210 p.

118. Thompson, H.R., 1954: Pangnirtung Pass, Baffin Island: an exploratory regional geomorphology. Ph.D. Thesis, McGill University, Montreal, Quebec, Canada. 279 p.

Contains results of the writer's field work as participant in the Arctic Institute of North America's Baffin Island Expedition, May 13-Sept. 6, 1953. His main purpose was to record landforms in the valley of Pangnirtung Pass (approx. 66°05'-67° N. 64°35'-66° W.), relationships between them, and therefore the assemblages of landforms displayed; also "to report on the condition of the present valley glaciers, and to give a provisional estimate of the regional denudation chronology." The valley is described geologically as a unit; landforms in each of three sub-regions are described, and the nature and evolution of valley and surrounding area are examined. Appendices: (A) recent glacier variations; (B) section in the Owl Valley Sands; (C) problems for the future.

"Cumberland Peninsula was uplifted and block-faulted in the Pliocene. It was first dissected to a depth of 1100-1500 feet and later to a maximum of 6600 feet in the great trench of Pangnirtung Pass. The latter was created

by alternating rivers and glaciers in a favourable geological structure. The intensity of vertical corrasion has allowed patches of the old peneplane to be preserved beneath summit icecaps. The Pass, which is composed of three distinctive sub-regions, is lined by hanging valleys whose altitudes are inversely proportional to the volumes of their glaciers. The latters' 'recent advance' occurred before 1850. Decay had set in by 1883 and all the glaciers are now thinning because of a lengthened ablation season. Ice cores in moraines left by the last trunk glaciers to occupy Pangnirtung Pass and Fiord are also melting. Around Pangnirtung Fiord raised beaches above ten feet are lacking. In the north they occur to fifty feet."--Author's abstract. AB37766. Page 76 in Vol. W1955, Dissertation Abstracts International. Not available from University Microfilms, Int'l.

119. Ward, W.H., 1959: Ice action on shores. Jour. Glaciol. 3(25): 437.

Reports observation of ice action at Generator Lake (69°39' N. 71°50' W.) central Baffin Island, and ramparts formed by drifting floes riding up the shore; also observations at Frobisher (ice hummocks in winter), Pangnirtung and Clyde Inlet. AB62588.

120. Wilkinson, T.J., 1972: Downslope sequences of sediment transport and deposition on High Arctic slopes. M.Sc. Thesis, McMaster Univ., Hamilton, Ontario, Canada. 156 p.

CLIMATE AND SEA ICE

121. Barry, R.G. and S. Fogarasi, 1968: Climatology studies of Baffin Island, Northwest Territories. Ottawa, Canada. Inland Waters Branch. Tech. Bull. 13. 106 p.

Reports the main results of Sept. 1966-June 1968 studies in a continuing investigation of the moisture sources for precipitation and synoptic climatology of events significant for snow accumulation/ablation; this is part of the Baffin Island Project of the Dept. of Energy, Mines and Resources. The results are plotted on maps and profiles, p. 7-106: vapor content and transport and mean surface pressures for overcast days, and days with > 2 in. of snowfall. AB102074.

122. Barry, R.G., 1974: Further climatological studies of Baffin Island. Northwest Territories. Canada. Inland Waters Directorate, Water Resources Branch. Tech. Bull. 65. 54 p.

123. Bilello, M.A., 1966: Survey of arctic and subarctic temperature inversions. CRREL TR 161. 35 p.

This study provides a statistical analysis of available data on Arctic and subarctic inversions, and includes data from locations in Canada, Greenland, and Alaska. The analysis considers inversions with respect to frequency, base height, thickness, base temperature, and temperature gradient. Auth.

124. Bovis, M.J. and R.G. Barry, 1974: A climatological analysis of north

polar desert areas. In: Smiley, T.L. and J.H. Zumberge (eds.), Polar deserts and modern man. Tucson, Arizona, Univ. Arizona Press, p. 23-31.

125. Bradley, R.S., 1973: Seasonal climatic fluctuations on Baffin Island during the period of instrumental records. Arctic 26: 230-243.

Temperature and precipitation records for Baffin Island are examined on a seasonal basis for the last 40 to 50 years. Accumulation season temperatures (September to May) during the late 1960s were similar to those which prevailed 30 to 40 years ago. Ablation season temperatures (June, July, August) during the same period were cooler than for at least 30 years. Precipitation variations showed much less spatial coherence, but during the last 10 to 15 years there have been marked increases, mostly during winter months. These increases, accompanied by cooler summers and warmer winters, have led to increased glacierization of the area. The most recent fluctuation of summer temperatures is related to changes in the frequency of synoptic types in the area. Baffin Island is sensitive to small changes in climate which are only revealed by an analysis of temperature and precipitation on a seasonal basis. Auth.

126. Coulcher, B.A., 1968: A study of the synoptic climatology of Baffin Island, N.W.T. M.Sc. Thesis, McGill Univ., Montreal, Quebec, Canada. 157 p.

127. Crane, R.G., 1978: Seasonal variations of sea ice extent in the Davis Strait-Labrador Sea area and relationships with synoptic-scale atmospheric circulation. Arctic 31(4): 434-447.

Using published data sources for south-eastern Baffin Island, Ungava Bay and the northern Labrador Sea area, a study of the general patterns of sea ice growth and decay has been made for the years 1964 to 1974. From a comparison of individual years an "early" and a "late" pattern of both ice advance and ice retreat are recognised. Mean daily sea-level pressure patterns for June-July and for October-mid-November are examined and a relationship is established between the type of ice advance or retreat pattern and the synoptic circulation over the area. In the years of early ice retreat there is an increased frequency of southerly airflow over the region. Strong winds and the advection of warm air leads to the more rapid removal of the ice compared to years of late ice retreat. Similarly for the years of early ice advance there is an increased frequency of northerly and westerly flow, bringing lower temperatures and an influx of second-year and multi-year ice into the area. Auth.

128. Crane, R.G., 1978: Synoptic controls on the energy budget regime of an ablating fast ice surface. M.A. Thesis, Univ. Colorado, Boulder, Colorado.

129. Godison, B., 1968: Some hydrometeorological aspects of an arctic drainage basin. B.A. Thesis, Waterloo Univ., Waterloo, Ontario, Canada.

130. Hare, F.K., 1950: Climate of the eastern Canadian Arctic and Subarctic, and its influence on accessibility. Ph.D. Thesis, Univ. Montreal, Montreal, Quebec, Canada. 484 p.

131. Hare, F.K. and M.R. Montgomery, 1949: Ice, open water, and winter climate in the eastern Arctic of North America: Part I-II. Arctic 2: 79-89.

Results of part of the research done by a group working at McGill University on the climatology of eastern Canada.

Contents: Pt. 1. Hare, F.K. Distribution of winter temperature over the eastern Arctic and sub-Arctic.

From climatic data for Canadian and Greenland Arctic, 1940-48, the author presents new air temperature maps, and evidence of the freezing over of Hudson Bay after January; discusses the open water bodies as "gulf of warmth" in Davis Strait-Baffin Bay, Hudson Strait and Hudson Bay.

Pt. 2. Montgomery, M.R. The pattern of winter ice.

The author summarizes present knowledge of winter conditions in each of the "gulfs of warmth," based on records of observers on land and sea in earlier years, and on flight observations 1927-28 (Hudson Strait), also winters of 1948-49 (Hudson Bay). Indicates that in late winter and early spring Hudson Bay was completely ice-covered (1947-48, 1948-49) and that further observations are planned for 1949-50. AB6655.

132. Jacobs, J.D. and R.G. Barry, 1972: Air-sea interaction studies in Davis Strait. EOS, Trans. A.G.U. 53: 387. Abstract.

133. Jacobs, J.D., J.T. Andrews, R.G. Barry, R.S. Bradley, R.L. Weaver, and L.D. Williams, 1973: Glaciological and meteorological studies on the Boas Glacier, Baffin Island, for two contrasting seasons (1969-70 and 1970-71). In: The role of snow and ice in hydrology. Proc. Banff Symp. 1972. IAHS AISH Pub. 107, 1: 371-382.

The results of mass and energy balance studies on the Boas Glacier are presented for two contrasting years. For 1969-70 the net winter balance (b_w) was 0.4 m H_2O and the net balance for the year (b_n) was +0.37 m H_2O. For 1970-71 the corresponding figures were 0.26 m H_2O and 0.2 m H_2O. Meteorological data for summer 1970 show that net radiation provides 60% of the energy input. Evaporation apparently made a significant contribution to the heat loss. The contrast between the two ablation seasons is analysed on the basis of synoptic circulation types and climatological parameters. Auth.

134. Jacobs, J.D. and R.G. Barry, 1972: Regional energy-budget studies in western Davis Strait 1970-72. EOS, Trans. A.G.U. 53: 1012. Abstract.

135. Jacobs, J.D., R.G. Barry, B. Stankov, and J. Williams, 1972: Short-term air-sea interactions and surface effects in the Baffin Bay-Davis Strait region from satellite observations. Colorado Univ., Institute of Arctic and Alpine Research. Occasional Pap. 4. 80 p.

A study of meteorological satellite data was undertaken for purposes of calculating surface energy budgets in relation to synoptic-term events in the Baffin Bay--Davis Strait region. Visual and infrared imagery, infrared temperature maps, satellite derived atmospheric temperature and humidity profiles and conventional synoptic data were used to determine exchange rates for selected days in June, July and August, 1970. An

evaluation was made of presently available satellite data in comparison with surface and airborne measurements in the region. While problems remain in the satellite data interpretation and in the simplified energy budget model used, it is demonstrated that assessments of short-term (daily) variations in surface fluxes are possible using this approach. Continuing field investigations and improved satellite coverage will permit an extenstion of this work in developing a synoptic energy budget climatology for this important sector of the Arctic.
-from U.S. Government Reports Announcements PB-233 696/6GA; GA 74B/2815.

136. Jacobs, J.D., 1974: Solar and atmospheric radiation data for Broughton Island, eastern Baffin Island, Canada, 1971-1973. Colorado Univ., Institute of Arctic and Alpine Research. Occasional Pap. 11. 15 p.

137. Jacobs, J.D., R.G. Barry, R.S. Bradley, and R.L. Weaver, 1974: Studies of climate and ice conditions in eastern Baffin Island, 1971-73. Colorado Univ., Institute of Arctic and Alpine Research. Occasional Pap. 9. 77 p.

Climatological investigations by the Institute of Arctic and Alpine Research (INSTAAR) in eastern Baffin Island began in 1970. Since 1971 the program has focused particularly on ice conditions in western Davis Strait-Baffin Bay in relation to weather and climate but, in addition, a variety of other related climatic studies have been carried out. These investigations complement the specific field measurements of energy budgets in relation to fast-ice break-up processes. This report is one of a planned series which presents preliminary results of some of these projects and documents data, and information on field activities not appropriate for regular journal publication. Auth. G.A. 75B/0241.

138. Jacobs, J.D., 1973: Synoptic energy budget studies in the eastern Baffin Island-Davis Strait region. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado. 242 p.

139. Johnson, J.P., 1957: Summer ice conditions in Baffin Bay, 1901-1950. M.A. Thesis, Clark Univ., Worcester, Massachusetts.

140. Keen, R.A., 1979: Temperature and circulation anomalies in the eastern Canadian Arctic, summer 1946-79. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado.

141. Latimer, J.R. and E.J. Truhlar, 1967: A survey of the measurement of solar and atmospheric radiation in Canada. In: Canadian Conf. on Micrometeorology, 1st, p. 116-135.

Reviews solar and atmospheric radiation observations in Canada from 1911 to 1967. Early measurements were taken with an Angström compensation pyrheliometer, but other instrumentation was added 1948-49. Reference is made to observations in the Arctic, particularly Axel Heiberg Island and Baffin Island. The storage and retrieval of the data are discussed, the National Radiation Archives in Toronto being the principal center. Special analyses of radiation data are reviewed, including ultraviolet radiation measurements, and approximately 45 main references are listed. Available significant

observations are listed by station, instrument, period of measurement and type of radiation measured; approximately 15 of these are arctic stations and 20 proposed new arctic stations are listed. AB97358.

142. LeDrew, E.F., 1976: Physical mechanisms responsible for the major synoptic systems in the eastern Canadian arctic in the winter and summer of 1973. Colorado Univ., Institute of Arctic and Alpine Research. Occasional Pap. 22. Also: National Center for Atmospheric Research Cooperative Thesis 38. 205 p.

143. Montgomery, M.R., 1950: Climate. In: Baird, P.D. and others. Baffin Island Expedition, 1950. Pub. in: Arctic 3: 144-146.

Brief discussion of weather, May 25-Aug. 31, the expedition's Camp B situated at the head of Clyde Inlet where conditions are "more favorable than at the heads of the more exposed fiords," also inland weather. Remarks on sunshine, temperature, precipitation, and wind, with comment "that Camp B enjoyed a more favorable climate than was typical of the area as a whole (east Baffin coast between about 69°31'-70°35' N. 69°40'-72°15' W.). The aridity, the high daytime temperature and the diurnal range of temperature... stress its continental character." AB24443.

144. Reynolds, R., 1972: A study of circulation types and energy budgets for the Baffin Island region during June, July and August, 1970. M.A. Thesis, Univ. Colorado, Boulder, Colorado.

145. Thyssen, F., H. Kohnen, M.V. Cowan, and G.W. Timco, 1974: DC resistivity measurements on the sea ice near Pond Inlet, N.W.T. (Baffin Island). Polarforschung 44(2): 117-126.

Extensive dc-resistivity measurements were carried out in May and June 1972 near Pond Inlet, N.W.T., to determine the resistivity and the anisotropy of the sea ice.

The sea ice proved to be transversely isotropic with regard to dc currents. The coefficient of anisotropy of undisturbed ice is approximately $\lambda = 0{,}26$. λ increased up to 1 in heavily disturbed parts of the ice cover. Ice thicknesses, determined from the dc-soundings without taking into account anisotropy, were too small compared with the true thicknesses determined from drilling. The average resistivity of the sea ice decreased significantly during the observation period according to the increase of the brine volume. The conductivity of the ice is controlled by this brine content since the ice matrix has an extremely low conductivity. The relation between the resistivity and the brine volume is compared with a model of conductivity in porous media. Auth.

146. U.S. Air Force. Air Weather Service, 5th Weather Group, 1953: Climate of the Northeast Air Command Region. New York. 64 p. Mimeo.

A general climatological summary is presented of the general area including Newfoundland, Labrador, Baffin Island, Ellesmere Island, and Greenland. Monthly and annual variations in temperature, precipitation, and snowfall are mapped. Prevailing wind direction and speed, and normal pressures are shown. Seasonal tracks of high and low pressure centers are also mapped. AB48527.

147. U.S. Weather Bureau, 194?: Climatic data for Baffin Island. Washington, D.C. 42 p. (Its: Special Report 221.)

Contains tabulated monthly data on precipitation, temperature, fog, relative humidity, cloudiness, wind, and visibility for Craig Harbour on Ellesmere, Lake Harbour, Pangnirtung, and Pond Inlet on Baffin Island and for Resolution and Nottingham Islands in Hudson Strait. AB43054.

148. Weaver, R.L., 1976: Aspects of the radiation budget related to fast ice decay, Broughton Island, Baffin Island, N.W.T. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 158 p.

149. Williams, L.D., R.G. Barry, and J.T. Andrews, 1972: Application of computer global radiation for areas of high relief. Jour. Appl. Meteorol. 11(3): 526-533.

The variation over uneven terrain of the daily total of incident short-wave (global) radiation under cloudless conditions may be estimated by existing methods for calculating direct and diffuse solar radiation on a slope. A computer program for performing these calculations, incorporating a technique to determine when the direct rays of the sun are screened by the horizon at each point, is described. The adequacy of the approximation for diffuse radiation is considered by comparison with published data. Computations for an area of east Baffin Island, Northwest Territories, Canada, demonstrate that the occurrence of glaciers there is influenced both by elevation and by solar radiation. The potential of such computations as an aid in selecting station sites for climatological studies is also discussed. Auth.

150. Yorke, B.J., 1972: Climatic inventory of Baffin Island National Park. Preliminary Report (Phase 1). To: Applied Research Division, Parks Canada, Dept. Indian and Northern Affairs, Gov't of Canada.

The author has compiled climatic data for the weather stations in and around the Park area on Cumberland Peninsula. General summaries are provided for Broughton Island, Cape Dyer A, Cape Hooper, Dewar Lakes, Ekalugad Fiord, Kivitoo, Padloping Island, and Pangnirtung. Detailed summaries are provided for Broughton Island, Cape Hooper, Dewar Lakes, and Pangnirtung. The Canada Dept. of Transport, Meteorological Branch publication titled "Snow Cover-Climatological Studies #3" by Potter is included. This latter publication refers to all of Canada. Cm 1-17.

GLACIOLOGY AND GLACIOMETEOROLOGY

151. American Geographical Society, 1958: Geographic study of mountain glaciation in the Northern Hemisphere. New York. 10 pt. in 9 v. maps, tables. (U.S. Army Quartermaster Research and Engineering Command, Contract DA 19-129-QM-409.)

Basic work, comprising information assembled and summarized from published and other sources on the location, distribution, characteristics, behavior, and significance of existing mountain glaciers; on classification

and terminology, with discussion of the glaciers region by region; prepared under direction of William O. Field. In 10 parts. AB49276.

152. Anonymous, 1967: Hydrology of the Lewis Glacier, north-central Baffin Island, N.W.T., and discussion of the reliability of the measurements. Geogr. Bull. 9(3): 232-261.

The Lewis Glacier is the only outlet glacier of the Barnes Ice Cap. Its surface area is 182 km^2 and the snout lies at an elevation of 245 metres, much below the general ice cap margin. The 1964 net budget was -65.4×10^6 m^3 water equivalent, representing a specific net loss over the entire glacier surface of 35.7 cm water equivalent. The 1965 net budget was -92.5×10^6 m^3 water equivalent, a specific net loss of 50.7 cm. A standard error margin of $\pm$12 percent is indicated for the net budget.

Water budgets were computed for the seasons 1963 to 1965 for the Lewis River watershed, of which the glacier comprises 88.8 percent. Error analysis showed that maximum discrepancies as great as +67 percent or -21 percent of runoff might have occurred from the data, but that the actually sustained discrepancies were less than $\pm$ 10 percent. Reasonable values of glacier net budget can be estimated from water budget accounts. On this basis a net budget of -126×10^6 m^3 water equivalent is estimated for 1963.

The sensitivity of the watershed to available heat, expressed as degree-hours, is used to account for the behavior of runoff as the season progresses and melting proceeds on the glacier, thereby relating runoff to weather conditions. The 1963 season was a warm one dominated by glacier melt, so that a regular runoff hydrograph resulted, whereas 1964 and 1965 were cool seasons whose runoff was characterized by storm peaks and little seasonal trend. Auth.

153. Baird, P.D., 1955: Glaciological research in the Canadian Arctic. Arctic 8(2): 96-108.

The "glacierized" highland rim of the Eastern Arctic extends north for 1,600 miles from southern Baffin Island to northernmost Ellesmere. Ice forms include glacier caps, highland, transection, valley, cirque, and piedmont glaciers, and shelf ice on the north coast of Ellesmere. Incidental ice observations prior to, and glaciological work after 1945 are reviewed, and some results given of the latter: Baffin Island Expeditions of the Arctic Institute in 1950 to the Clyde area and Barnes Icecap; in 1953 to Penny Highland Icecap on Cumberland Peninsula; Ellesmere Ice Shelf Expeditions of Hattersley-Smith and others in 1953 and 1954; and investigations by J. Mercer on Grinnell and Terra Nivea Icecaps in southern Baffin, 1952 and 1953. General appearance and budgetary state of Canadian Arctic glaciers are noted, with suggestions of future glaciological, geomorphological, and bathymetrical problems. AB38655.

154. Baird, P.D., 1952: The glaciological studies of the Baffin Island Expedition, 1950, part I. Method of nourishment of the Barnes Ice Cap. Jour. Glaciol. 2(11): 2-9.

Contains paper read at a meeting of the International Commission on Snow and Ice, Brussels, 1951: an account of the methods and results of measurements made on accumulation and ablation of the Barnes Ice Cap 69°35'-70°30' N. 71°50'-74°30' W. on Baffin Island in the summer of 1950; results indicate a balanced budget, without the occurrence of firn. "It is postulated that its nourishment is by superimposed ice due to immediate

refreezing of much of the melt water of summer. It is further inferred that a similar process nourishes many arctic glaciers and ice caps where elevation, precipitation and temperature are all low. The name 'Baffin type' is proposed for these in the classification of glaciers." - Author's abstract. AB20415.

155. Baird, P.D., 1951: Method of nourishment of an ice cap in Baffin Island. IUGG Association of Scientific Hydrology. General Assembly, Brussels, pub. 1952? t. 1, p. 194-202.

Contains results of investigations made by the author and others during the Baffin Island Expedition of the Arctic Institute of North America, late May to late Aug. 1950. A camp was set up in the accumulation area on the southeast lobe of the Barnes Ice Cap (about 70° N. lat., inland from Clyde Post, central Baffin Island), transient camps established at or on the edge of the icecap and measurements of accumulation and ablation carried on. Methods are described and a chronological summary of climatic and glaciological events is given. The icecap "some 6,000 sq. km in extent, appears to have an approximately balanced budget, and yet there is no firn on its surface. It is postulated that its nourishment is by superimposed ice due to immediate refreezing of much of the meltwater of summer. It is further inferred that a similar process nourishes many arctic glaciers and icecaps where elevation, precipitation and temperature are all low. The name 'Baffin type' is proposed for these in the classification of glaciers." AB27933.

156. Baker, R.W., 1978: Thrust planes in glacier ice: a quantitative assessment. Geol. Soc. Amer. Abstracts with Programs 10(7): 362.

157. Boulton, G.S., 1971: Englacial debris in glaciers: reply to the comments of Dr. J.T. Andrews. Jour. Glaciol. 10(60): 410-411. Correspondence.

158. Bradley, R.S. and G.H. Miller, 1972: Recent climatic change in the eastern Canadian Arctic. Geol. Soc. Amer. Abstracts with Programs 4(6): 368.

159. Bridge, C.W., 1964: The Barnes Ice Cap. B.A. Thesis, Univ. Toronto, Toronto, Ontario, Canada. 96 p.

Presents results of studies made while a field assistant with a Geographical Branch party in summer 1962. A group of five weather types is defined on the basis of surface weather charts and the icecap pressure record for that summer. These types are then grouped into five periods of dominance, which in turn are used to describe local synoptic weather on the icecap. Ablation is discussed with reference to weather period and local synoptic weather. A correlation is shown to exist between ablation and shortwave radiation, under clear skies, and mean daily temperatures under cloudy skies. Runoff is similarly treated. Daily weather is shown to be a major factor in the commencement of runoff and ablation, and in their variations. AB85853.

160. Bridge, C.W., 1966: The Inugsuin Glacier: a mass budget study. M.Sc. Thesis, McGill Univ., Montreal, Quebec, Canada.

161. Buckley, J.T., 1969: Gradients of past and present outlet glaciers. Can. Geol. Surv. Pap. 69-29. 13 p.

Reports on calculations of gradients for existing outlet glaciers that extend from interior icecaps or from headwalls in mountains to a fiord in southern and southeastern coastal Alaska, coastal Greenland, northeast Canadian Arctic islands areas and coastal Antarctica bordering the Ross Ice Shelf and Ross Sea. Results demonstrate a linear relationship between the overall length and the gradient of the glaciers. The method is applied to reconstruction of ice surfaces of former outlet glaciers in previously glaciated areas with an example drawn from Sam Ford Fiord, Baffin Island: some mountains seem to have functioned as nunataks but no conclusions can be drawn as to local icecaps on the high mountains. AB102629.

162. Canada. Inland Waters Directorate, 1974: Research projects in glaciology, 1974. Its: Report Series 36. 130 p.

163. Classen, D.F., 1975: Canada Barnes Ice Cap, Baffin Island. Ice 49: 2.

164. Classen, D.F., 1977: Temperature profiles for the Barnes Ice Cap surge zone. Jour. Glaciol. 18(80): 391-405.

Thermal drilling and deep ice-temperature measurements along a flow line in a surge area of the Barnes Ice Cap, Baffin Island, N.W.T., Canada, revealed a layer of basal temperate ice 30 m thick. Marginal areas were determined to be frozen to bedrock and geothermal heat flow estimated to be 1.02 $\mu cal/cm^2$ s (42 mW/m^2). Auth.

165. Evans, K., D.J. Goodman, and G. Holdsworth, 1978: Recording wire strainmeters on the Barnes Ice Cap, Baffin Island, Canada. Jour. Glaciol. 20(83): 409-423.

The report describes an experiment to evaluate the use of geophysical (Cambridge-type) wire strainmeters for the rapid acquisition of strain-rate data and to compare strains on a large ice mass over gauge distances of 5 m, 50 m, and 1 km.

Three continuously recording wire strainmeters were installed at the centre of two separate arrays of strain poles 10.6 km and 19.5 km from the ice divide on the Barnes Ice Cap. Data was collected between 24 April and 15 May 1976. The 1 km strain arrays had previously been measured in 1974 and 1975. The results show good agreement between the strainmeter data and the larger strain arrays at the 10.6 km site but differ at the 19.5 km site. When the daily means are calculated for the strainmeters at the 19.5 km site, the strain-rates show a possible periodic variation with an apparent period of about 11 d. Since there appears to be no direct correlation between the strainmeter signal and either temperature or pressure, the result is assumed to represent real varying strain within the ice. Auth.

166. Falconer, G., 1962: Glaciers of northern Baffin and Bylot Islands, N.W.T. Can. Geogr. Branch. Geogr. Pap. 33. 31 p.

Presents first in a planned series of regional inventories of Canadian glaciers, as part of the Geographical Branch terrain analysis and glaciological research programs. The 59 glaciers specifically dealt with are identified by number on the index map, at scale 1 in.:7 mi. Evidence of possible glacial fluctuations is summarized for the Brodeur and Borden Peninsulas, Bylot and part of northeast Baffin Islands. Termini of a half dozen glaciers were visited and photographed in 1961. Marginal variations seem to have occurred only in certain small icefields and valley glaciers; the marked recession of the interior icefields of northern Baffin was probably underway prior to the earliest (1948) photographs; the larger valley glaciers, stable for 15 or more years, may be close to their most advanced positions in post-glacial time. AB71339.

167. G., O., 1952: Vom Toteis zum lebenden Eis; Problemstellungen der arktischen Inseln. Berge der Welt, Bd. 7, p. 41-42. Text in German. Title tr.: From dead ice to living ice; problems of the arctic islands.

Contains notes on the geology of Greenland and on the inland ice, also Baffin Island and its Barnes and Penny Icecaps. Further studies of these problems on Baffin Island and West Greenland, are suggested. AB39922.

168. Glaciological Conference, 2d., New York, Jan., 1951: Proceedings. 46 p.

"A transcript of the papers presented and the discussion recorded at the second Glaciological Conference is given. Topics discussed include: the results of a glaciological study of the icecap in Baffin Island, the relationship between glacial research and permafrost studies, the deformation of Bay and Shelf Ice in the Bay of Whales, Antarctica, a discussion of Ice Islands, the radiocarbon method of reconstructing glacial history, a report on the progress of Project Snow Cornice, the program of the Research Committee on Glaciers, the purpose of the Snow, Ice, and Permafrost Research Establishment, and an evaluation of the Arctic from a military viewpoint." --SIPRE. AB22130.

169. Goldthwait, R.P., O.H. Løken, and W. Blake, Jr., 1969: Discussion of "Evidences of surges on the Barnes Ice Cap, Baffin Island." Can. Jour. Earth Sci. 6(4, pt. 2): 900-901.

170. Henoch, W.E. and A. Stanley (comps.), 1968: Glacier map of northern Baffin Island (District of Franklin)--IWB 1005. Ottawa, Ontario, Canada Dept. Energy, Mines and Resources, scale 1:1,000,000.

171. Henoch, W.E. and A. Stanley (comps.), 1968: Glacier map of southern Baffin Island (District of Franklin) and northern Labrador Peninsula (Quebec and Newfoundland)--IWB 1006. Ottawa, Ontario, Canada Dept. Energy, Mines and Resources, scale 1:1,000,000.

172. Holdsworth, G., 1973: Barnes Ice Cap and englacial debris in glaciers. Jour. Glaciol. 12(64): 147-148. Correspondence.

173. Holdsworth, G., 1975: Deformation and flow of Barnes Ice Cap, Baffin Island. Canada. Inland Waters Directorate. Scientific Series 52. 19 p.

Measurements taken in 1970 and 1971 of the positions of 43 surface stations along a transect (10.4 km long) from the divide to the northeast margin of the south dome of Barnes Ice Cap, have enabled surface velocities and strain rates to be computed along surface "flow lines" generated from the velocity distribution. Using a variation of a method developed by Budd (1969), the parameters $n = 4.2 \pm 0.1$ and $B = 11.9\ (\pm 1.0)$. MN $m^{-2}{}_s 1/4.2$ in the flow law are determined for the stress range $0.05 < \tau < 0.1$ MN m^{-2} where τ is the effective stress. From the measured vertical velocities of the ice and the buildup of superimposed ice over the period 1970-73, it appears that this part of the ice-cap surface is rising. This is not necessarily the case elsewhere or when averaging is done over longer periods of time. More data are required before it is known whether the divide is stable or is still migrating, as the result of a surge. Auth.

174. Holdsworth, G., 1973: Evidence of a surge on Barnes Ice Cap, Baffin Island. Can. Jour. Earth Sci. 10(10): 1565-1574.

175. Holdsworth, G., 1977: Surge activity on the Barnes Ice Cap. Nature 269(5629): 588-590.

176. Hooke, R. LeB., 1973: Flow near the margin of the Barnes Ice Cap, and the development of ice-cored moraines. Geol. Soc. Amer. Bull. 84(12): 3929-3948.

Fabric studies suggest that an up-glacier thinning wedge of deformed superimposed ice is present beneath glacial ice at the margin of the Barnes Ice Cap. Where the glacial ice contains debris, the contact between the two is approximately marked by a ridge-shaped ice-cored moraine, 100 to 150 m from the margin. Where the glacial ice contains little or no debris, the surface profile is smooth and convex upward. Measurements of surface flow and ablation rates on both types of margins suggest that a general advance of the glacier is necessary to incorporate such superimposed ice into the margin, and hence, to instigate development of this type of ice-cored moraine. However, once a moraine forms, it may continue to grow in height and move outward without further advance of the glacier as a whole. As the moraine moves outward, the depression up-glacier from it becomes deeper, and the moraine is gradually separated from the glacier.

Debris that slumps from the moraine onto forelying superimposed ice may become buried by new superimposed ice and be reincorporated into the margin. During a subsequent advance, this debris layer will be deformed, possibly overturned, and finally brought back to the surface where it will melt to form a new ridge. Such recycling of debris may result in very complex structures in an ice-cap margin.

Measurements in boreholes and in a 125-m ice tunnel do not support the hypothesis that discrete shear zones occur at or near the contact between the dirt-bearing glacial ice and the superimposed ice. Auth.

177. Hooke, R. LeB., 1976: Pleistocene ice at the base of the Barnes Ice Cap, Baffin Island, N.W.T., Canada. Jour. Glaciol. 17(75): 49-59.

Oxygen-isotope ratios indicate that a distinctive band of white ice along the margin of the Barnes Ice Cap is of Pleistocene age. It is estimated from a flow model that beneath the center of the ice cap the thickness

of the band should be about 0.6 times its thickness at the margin, or about 8 m. However, an independent estimate, based on calculated vertical strain-rates and explicitly assuming no basal melting, predicts a thickness of about 22 m beneath the center of the ice cap. The discrepancy between the two thickness estimates is interpreted as indicating that basal melting has occurred. Calculated basal temperatures support this conclusion. Auth.

178. Hooke, R. LeB., 1973: Structure and flow in the margin of the Barnes Ice Cap, Baffin Island, N.W.T., Canada. Jour. Glaciol. 12(66): 423-438.

The structure and flow field in the margin of the Barnes Ice Cap was determined through observations on the ice-cap surface, in four bore holes, and in a 125 m ice tunnel. A band of fine bubbly white ice with a single maximum fabric appears at the glacier surface about 160 m from the margin. This band is overlain by coarse blue ice with a four-maximum fabric, and underlain by alternating bands of fine ice with a single-maximum fabric and moderately coarse ice with a two or three-maximum fabric.

The effective strain rate $\dot{\varepsilon}$ was determined from the bore-hole and tunnel deformation data, and possible variations in the other three parameters in Glen's flow law, $\dot{\varepsilon} = (\tau/A)^n$, were studied. It appears that τ_{xy} is independent of depth near the surface, and that relative to the coarse blue ice, A is 40 to 50% lower in the white ice and possibly 10% lower in the fine blue ice.

Dips of foliation planes decrease rapidly with increasing depth and distance from the margin. This foliation is assumed to have developed near and parallel to the bed some distance from the margin. An analysis based on this assumption predicts the observed change in dip, but suggests that it did not develop under the present flow field. The ice cap was probably thicker a few tens of years ago, and the observed foliation pattern may be a relict from that time. Auth.

179. Hooke, R. LeB. and B.R. Koci, 1978: Temperature measurements on the Barnes Ice Cap, Baffin Island, Canada, and on Sukkertoppen Iskappe, Greenland. Jour. Glaciol. 20(83): 441-443. Correspondence.

180. Hudleston, P.J., 1975: An analysis of recumbent folding in glacier ice. Geol. Soc. Amer. Abstracts with Programs 7(7): 1124.

181. Hudleston, P.J. and R. LeB. Hooke, 1978: Cumulative deformation and development of foliation and fabric in glaciers. Geol. Soc. Amer. Abstracts with Programs 10(7): 425-426.

182. Hudleston, P.J., 1976: Recumbent folding in the base of the Barnes Ice Cap, Baffin Island, Northwest Territories, Canada. Geol. Soc. Amer. Bull. 87(12): 1684-1692.

Recumbent folds exposed in an ice cliff at the southeast side of the Barnes Ice Cap occur in banded ice and have hinges subparallel to the glacier margin. The folds appear similar in shape and attitude to others expressed on the glacier surface as a series of irregular lenses of white ice that are elongate parallel to the margin and are surrounded by blue ice. Such lenses are all around the margin of the south dome of the ice cap. Both sets of folds are thought to have a common origin.

Fold geometry and fabric studies suggest that the ice is behaving homogeneously on the scale of the folds and that the banding is essentially passive. Flow considerations indicate that banding or foliation will tend to become parallel to the particle paths near the glacier base and toward the margin under steady-state conditions. However, departures from the steady state in the form of minor advances or retreats may change the flow pattern sufficiently for the particle paths to depart from parallelism with the banding, which may then become passively deformed and eventually folded. For this to occur, the bedrock surface must be appropriately irregular. A simple mathematical model describes this process and successfully accounts for the geometrical features of the folds observed. This theory is consistent with earlier observations of the Barnes Ice Cap, which suggest that there have been fluctuations in the position of the ice-cap margin in the last few centuries. Auth.

183. Jones, S.J., 1972: Radio depth-sounding on Meighen and Barnes Ice Caps, arctic Canada. Canada. Inland Waters Directorate. Scientific Series 25. 13 p.

Depth measurements are given for Meighen Ice Cap and Barnes Ice Cap which were obtained by using a 35 MHz S.P.R.I. radio echo sounder. By comparison with a known borehole depth on Meighen, the velocity of the radio waves in the ice was 178 $\pm$ 2 m μs^{-1}. The minimum depth that could be sounded was 90 m. On Barnes Ice Cap, the velocity was measured by a wide angle reflection technique as 168 $\pm$ 2 m μs^{-1} and continuous photographic recording of the depth was obtained. Estimates of absorption in the ice from attenuator settings of the echo sounder were significantly greater than previously published values. PCSP 0773.

184. Littlewood, C.A., 1952: Gravity measurements on the Barnes Icecap, Baffin Island. Arctic 5: 118-124.

"A survey was made (during the Baffin Island Expedition of the Arctic Institute of North America, 1950) of the southeastern lobe of the Barnes Icecap to determine ice thickness and topographical features of the underlying rock surface by means of the gravimeter method. Gravity was measured at stations along 7 traverses (45 mi.) with a Worden gravimeter no. 44 equipped with a high range reset mechanism and controlled by a dial calibrated in gravity units. The methods of calculation and the sources of errors are indicated. The measured surface elevations and the computed rock elevations and ice thicknesses for the traverses are shown diagrammatically, and tables present the principal facts for gravity stations. The greatest ice thickness indicated by the results is 1,533 ft. The greatest slope occurs where the rock elevation changes about 60 ft. in 0.75 mi. The floor of the icecap near the middle of the lobe averages about 100 ft. lower than near the margin." -- SIPRE. AB23949.

185. Littlewood, C.A., 1951: Gravity survey of the Barnes Ice Cap. Arctic Circular 4(4): 58-61.

186. Løken, O.H., 1969: Evidence of surges on the Barnes Ice Cap, Baffin Island. Can. Jour. Earth Sci. 6(4, pt. 2): 899-901.

Study of detailed topographic maps shows that the trend of the surface contours generally conforms to the outline of the icecap. In an area near Generator Lake on the south and near Blanchfield Lake on the west, however, lower contour lines bulge out towards the ice margin, but higher on the icecap the contours curve in the opposite direction. This suggests mass transfer from a higher reservoir to the lower part of the icecap. Moraine patterns adjacent to the icecap show that the ice margin in the two areas has recently advanced in contrast to the general retreat in adjacent areas. The discussion indicates that the surge occurred prior to 1950 and after the formation of the old moraines some 700-800 BP. AB105413.

187. Løken, O.H., 1967: The form of the Barnes Ice Cap, Baffin Island, Northwest Territories. Geol. Assoc. Can.-Mineral Assoc. Can., Int. Meeting, Abstract Pap., p. 51.

188. Løken, O.H., 1966: Glaciologia y geomorfologia del extremo sur de la capa de hiela de Barnes. Intl. Geographical Union. Latin-American Regional Conference, Mexico. Proc. 3: 155-176. In Spanish. Title tr.: Glaciology and geomorphology of the Barnes Icecap.

Investigations reveal distinct contrasts between the northeast and southeast margins of the icecap and suggest that the south end of the icecap has been subject to change in the recent past, though results also indicate that the icecap has outlived the last glaciation. These investigations are preliminary; further study is needed on mass balance, ice movement, and geomorphology of the adjacent area. AB97608.

189. Løken, O.H. and J.T. Andrews, 1966: Glaciology and chronology of fluctuations of the ice margin at the south end of the Barnes Ice Cap, Baffin Island, N.W.T. Geogr. Bull. 8(4): 341-359.

Initial investigations on and around the south dome of the Barnes Ice Cap, which include mass balance measurements on the ice cap itself, air photo analysis of the adjacent glacial deposits and lichenometric investigations along the southwest margin, reveal distinct contrasts between the northeast and southwest sides of the dome. Drifting, due to the prevailing and katabatic winds, results in an asymmetric snow accumulation and a negative budget on the southwest side relative to that on the northeast. Precipitation is much greater over the ice cap than over the adjacent area and this orographically-induced increase is a major source of the ice cap nourishment.

Climatic considerations strongly suggest that a proto-Barnes Ice Cap must have existed over central Baffin Island during the Hypsithermal as subsequent climatic deterioration was insufficient to redevelop an ice cap.

Distribution of terminal moraines around the south dome suggests that a part of the dome slumped recently and confirms not only the difference in budget on either side of the crest but also the apparent northeastward migration of the ice cap.

The chronology of the ice margin fluctuations on the south dome over approximately the last 1,200 years are outlined and comparisons made with margin elsewhere on the ice cap. In general the ice margin has retreated, but major readvance moraines were formed in approximately A.D. 1300, 1500 and 1700. Auth.

190. Løken, O.H. and R.B. Sagar, 1967: Mass balance observations on the Barnes Ice Cap, Baffin Island, Canada. Comm. of Snow and Ice, Gen. Assembly of Berne, IASH-AISH Pub. 79: 282-291.

The stake network, field methods and the method of calculating the mass balance parameters are outlined. The southern part receives more winter accumulation than the northern part of the ice cap. The winter balance on the top of the ice cap exceeds the winter season precipitation at nearby weather stations by a factor of 3-4. The northeast side has a relative positive mass balance when compared to the southwest side. Studies of moraine patterns around the ice cap indicate that this pattern has persisted for a long time possibly as much as five thousand years.

190a. Mahaffy, M.W., 1976: A numerical three-dimensional ice flow model. Jour. Geophysical Res. 81: 1059-1066.

191. Mahaffy, M.W., 1974: A three-dimensional numerical method for computing the load distribution of ice sheets with time. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 75 p.

192. Mercer, J.H., 1975: Glaciers of Baffin and Bylot islands. In: Field, W.O. (ed.), Mountain glaciers of the Northern Hemisphere: Vol. 2, Alaska and adjacent Canada; Arctic Canada; North Atlantic islands. Hanover, N.H., CRREL, p. 683-721.

193. Mercer, J.H., 1956: The Grinnell and Terra Nivea ice caps, Baffin Island. Jour. Glaciol. 2(19): 653-656.

Contains results of the author and W. Blake's investigations in 1952, and author's in 1953, on the "Kingaite Peninsula" (approx. 62°30' N. 68° W.). The icecaps are the southernmost of a series on the eastern side of Ellesmere, Devon, and Baffin Islands. Highest point on Grinnell is 870 m. (2,854 ft.); Terra Nivea appears similar. Both icecaps are thin, general tendency is for slight retreat, but one large glacier of Grinnell is advancing. Economy of Grinnell is discussed. Equilibrium line is considerably lower than on the Penny icecap to the north. Both firn and superimposed ice are important in the economy. AB46717.

194. O'Neil, R.A. and S.J. Jones, 1975: Radio depth sounding on Barnes Ice Cap. Jour. Glaciol. 15(73): 458-459. (Symposium on remote sensing in glaciology.) Abstract and discussion.

195. Orvig, S., 1951: The climate of the ablation period on the Barnes Icecap in 1950. Geogr. Ann. 33: 166-209.

Contains report on meteorological observations carried out on the icecap by the Baffin Island Expedition of the Arctic Institute of North America during June-Aug. 1950. "The regime of the icecap, the ablation at the Main Camp, and the meteorological conditions at the edge and at the Main Camp, both at the surface and at various levels above the surface

were investigated. Observations included pressure, temperature, and humidity at 3 ft. and at 23 ft. above the surface, temperature at 13 ft., wind speed and direction at 7 ft. and at 23 ft. above the surface. Clouds, cloudiness, fog, visibility, and ceiling were recorded. Maximum and minimum temperatures and precipitation were observed 3 times daily. Snowfall was measured by stakes, rain by means of rain gages. Two thermistors were placed at 4 m. and 2.5 m. below the surface of the ice and read throughout the summer. No firn was found anywhere on the icecap, and 89 cm. of snow were measured on the ice near the highest point. The ice thickness under the Main Camp was 466 m. The increase in temperature with height was nearly clear, 0.13° F./ft. between 3-23 ft. The frequency distribution of temperatures shows that the icecap acts as temperature stabilizer."--SIPRE. AB24870.

196. Orvig, S., 1954: Glacial-meteorological observations on icecaps in Baffin Island. Geogr. Ann. 36(3-4): 193-318.

Observations were made by the author on Penny Icecap, Cumberland Peninsula (67°15' N. 66° W.), during the Arctic Institute of North America Baffin Island Expedition (led by P.D. Baird), May-Sept. 1953. Purpose of the study was: to describe meteorological conditions on the icecap between late May and early Aug. 1953; to compare these conditions with those observed by the author on Barnes Icecap (69°35'-70°30' N. 71°50'-74°30' W.) during the 1950 Baffin Island Expedition (Arctic Bibliography, No. 24870); to calculate heat balance at the snow surface and show relationship between ablation and meteorological conditions; to compare (briefly) the results with similar investigations in other localities. Weather conditions on Cumberland Peninsula 1952-1953 are described, and meteorological, radiation, and ablation data collected in summer 1953 are discussed, tabulated, and graphed. Instruments are illustrated. AB41710.

197. Orvig, S., 1954: Glacial-meteorological observations on icecaps in Baffin Island. Ph.D. Thesis, McGill University, Montreal, Quebec, Canada.

Page 83 in Vol. W1954, Dissertation Abstracts International. Not available from University Microfilms Int'l.

198. Orvig, S., 1953: The glaciological studies of the Baffin Island Expedition, 1950, part V. On the variation of the shear stress on the bed of an ice cap. Jour. Glaciol. 2(15): 242-248.

"Nye's formula for shear stress on a glacier bed was applied to the southern lobe of the Barnes Ice Cap. Data from four of the traverses, obtained in 1950, were used to calculate the variation of the shear stress on the bed. An ice density of 0.91 gm./cu. cm. was used in the calculations. Some of the values obtained are exceptionally low, possibly due to the fact that the lines of travel over the surface do not necessarily correspond to the lines of greatest slope or lines of flow. The values are relatively high in only one direction, and it is concluded that there is a considerably greater movement of the ice toward the northeast side of the southern lobe."--SIPRE. Appended (p. 247-248) are comments by W.H. Ward suggesting that the lowering of water level in lobes impounded on the northeast side has removed a stabilizing force, causing increase of ice flow toward the lakes. For pt. 1-3 of these studies, see Arctic Bibliography, No. 20451, 27260-27261. AB31125.

199. Orvig, S., 1955: Meteorological work in Baffin Island. Weather 10(3): 72-77.

During the Baffin Island Expeditions of the Arctic Institute of North America (led by P.D. Baird), meteorological observations were made on the Barnes Icecap (69°35'-70°30' N. 71°50'-74°30' W.) at 2,840 feet for 92 days in 1950, and on the Penny Icecap, Cumberland Peninsula (67°06' N. 65°42' W.) at 6,725 ft. for 86 days in 1953. Glaciological, seismic and gravimetric work was also carried out. Climatic conditions in summer 1953 were close to normal and snow accumulation was average. Radiation was estimated to cause 68 percent of the ablation on the Barnes and 61 percent of that on the Penny. Average albedo of the latter was 0.81 in clear weather with a frozen snow surface. Climatic conditions on the Penny Icecap are favorable for continued glaciation. Recent rapid wasting of its outlet glaciers must be the result of increased ablation due to increased transfer of heat from the air. Results of ablation studies are probably indicative of conditions in high-polar regions. AB41711.

200. Østrem, G., 1963: Comparative crystallographic studies on ice from ice-cored moraines, snowbanks and glaciers. Geogr. Ann. 45(4): 210-240.

Describes in some detail, results of crystal size and orientation measurements carried out 1959-1963 on ice from the Jotunheimen area in southern Norway, Kebnekaise in northern Sweden, and edge of the Barnes Ice Cap on Baffin Island, Canada. Sampling methods, thin section preparation, photographic procedures, and crystal measurement techniques, are outlined. Buried ice as sampled from ice-cored moraines consists of small crystals, except below dirt bands or near boulders; that found at Isfallsglaciären is not old glacier ice, but appears to have originated from massive snow-bank ice. Moraine ice seems to have a single preferred crystal orientation; it is perpendicular to dirt bands where present, various in snow-bank ice layers and superimposed ice. AB81773.

201. Østrem, G., 1964: Ice crystals from an ice-cored moraine on Baffin Island, N.W.T. Geogr. Bull. (22): 72-79.

Explains the technique used for study of ice-cored moraines, in 1962 and 1963 field work in north-central Baffin by the Canadian Geographical Branch. A pit was dug in one of the morainic ridges parallel to the western edge of the Barnes Ice Cap, at 70°N 74°20' W; results of crystallographic studies of the buried ice are given. Its striking difference in crystal size from the glacier ice at the margin of the icecap suggests that the buried ice is not an old deposit of the glacier. Similar investigations in Scandinavia indicate that such buried ice can originate from snowbanks. AB90403

202. Polar Record, 1953: Glaciological work on Grinnell Glacier, Baffin Island. Polar Record 6(46): 805.

Contains note of work done by John Mercer and Weston Blake, July 16-Aug. 22. The maximum height of the icecap (62°35'N. 66°55'W.) and névé line were determined and shrinkage and advances of parts of the ice cap noted. AB31371.

203. Röthlisberger, H., 1955: Studies in glacier physics on the Penny Ice Cap, Baffin Island, 1953, part III. Seismic sounding. Jour. Glaciol. 3(18): 539-552.

"Firn and ice thickness measurements were carried out by seismic refraction and reflection methods on a flat col of the highland snowfields of the Penny Ice Cap and on a medium-sized valley glacier (Highway Glacier). The longitudinal wave velocities were found to vary from some 1,000 m/sec (3,280 ft/sec) in firn to 3,810 m/sec (12,500 ft/sec) in ice and approximately 6,000 m/sec (20,000 ft/sec) in the bedrock (gneiss). The thickness of firn and ice at the firn col was found to be 254 m (834 ft). On Highway Glacier some 80 reflections were evaluated, giving position, dip and strike of the bedrock surface. A longitudinal profile of Highway Glacier from the junction of three main tributary glaciers to the tongue is given; the ice thickness slowly decreases. At the junction, the bedrock is 400 m (1,310 ft) deep; there is no deep basin as might be expected from the surface features. The mean slope of the glacier surface is about 3^{o} of arc and of the bed about 1^{o}."--Author's abstract. Pt. I-II, IV of these studies from the 1953 expedition of the Arctic Institute of North America are listed as No. 38158-38159, 43245. AB42134.

204. Sagar, R.B., 1966: Glaciological and climatological studies on the Barnes Ice Cap, 1962-64. Geogr. Bull. 8(1): 3-47.

Results of field studies on the Barnes Ice Cap for all or part of the summers of 1962-65 are reported. Long-term records of Clyde weather station and those of the ice cap indicate that the relatively warm summer of 1962 was followed by cool summers during 1963 and 1964. Records of summer precipitation and snow depth and density measurements, made chiefly at altitudes above 914 metres, show that the budget years ending 1962 and 1964 were relatively dry ones, 35 to 40 cm compared with 45 to 50 cm in 1963. Close to the ice cap crest, at $70^{o}13.5'$ N, $73^{o}54.5'$ W, 1,073 metres above sea level, a net accumulation of 0.0 ± 2.0 cm of water equivalent was measured for the budget year 1961-62, 47.0 ± 2.0 cm for 1962-63 and 38.0 ± 2.0 cm for 1963-64. Estimates of the glacier material balance north of 70^{o} N show mass changes of -0.23 percent for the budget year ending in 1962, -0.01 percent for 1963 and +0.01 percent for 1964.

Radiative energy surplus accounted for 70 percent of the heat used to reduce subsurface cold content and to promote melting during 1962. The comparable value during 1963 approached 100 percent and was estimated to be similarly high during 1964. Preliminary analyses of surface and 850 mb level charts showed that southerly warm air advection, associated with cyclonic activity, was relatively frequent during the 1962 summer season. Ice cores, to a depth of 20 metres, extracted at the station 1,073 metres above sea level showed that accumulation, in the form of iced snow and superimposed ice, occurs intermittently from year to year. Tritium content analyses of ice extracted at 1,073 metres above sea level indicate that the 1953-54 budget year accumulation is presently preserved at about 1.5 metres below the 1964 late-summer surface. Auth.

205. Sharp, R.P., 1956: Glaciers in the Arctic. Arctic 9(1-2): 78-117. Also pub. in: U.S. Office of Naval Operation. The dynamic North: 1(7) (OPNAV PO3-28).

Contains a compilation of literature and available data on arctic glaciers, originally prepared for Encyclopedia Arctica in 1949, and brought up to date. Ahlmann's morphological classification of glaciers is given, and the distribution, area, volume, and present regime of the glaciers is described. Regional treatment follows: Greenland, Iceland, Jan Mayen, Svalbard, Novaya Zemlya, Zemlya Frantsa-Iosifa, Severnaya Zemlya, also other small Siberian islands, are considered in turn, and their glaciers characterized; similarly: Scandinavia, the Urals and continental Siberia, continental Canada and Alaska, also Ellesmere, Baffin and Bylot, Devon, Axel Heiberg, Meighen, and Melville Islands in the Canadian Arctic Archipelago. AB47921.

206. Ward, W.H., 1955?: Glaciological studies in the Penny Highland, Baffin Island, 1953. IUGG Assoc. Sci. Hydrol. General Assembly, Rome, 1954, t. 4, p. 297-308.

Reports work of the 1953 Baffin Island Expedition of the Arctic Institute of North America, led by P.D. Baird. Studies were concentrated on the southeast end of this icecap, which rises to 2,100 m above sea level at 67°06' N. 65°42' W. on Cumberland Peninsula. They comprised meteorological observations, measurements of accumulation and ablation, measurement of temperature profiles in snow and ice, cross-sections of the ice mass of Highway Glacier and two sets of surveys to determine its surface velocity. Results are briefly described and some comparisons made with the Barnes Icecap to the north, studied in 1950. AB43244.

207. Ward, W.H., 1952: The glaciological studies of the Baffin Island Expedition, 1950, part II. The physics of deglaciation in central Baffin Island. Jour. Glaciol. 2(11): 9-23. (From a paper read at a meeting of the International Commission on Snow and Ice, Brussels, 1951.)

Contains discussion of "the shearing and ablation of 'cold' ice that leads to the formation of ablation and end moraines and the characteristic form of the S.E. edge of the Barnes Ice Cap. Some evidence suggests the existence of considerable areas of dead glacier ice extending well beyond the current moraines and completely insulated from melting by glacial debris. This debris consists of old moraines whose relief has been inverted and subdued."--Author's abstract.

Appendix (p. 22-23): Moraine plant succession at the edge of the ice cap, by M.A. Hale, who concludes "that the last stable position of the S.E. edge of the icecap occurred about 1860 and has been followed by retreat at an average rate of about three meters per year." AB27260.

208. Ward, W.H., 1952: The glaciological studies of the Baffin Island Expedition, 1950, part III. Equipment and techniques. Jour. Glaciol. 2(12): 115-121.

"A thermo-electric boring rig which achieved a maximum penetration of only 70 ft. due to low temperature and imperviousness of the ice is described. Thirty kw. would be needed to penetrate the ice with this equipment at a depth of 1000 ft. Mechanical drilling and temperature measurement in cold rock and ice are discussed. Cold ice may be drilled with a

saw toothed coring tool, either dry or with a non-freezing liquid to flush the ice cuttings. Thermistors were used for the remote temperature measurements. The paper and pencil technique of crystal rubbings commonly used on temperate glaciers proved unsatisfactory on cold ice, since satisfactory rubbings can only be made on melting ice."--SIPRE. Bibliography (7 items). AB27261.

209. Ward, W.H. and S. Orvig, 1953: The glaciological studies of the Baffin Island Expedition, 1950, Part IV. The heat exchange at the surface of the Barnes Ice Cap during the ablation period. Jour. Glaciol. 2(13): 158-168.

"The atmospheric heat causes melting of the whole of the annual snow accumulation and leads to the formation of slush rivers. Some of the meltwater refreezes at the original ice surface and forms a new layer of ice which yields its latent heat downward. A theoretical estimate of the rate of formation of superimposed ice and the change of temperature of the original ice agrees with actual measurements. Measurement of the meltwater runoff checks with observed ablation and superimposed ice. The total energy available for melting as observed from radiation and convection underestimates the actual ablation measured. About 70 percent of the energy received during the melting season is discharged as meltwater to rivers and lakes surrounding the low temperature ice."--SIPRE. For previous parts of these studies, see Arctic Bibliography, No. 20415, 27260-27261. AB32836.

210. Ward, W.H., 1950: Glaciology. In: Baird, P.D. and others Baffin Island Expedition, 1950. Pub. in: Arctic 3: 141-143.

Brief preliminary report describing the Barnes Ice Cap (69°35'-70°30' N. 71°50'-74°30' W.) in the center of Baffin Island; it is about 145 km. long NW.-SE., up to 56 km. wide, rises from about 460 m. to 1130 m.; and appears to have a thickness of about 600 m. AB27262.

211. Ward, W.H. and P.D. Baird, 1954: Studies in glacier physics on the Penny Ice Cap, Baffin Island. Part I. A description of the Penny Ice Cap, its accumulation and ablation. Jour. Glaciol. 2(15): 342-355.

A brief outline and chronology of the glaciological program is presented. The Penny Icecap (approx. 67°06' N. 65°42' W.) has an area of about 5900 sq. km. and rests on a 2000 m. high mountain range. Ten outflowing glaciers are of major significance. A series of bamboo stakes was established and pits were dug to measure the relative level of the snow surface and the varying density of the settled snow, and to record the snow profile. The progress of snow accumulation and ablation and the net annual loss or gain of water at various altitudes are recorded. The firn line is at about 1550 m. A general increase in the extent of glaciation 150 to 200 years ago was followed by a retreat beginning about 50 years ago and still notably in progress. AB38158.

212. Ward, W.H., 1953: Studies in glacier physics on the Penny Ice Cap, Baffin Island, 1953. Part 2. Portable ice-boring equipment. Jour. Glaciol. 2(16): 433-436.

Construction and use of ice-boring equipment taken on the 1953 Baffin Island Expedition of the Arctic Institute of North America are described in some detail. A total of 250 ft. (75 m.) of boring, mostly in dense ice, was carried out on the Penny Icecap, the deepest hole being 60 ft. (18 m.). Ice temperature varied down to -14°C. Using this equipment (total weight 80 lb. or 36 kg.) two men could bore to a depth of 150 ft. (45 m.) in dense ice by hand. AB38159.

213. Ward, W.H., 1955: Studies in glacier physics on the Penny Ice Cap, Baffin Island, 1953. Part IV. The flow of Highway Glacier. Jour. Glaciol. 2(18): 592-598.

"The horizontal and vertical motions of eight points on the surface of Highway Glacier, Baffin Island, are reported. The average horizontal speed below the lowest tributary glacier is 56 m/yr. The major part of this motion arises from the glacier sliding on its bed. The mean shear stress on the bed is practically constant and equal to about 0.9 bars, but it is much smaller beneath the retreating tongue. A measure of the retreat in the lower part of the glacier is obtained from the difference between the ice discharge and the net ablation."--Author's abstract. No. I-III of these studies from the Arctic Institute of North America's expedition are listed as AB No. 38158-38159, 42134. AB43245.

214. Weaver, R.L., 1975: "Boas" glacier (Baffin Island, N.W.T., Canada) mass balance for the five budget years 1969 to 1974. Arctic and Alpine Res. 7(3): 279-284.

The "Boas" Glacier (67°35'N; 65°16'W) exhibited a 2-year alternation of strong mass gains and losses during the first 4 years of the 1969 to 1974 5-year period. During the last budget year (1973-74) the net specific mass balance was strongly negative. The glacier gained approximately .38 m H_2O in its specific net mass balance (b_n) during the first 4 years but lost at least .16 m H_2O over the whole 5-year period of record. The fluctuations of mass are principally controlled by changes in summer ablation rates. Auth.

215. Weber, J.R., 1967: A gravimetric determination of the vertical ice movement of the Penny Ice Cap, Baffin Island. IUGG Gen. Assembly, Switzerland, Sept. 25-Oct. 5, 1967. Abstracts of papers VI(XIV): 71.

216. Weber, J.R. and P. Andrieux, 1970: Radar soundings on the Penny ice cap, Baffin Island. Jour. Glaciol. 9(55): 49-54.

The first successful radar echo soundings through glacier ice in Canada were carried out by the Dominion Observatory in 1965 on an outlet glacier of the Penny Ice Cap in Baffin Island. An unmodified 440 MHz SCR-718 radar altimeter was used, of the type that is readily and inexpensively available on the surplus market. The radar soundings were generally in agreement, within the range of the reading accuracy of the oscilloscope ($\pm$ 15 m), with depths obtained seismically, gravimetrically, and by the electrical resistivity method. The minimum and maximum recorded depths were 45 m and 550 m, respectively. The pip positions on the standard oscilloscope were recorded visually. This recording method was not satsifactory, but for future use

the instrument could easily be modified to incorporate a larger oscilloscope with continuous photographic recording. Use of the relatively high carrier frequency of 440 MHz (compared with the more customary frequency of about 35 MHz) allows the use of smaller antennas and results in better resolution of the bedrock surface. PCSP 0365.

217. Weertman, J., 1961: Equilibrium profile of ice caps. CRREL RR 84. 12 p.

Modifies Nye's theory of the equilibrium surface profile of a two-dimensional ice sheet lying on a horizontal bed (AB60600) to include the effect of a longitudinal stress. Sample profile calculations, from the Greenland Inland Ice at about 78° N. and from the Barnes Ice Cap on Baffin Island, show that for a large icecap Nye's theory is satisfactory; for a small icecap the modification to the theoretical profile is valid over an appreciable part (about 7 of 33 km.) of its width. A simple extension of this analysis allows for the affect of isostatic sinking of the bedrock surface under a large icecap. Theoretical and measured profiles for the two samples are plotted; theoretical profiles of the central part of a small icecap are compared to show effect of author's modification. The sliding velocity thus depends on the longitudinal stress as well as the shear stress acting at the bottom of the ice mass. AB84348.

GLACIAL GEOLOGY

218. Anderson, L.W., 1978: Cirque glacier erosion rates and characteristics of neoglacial tills, Pangnirtung Fiord area, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 10(4): 749-760.

Ten cirque glaciers and their Neoglacial deposits were studied in the Pangnirtung Fiord area of Baffin Island to determine the origin of glacial debris and the erosion rates of subpolar glaciers. Aerial photographs, topographic maps, laboratory work, and field surveys provided information on glacier and cirque areas, volume, texture and source of till.

The rate of debris production for glaciers of this study was 24 to 155 $m^3\ yr^{-1}$. Clast rounding indicates that 84 to 96% of the till may be subglacially derived, and was produced at a rate of 22 to 140 $m^3\ yr^{-1}$. Rockfall rates were low in the Baffin Island cirques, averaging 1 to 22 $m^3\ yr^{-1}$. Grain-size analyses of Baffin Island Neoglacial tills indicate that they contain little silt (5%) and clay (1%). Abrasion is probably negligible at the base of the Baffin glaciers. The low amounts of silt and clay suggest the glaciers are either wholly or partly frozen to their beds.

Computed rates of total erosion by the glaciers of this study range from 8 to 76 mm · 1000 yr^{-1}, and are one to two times lower than those for Arapaho Glacier in Colorado. Glaciers occupying cirques with the highest rockfall rates also have the highest rates of glacial erosion. The limited data also indicate that large south-facing glaciers have the highest erosion rates. The low erosion rates (8 to 76 mm · 1000 yr^{-1}) suggest that 2 million to 14 million years were required to erode the cirques, and/or the erosion rates have not been constant. Auth.

219. Anderson, L.W., 1976: Comparison of rates of glacial erosion in the Colorado Front Range with those in the Pangnirtung Fiord area, Baffin Island, N.W.T., Canada. Geol. Soc. Amer. Abstracts with Programs 8(5): 561-562.

220. Anderson, L.W., 1976: Rates of cirque glacier erosion and source of glacial debris, Pangnirtung Fiord area, Baffin Island, N.W.T., Canada. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 78 p.

221. Anderson, L.W., 1976: Source of cirque glacier debris, Pangnirtung Fiord area, Baffin Island, N.W.T., Canada. AMQUA 4th Biennial Meeting, Arizona State Univ., Tempe, Abstracts, p. 120.

222. Andrews, J.T., 1963: The cross-valley moraines of north-central Baffin Island: a quantitative analysis. Geogr. Bull. 20: 82-129.

Reviews data collected in 1961-62 in connection with the Canadian Geographical Branch studies near Barnes Ice Cap. Three studies are presented re-examining the five possible hypotheses on the genesis of these moraines. First, the sediments of the moraines and kames are respectively coarse, unsorted, sandy till, and bedded and sorted sand and gravel. Second, orientation and dip of included particles appear to depend upon the type of slope: proximal, distal, or lateral. Third, spacing of the moraines is related to distance from the Isortoq watershed and effective stress at the base of a glacier ending in a glacial lake. From these studies it seems that the moraines were formed by the flow of saturated till into a system of basal crevasses when a critical hydraulic condition was reached. Similarity between the De Geer moraines, certain washboard moraines, and cross-valley moraines is pointed out. AB77030.

223. Andrews, J.T., 1963: Cross-valley moraines of the Rimrock and Isortoq River valleys, Baffin Island, N.W.T., a descriptive analysis. Geogr. Bull. 19: 49-77.

Describes in detail, moraines initially observed on air photographs as a series of cross-valley ridges near Barnes Ice Cap margins, and examined in 1961. These moraines are known to occur widely (though virtually absent from some parts) in the Cockburn Land area as well as to the north and south. The probability of their association with former glacial lakes suggests a relationship with other moraines and ridges, and possibly former lake shorelines. Five working hypotheses of origin are advanced, to provide a basis for a quantitative analysis of the moraines. Consideration is invited for the theory that these moraines are frontal features emplaced under deep-water conditions, similar to the Generator Lake cross-valley moraines. AB77031.

224. Andrews, J.T., 1971: Englacial debris in glaciers. Jour. Glaciol. 10(60): 410. Correspondence.

225. Andrews, J.T., 1972: Englacial debris in glaciers. Jour. Glaciol. 11(61): 155. Correspondence.

226. Andrews, J.T. and V.W. Sim, 1964: Examination of the carbonate content of drift in the area of Foxe Basin, N.W.T. Geogr. Bull. 21: 44-53.

Describes the use of the Chittick gasometric apparatus to examine the carbonate content of glacial till from Melville Peninsula and central Baffin Island. According to analysis of 54 samples, a high carbonate content across Melville Peninsula supports the hypothesis of a westward ice movement from Foxe Basin, but the Baffin Island samples possibly indicate an eastward ice movement across the island, followed by a later westward flow toward Foxe Basin. AB85077.

227. Andrews, J.T., 1965: Glacial geomorphological studies on north-central Baffin Island, N.W.T. Ph.D. Thesis, Univ. Nottingham, Nottingham, U.K.

This paper discusses: (1) the physical milieu, and the aims and methods of research; (2) systematic studies, including till fabric of cross-valley moraines, surface boulder orientations around the northwest margin of the Barnes Icecap, and application of lichenometry to glacial geomorphology; and (3) glacial chronology, beginning with the Flitaway Interglacial at 40,000 B.P., followed by the Foxe Glaciation, and the Steensby Interstadial at 19,000 B.P. Moraines indicating later advances, and the late-glacial marine transgressions are described. Land uplift is still continuing. The recent history of the Barnes Icecap and Lewis Glacier are given. A final section contains conclusions, and appendixes of the petrologic techniques. GeoRef 65-03080-N.

228. Andrews, J.T., 1965: Surface boulder orientation studies around the northwestern margin of the Barnes Ice Cap, Baffin Island, Canada. Jour. Sediment. Petrol. 35(3): 753-758.

The paper examines the orientation of 37 surface boulder fabrics taken from three depositional environments around the Barnes Ice Cap, north-central Baffin Island. These were the surface of ground moraine, including both till plains and boulder fields, in front of end, or lateral, moraines and on outwash plains. The results are tested by vector analysis. They show that the orientation of surface boulders in the first two environments correspond very closely with the known ice movement. This method is both more accurate and faster than ground moraine till fabric techniques. Auth.

229. Andrews, J.T. and B.B. Smithson, 1966: Till fabrics of the cross-valley moraines of north-central Baffin Island, Northwest Territories, Canada. Geol. Soc. Amer. Bull. 77(3): 271-290.

Analyzes 103 till fabrics from this region. On the basis of dip patterns, fabric strengths and morphology four types are distinguished: simple linear, s-shaped, hooked, and asymmetric. Problems of their origin and relation to kame features are discussed. Cross-valley moraines are considered as forming at the base of an ice cliff grounded in a glacial lake. AB93571.

230. Barnett, D.M., 1977: Glacial geomorphology in a sub-polar proglacial lake basin: a process-response model. Ph.D. Thesis, Univ. Western Ontario, London, Ontario, Canada. 302 p.

231. Barnett, D.M. and G. Holdsworth, 1974: Origin, morphology, and chronology of sublacustrine moraines, Generator Lake, Baffin Island, Northwest Territories, Canada. Can. Jour. Earth Sci. 11: 380-408.

The morphology and chronology of exposed sublacustrine moraines is discussed. These are shown to have been formed in a sublacustrine environment. The moraines are characterized by their occurrence in large numbers within a former ice dammed lake basin and by their asymmetric cross section. Using moraine volume estimates combined with the time control, a till depositional rate is calculated.

A radiocarbon chronology for the Generator Lake area over the last 4500 years is presented.

Hydrological relationships are established which are shown to influence the formation of sublacustrine moraines. The relationships are physically connected and are not empirical. Current studies of the calving ice front at Generator Lake show that moraines must be forming under the tapered ice ramps which flow into the lake. Measurements of debris content within the ice combined with ice flow rate measurements show that the present till supply rates are consistent with those calculated from the exposed moraine field.

A model is set up which connects the lake hydrology with the existence or destruction of the ice ramps, as controlled by bending induced by buoyancy forces. The time of existence and subsequent behavior of the ramps is shown to influence the geometry and indirectly the spacing of the sublacustrine moraines. Auth.

232. Blackadar, R.B., 1958: Patterns resulting from glacier movements north of Foxe Basin, N.W.T. Arctic 11(3): 157-165.

Maps and describes features indicating marine transgression and ice movement in the area (approx. 64°-71° N. 74°-88° W.), viz.: raised beaches, marine shell localities, perched boulders, glacial striae, drumlinoid ridges, glacial flutings, craig and tail structures, eskers, and directions of ice movement. The maximum extent of the last marine submergence is considered and the presumed extent mapped. Elevations in feet of raised beaches and marine shell localities are given. AB49760.

233. Carrara, P.E., 1975: The ice-cored moraines of Akudnirmuit glacier, Cumberland Peninsula, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 7(1): 61-67.

The Akudnirmuit Glacier, a small localized ice body during late-Wisconsin and Neoglacial times, deposited five morainal systems in the hanging cross valley between the heads of Narpaing and Quajon fiords. The inner four of these moraines are ice-cored and the glacier's terminus is covered by ablation till. The outermost morainal system, pre-Altithermal in age, has no ice core, indicating that conditions during the Altithermal were such that the former ice core did not survive this period. Currently, the ice cores are down-wasting. This is attested to by the presence of kettle lakes, the amount of stream dissection, the numerous slides occurring at the debris/ice interface, collapse features, and thermistor data. Many lichen-covered boulders at the bases of the moraines indicate that the ice-cored deposits were stable until quite recently. Thermistor data indicate that even with a thin debris cover much less heat is conducted into the ice of the moraines than into a debris-free site on a nearby glacier. Auth.

234. Foessel, D.G., 1972: The mode of formation of sub-lacustrine moraines at Generator Lake, Baffin Island, N.W.T. B.A. Thesis, Carleton Univ., Ottawa, Ontario, Canada.

235. Froese, A., 1967: 3-dimensional analysis and interpretation of till fabrics from the tills of the Clyde Foreland cliffs, Baffin Island. B.A. Thesis, Univ. Western Ontario, London, Ontario, Canada. 58 p.

236. Goldthwait, R.P., 1951: Development of end moraines in east-central Baffin Island. Jour. Geology 59: 567-577.

Results of observations made during the Arctic Institute of North America's Baffin Island Expedition, 1950. "Five steps in the accumulation and deposition of end moraines are postulated from observations of profiles and ablation features around the south end of Barnes Icecap. This end of the icecap is generally more expanded than it was throughout the past century, but a retreat, producing end moraines, has begun on the southern and southwestern sides. Dirt is raised to the surface on shear planes along a narrow fringe of black ice around the edge of the icecap. This is till, exposed in small amounts by 5-7 ft. of ablation each summer. This film of debris slips and slides down the 10^{o}-30^{o} marginal slope and gathers over the lower ice slope. Where the ice becomes blanketed by 3 ft. of ablation moraine, and dirt-filmed ice above melts back rapidly, a trough develops parallel to the margin, isolating a steep-sided moraine on an ice core. After many years this material is let down irregularly to solid ground by flow of the till cover, cuts by transecting streams, and lateral undermining of the exposed core ice." (Author's abstract.) AB22154.

237. Hodgson, D.A. and G.M. Haselton, 1974: Reconnaissance glacial geology, northeastern Baffin Island. Can. Geol. Surv. Pap. 74-20. 10 p.

Surficial geological materials and the principal glacial depositional landforms of northeastern Baffin Island have been mapped at a scale of 1:500,000. Major end moraines on Bylot Island are outlined. Surficial materials, largely coarse glacial till and fluvial deposits, are thickest and most varied in two zones - at the heads of fiords, coincident with the Cockburn Moraine System, and on the outer coast where glacial ice issued from the fiords onto the continental shelf.

The oldest moraines, remnants of an ice sheet assumed to be of continental origin, are found on the Baffin Bay Coastal Foreland the continental shelf, and on the shores of Navy Board Inlet and Lancaster Sound. The latter case is a record of glacial ice, possibly 1,000 m thick, that moved through Lancaster Sound north of Bylot Island. The Cockburn Moraines, crossing the heads of the fiords, are part of a system which can be traced through much of eastern Arctic Canada; the most distinct of the readvance moraine ridges in the study area has a C^{14} age greater than 6,330 $\pm$ 140 years (GSC-1094) and was in the process of formation, 8,090 $\pm$ 140 years ago (GSC-1060).

End moraines, channels, and lichen trimlines record fluctuations in the size of local icefields. Bylot Island glaciers have expanded greatly both prior and subsequent to the glaciation of Lancaster Sound; the northeast Baffin icefields expanded by several magnitudes prior to the formation of the inner Cockburn Moraines; most icefields, outlet glaciers, and glacierets currently are receding from a recent (post-continental glaciation) maximum. Auth.

238. Holdsworth, G., 1973: Ice calving into the proglacial Generator Lake, Baffin Island, N.W.T., Canada. Jour. Glaciol. 12(65): 235-250.

The morphology of the Barnes Ice Cap margin at the proglacial Generator Lake is described. Types of calving that take place into the lake are discussed, particularly an observed calving in July 1970 when an ice-ramp of about 0.4×10^6 m^3 volume broke off due to a rise in lake level. Bending analyses which throw some light on the calving mechanism are presented. Auth.

239. Holdsworth, G., 1973: Ice deformation and moraine formation at the margin of an ice cap adjacent to a proglacial lake. Guelph Symposium on Geomorphology, 3rd, Univ. of Guelph, 1973. In: Fahey, B.D. and R.D. Thompson (eds.), Research in polar and alpine geomorphology. Norwich, England, Geo Abstracts Ltd., p. 187-199.

240. Holdsworth, G. and P. McLaren, 1971: Proglacial lake studies, Barnes Ice Cap, Baffin Island progress report. Arctic Circular 21(3): 164-175.

241. Ives, J.D. and J.T. Buckley, 1969: Glacial geomorphology of Remote Peninsula, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 1(2): 83-96.

The physiography of Remote Peninsula is described as a basis for interpretation of the area's glacial geomorphology. Two moraine systems are recognized: the older, at least in part, predates the "classical" Wisconsin Stage, whereas the younger system is associated with existing local glaciers. Radiocarbon dates on mollusc shells collected in situ from deltas between individual members of the older moraine system give an age estimate of 36,000 years BP, although this is probably minimal. On this basis it is concluded that large areas of high mountains and coastal uplands remained ice-free during the "classical" Wisconsin Stage. Support for this contention is derived from the construction of two trend surface analysis maps using spot heights on two members of the older moraine system. An examination of the gradients of 200 extant glaciers in Greenland, Antarctica, Alaska, and Arctic Canada provides supporting evidence in the form of a range of elevations of glacier ice in relation to distance from termini in salt water. Finally, geomorphic investigation of the upland areas of Remote Peninsula points to an absence of glacial forms. The subaerial weathering forms of the uplands also indicate that a considerably longer time lapse is required for their formation than is available since culmination of the "classical" Wisconsin Stage. Auth.

242. Ives, J.D., 1967: Glacier terminal features in northeast Baffin Island--illustrations with descriptive notes. Geogr. Bull. 9(1): 62-70.

Presents photographs of five glacier termini and the associated end moraine forms, including a normal valley glacier, a transection glacier system, an outlet glacier, and a cirque glacier. The various end moraine forms are discussed. AB96399.

243. Ives, J.D. and J.T. Andrews, 1963: Studies in the physical geography of north-central Baffin Island, N.W.T. Geogr. Bull. 19: 5-48.

Presents the first in a series of terrain analysis maps of Baffin Island: glacial features on the Cockburn Land sheet 1 in.:8 mi., and the Isortoq River quadrant, 1 in.:4 mi. as compiled from 1961 reconnaissance field data and intensive photointerpretation. Text provides detailed description and suggests the probable course of deglaciation of the Baffin Island-Foxe Basin area. Mountain glaciers played a minor part in the glaciation of the Island; late in the last glacial stage a large inland ice mass occupied most of western Baffin and extended into Foxe Basin. Ice lobes persisted in the valleys which tended to resist encroachment of the late-glacial sea. The interior uplands rather than the eastern mountain rim have been the chief locality for glaciers and glaciation; Flint's concept of initiation of glaciation (No. 21847) is discarded in favor of instantaneous glacierization across wide areas of the plateau (No. 52022). Other conclusions are summarized in a chronological table. Graphic and hypothetical interpretation of data is shown on four small-scale maps. AB79718.

244. King, C.A.M., 1969: Moraine types on Henry Kater Peninsula, east Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 1(4): 289-294.

Field observations of the morphology, till fabric, and stone roundness of moraines on Henry Kater Peninsula, Baffin Island, are analyzed. Several groups of moraines are differentiated by the analysis, which throws light on the method of moraine formation. Auth.

245. Mark, D.M. and J.T. Andrews, 1975: A re-examination of the till fabrics and the origins of some "cross-valley" moraines on Baffin Island. Geol. Foeren. Stockh., Foerh. 97(563): 321-325.

This article re-evaluates the till fabrics from "cross-valley" moraines in the Isortoq Valley on Baffin Island, North-West Territories, using the eigenvalue method for three-dimensional axial data. Four parameters are proposed which together characterize the internal relationships of the fabric distributions. Contrary to the results of an earlier study, these show little relationship to the moraine morphology. This suggests that a single process was probably responsible for all of the "cross-valley" moraines in this area. It was also found that, for the particular fabric-forming process involved, the preferred orientations of the fabrics are a more reliable indicator of process "direction" than are the dip directions of the preferred fabric planes. These and other data are then briefly used to discuss alternative modes of emplacement on these complex moraine ridges. Auth.

246. Mears, A.I., 1972: Glacial geology and crustal properties in the Nedlukseak Fiord region, east Baffin Island, Canada. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado. 60 p.

247. Neilson, J.M., 1960: Geomorphology and glacial geology of southwestern Baffin Island, District of Franklin, Northwest Territories, Canada. Int. Geol. Congr. 21st, Copenhagen, Report pt. 21, Other Subjects, p. 90-104.

Describes the physiography, lithology and structure of Precambrian and Paleozoic rocks, glaciation and geomorphic processes of Foxe Peninsula and other areas of the Island visited for mineral explorations in summers 1957-1958. Glacial erratics, striae and grooves, glacial tills, boulders and other evidence of Pleistocene glaciation are cited, and the direction of glacial movement, erosion and deposition is discussed. Frost action, weathering, block fields or felsenmeere, patterned ground and other post-glacial geomorphic processes are briefly reported. AB66997.

248. Prest, V.K., 1970: Quaternary geology of Canada. In: Douglas, R.J.W. (ed.), Geology and economic minerals of Canada. Can. Geol. Surv. Econ. Geol. Rept. 1: 676-764.

249. Sim, V.W., 1964: Terrain analysis of west-central Baffin Island, N.W.T. Geogr. Bull. 21: 66-92.

Companion study to Ives and Andrews' report on north-central Baffin, No. 79718. Sim combines photointerpretation and 1961 fieldwork to provide a descriptive appraisal of terrain conditions represented on the 1:500,000 Foxe Basin North Sheet, 68°-70° N 72°-80° W. Glacial features and surface materials are each shown on a 1 in.:8 mi. scale map and are described in the text. The five physiographic regions as delimited disagree with those described in the 1962 Rand report, No. 80926. The final subsection outlines the extent of post-glacial marine submergence and some problems associated with analysis of subsequent land emergence. AB91777.

250. Smith, J.E., 1966: Sam Ford Fiord; a study in deglaciation. M.Sc. Thesis, McGill Univ., Montreal, Quebec, Canada. 93 p.

251. Smithson, B.B., 1965: The glacial geomorphology of the Upper Isortoq River, Baffin Island, N.W.T. M.Sc. Thesis, Univ. Western Ontario, London, Ontario, Canada. 153 p.

252. Thompson, H.R., 1954: Glaciers and land forms in the Cumberland Peninsula of Baffin Island. Eastern Snow Conf. Proc. 2: 29-34.

Results of the glaciological and geomorphological work of the Baffin Island Expedition of the Arctic Institute of North America in 1953 are summarized. The Penny Icecap, Highway Glacier and the hanging glaciers of Pangnirtung Pass offer classic examples of the zones of predominant supply, predominant movement and predominant wastage described by Wright and Priestly. Each type of glacier has its own relation to the bedrock topography. Morainic deposits are described. Melt-water action during the summer is of great importance in the region. The equilibrium temperature of 8.5° F. in the Penny Icecap implies that a marked warming of the climate at 6,000-7,000 ft. is necessary to cause serious glacial shrinkage there. The present decay of glacier tongues along Pangnirtung Pass is related to the recent warming around the N. Atlantic.--From SIPRE. AB42803.

253. Thompson, H.R., 1955: A landslide moraine in Baffin Island. Can. Geogr. 6: 13-16.

Description of a feature observed in Pangnirtung Pass (66°06'N. 65°58' W.) during the 1953 Baffin Island Expedition of the Arctic Institute of North America. A wedge-shaped area of debris extended from a cirque downward to Owl River at the axis of the Pass. Its morphology is described. Two hypotheses for its origin are set forth: a ground moraine, or the result of mass sliding of a corrie moraine and its outwash deposits. Author favors the latter, suggesting that the movement was a debris slide. AB42804.

254. Thompson, H.R., 1957: The old moraines of Pangnirtung Pass, Baffin Island. Jour. Glaciol. 3(21): 42-49.

Results of observations made during the 1953 Baffin Island Expedition of the Arctic Institute of North America. Most convincing signs of past glaciation in Pangnirtung Pass (66°06' N. 65°59' W.) are the so-called "old moraines." Various hypotheses as to their origin are considered. The features are probably of complex origin, but consist primarily of moraines deposited by trunk glaciers flowing in the Pass. Deposits have been reworked and dissected by rivers; melting of ice cores in the moraines has further complicated topography. Disappearance of the trunk glaciers is tentatively estimated at 500 A.D. At least two main advances of the tributary glaciers have occurred, one closely following disappearance of the trunk glaciers, the other not later than 1850. AB55411.

255. Thompson, H.R. and B.H. Bonnlander, 1956: Temperature measurements at a cirque bergschrund in Baffin Island: some results of W.R.B. Battle's work in 1953. Jour. Glaciol. 2(20): 726-762.

Results of field work in Pangnirtung Pass (approx. 66°06' N. 65°58' W.) during the Arctic Institute's Baffin Island Expedition, summer 1953. "Thermograph, thermistor, and thermometer readings at a 30 m. deep bergschrund from June 6 to July 22, 1953, showed . . . little direct relationship between air temperatures outside and at the bottom of the schrund. The air temperature inside ranged from -3.7° C. (25.3° F.) to +0.5° C. (32.9° F.), but from July 2 onwards it oscillated between -0.5° C. and +0.5° C., with a 3-4 day periodicity. The ice temperature at the bottom of the schrund behaved similarly, though it was about 0.5° C. colder. The oscillations may have been caused by the interplay of flowing meltwater (source of heat) and air drainage in quiet weather (source of cold). The granite-gneiss headwall, where not sheathed by refrozen melt water, appeared to be chemically and mechanically unweathered."--Authors' abstract. AB48377.

256. Ward, W.H., 1951: The physics of deglaciation in central Baffin Island. IUGG Assoc. Sci. Hydrol. General Assembly, Brussels, pub. 1952?, t. 1, p. 237-245.

Contains results of investigations made by the writer during the Baffin Island Expedition of the Arctic Institute of North America, May-Sept. 1950. The area studied was at the southern end of the Barnes Ice Cap (about 70° N. lat., inland from Clyde Post). The physical processes of deglaciation and formation of glacial deposits were studied by observing (1) the melting out of deposits held in the ice, (2) the "subsequent forms of deposition," and (3) the "occurrence of buried glacier ice well beyond its present visible limits." Glacial deposits and their origin are discussed in detail in terms of these three subjects, and the landforms around the edge of the icecap are described. AB32837.

257. Weertman, J., 1962: Mechanism for the formation of inner moraines found near the edge of cold ice caps. CRREL RR 94. 12 p.

A new mechanism is described which explains the formation of moraines in the ablation areas of cold ice caps. The mechanism involves the freezing of water onto the bottom surface of an ice cap. This water comes from regions of the bottom surface where the combination of the geothermal heat and the heat produced by sliding of ice over the bed is sufficient to melt ice. A number of criticisms are made of the shear hypothesis, which has been advanced to explain moraines occurring on Baffin Island and near Thule, Greenland. It is concluded that this older hypothesis may be inadequate to account for these moraines.

Although in theory the mechanism proposed here undoubtedly would lead to the formation of moraines, the existing field data are insufficient to prove conclusively that actual moraines have originated in this way. Auth.

258. Weertman, J., 1961: Mechanism for the formation of inner moraines found near the edge of cold ice caps and ice sheets. Jour. Glaciol. 3(30): 965-978. Also pub. as: CRREL MP 481.

A new mechanism is described which explains the formation of moraines in the ablation areas of cold ice sheets. The mechanism involves the freezing of water onto the bottom surface of an ice sheet. This water comes from regions of the bottom surface where the combination of the geothermal heat and the heat produced by the sliding of ice over the bed is sufficient to melt ice. A number of criticisms are made of the shear hypothesis, which has been advanced to explain moraines occurring on Baffin Island and near Thule, Greenland. It is concluded that this older hypothesis may be inadequate to account for these moraines.

Although in theory the mechanism proposed in this paper undoubtedly will lead to the formation of moraines, the existing field data are insufficient to prove conclusively that actual moraines have originated by means of this mechanism. Auth.

SEA LEVEL CHANGES

259. Andrews, J.T. and R.E. Dugdale, 1970: Age prediction of glacio-isostatic strandlines based on their gradients. Geol. Soc. Amer. Bull. 81: 3769-3771.

Scandinavian research has shown that strandline gradients decrease exponentially toward the present day. The relationship of gradient to age can be used to estimate the time of formation of a strandline that has not been directly dated, provided that: (1) the gradient of the strandline has been determined, and (2) both gradient and age estimates for two or more other strandlines in the series are available. As an example, six strandlines of previously unknown age in southeast Scotland are dated by means of an expression devised from the age and gradient of three other strandlines from the same series. Any such relationship, however, is valid only for the local area. Auth.

260. Andrews, J.T., J.C. Harrison, G.H. Miller, and A.S. Dyke, 1973: Annual report of the National Science Foundation (Grant GA-28003): glacio-isostatic recovery of certain fiords in east Baffin Island, N.W.T., Canada. INSTAAR, Univ. Colorado, Boulder, Colorado. 31 p.

Reports the field work conducted during 1972 by Miller in the Kangetokjuak and Kangetogusikrukuk fiords, and Church on the Maktak sandur; together with a listing of theses and papers completed or in preparation related to this contract. Also presents initial results of a geophysical modelling study by Harrison and Andrews. Gsg 1-20.

261. Andrews, J.T., R. McGhee, and L. McKenzie-Pollack, 1971: Comparisons of elevations of archaeological sites and calculated sea levels in arctic Canada. Arctic 24: 210-228.

Based on a study of postglacial uplift in the Canadian Arctic it has been proposed that relative emergence can be estimated if the age and elevation of late-glacial marine limits are known. This suggestion is used to construct 5 maps showing the amounts of relative sea level emergence since 4,000, 3,200, 2,400, 1,600 and 800 B.P. The archaeological sequence of coastal arctic Canada has been artificially divided into 5 corresponding 800-year periods. Eighty-four archaeological sites are examined; 71 of these appear to have been located with reference to contemporaneous sea level. The mean elevation of the 71 sites is only 5.2 m. above the interpolated sea level for each period; the Spearman rank correlation between site elevations and interpolated sea level is 0.82. The maps can therefore be used to delimit area of search for cultural remains of specific ages in archaeological reconnaissance, but the relationship is not sufficiently close to allow the construction of a detailed chronological sequence using elevation data alone. Auth.

262. Andrews, J.T., 1969: Corrected shoreline relation diagram for arctic Canada for 11,000 to 14,000 B.P. Arctic and Alpine Res. 1(3): 221-222.

A corrected i value for Arctic Canada of 1.521 results in the change of the shoreline relation diagram for 11,000 to 14,000 BP but <u>not</u> for periods $\leq$ 10,000 BP. Redrawn diagrams are illustrated. Auth.

263. Andrews, J.T., 1974: Crustal flexing and relative sea level changes over the last 120,000 years, eastern Baffin Island, Canada. Geol. Soc. Amer. Abstracts with Programs 6(7): 636.

264. Andrews, J.T., 1970: Differential crustal recovery and glacial chronology (6,700 to 0 B.P.), west Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 2(2): 115-134.

Eight marine strandlines are delimited on morphological evidence. They dip toward 050° at gradients that decrease with age to the present. The maximum ice load was therefore located southwest of Baffin Island, possibly between Baker Lake and Southampton Island. Five strandlines are associated with stillstands of the western margin of the residual Baffin Island ice cap. Each strandline is dated by reference to a radiocarbon-controlled emergence curve. The validity of the strandlines is tested by four methods; the strand-

lines appear as reasonable approximations of crustal deformation through time. Correlative geologic-climatic phases along the western margin of the late-glacial Barnes Ice Cap are indicated by the moraine evidence. The Isortoq Phase is dated about 6,700 BP. It was succeeded by a period of retreat with limited halts. Another major glacial phase, the Flint, occurred about 5,000 BP, and is correlative with the growth of the Ellesmere ice shelf and glacier readvance in other parts of the world. Younger prominent moraines are > 1,700,700 and 250 years old. Auth.

265. Andrews, J.T., 1970: A geomorphological study of post glacial uplift with particular reference to arctic Canada. London. Institute of British Geographers, Spec. Pub. 2. 156 p.

This monograph synthesises recent research on glacio isostatic recovery in the Canadian arctic, with particular reference to the geological and geomorphological evidence, and provides a series of arguments for reconstructing and post-glacial uplift, emergence and crustal deformation for areas varying in size from local to continental. Gsg 1-5.

266. Andrews, J.T. and J.C. Harrison, 1973: Glacio isostatic recovery of certain fiords in east Baffin Island. Final Tech. Rept. to the Nat'l. Sci. Foundation (Grant GA 28083). 37 p.

267. Andrews, J.T., A.I. Mears, G.H. Miller, and D.R. Pheasant, 1972: Holocene late glacial maximum and marine transgression in the eastern Canadian Arctic. Nature; Phys. Sci. 239(96): 147-149.

Presents C^{14} dates from northern Cumberland Peninsula and discusses the evidence in favor of a late glacial maximum in east Baffin Island dated ca. 8000 BP. Gsg 1-22.

268. Andrews, J.T., 1973: Maps of the maximum post-glacial marine limit and rebound for the former Laurentide Ice Sheet. Arctic and Alpine Res. 5(1): 41-48.

A revised map of marine limit elevations and the amount of postglacial rebound in the area formerly covered by the Laurentide ice sheet has been produced in color at a scale of 1:30 million for The National Atlas of Canada and is included in this paper. The map is compared with others published in 1892, 1918, 1934, and 1962. Because of the scale factor, detailed research is unlikely to alter the main features of the map but it is stressed that detailed mapping of marine limits is a powerful and sensitive tool for deciphering local deglacial histories. Such local studies, combined with the mapping of lower significant strandlines and their dating by ^{14}C is necessary if meaningful checks on geophysical modeling of the earth's rheology are required. Auth.

269. Andrews, J.T., 1968: Notes on glacioisostatic rebound studies, Baffin Island, Northwest Territories, Canada. Coastal Res. Notes 2(7): 11-14.

Evidences of present submergence of north and east coasts of Baffin Island have been noted, in active cliff-cutting and prograding shingle ridges; the low-energy west coast has extensive flats. A SW uptilt

agrees with other evidence of unequal ice-loading. Recent studies indicate that use of three methods of determining tilt direction (Anderson, 1967) depends largely on geometry of the area investigated. From 10 recent uplift curves of Baffin Island and data from 67 sites in Arctic Canada, where uplift and date of deglaciation were known, a graph expresses the effect of different rates of retreat on the amount of postglacial rebound. Analysis of 21 postglacial uplift curves shows similar proportional response. The lower strandlines are related more to fluctuations in sediment supply than to balance between isostatic and eustatic rates of rise. GeoRef AN-68-01133-N.

270. Andrews, J.T. and K. Tyler, 1977: The observed postglacial recovery of Québec and Nouveau-Québec since 12,000 B.P. Géogr. phys. Quat. 31(3-4): 389-400.

Radiocarbon dated relative sea levels, the tilts of proglacial lake shorelines and raised marine shorelines, the directions of the tilt of these features, and postglacial delevelling are used to construct six isobase maps showing relative sea level movements over the last 12,000, 10,000, 8000, 4000, and 2000 years. No map has more than 30 control points and usually there are only 12 "good" points controlling the isobase patterns. Each map shows the relationship of the isobases to the current ice sheet extent. Along the southern margin of the Laurentide Ice Sheet, the maximum postglacial emergence has been quite uniform with the 240 to 200 m isobase always close to the ice margin. Along the northeastern margin of the ice sheet, the postglacial emergence at the retreating ice edge was closer to 100 m. Equidistant diagrams are drawn along planes southeast from southern Hudson Bay and eastward from Southampton Island. If these diagrams are compared on a Shoreline Relation Diagram, the two profiles appear similar and compare moderately well with a theoretical SR Diagram published in 1969. The isobases show a major uplift center located around the area of James Bay and southern Hudson Bay where a maximum emergence of nearly 300 m occurred in the last 7500 years. High marine limits southwest of Ungava Bay need to be dated because if they date close to 8000 BP as we suggest, then more emergence is suggested for the region southwest of Ungava Bay than we currently allow for. Auth.

271. Andrews, J.T., 1968: Pattern and cause of variability of postglacial uplift and rate of uplift in Arctic Canada. Jour. Geology 76(4): 404-425.

Discusses results of analyses of sites in arctic Canada exclusive of the Queen Elizabeth Islands, where elevation and age of marine limits are known. They indicate that the marked variability of postglacial uplift and rate of uplift is explicable in terms of distance from the former ice margin (a measure of ice thickness) and date of deglaciation. Trend surfaces for postglacial uplift in the last 6000 yr and the present rate are given. Mathematical models are developed that indicate the effect of different rates of glacial retreat on postglacial uplift, elevation of the marine limit and strandline deformation. AB101814.

272. Andrews, J.T., 1966: Pattern of coastal uplift and deglacierization west Baffin Island, N.W.T. Geogr. Bull. 8(2): 174-193.

The marine limit in the Grant-Suttie Bay/Isortoq Fiord area is a major strandline formed in association with the Isortoq Phase moraines and established, according to radiocarbon dating, less than 7,000 years ago. Subsequent offshore updoming resulted in an upward tilt of the area toward S 35° W at the rate of 1.0 metre/km. A lower strandline at about 20 metres above sea level was formed less than 4,000 years ago. Uplift of the west coast of Baffin Island has been slow compared to adjacent glacial dispersal zones. It is suggested that this relates in part to the dampening effect of the Baffin Island ice cap which was of major proportions during the initial rebound period. Rates of uplift are compared from both sides of Foxe Basin and found to differ. Auth.

273. Andrews, J.T., 1967: Pattern of postglacial rebound in Arctic Canada. Abstract of paper presented at the 80th Annual Meeting of the GSA, held in New Orleans, Nov. 1967, in: Program of 1967 Annual Meeting, p. 6-7.

274. Andrews, J.T., 1968: Postglacial rebound in Arctic Canada, similarity and prediction of uplift curves. Can. Jour. Earth Sci. 5(1): 39-47.

Uplift curves, constructed from data for 21 locations in close vertical proximity to the local marine limit, indicate a similar proportional response through time. At these sites the marine limit is assumed to be synchronous with deglaciation and the age of their marine shells to date the formation of the marine limit. The time/altitude relationship can thus be expressed as a percent of uplift within a specific time period. A graph of the results is a smoothly decelerating curve. A formula approximating the curves is given, as are tables and a figure so that uplift curves can be predicted on the basis of elevation of the marine limit and date of site deglaciation. Velocities derived from uplift curves allow the calculation of residual uplift. For a sector of Hudson Bay the figure is 100 m. AB101816.

275. Andrews, J.T. and D.R. Pheasant, 1970: Preliminary report to the National Science Foundation on: A study of past and future glacio-isostatic recovery in certain fiords of the eastern Canadian Arctic. For the period March, 1969 to March, 1970. 9(+3) p.

276. Andrews, J.T., 1970: Present and postglacial rates of uplift for glaciated northern and eastern North America derived from postglacial uplift curves. Can. Jour. Earth Sci. 7(2, pt. 2): 703-715.

Average rates of postglacial uplift reach a maximum value of nearly 4 m 100 y^{-1} over southeastern Hudson Bay, and another high cell, with rates of about 2.5 m 100 y^{-1}, lies between Bathurst Inlet and Southampton Island. Current rates of uplift are underestimated if exponential curves are fitted solely to dated raised marine deposits without considering the amount of future recovery. Rates of rebound are, instead, derived from A/t where A is uplift in the first 1000 y since deglaciation, and t is time since deglaciation. For the northwest margin of the former ice sheet coefficients of determination for rate of uplift, at specific times, as a function of distance are $\geq$ 0.934. Maps of rates of uplift for northern and eastern North America are presented for 8000 y B.P., 6000 y B.P. and the present

day. They reveal the existence of three uplift centers and show that rates of uplift declined from a maximum of 10 to 12 m 100 y^{-1}, immediately following deglaciation, to a current maximum of about 1.3 m 100 y^{-1}. Agreement is satisfactory when calculated rates of uplift are compared with those derived from geological observations, radiocarbon dates, and from water-level records. A final map shows isochrones on the uplift rate of $\sim$ 1 m 100 y^{-1}. The rate dropped to this value about 10,000 y ago on the outer northwest and southeast coasts, whereas the value might not be reached for another 2000 y in southeastern Hudson Bay. Auth.

277. Andrews, J.T., 1979: Progress in relative sea level and ice sheet reconstructions Baffin Island, N.W.T., for the last 125,000 years. In: Mörner, N.-A. (ed.), Earth rheology, isostasy and eustasy. London, Wiley & Sons, p. 175-200.

278. Andrews, J.T., 1969: Shoreline relation diagram: physical basis and use for predicting age of relative sea levels (evidence from Arctic Canada). Arctic and Alpine Res. 1(1): 67-68.

A shoreline diagram for Arctic Canada is constructed from the equation of the form of postglacial uplift. This operation in itself indicates that the shoreline relation diagram represents a valid concept. The diagram is then used to predict the age and elevation of marine limits, glacial lake strandlines, and lower relative sea levels. A comparison of predicted and observed values suggests that the shoreline relation diagram presented in the paper functions efficiently as a chronological forecaster that can complement and extend late-glacial and postglacial chronologies. The workings of the diagram are such that a few selected radiocarbon dates can be used to establish an extensive and detailed chronology. Auth.

279. Andrews, J.T., 1975: Support for a stable late Wisconsin ice margin (14,000 to 9,000 BP): a test based on glacial rebound. Geology 3: 617-620.

Three alternative hypotheses for the timing and rate of deglaciation in the outer fiords and coasts of the eastern Canadian Arctic are tested by a computer program that provides information on the amount and form of crustal deflection according to a two-layer geophysical model. The three alternative hypotheses are (1) a glacial advance that started about 20,000 B.P. and reached a maximum at the outer coast at 18,000 B.P. and a slow glacial retreat that began at 14,000 B.P., (2) a glacial advance about 20,000 B.P. with the glacial margin stabilized along the Cockburn moraines near the fiord heads from 15,000 to 8000 B.P., and (3) a glacial advance to the coast from 20,000 to 19,000 B.P. with the glacial margin stabilized until 9000 B.P. and then a rapid glacial retreat to the fiord heads.

The derived-deflection and relative-sea-level curves, for a position equivalent to the outer coast of Baffin Island, indicate that the results from hypotheses 1 and 3 are incompatible with the observed distribution of raised Holocene and late Pleistocene marine sediments and their associated ^{14}C dates. In contrast, the curve for relative sea level from hypothesis 2 explains significant elements of the distribution of radiocarbon dates and suggests that a marine transgression affected the outer coast until about 8500 B.P. The marine transgression was not caused by the peak in eustatic sea level but by the glacio-isostatic depression of the coast

maintained by the stable mass of the northeastern sector of the Laurentide Ice Sheet. Auth.

280. Blake, W., Jr., 1973: Age of pumice beaches, eastern Arctic Canada. Can. Geol. Surv. Pap. 73-1B: 141-142.

Dating of pumice collected from several sites around western Jones Sound on Ellesmere and Devon Islands, found in close proximity with driftwood which was also dated, confirmed that the pumice is approximately 5,000 years old. Samples of wood collected more than 0.5 m below the level of the pumice are less than 5,000 years old (conventional radio-carbon years) and samples collected above the pumice level are more than 5,000 years old. The driftwood was identified as *Picea* or *Larix* sp.

At Cape Tanfield, Baffin Island, a charred piece of fat, possibly seal fat, was dated as 4,690 $\pm$ 360 years old. Ecol. 892.

281. Blake, W., Jr., 1971: The pumice of the raised beaches of Spitsbergen and arctic Canada (Abstract in Les Niveaux Marins Quaternaires, Part 1, Holocene). Quaternaria 14: 19-20.

282. Blake, W., Jr., 1970: Studies of glacial history in arctic Canada, 1: Pumice, radiocarbon dates, and differential postglacial uplift in the eastern Queen Elizabeth Islands. Can. Jour. Earth Sci. 7 (2, pt. 2): 634-664.

Reports on recent finds of pumice on raised beaches of Ellesmere and Devon Islands and in archeological sites on Baffin Island, compares its appearance and chemical composition with that occurring in Greenland, Spitsbergen and Scandinavia and discusses the significance of differential postglacial uplift of the land relative to the sea in the eastern Queen Elizabeth Islands, as indicated by the elevation at which pumice and dated materials occur. In the eastern and central part of the archipelago there is a region where 25 m of uplift has occurred during the last 5000 yr. This region, including considerable areas that are now sea, is believed to have been covered by a major ice sheet during the last glaciation. Tabulated data on radiocarbon dates and the chemical composition of the pumice are given. AB102351.

283. Clark, J., 1973: An isostatic uplift model for Arctic Canada. Unpublished manuscript. Univ. Colorado, Boulder, Colorado.

284. Compton, P.A., 1963: Post-glacial fluctuating of sea level around north-east Brodeur Peninsula, Baffin Island. M.Sc. Thesis, McGill Univ., Montreal, Quebec, Canada.

285. Compton, P.A., 1964: Recent changes of sea-level along the north-east coast of Brodeur Peninsula, Baffin Island, N.W.T., Canada. Arctic 17(4): 279-285.

Describes a geomorphic investigation of raised marine depositional features. Two sets were identified; a younger up to 375 ft. above sea level is referred to the Recent isostatic emergence of the area; the older and higher set are considered evidence of either an older emergence or earlier deglaciation. Investigation of Eskimo Spit (map) showed uplift to be continuing or to have ceased only recently. AB86287.

286. England, J.H., 1969: The late glacial chronology and pattern of post-glacial isostatic uplift in Home Bay, east-central Baffin Island, N.W.T., Canada. M.A. Thesis, Univ. Colorado, Boulder, Colorado. 99 p.

287. Ives, J.D., 1963: Determination of the marine limit in eastern arctic Canada. Geogr. Bull. 19: 117-122.

Proposes a modification of an initial map compiled by Farrand and Gajda (No. 71342) which closed the reconnaissance phase of a Geographical Branch study of late- and post-glacial marine submergence in Canada. Second phase is a detailed survey of raised shore features in selected areas, including Melville and Bathurst Islands, Foxe Basin-Baffin Island, and Hudson Strait-Ungava Bay. The validity of Farrand and Gajda's 500-foot "isobase," which roughly parallels the east Baffin coast, and the 400-ft. interpolation drawn farther west through Eclipse Sound, is questioned, as resulting from mis-interpretation of terraces seen off shipboard and from inappropriate selection of data. It is suggested that the 500-ft. isobase be deleted; maximum submergence of 85 ft. is indicated for the Cape Dyer vicinity, and 100 ft. for the coast north of Cape Adair. Problems connected with evaluation of diverse data are discussed as they relate to this study; author's proposal would clarify knowledge on marine submergence in eastern Baffin Island and resolve some problems in the Ungava Bay-Hudson Strait area. AB79715.

288. Løken, O.H., 1965: Postglacial emergence at the south end of Inugsuin Fiord, Baffin Island, N.W.T. Geogr. Bull. 7: 243-258.

A beach deposit from Inugsuin Fiord, Baffin Island, is described and its mode of formation outlined. It was possible to relate a number of shell samples to the sea levels prevailing when the shells lived. An accurate emergence curve has been drawn which is similar in form to curves obtained from other areas. The early part of postglacial time was characterized by a rate of emergence much smaller than observed in other areas and there are distinct differences between the pattern of emergence on the west and the east coasts of Baffin Island.

A pronounced bench on the beach deposit is discussed and is believed to be associated with a postglacial halt in the process of emergence. This is possibly a parallel to a postglacial transgression in northern Labrador and of late Tapes age. Fossil evidence suggests a climate in early postglacial time warmer than the present. Auth.

289. Mercer, J.H., 1955: Geomorphological studies in Frobisher Bay, 1953. Polar Record 7(59): 317.

Contains note on study made by the writer in Aug. 1953, of raised beaches along the southwest shore of Frobisher Bay, Baffin Island. Beaches to maximum height of 1,425 ft. were found near Cape Rammelsberg. AB41364.

290. Moran, J.M. and R.A. Bryson, 1969: The contribution of Laurentide ice wastage to the eustatic rise of sea level 10,000 to 6,000 B.P. Arctic and Alpine Res. 1(2): 97-104.

The contribution of the wasting Laurentide Ice Sheet to eustatic sea-level rise between 10,000 and 6,000 BP was estimated. Volumetric models were constructed on the basis of the present Greenland profile and past areal distributions of ice as delineated by the radiocarbon isochrone map of Bryson and Wendland. It was found that even with the assumption of negligible ice in the Arctic Archipelago, the Laurentide sheet was by far the major contributor to sea-level rise. A double-dome model resulted in a eustatic sea-level curve which conforms quite well with those derived in other independent studies. Auth.

291. Walcott, R.I., 1970: Isostatic response to loading of the crust in Canada. Can. Jour. Earth Sci. 7(2): 716-727.

A smoothed free air anomaly map of Canada indicates that the central part of the region occupied by the Laurentide Ice Sheet is over-compensated. Due to the close association of the free air gravity, the apparent crustal warping, the time of deglaciation, and the congruence of the gravity anomalies and the Wisconsin Glaciation, it is concluded that the over-compensation is due to incomplete recovery of the lithosphere from the displacement caused by the Pleistocene ice loads. The amplitude of the anomalies, about -50 milligals, suggest that a substantial amount of uplift has yet to occur and that the relaxation time of crustal warping is of the order of 10,000 to 20,000 y.

The profile of the ground surface at the edge of a continental ice sheet on an elastic lithosphere is assessed using a value of the flexural parameter of the lithosphere calculated from gravity and deformation studies in the Interior Plains. The conclusions are: (a) a purely elastic forebulge is not likely to reach an amplitude of more than a few tens of meters; (b) the crust will be depressed for a considerable distance beyond the edge of the ice sheet; and (c) for large ice sheets crustal failure will probably occur in a preferential zone several hundred kilometers inside the maximum ice limit. Auth.

292. Ward, W.H., 1952: A note on elevated strandlines of Frobisher Bay, Baffin Island. Geogr. Rev. 42(4): 651.

Contains challenge of view expressed by S.A. Wengerd, q.v. On the basis of two crossings by sea and one by air while a member of the Baffin Island Expedition of 1950, the author doubts that the strandlines of Frobisher Bay, or of the other bays along the east coast of Baffin Island, are necessarily indications of sea levels or uplift of land. He suggests that these strandlines may have been formed by glaciers cutting off bays and damming up their water, which subsequently changed levels independently of the sea, such phenomena occurring at present, in other places, are quoted in support. AB27263.

293. Watson, T.L., 1897: Evidences of recent elevation of the southern coast of Baffins Land. Jour. Geology V(1): 17-33.

294. Wengerd, S.A., 1951: Elevated strandlines of Frobisher Bay, Baffin Island, Canadian Arctic. Geogr. Rev. 41: 622-637.

Based on author's observations in 1943, while a member of the U.S. Hydrographic Office party aboard the Morrissey. Description is given of the physiographic features and general geology of the region and discussion of mode and age of formation of the eight to twelve strandlines around Frobisher Bay; with conjecture that the area is still out of isostatic adjustment, so that further uplift may be expected. Author's view is challenged by W.H. Ward in a note on . . . strandlines, 1952. AB27328.

CLIMATIC CHANGE AND SNOWLINES

295. Andrews, J.T. and R.E. Dugdale, 1971: Factors affecting corrie glacierization in Okoa Bay region, east Baffin Island, Canadian Arctic. Geol. Soc. Amer. Abstracts with Programs 3(4): 253.

296. Andrews, J.T., 1977: Inferred climates of the last interglacial and early Wisconsin glaciation, Baffin Island, N.W.T., Canada: biostratigraphic evidence. X INQUA Congress, Birmingham, Abstracts, p. 16.

297. Andrews, J.T., R.G. Barry, and L. Drapier, 1970: An inventory of the present and past glacierization of Home Bay and Okoa Bay, east Baffin Island, N.W.T., Canada, and some climatic and palaeoclimatic considerations. Jour. Glaciol. 9(57): 337-362.

An air-photograph inventory of the present glacierization of areas of east Baffin Island adjoining Home Bay and Okoa Bay is described. Ice fields characterize the broad mountain summits of the former, while the latter is an area of cirque glaciers. The extent of glacierization is statistically related to various topographic parameters. It is found that there is a 4:1 ratio between Home Bay and Okoa Bay in the area of ice as a percent of the land area above 600 m a.s.l. Trend-surface analyses are made of the distribution of snow-banks and of cirques (empty and with ice bodies) in the two areas. The orientation of the cirques and of the ice-field glaciers in Home Bay is also examined. 39% of empty cirques in Okoa Bay face south, whereas those with existing glaciers are restricted to orientations with azimuths between 310°-145°. Neither glacier length nor the observable recession in the Home Bay area show any significant difference with regard to aspect.

Consideration of climatic parameters (snowfall and degree days) and synoptic-climatological results provide no reason for the strong contrast between the two areas. Cool, cloudy summer conditions are associated with easterly flow components that should affect both areas. A possible model for the inception of the mountain ice fields of Home Bay ca. 2000-4000 years ago is outlined and it is suggested that differential lag effects between the ice bodies in the two areas may be responsible for some of the observed difference. The many paradoxical relationships between glacierization, topography and climate in these areas, and the rather negative results, emphasize the dangers of facile palaeoclimatic interpretations. Auth.

298. Andrews, J.T., R.G. Barry, and L. Drapier, 1969: Past and present glacierization in two areas of east Baffin Island, N.W.T., Canada, and some palaeoclimatic implications. VIII Congres INQUA, Paris, 1969, Résumés des Communications, p. 141. Abstract, in French.

299. Andrews, J.T., R.G. Barry, R.S. Bradley, G.H. Miller, and L.D. Williams, 1972: Past and present glaciological responses to climate in eastern Baffin Island. Quat. Res. 2(3): 303-314.

Much of Baffin Island is close to the modern glaciation limit and climatic changes within the last decade are already being reflected in snow cover extent. Statistical analysis of glacierized and ice-free corries indicates that changes in direct solar radiation due to astronomical factors are inadequate to account for glacierization of those at present ice-free. These and other sources of evidence demonstrate the need for augmented winter snowfall in order to increase the extent of glacierization. The pattern of glacial history in this area is for maximum ice extent during the early glacial phase (>68,000, <137,000 BP), followed by a reduction in ice volume during the cold pleniglacial (>24,000, <68,000 BP) and then a limited late glacial advance (the Cockburn Stade, ca. 8,000 BP) due to increased precipitation. The Barnes Ice Cap did not disappear in the Holocene as it did in the last interglacial. The area is highly suitable for long-term monitoring of climatic change and glacial response. Auth.

300. Andrews, J.T. and R.G. Barry, 1972: Present and palaeo-climatic influences on the glacierization and deglacierization of Cumberland Peninsula, Baffin Island, N.W.T., Canada. Colorado. University. Institute of Arctic and Alpine Research. Occasional Pap. 2. Various pagings.

The purpose of the research discussed in this report was to attempt an integrated analysis of the past and present climates of the northern Cumberland Peninsula region with specific attention focused on the links between glacier distribution and fluctuations and the climate. The final objective of the research is to attempt to model the palaeoclimate of the region during the late Quaternary. GA 74A/1392 - from STAR, N73-24457.

301. Andrews, J.T., 1971: Quantitative analysis of the factors controlling the distribution of corrie glaciers in Okoa Bay, east Baffin Island: (with particular reference to global radiation). In: Morisawa, M. (ed.), Quantitative geomorphology: some aspects and applications. Proceedings...Second Annual Geomorphology Symposia Series held at Binghamton, N.Y., October 15-16, 1971. Binghamton, N.Y., State University of New York, Publications in Geomorphology, p. 223-241.

The state of glacierization of corries on the Okoa Bay map, east Baffin Island, N.W.T., Canada (67° to 68°N) is studied using two main quantitative methods: the first discusses the importance of various indirect glaciological climatological measures (such as elevation, geometry and size) using multiple stepwise discriminant analysis. Of five variables selected the most important are residuals from two trend surfaces on corrie lip and mountain summit elevations. Ice-filled and ice-free corries only differ on the average by 200 m elevation. Auth.

302. Andrews, J.T. and G.H. Miller, 1972: Quaternary history of northern Cumberland Peninsula, Baffin Island, N.W.T., Canada: Part IV: Maps of the present glaciation limits and lowest equilibrium line altitude for north and south Baffin Island. Arctic and Alpine Res. 4(1): 45-59.

Maps of the glaciation limit and lowest equilibrium line altitude (ELA) are presented for southern and northern Baffin Island. The glaciation limit was determined by "summit method;" the ELAs were determined by assuming a steady state accumulation area ratio of 0.65. Data was derived from the 1:250,000 map series based on between six and eight points per map. The isoglacihypses are roughly parallel to the east coast of the island and rise inland at approximately 4 m km^{-1}. Along the outermost coast a typical elevation is 700 m a.s.l. rising to between 1,000 and 1,300 m inland. There is evidence on the northern map that the glaciation limit declines from a high point to both the east (Baffin Bay) and the west (Foxe Basin). Enclosed, high contours exist in the vicinity of the Penny Ice Cap, the Barnes Ice Cap, and the heavily glacierized region near Pond Inlet and Bylot Island. ELAs are, on the average, 200 m below the glaciation limit. A study of features in Okoa Bay indicates that paleo-ELAs were once about 400 m lower than today during the late Quaternary. Analysis of the height of the average July 0°C isotherm, assuming an environmental lapse rate of 0.75°C per 100 m, indicates considerable variation on the initial analysis although subsequent work indicates that the relationship between the glaciation limit and the height of the July freezing level has broad, spatial correlation. Glaciation limit gradients from Norway, British Columbia, Greenland, and Baffin Island are compared and shown to be similar with a gradient of about 4 m km^{-1}. Auth.

303. Andrews, J.T. and R.E. Dugdale, 1971: Quaternary history of northern Cumberland Peninsula, Baffin Island, N.W.T.: Part V: Factors affecting corrie glacierization in Okoa Bay. Quat. Res. 1(4): 532-551.

Corries in Okoa Bay contain glaciers, ice patches or are empty. Each of 165 corries is described by 17 variables that describe shape, location and geometry and also have some relationship to the glaciological conditions in each basin. Analyses of these data in terms of "explaining" the factors controlling glacierization (using information and graph-theoretic methods and multiple stepwise discriminant analysis) all emphasize the importance of elevation on the current pattern. Orientation is also significant as virtually all glaciers and ice patches are contained in north-facing corries. Residual elevations from a linear trend surface on corrie lip altitudes indicate that empty corries lie, on average, only 200 m below those currently ice-filled, thus the area is extremely sensitive to the effects of climatic change. Empty corries also lie at the same elevations, on average, in north- and south-facing locations. The orientation of glacierized corries toward the north is a reflection of the variations in insolation between north- and south-facing slopes at latitude 67°30'N. Calculations indicate a difference under clear skies of 25% for global radiation and ∿50% for absorbed short-wave radiation. The 200-m lowering of local snowline implied by the corrie lip data is equivalent to a 1.2°C temperature decrease--this is the same as estimates based on

changes in the earth's orbital parameters for this latitude. A lowering of temperature results in an increase in the ratio: sublimation/melting which leads to a reduction in the amount of ablation. It is suggested that glacierization of much of Baffin Island is possible with a lowering of snowline by 200 m, this could then trigger other areas such as Labrador and Keewatin. Auth.

304. Barry, R.G., 1973: Conditions favoring glacierization and deglacierization in North America from a climatological viewpoint. Arctic and Alpine Res. 5(3, pt. 1): 171-184.

Approaches to paleoclimatic reconstruction on a local-regional scale through synoptic climatology and on a global scale through numerical modeling are discussed. Synoptic climatological considerations indicate the importance of southeasterly flow components for glacierization in Baffin Island, Labrador-Ungava, and Keewatin. It appears that no individual synoptic pattern is responsible for most of the ablation of ice bodies in eastern Baffin Island so that a synoptic climatological approach to deglacierization is likely to be indeterminate.

The NCAR global circulation model with modified surface boundary conditions has been used to simulate the circulation at the last glacial maximum in January and July. The input data include the vertical and horizontal extent of ice, albedos relating to snow cover and vegetation distributions, and ocean temperature. Comparisons with control cases for present conditions show weaker jet maxima, but rather stronger low to mid-tropospheric westerly flow in the Northern Hemisphere, than at present for January and stronger upper westerlies in July. The MSL pressure maps, which must be interpreted with care in the vicinity of the ice sheets, are also discussed. The reconstructions provide a starting point on which hypotheses relating to the Wisconsin deglaciation must be based. Auth.

305. Bradley, R.S., 1972: The problem of inversions in estimating the height of glaciation limits in arctic regions (discussion). Arctic and Alpine Res. 4(4): 359-360.

306. Bradley, R.S. and G.H. Miller, 1972: Recent climatic change and increased glacierization in the eastern Canadian Arctic. Nature 237(5355): 385-387.

On Baffin Island between 1960 and 1969, the mean temperature of the ablation season (June-August) has decreased by as much as 2.1°C, whereas the mean temperature of the accumulation season (September-May) shows an increase of as much as 2.0°C. These trends hold for all stations except for these at Cape Dyer and Frobisher Bay, where local conditions explain the anomalies. Winter precipitation shows marked increases but summer records are more variable. The cooling in summer is due to a 29% increase in the frequency of cool easterly to north-easterly flow, and the winter warming is due to an increased frequency of warm southerly winds. Field observations and aerial photo comparisons show that snowbanks decreased in area from 1949 to 1960, whereas all observed snowbanks in the Cumberland Peninsula increased in area from 1960 to 1971. The greatest increase occurred in small snowbanks (10 m diameter) because of their shorter time constant. Cm 1-8.

307. Bradley, R.S., 1973: Recent freezing level changes and climatic deterioration of the Canadian Arctic Archipelago. Nature 243(5407): 398-400.

308. Ives, J.D., J.T. Andrews, and R.G. Barry, 1975: Growth and decay of the Laurentide Ice Sheet and comparisons with Fenno-Scandinavia. Naturwissenschaften 62: 118-125.

The history of thought relating to the initiation, growth, and decay of the Laurentide Ice Sheet is traced and the traditional hypothesis of "highland origin and windward growth" is re-examined. Extensive field data from Labrador-Ungava and Baffin Island are reviewed in a climatological context. An alternative conceptual model of "instantaneous glacierization," based on a late Neoglacial extensive snow cover over much of the eastern Canadian Arctic and Subarctic, is proposed. Comparisons with Fenno-Scandinavia are made in the light of this new model. Auth.

309. Ives, J.D., R.G. Barry, and J.T. Andrews, 1973: The inception of the Laurentide Ice Sheet; a review. Geol. Soc. Amer. Abstracts with Programs 5(7): 680-681.

310. Johnson, R.G. and J.T. Andrews, 1979: Rapid ice-sheet growth and initiation of the last glaciation. Quat. Res. 12: 119-134.

Calculations based on temperature-corrected oxygen-isotope ratios from deep-sea cores yield a glacioeustatic sea-level fall in excess of 50 m during the first 10,000 yr of the last glaciation, and generally support the local regression of about 70 m inferred from tectonically rising New Guinea beaches. We propose that this rapid glacial buildup depended on high-latitude cooling, and large increases of high-latitude regional winter precipitation in the Laurentide and the Fennoscandian-Barents Sea areas, and that these factors were caused by a critical alteration of North Atlantic Drift currents and their associated subpolar atmospheric circulation. In support of this, faunal data from northeast North Atlantic deep-sea cores show that the glacial buildup was accompanied by a sudden loss of most of the North Atlantic Drift from the Greenland-Norwegian Sea, a factor favoring reduced heat input into the higher latitudes. Subpolar mollusk and foraminifera fauna from elevated marine deposits on the Baffin Island coast, and northwest North Atlantic core data suggest a continuation or an associated restoration of subpolar water west of Greenland as far north as Baffin Bay, a factor favoring precipitation in the northeast Canadian region. Heat transport and atmospheric circulation considerations suggest that the loss of the northeast North Atlantic Drift was itself a major instrument of high-latitude climate change, and probably marked the initiation of major new ice-sheet growth. Auth.

311. Lamb, H. and A. Woodroffe, 1971: Atmospheric circulation during the last ice age. Quat. Res. (1): 29-58.

The prevailing surface temperatures in summer and winter at several different stages of the last ice age, indicated at various points scattered over the Northern Hemisphere, by botanical, glaciological, marine biological, oceanographic, etc. evidence, are used to derive probable distributions of 1000-500 mbar thickness, roughly equivalent to mean

temperature of the lowest 5 km of the atmosphere and indicating the general flow pattern of the atmosphere in depth. From these thermal wind patterns computation of the tendency to cyclonic and anticyclonic development is possible. Maps of this development field, taken together with the indicated steering of surface cyclones and anticyclones by the thermal winds, make it possible to sketch probable distributions of surface pressure (and, by implication, surface winds) prevailing during each of the glacial stages studied. New light is thrown on the onset of glaciation and on the regimes associated with the maximum extent of glaciation, with the Alleröd warm epoch and the Post-Alleröd cold stage when there was some readvance of the ice. Auth.

312. Loewe, F., 1971: Considerations on the origin of the Quaternary ice sheet of North America. Arctic and Alpine Res. 3(4): 331-344.

It is generally agreed that the Quaternary ice sheets of the Northern Hemisphere were brought about by a cooling of the atmosphere. A temperature decrease tends to reduce water vapor in the air and thus the precipitation. Ahlmann's curve connecting summer temperature and apparent accumulation at the glaciation limit is probably not applicable to the start of the Labrador-Ungava ice sheet which could have been initiated with smaller accumulation than the curve indicates. However, a cooling of 6°C with the present precipitation hardly seems sufficient. It is unlikely that "glacial ice" of high density could have started an ice sheet itself. Even if the possibility of a growth of the Keewatin ice sheet from "valley ice" is accepted, a cooling of only 6°C would not be enough. The region would then have had the climate of unglacierized northern Siberia today. The start of the North American ice sheet would have required an initial cooling considerably greater than 6°C, or a decrease of 6°C with precipitation somewhat higher than the present. The conditions which brought about the synoptic and climatic changes which started the Quarternary ice sheet of North America are still not established. Auth.

313. Løken, O.H., 1972: Growth and decay of glaciers as an indicator of long-term environmental changes. In: Symposium on environmental conditions in the northwest Atlantic, 1960-1969. International Commission for the Northwest Atlantic Fisheries, Spec. Publ. 8: 71-85.

Glaciers have for a long time been considered as sensitive indicators of climatic fluctuation but the nature of the glacier climate relationship has not been well understood. This is still the situation although great advances have been made in the last 10 to 15 years. The progress has come from two sources: (1) vastly improved understanding of the dynamic behaviour of glaciers and of their response to changes in the mass balance, and (2) greatly improved field data from several parts of the world due to scientific cooperation under the auspices of the International Geophysical Year (IGY) and the still ongoing International Hydrological Decade (IHD). Auth.

314. Miller, G.H. and L.D. Williams, 1974: Late Wisconsin paleoclimate derived from a snowmelt program and variations in glacier response: eastern Baffin Island. Geol. Soc. Amer. Abstracts with Programs 6(7): 870.

315. Williams, L.D., G.H. Miller, R.S. Bradley, R.G. Barry, and J.T. Andrews, 1972: Evidence from eastern Baffin Island of past and present glaciological response to climate. Paper presented at Conf. on "The Present Interglacial - How and When Will it End?" Brown Univ., Jan. 26-27.

316. Williams, L.D., 1978: Ice-sheet initiation and climatic influences of expanded snow cover in arctic Canada. Quat. Res. 10: 141-149.

It has been suggested that the Laurentide Ice Sheet originated with extensive perennial snow cover, and that the snow cover affected climate so as to aid ice-sheet development. In this study, a large increase in extent of October 1st snow cover in the Canadian Arctic from 1967-70 to 1971-75 is compared to changes in October means of other climate variables. Over the area of snow-cover expansion, mean surface air temperature decreased by up to 3°C, mean 500-mbar height was lowered by over 60 m, and precipitation was increased by up to a factor of two. These effects, if applied to the entire summer, together with the temperature change computed by Shaw and Donn for a Northern Hemisphere summer insolation minimum (the Milankovich effect), can account for glacierization of the Central Canadian Arctic. Auth.

317. Williams, L.D., 1972: Some factors influencing cirque glacierization on eastern Cumberland Peninsula, Baffin Island, Canada. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado.

A statistical and mathematical treatment of cirques in two areas, involving an attempt to determine the various climatic controls on glacierization. Csg 1-84.

318. Williams, L.D., 1975: The variation of corrie elevation and equilibrium line altitude with aspect in eastern Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 7(2): 169-181.

It has been common practice to estimate ice-age climates by calculating the difference in temperature, at an assumed lapse rate, between the elevation of the present snowline and that represented by the lowest corries (cirques) in a region. Such a procedure not only ignores many other factors which may affect corrie glacierization, but is actually incorrect, because the change in snowline for a given temperature change does not depend only on lapse rate. This study suggests that the variation of equilibrium line altitude (ELA) with aspect provides a climatic "signature" supplementary to that of lowest ELA. A method of computing heat and water balances on glaciers from climatic data is described and tested against observations on Baffin Island glaciers. This model is used to estimate ELA as a function of aspect in the Okoa Bay area of Baffin Island, using 1963 to 1972 climatic data, and then for two contrasting climates which have been suggested for early and late stages in the last glaciation. The results are compared with distributions of corrie glaciers and ice-free corries in the area. Auth.

PALYNOLOGY AND PALEOBOTANY

319. Andrews, J.T., P.T. Davis, L. Glassgold, and H. Nichols, 1979: Late Holocene July temperatures from Ennadai Lake (Keewatin) and Windy

Lake (Baffin Island), Arctic Canada, based on transfer function equations on fossil peats. Geol. Soc. Amer. Abstracts with Programs 11 (7): 379.

320. Andrews, J.T., P.J. Webber, and H. Nichols, 1979: A late Holocene pollen diagram from Pangnirtung Pass, Baffin Island, N.W.T., Canada. Rev. Palaeobotany and Palynology 27: 1-28.

A 1.2 m section of organic-rich sediment from near Windy Lake, Pangnirtung Pass, Baffin Island, Canada, is dated by twelve radiocarbon assays which indicate that the sediment accumulated at an average rate of 6.5 cm 100 yr^{-1}. The base of the studied exposure is about 2500 years old, whereas the sediment at a depth of 4 to 9 cm is dated about 650 years old. The sampling interval for pollen averages one sample every 39 years. The section is described in terms of the lithology of the inorganic matrix, in the plant growth form and moisture preference of the pollen taxa, and in the variations in the influx of exotic pollen (*Alnus*, *Picea*, and *Pinus*). Principal Components Analysis and clustering of pollen levels were used to zone five different groupings of the pollen taxa "objectively." Both relative and "absolute" pollen values were used in these various steps. Pollen accumulation varied between 24 and 14,300 grains cm^{-2} yr^{-1} with a median value of 501. Thirteen biozones are recognized primarily from changes in the rates of pollen accumulation and diversity. The broad climatic interpretation of the pollen stratigraphy has similarities and differences from nearby glacial moraine chronologies. Sharp increases in exotic pollen (especially *Alnus*) are provisionally associated with major advection of southerly air toward Cumberland Peninsula, southeastern Baffin Island. Auth.

321. Andrews, J.T., 1978: Quantitative Holocene climatic parameters derived from pollen records in the eastern Canadian Arctic. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 183.

322. Andrews, J.T., 1976: Rates of climatic change in the Baffin Bay/Davis Strait region during the last interglacial/glacial transition. Geol. Soc. Amer. Abstracts with Programs 8(6): 755.

323. Arundale, W.H., 1976: A discussion of two models related to climatic change in the eastern Arctic. Paper presented at the 41st Annual Meeting of the Society for American Archaeology, St. Louis. 15 p.

324. Boulton, G.S., J.H. Dickson, H. Nichols, M. Nichols, and S.K. Short, 1976: Late Holocene glacier fluctuations and vegetation changes at Maktak Fiord, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 8(4): 343-356.

Maktak Glacier is a major distributary of the Penny Ice Cap and thus changes in its frontal position reflect variations in the mass balance of the ice cap. The Neoglacial terminal moraine of this glacier consists of a 20-m thick sedimentary sequence of till, overlain by up to 18 m of sands and gravels which contain a 1-m thick peat bed. These sediments were deformed by glacier pushing and are overlain by a younger till. The basal till and the overlying sands and gravels beneath the peat were deposited during the retreat from the Cockburn Stade. The site was deglaciated at some time after 5000 to 6000 BP. Peat on a terrace surface was studied

using "absolute" pollen analyses, and clustering routines to distinguish pollen zones. The start of peat growth at 2500 BP (synchronous with such events elsewhere) is attributable to altered permafrost levels and/or increases in precipitation/evaporation budgets, producing wetter conditions locally. The vegetational history began with a moist willow episode, which was followed by a dominantly grass community as local conditions became drier. The initial rapid growth of peat became progressively slower throughout the profile, until by 1500 BP the slow accumulation of humified peat was overwhelmed by windblown sand which inhibited further growth. A subsequent Maktak Glacier advance deposited sands and gravels over the peat bed. Between 350 and 65 BP, glacial pushing and overriding of the terrace and peat sediments occurred. Exotic tree pollens were identified in the sediments; their changing frequencies may provide some tentative measure of changing airflows into the High Arctic.

The eastern part of the Penny Ice Cap, as represented by the Maktak Glacier, may have a relatively simple Holocene history of post-Cockburn decline, growth after 4000 BP, and decline in recent decades. This contrasts with more complex response patterns of small cirque glaciers in the same areas. It is stressed that the data used in the paper cannot identify small-scale glacier oscillations. Auth.

325. Davis, P.T., 1978: Correlation of Holocene moraine stabilization and influx of "exotic" pine and spruce pollen, Cumberland Peninsula, Baffin Island, Canada. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 163.

326. Mode, W.N., 1978: Preliminary Holocene pollen stratigraphy, Clyde Foreland, Baffin Island. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 172.

327. Nichols, H., P.M. Kelly, and J.T. Andrews, 1978: Holocene palaeowind evidence from palynology in Baffin Island. Nature 273(5658): 140-142.

328. Nichols, H., 1975: Palynological and paleoclimatic study of the late Quaternary displacement of the boreal forest-tundra ecotone in Keewatin and Mackenzie, N.W.T., Canada. Colorado. University. Institute of Arctic and Alpine Research. Occasional Paper 15. 87 p.

329. Schwarzenbach, F.H., 1975: Botanical observations on the Penny Highlands of Baffin Island. Translated from German manuscript by D. Löve, available from Institute of Arctic and Alpine Research, Univ. Colorado, Boulder, Colorado. 164 p.

330. Terasmae, J., P.J. Webber, and J.T. Andrews, 1966: A study of late-Quaternary plant-bearing beds in north-central Baffin Island, Canada. Arctic 19(4): 296-318.

Plant-bearing beds, exposed by downcutting of the Isortoq River at the northern end of the Barnes Icecap, have been folded, apparently by east-west moving overriding ice, truncated and overlain by horizontal alluvial sediments. Radiocarbon dates for plant material from the Isortoq River (folded unit), Flitaway Lake, and Lewis Glacier localities are greater than

30,000 to greater than 40,000 yr BP, from the horizontal beds, 14,000± 400 yr BP. The vegetation was probably similar to that of southern Baffin Island today; the Isortoq beds are assigned to the Sangamon interglacial. Pollen diagrams and description of the present vegetation and climate are included. AB100627.

331. Webber, P.J., 1971: Gradient analysis of the vegetation in the Lewis Valley region, north-central Baffin Island, N.W.T. Ph.D. Thesis, Queen's Univ., Kingston, Ontario, Canada. 366 p.

MARINE GEOLOGY AND BIOSTRATIGRAPHY

332. Aksu, A.E. and D.J.W. Piper, 1979: Baffin Bay in the past 100,000 yr. Geology 7: 245-248.

Upper Quaternary sediments in Baffin Bay are predominantly debris flows and turbidites derived from ice-rafted sediments on the continental slope. Individual lithofacies can be correlated across hundreds of kilometres. Two ash horizons provide useful stratigraphic markers. Peaks in foraminiferal abundance indicate that two main penetrations of subarctic water occurred in Baffin Bay during the past 100,000 yr. One penetration occurred about 70,000 to 40,000 yr B.P. and another at 9,000 to 6,000 yr B.P. Both were accompanied by distribution of ice-rafted carbonate sediment over a wide area of Baffin Bay and the eastern Canadian continental margin. Auth.

333. Aksu, A.E., 1977: The late Quaternary stratigraphy and sedimentation history of Baffin Bay. M.Sc. Thesis, Dalhousie University, Halifax, N.S., Canada. 170 p.

334. Andrews, J.T., 1976: Last interglacial, interstadial, and Holocene marine bivalve assemblages, eastern Baffin Island, N.W.T., Canada. AMQUA 4th Biennial Meeting, Arizona State Univ., Tempe, Abstracts, p. 121.

335. Andrews, J.T., 1973: Late Quaternary variations in oxygen and carbon isotopic compositions in Canadian arctic marine bivalves. Palaeogeogr., Palaeoclimatol., Palaeoecol. 14: 187-192.

The oxygen and carbon isotopic composition of arctic marine bivalves *Mya truncata*, *Hiatella arctica*, and *Mytilus edulis* are reported on samples from raised marine deposits in Hudson Bay and eastern Baffin Island. The shells range in age from modern, through the Holocene, to "old" marine units. During the Holocene the $^{18}O/^{16}O$ ratio in shells rose to a maximum about 3,500 B.P. which coincides in time with the period of maximum growth rates of bivalves, maximum size and maximum faunal diversity. The change is interpreted to indicate that about 3,500 years ago arctic waters may have reached a salinity $\sim$ 1-2$^{o}/_{oo}$ greater than present. Comparison of Holocene shell-carbonate isotopic compositions with those from the "old" marine shells (that are characteristically extremely thick) suggests that during the early Wisconsin advance on eastern Baffin Island, surface and near-surface waters were more saline than at present. This may have been related to low meltwater discharge. Paradoxically, positive values of

$^{18}O/^{16}O$ and $^{13}O/^{12}C$ in marine shells occurred during the Holocene marine optimum and during the early Wisconsin ice advance. Auth.

336. Andrews, J.T., 1972: Recent and fossil growth rates of marine bivalves, Canadian Arctic, and Late-Quaternary arctic marine environments. Palaeogeogr., Palaeoclimatol., Palaeoecol. 11(3): 157-176.

Growth rates of three marine bivalves--*Mytilus edulis*, *Serripes groenlandicum* and *Clinocardium ciliatum*--are used to elucidate Late-Quaternary marine conditions in the Canadian Arctic and Subarctic. Present-day growth rates in Subarctic waters are statistically faster than those for the same species in Arctic waters. Fossil growth rates are analysed for a 6,000- and 8,500-year sequence from central Hudson Bay and east Baffin Island. These data suggest that growth rates and the size of coexistent clams, *Mya truncata* and *Mya pseudoarenaria*, increased to a maximum about 3,500 B.P. and have since declined. Growth rates did not increase to Subarctic values and hence the increase is related to temperature and salinity changes of the surface layer rather than by vertical mixing with the Atlantic water layer at depth. During the period 8,000-2,500 B.P. *M. edulis* and *Macoma balthica* extended up the east coast of Baffin Island and across the entire Arctic mainland coast; *Chlamys islandicus* does not appear to have been as widespread. In the last 2,500 years or so these species have retreated to the west and south.

A comparison of raised, Late-Quaternary marine deposits throughout the North-Atlantic Arctic indicates similar biostratigraphic zones. Warmer conditions than today prevailed between 8,500-2,500 B.P. with an optimum $\sim$ 3,500 B.P. These dates suggest that marine conditions lagged behind terrestrial climatic changes, thus superimposing (in time) a cool atmosphere/warm ocean system that might explain the renewed glacierization of Arctic regions in the Neoglacial. Auth.

337. Baker, S.R., 1971: Sedimentation in an arctic marine environment: Baffin Bay between Greenland and the Canadian Arctic Archipelago. Ph.D. Thesis, Rensselaer Polytechnic Institute, Troy, N.Y. 124 p.

Page 5865 in Vol. 32/10-B of Dissertation Abstracts International. Order No. 72-10850.

338. Baker, S.R. and G.M. Friedman, 1973: Sedimentation in an arctic marine environment: Baffin Bay between Greenland and the Canadian Arctic Archipelago. Can. Geol. Surv. Pap. 71-23: 471-498. (Earth Science Symposium on Offshore Eastern Canada.)

Analysis of cores and grab samples from Baffin Bay indicates that sediment texture reflects the local bottom topography and the random distribution of sediments by ice-rafting. The distribution of ice-rafted sand and gravel can be related to the surface currents in Baffin Bay. The shelf sediments are composed by and large of sands and gravels intermixed with mud. Large depressions on the shelf contain fine-grained sediments similar to those that floor the deep bathyal basin in the central part of Baffin Bay. Fine-grained sediments extend from the mouths of the fiords north of Disko Island across the continental shelf to the bottom of the basin. These fine-grained sediments are inferred to have been deposited as a hyperpycnal deltaic flow that issued from the margin of the glaciers.

The sediment currently being deposited in many areas of the bay is not representative of the underlying sediments. Many cores exhibit alternating intervals of coarse- and fine-grained sediments indicating varying processes of sedimentation in the past. Auth.

339. Boyd, R.W. and D.J.W. Piper, 1976: Baffin Bay continental shelf clay mineralogy. Marit. Sediments 12/1: 17-18.

340. Dunbar, M.J., 1955: The present status of climatic change in the Atlantic sector of northern seas, with special reference to Canadian eastern arctic waters. Royal Soc. Can. Trans., Third series, v. 49, Oceanographic session, p. 1-7.

Increased flow of Atlantic water in the Gulf Stream-North Atlantic Drift system since about 1920 requires increased flow of polar water southward. Areas affected by the southward-flowing East Greenland and Canadian Arctic (Baffin Island) Currents have thus been "buffered" against marine climatic change. Slight warming of these areas after peak or trough of a strong climatic cycle is discussed, with particular reference to the Ungava Bay region in the 1880's. Warming of recent decades appears to be at a standstill in West Greenland, and on the wane farther east. In the next few years, therefore, some warming of marine climate may occur in the Canadian Eastern Arctic. AB39622.

341. Ellis, D.V., 1959: The benthos of soft sea-bottom in arctic North America. Nature 184(4688): B.A. 79-B.A. 80.

Discussion of soft-bottom communities, especially that of Macoma arctica, studied in Baffin Island and Greenland areas and in Foxe Basin by expeditions organized by the Arctic Institute of North America and the Fisheries Research Board of Canada. The role of environmental factors, especially of temperature in the geographic distribution of these communities is noted. AB57867.

342. Feyling-Hanssen, R.W., 1975: The Clyde Foreland Formation: a micropaleontological study of Quaternary stratigraphy. 1st International Symposium on Benthonic Foraminifera of Continental Margins: Part B, Paleoecology and Biostratigraphy. Marit. Sediments Spec. Pub. 1: 315-377.

A Clyde Foreland Formation is defined as comprising unconsolidated or only slightly consolidated deposits, varying in grain size from very coarse bouldery gravel to clay, between the outermost part of Clyde Inlet and the coastal mountains west-northwest of Kogalu River on the northeast coast of Baffin Island, Arctic Canada. They outcrop in an up to 40-m high, almost straight-lined, coastal cliff facing Baffin Bay and are composed of mainly marine deposits interbedded with glacigenic layers.

Investigation of assemblages of fossil foraminifera revealed three main stratigraphical units of the marine deposits, viz., the *Islandiella* zone, being the youngest, the *Cibicides rotundatus* zone, and the *Nonion tallahattensis* zone, being the oldest. The *Islandiella* zone is subdivided into 2 subzones, viz., the *Islandiella islandica* subzone, the upper one, and the *Cassidulina teretis* subzone, the lower one. The *Cibicides rotundatus* zone is subdivided into 4 subzones, viz., the *Protelphidium orbiculare-Elphidium*

excavatum subzone, being the uppermost, the *Elphidium subarcticum-Cassidulina subacuta* subzone, the *Elphidium excavatum-Cassidulina teretis* subzone, and the *Protelphidium orbiculare-Cassidulina teretis* subzone, being the lowermost.

Glacigenic deposits, i.e., tills or glacifluvial layers, were observed on top of the *Islandiella islandica* subzone: drift 1, between the *Islandiella islandica* subzone and the *Cassidulina teretis* subzone: drift 2, between the *Islandiella* zone and the *Cibicides rotundatus* zone: drift 3, between the *Elphidium excavatum-Cassidulina teretis* subzone and the *Protelphidium orbiculare-Cassidulina teretis* subzone: drift 4, and between the *Cibicides rotundatus* zone and the *Nonion tallahattensis* zone: drift 5. A drift 6 may occur below the *Nonion tallahattensis* zone.

The *Islandiella* zone is supposed to be Upper Pleistocene of age, the *Islandiella islandica* subzone is correlatable with the large Mid-Wisconsin (Mid-Weichselian) interstadial, and the *Cassidulina teretis* subzone may be correlated with the Sangamonian (Eemian). Drift 3 is thought to have been deposited by an Illinoian (Saalian) glacial advance, and the *Cibicides rotundatus* zone may comprise Illinoian interstadial deposits as well as such of Yarmouthian (Holsteinian) interglacial age. The *Nonion tallahattensis* zone represents an older (Aftonian?) mild interval. Auth.

343. Feyling-Hanssen, R.W., 1976: A mid-Wisconsinian interstadial on Broughton Island, arctic Canada, and its foraminifera. Arctic and Alpine Res. 8: 161-182.

Quantitative analysis of fossil foraminifera faunas in raised marine deposits on Broughton Island, Baffin Island, reveals assemblages which can be correlated with Mid-Weichselian (Mid-Würmian) foraminiferal assemblages from the Kola Peninsula of arctic USSR. This correlation is also supported by radiocarbon datings from the two areas and leads to the conclusion that a Mid-Weichselian (Mid-Wisconsinian) interstadial can be identified for Broughton Island. It is termed the Cape Broughton interstadial. During this interstadial the sea level at Broughton Island reached to at least 46 m above the present level, and the faunal diversity there ranged between 14 and 23, which is high for arctic areas. One site, on the east side of Broughton Island, has a fauna that indicates a greater age than those correlative with the Cape Broughton type assemblage. This deposit may be Sangamonian in age. Auth.

344. Feyling-Hanssen, R.W., 1976: The stratigraphy of the Quaternary Clyde Foreland Formation, Baffin Island, illustrated by the distribution of benthic foraminifera. Boreas 5: 77-94.

The Clyde Foreland Formation is defined as comprising unconsolidated or only slightly consolidated deposits, varying in grain size from very coarse boulder gravel to clay, situated between the outermost part of Clyde Inlet and the coastal mountains west-northwest of Kogalu River on the northeast coast of Baffin Island, Arctic Canada. They outcrop in an up to 40 m high almost straight-lined coastal cliff facing Baffin Bay and are composed of mainly marine deposits interbedded with glacigenic layers.

Investigation of assemblages of fossil foraminifera revealed three main stratigraphical units of the marine deposits, viz., the *Islandiella* zone, being the youngest, the *Cibicides rotundatus* zone, and the *Nonion tallahattensis* zone, being the oldest.

The *Islandiella* zone is supposed to be upper Pleistocene of age, comprising a large Mid-Wisconsinian (Mid-Weichselian) interstadial, and an interglacial that can be correlated with the Sangamonian (Eemian) interglacial. The *Cibicides rotundatus* zone may comprise Illinoian interstadial deposits as well as deposits of Yarmouthian (Holsteinian) interglacial age. The *Nonion tallahattensis* zone represents an older (Aftonian?) mild interval. Auth.

345. Gilbert, R., 1978: Observations on oceanography and sedimentation at Pangnirtung Fiord, Baffin Island. Marit. Sediments 14(1): 1-9.

Pangnirtung Fiord is a glacial trough draining the southwest portion of Penny Icecap, Baffin Island. Sills associated with riegels divide the fiord into four basins. Despite a large inflow of sediment from streams draining the glaciers and Penny Icecap, glacio-marine sediments have been deposited in sufficient thickness to mask glacial features only in the central portion of the fiord. A major trench in the fiord floor is believed to result from erosion by turbidity currents. A shallow sill (12 to 22 m below mean tide level) at the mouth of the fiord, a large tidal range (up to 6.7 m), and moderate fresh water inflow strongly influence circulation and stability of fiord water. Replacement of bottom water occurs frequently or continuously during the year and helps to determine the distribution of sediment. The oxygen-rich bottom water supports a large benthic fauna which severely bioturbates the sediments making them useless for the interpretation of Holocene events in the region. Auth.

346. Grant, A.C., 1965: Distributional trends in the recent marine sediments of northern Baffin Bay. Bedford Institute of Oceanography. Report B.I.O. 65-9. Unpublished manuscript. 74 p.

Reports results of a granulometric study of 69 snapper samples of bottom sediment collected in a section across northern Baffin Bay, during the cruise of CCGS Labrador, Sep-Oct 1964, and discusses the distribution of size fractions in relation to depth, bottom configuration and agents of transport. The sediment transport is mainly by ice-rafting, with ice movement controlled by surface currents. As in a model of a dynamic sedimentary basin, the gravel is deposited in the peripheral zone of surface water circulation and average grain size of the bottom sediment decreases toward the central part of the basin. Sorting of the sediment indicates water movement to a depth of about 400 m. Carbonate material in the sand-silt-clay fraction shows higher values in the western part of the area and reflects sediment transport by the Baffin Current from Paleozoic terrain to the north and west. Limestone, sandstone and coal in the gravel fraction indicates the same transport. Quartzite, basalt, and gabbro gravel indicates northward transport by the West Greenland Current. AB-95746.

347. Illman, W.I., J. McLachlan, and T. Edelstein, 1972: Two assemblages of marine algae from post-glacial deposits in the eastern Canadian Arctic. Can. Jour. Earth Sci. 9: 109-115.

The marine algae of the post-glacial deposits from the Ottawa Islands, Hudson Bay and Broughton Island off East Baffin Island were examined. A

total of 15 non-calcareous species were identified, of which the most abundant at both sites were *Sphacelaria plumosa* and *Desmarestia aculeata*. The species assemblages are characteristic of present-day arctic and subarctic floras. Auth.

348. Knight, R.J., 1970: Distribution trends in the recent marine sediments of Tasiujaq Cove of Ekalugad Fiord, Baffin Island, N.W.T. M.Sc. Thesis, Queen's Univ., Kingston, Ontario, Canada. 111 p.

349. Knight, R.J., 1971: Distributional trends in the recent marine sediments of Tasiujaq Cove of Ekalugad Fiord, Baffin Island, N.W.T. Marit. Sediments 7(1): 1-18.

350. Kranck, K., 1964: Sediments of Exeter Bay, District of Franklin. Bedford Institute of Oceanography. Report B.I.O. 64-15. 60 p. Pub. also as: Can. Geol. Surv. Pap. 66-8. 60 p.

Exeter Bay, northeast coast of Cumberland Peninsula, Baffin Island, is affected by a counter eddy of the Canadian current which flows south past the bay. All iceberg floes and blocks which drift south through Baffin Bay, pass through or near the sample area. Granulometric and petrologic analyses and heavy mineral distribution patterns of bottom sediments in this area indicate that current transportation accounts for the sands which dominate the inshore areas. The sand is mainly of local origin, derived from sillimanite and amphibole schist. Ice rafting of the coarse gravel on the offshore shelf and slope is inferred from the great variation of rock types represented, of which carbonate is one of the most common. Carbonate rocks do not outcrop anywhere within 250 mi of the sample area. AB97065.

351. Locke, W.W., III, 1978: Paleomagentism of a raised marine section, Cape Dyer, N.W.T., Canada. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 220.

352. Løken, O.H., 1973: Bathymetric observations along the east coast of Baffin Island: submerged moraines and iceberg distribution. Can. Geol. Surv. Pap. 71-23: 509-519.

Detailed studies of the submarine trough which extends across the continental shelf off Clyde Inlet show that a terminal moraine lies across the outer part of the trough and that there is further evidence of four (4) other ice marginal positions, all seaward of the present shoreline. The oldest submarine feature is correlated with a supramarine moraine. The irregular topography of the trough differs sharply from the very smooth bottom topography on either side. The submarine moraine along the northwest side of the Clyde trough forms a barrier to the southward flowing icebergs which become stranded, thus accounting for the well-known field of icebergs characteristic of the Cape Christian area; which has an important stabilizing influence on the ice cover in the area. Studies of this naturally stabilized ice cover will be relevant to plans for artificially constructed ice islands in other areas. Auth.

353. Løken, O.H. and D.A. Hodgson, 1971: On the submarine geomorphology along the east coast of Baffin Island. Can. Jour. Earth Sci. 8(2): 185-195.

A reconnaissance survey was made of the submarine geomorphology along the east coast of Baffin Island using an echo sounder. The survey focused on: (1) the continental slope, (2) the continental shelf, and (3) the fiords. The depth contours on the continental slope are roughly parallel to the coastline. The overall steepness of the slope is typically 2-3°, with the steeper sections near the top. Small irregularities of unknown origin are commonly found in the slope profiles.

Transverse troughs with depths of almost 900 m are the most distinct features of the 30-50 km-wide continental shelf. The larger channels are associated with major fiord-valley systems on the island. Ridges, interpreted as lateral moraines, extend along the trough margins. Marginal channels commonly found along glaciated coasts appear to be absent from this section of the Baffin Island coast, but subbottom profiles are not yet available.

The fiords of east Baffin Island show the typical fiord characteristics and reach a maximum depth of 900 m. The deepest part is usually below the highest mountains along the fiord. All fiords continue into offshore channels of varying depth.

Many significant changes to the bathymetric map of the west side of Baffin Bay have been made. This is partly due to the survey plan and partly to the greatly improved plotting charts which were used. Auth.

354. Lubinsky, I., 1972: The marine bivalve molluscs of the Canadian Arctic. Ph.D. Thesis, McGill University, Montreal, Quebec, Canada. 318 p.

355. Matthews, B., 1967: Late Quaternary marine fossils from Frobisher Bay, Baffin Island, N.W.T., Canada. Palaeogeogr., Palaeoclimatol., Palaeoecol. 3(2): 243-263.

Reports a study begun in 1962 and finished during the 1965 Leeds University Arctic Ungava Expedition. Of 18 marine pelecypod species from raised beach deposits at 27, 48 and 77 ft above sea level, six are new arctic Canada records, two are pan-arctic species and three do not occur in Canadian arctic waters at present. The last three species and the presence of temperate foraminifer species in sediments at the 21 ft level indicate warmer conditions about 6000-6500 BP. C-14 datings on shells at 48 and 11 ft levels indicate deglaciation of the upper part of Frobisher Bay at least 6500 yr ago and an average land emergence of approx. 1 ft/century in the last 6000 yr. Data on the fauna C-14 dates and sediment mechanical analyses are tabulated and the sedimentation conditions and rates and variations of water depths, temperature and salinity discussed in relation to the faunal evidence of a cool and an optimum climatic phase. AB105724.

356. McLaren, I.A., 1961: The hydrography and zooplankton biology of Ogac Lake, a landlocked fiord on Baffin Island. Ph.D. Thesis, Yale University, New Haven, Connecticut. Not available from University Microfilms Int'l.

357. McMillan, N.J., 1973: Surficial geology of Labrador and Baffin Island shelves. Can. Geol. Surv. Pap. 71-23: 451-469. (Earth Science Symposium on Offshore Eastern Canada.)

The shelves of Labrador and Baffin Island are smooth plains in contrast to the rugged, glaciated and fiord-indented land to the west. These shelves are mainly underlain by sedimentary rocks that have also been glaciated. The abrupt boundary between Precambrian rocks and shelf sediments occurs at tectonic hinge lines which are marked by the marginal channels described by the Holtedahls. Eastward-moving continental glaciers, underloaded with debris, became loaded with available erodable sediments at the trace of the tectonic hinge line thus causing the marginal channels.

Hundreds of bottom samples from Baffin Bay and Labrador Sea have been described in the literature since 1900. The extent of the sedimentary component of these grab samples and gravity cores seems to coincide with the presence of sedimentary bedrock. The idea that icebergs dropped all of the material seems unlikely because sedimentary debris has not been found in previously flooded land areas and because the sedimentary component is absent in certain areas where icebergs are abundant. Furthermore, if all of the icebergs deposited all of their debris on the Labrador Shelf, only a few inches of sediment would have been deposited in the last 10,000 years. It is tentatively concluded that the sedimentary component of bottom samples is part of the ground moraine which has moved only a few miles from its origin elsewhere on the shelf. Auth.

358. Menard, H.W. and S.M. Smith, 1966: Hypsometry of ocean basin provinces. Jour. Geophysical Res. 71(18): 4305-4325.

Studies the frequency distribution of the depths of ocean basins, rises and ridges, and continental shelves and slopes, using recent American and Russian oceanographic charts, including the 1:10 million tectonic map of the Arctic. Arctic Ocean studies include Hudson Bay, Baffin Bay, and Canadian Straits sea. Arctic shelf seas, Barents and Bering Seas, and Sea of Okhotsk are studied as separate ocean divisions. The depth distribution of the World Ocean area, volume, and mean depth of the oceans are given in tables. Area of depth zones in the oceans is tabulated in km^2 and %. The hypsometric curve for all oceans differs but little from those obtained by Sir J. Murray and J. Hjort (1912), and E. Kossinna (1921), the differences being attributed to the sea-floor epeirogeny, sea-floor spreading, and continental drift. Major changes in ocean depths, rises and ridges are shown on charts. AB98029.

359. Osterman, L.E., 1978: Preliminary results of a study of cores from outer Frobisher Bay. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 230.

360. Pelletier, B.R., 1966: Canadian Arctic Archipelago and Baffin Bay, Part B. Bathymetry and geology. In: Fairbridge, R.W. (ed.), The encyclopedia of oceanography (Encyclopedia of earth sciences series, volume 1). New York, Reinhold Pub. Corp., p. 160-167.

361. Pelletier, B.R., 1966: Development of submarine physiography in the Canadian Arctic and its relation to crustal movements. Roy. Soc. Can. Spec. Pub. 9: 77-101. Also pub. as: Bedford Institute of

Oceanography, unpublished manuscripts. Report B.I.O. 64-16.

New soundings, and paleontologic and lithologic evidence obtained with bottom grabbers and cores in Canadian Arctic Islands waters offer support to the general theory of Fortier and Morley (cf No. 50953) of subaerial erosion of a pre-existing single land mass by streams, of modification of such river valleys by valley glaciers, and the subsequent widespread submergence. There is equally strong evidence of post-Pleistocene emergence. The theory of simple ice loading and unloading is not enough to explain the overall vertical movement of 2000 ft in so short a time. It appears that a general tectonic force acted over the entire archipelago, exclusive of the presumed tectonism associated with the origin of Baffin Bay. From a physiographic and tectonic point of view both northern Greenland and the Canadian Arctic Islands have identical histories. Nares Strait appears to be part of a former river system complete with watersheds and tributaries; geologic structure probably controlled the original drainage system. AB98916.

362. Phleger, F.B., 1951: Foraminifera distribution in some sediment samples from the Canadian and Greenland Arctic. California. University. Scripps Institution of Oceanography. Submarine geology report no. 18. (Results of research carried out for the U.S. Navy Office of Naval Research under Project no. NR 081, 050.)

Contains notes on the occurrence, freqency, and zonation of planktonic and benthonic foraminifers in bottom samples taken in waters from Baffin Bay northward to Kennedy Channel and along the southern Canadian Arctic Islands. AB25084.

363. Phleger, F.B., 1952: Foraminifera distribution in some sediment samples from the Canadian and Greenland Arctic. Cushman Foundation for Foraminiferal Research. Contributions 3(pt. 2): 80-89.

Contains an analysis of foraminifera populations in 49 bottom sediment samples between 70°-80° N. 59°-112° W. which show the predominance of Benthonic species, an indication of depth zonation in Baffin Bay, Lancaster Sound, and Melville Sound and of mixing of faunas due to ice rafting, and which demonstrates that regional faunas are distinguishable. AB25085.

364. Piper, D.J.W., 1973: A late Quaternary stratigraphic marker in the central basin of Baffin Bay. Marit. Sediments 9(2): 62-63.

365. Rvachev, V.D., 1967: O proiskhozhdenii sredinno-okeanicheskogo podvodnogo kan'ona Severnoi Atlantiki. Okeanologiia 7(3): 477-482. In Russian. English summary. Title tr.: Origin of a mid-oceanic submarine canyon in the North Atlantic.

Presents four echo-sounding profiles made in Davis Strait during 1959-64 by the Sevastopol' and Akademik Knipovich. This canyon was first discovered by C.L. Drake and others (AB86630). Its origin is discussed: it may be a relic of an old river-bed which occupied the area during the subaerial development of the mid-Labrador Sea ridge as longitudinal intermountain valley. AB99610.

366. Spencer, J.W., 1903: Submarine valleys off the American coast and in the North Atlantic. Geol. Soc. Amer. Bull. 14: 207-226.

Includes notes on submarine valleys in Baffin Bay-Davis Strait, Denmark Strait, and between Greenland and Svalbard, based on scattered or preliminary data. Deepest water in Labrador Sea is said to be 12,196 ft., and between southern Baffin Island and Greenland 8,100 ft. In latitude 66° N. fragments of the West Greenland coastal plain up to 7-mi. wide are submerged less than 300 ft., the trough through Davis Strait is generally about 2200 ft. deep. Soundings in Baffin Bay show fiords as deep as 4000 ft.: the Bay may be a distinct basin, or (rather) the Davis Strait passageway may have been obstructed by glacial or iceberg deposits. Submerged fiords off the East Greenland coast are also noted. AB83213.

367. Vilks, G., 1974: The distribution of planktonic foraminifera in the sediments and water of the Northwest Passage and northern Baffin Bay: a tool for paleo-oceanographic synthesis. Can. Geol. Surv. Pap. 74-30: 109-121.

The distribution of the various phenotypes of *Globorotalia pachyderma* (Ehrenberg) is correlated with oceanographic parameters. Large percentages of small normalform adults were found in the mixed waters of eastern Lancaster Sound. After death 80% of these fragile normalforms are destroyed, leaving the Lancaster Sound sediments almost barren of planktonic foraminifera. The kummerform and quadrate phenotypes that developed under less favourable conditions have thicker test walls and are consequently more readily preserved. It is proposed that the fraction of normalform phenotypes in the sediment cores are useful to interpret paleoenvironments. Auth.

LICHENOMETRY AND NEOGLACIATION

368. Andrews, J.T. and D.M. Barnett, 1979: Holocene (Neoglacial) moraine and proglacial lake chronology, Barnes Ice Cap, Canada. Boreas 8: 339-356.

Lichen diameters and radiocarbon dates from the western and southern margins of the Barnes Ice Cap yield a growth curve similar to that from southeastern Baffin Island. As a consequence, the moraine chronology of the northern and western Barnes Ice Cap needs revision, as does the chronology of the large proglacial lakes that existed north of the present Barnes Ice Cap. The revised chronology indicates that moraines were formed along the western margin of the Barnes Ice Cap during the following intervals: (1) less than 100 years ago; (2) 400-500 B.P.; (3) ca. 750 B.P.; (4) ca. 1000 B.P.; (5) ca. 1600 B.P.; (6) ca. 2100 B.P.; and (7) 2800 to 3100 B.P. As the western margin of the Barnes Ice Cap retreated, punctuated by stillstands and readvances, the northern margin of the Barnes Ice Cap lay athwart a series of westerly draining valleys, and a complex of proglacial lakes were dammed between the ice margin and the height of land. This sequence is traced by means of well-developed shorelines, lacustrine deltas, and spillways: specific lake levels are dated by lichenometry.

The Barnes Ice Cap moraine sequence is more complex than other Neoglacial records fringing mountain glaciers in Colorado, Alaska and Lappland. However, the chronology for the western Barnes Ice Cap closely resembles independent moraine chronology of mountain glaciers in Cumberland Peninsula, Baffin Island, and thus indicates that the difference between the Baffin Island climatic record and the general Neoglacial/Holocene climatic record (Denton & Karlén, Quaternary Research 7, 1977) is real. Comparison of specific data from Swedish Lappland and Baffin Island shows substantial agreement. Although Neoglacial records may be globally synchronous, the case for a 2500 year periodicity of glacial fluctuations is not proven: a 300 to 600 year return interval is suggested for the period between 0 and 3000 B.P. Auth.

369. Andrews, J.T. and P.J. Webber, 1964: A lichenometrical study of the northwestern margin of the Barnes Ice Cap, a geomorphological technique. Geogr. Bull. 22: 80-104.

Reviews results of lichen measurements made during 1961-1963 studies by the Canadian Geographical Branch. The seven main species used are described, and their growth rates are calculated on the assumption of a linear retreat of the glacier from the present margin to the first *Alectoria minuscula*. Growth rate for this species was 0.40 mm/yr, from which growth rates of the other species were calculated. Results were used in studying the recent history of the Lewis Glacier, 70°20' N 74°50' W, and that of the icecap margins. Existence is suggested of a major end-moraine system of Sub-Atlantic age and of other important moraines dating back to AD 1680, 1790, 1890, and 1920. These moraines are compared in age with others on the southeastern margin of the icecap, which has a different history, and with portions of Greenland. The lichenometric method is considered feasible and important for a time period for which C14 dating is relatively inaccurate. AB85078.

370. Andrews, J.T. and P.J. Webber, 1969: Lichenometry to evaluate changes in glacial mass budgets: as illustrated from north-central Baffin Island, N.W.T. Arctic and Alpine Res. 1(3): 181-194.

Direct measurement of the growth of *Alectoria minuscula* over 4.3 growing seasons enables a further assessment to be made on the value of lichenometry around the Barnes Ice Cap. Detailed lichen sampling in two formerly glacierized valleys allows isophyses to be drawn for specific diameters of *A. minuscula*. The gradients of the isophyses are similar to those of lateral glacial features. These reconstructions define ice margins from about 1650 A.D. to the present time and enable glacier changes in length, area, and volume to be estimated for the Lewis and Pintail glaciers. Local differences in the trend of area or volume loss are explained by differences in deglacial history. Specific ablation for the expanded Lewis Glacier below the 500 m ice contour averaged about 1.5 m ice equivalent per year, a value not dissimilar to those determined on the present glacier of about 1.3 m ice equivalent.

Sampling over extended distances on substrates of similar age around the Barnes Ice Cap indicates comparable maximum lichen diameters are present. The value of lichenometry in arctic areas is reaffirmed. Auth.

371. Andrews, J.T., P.T. Davis and C. Wright, 1976: Little ice age permanent snowcover in the eastern Canadian Arctic: extent mapped from LANDSAT-1 satellite imagery. Geogr. Ann. 58A(1-2): 71-81.

Extensive areas of the eastern Canadian Arctic are light grey/white on both conventional black and white air photography and on multi-spectral LANDSAT-1 satellite imagery. These areas stand out in marked contrast to the darker toned surrounding terrain. Field investigations indicate that the light grey areas possess few lichens or plants; in contrast, their margins abut terrain with a mature lichen cover. Areas within the lichen trimlines are interpreted as the sites of former permanent snowbeds and snowfields. Radiometric and lichenometric dates indicate that the episode of permanent snowfields occurred about 500 to 300 years ago with retreat starting between 300 and 70 years ago. The LANDSAT-1 satellite imagery at a scale of 1:1,000,000 has proven ideal for mapping the regional extent of this former snow-cover and this is illustrated by two frames from north-central Baffin Island. Interpretation problems can arise from a number of sources, such as: light early summer or fall snowcover, limestone bedrock, recent outwash plains, and low clouds. However, ambiguities can be eliminated by inspection of LANDSAT-1 frames from different passes, by the examination of 1:60,000 air photographs, by the use of 1:250,000 scale contour maps, and by comparison with maps of the bedrock geology.

A comparison of Little Ice Age glaciation levels with those based on the present distribution of permanent ice/snow bodies indicates that during the Little Ice Age the regional snowline fell between 100 and 400 m; thus extensive areas of the upland plateaus of Baffin Island above 600 m were mantled by a thin but extensive permanent snowcover. This study serves to provide a realistic model for the inception of a North American ice sheet. Auth.

372. Arundale, W.H., 1976: The archaeology of the Nanook Site; an explanatory approach. Ph.D. Thesis, Michigan State Univ., East Lansing, Michigan. 578 p.

373. Barry, R.G., W.H. Arundale, J.T. Andrews, R.S. Bradley, and H. Nichols, 1977: Environmental change and cultural change in the eastern Canadian Arctic during the last 5000 years. Arctic and Alpine Res. 9(2): 193-210.

Archaeological research suggests that cultural changes in the Canadian Arctic are closely linked to environmental changes. Current knowledge of postglacial climate and marine conditions in the eastern Canadian Arctic--an area demonstrably sensitive to small fluctuations in these conditions--is reviewed in the context of the prehistoric cultural sequence. Most of the major cultural events since 4500 BP appear to correlate well with the paleoclimatic conditions inferred from environmental data, although specific causal mechanisms cannot be documented.

The expansions of Arctic Small Tool tradition (ASTt) and later of the Thule people seem to be related to warmer climatic conditions, whereas the evolution and decline of Dorset culture seems to show an inverse relation to temperature trends. More work is required on the dating of environmental and cultural changes and on the precise nature of possible interactions between environmental factors and cultural response. Auth.

374. Blake, W., Jr., 1953: Studies of the Grinnell Glacier, Baffin Island. Arctic 6(2): 167.

Contains a note on a two-man expedition (part of the McGill Univ.-Arctic Institute Carnegie Program) led by J. Mercer during July-Aug. 1952. Its purpose was to carry out glaciological and geomorphological studies in southeastern Baffin Island. Geological, botanical, and entomological collections were made and landforms photographed. Grinnell and nearby corrie glaciers were studied. Work was continued by J. Mercer in July 1953. AB-28169.

375. Carrara, P.E., 1972: Late and neoglacial history of Smirling and Sulung valleys, eastern Baffin Island, N.W.T., Canada. M.Sc. Thesis, Univ. Colorado, Boulder, Colorado.

376. Carrara, P.E. and J.T. Andrews, 1972: The Quaternary history of northern Cumberland Peninsula, Baffin Island, N.W.T. Part I: The Late- and Neoglacial deposits of the Akudlermuit and Boas Glaciers. Can. Jour. Earth Sci. 9(4): 403-414.

Moraines of local glaciers predating the Neoglacial occur in sections of northern Cumberland Peninsula. A study of these deposits is reported for the area between the heads of Quajon and Narpaing Fiords. A chronology is developed based on lichenometry, percent of lichen cover, and the weathering of boulders and pebbles. Initial dating is done by lichenometry and dates older than about 6000 BP are attempted by establishing rates of weathering. About 12,500 BP glaciers existed in both south- and north-facing corries with an equilibrium line at 850 m a.s.l. During the next 5000 years the south-facing glaciers retreated and disappeared. About 7000 BP, moraines were deposited in front of the Akudlermuit and Boas glaciers--these moraines are no longer ice-cored. The equilibrium line lay between 850 and 975 m a.s.l. A 'warm' interval followed and the ice cores melted. This was followed by an early Neoglacial advance, dated about 3800 BP for the period of moraine stabilization; after a 2000 year interval four younger readvances are recorded. All Neoglacial moraines are ice-cored. During the last few decades the equilibrium line has risen. Auth.

377. Davis, P.T. and C. Wright, 1975: Extent of little ice age snowcover in the eastern Canadian Arctic: an example of an abortive continental glaciation. Geol. Soc. Amer. Abstracts with Programs 7(7): 1046-1047.

378. Falconer, G., 1966: Preservation of vegetation and patterned ground under a thin ice body in northern Baffin Island, N.W.T. Geogr. Bull. 8(2): 194-200.

Describes these features revealed through rapid recession. A sample of moss of 330 $\pm$ 75 yr radiocarbon age suggests a markedly more nival period in parts of arctic Canada two-to-three centuries ago. AB95213.

379. Harrison, D.A., 1966: Recent fluctuations of the snout of a glacier at McBeth Fiord, Baffin Island, N.W.T. Geogr. Bull. 8(1): 48-58.

Recent fluctuations of the snout of "Siward Glacier," McBeth Fiord, Baffin Island, are described. A chronology of the retreat phases of the glacier margin and an associated series of ice-dammed lakes is established by application of techniques in air-photograph interpretation, geomorphology, dendrochronology, lichenometry and radiocarbon dating. Results derived from the different techniques show a good measure of correspondence, except for lichenometry, where local variations in microclimate are probably responsible for large anomalies in lichen growth rates. Auth.

380. Harrison, D.A., 1964: A reconnaissance glacier and geomorphological survey of the Duart Lake area, Bruce Mountains, Baffin Island, N.W.T. Geogr. Bull. 22: 57-71.

Describes the 1963 survey of glacier fronts in this northeast Baffin Island area, about 71°20'N 72°45'W, part of a worldwide study of the variations in existing glaciers recommended by the Snow and Ice Commission of the Int. Assoc. of Scientific Hydrology. Also considered is the geomorphic and botanical evidence of the former extent of glaciation; recent phases of the process are compared with those in such other areas as Barnes Ice Cap, northern Sweden, western Norway, and Greenland. This survey shows some correlation between glacier advance and moraine formation in this and other areas, particularly in high latitudes, though techniques are needed to date the initial formation of the young end moraines and the old moraine remnants. The study is to be extended in 1964 and during the International Hydrological Decade. AB87739.

381. Ives, J.D., 1962: Indications of recent extensive glacierization in north-central Baffin Island, N.W.T. Jour. Glaciol. (32): 197-205.

Studies of the geomorphology and rock lichen development north of the Barnes Ice Cap prompt the conclusion that 70% of this extensive, interior region was covered by permanent ice some 300-400 years ago. The northern Barnes Ice Cap was significantly larger then than now; it dammed a lake in the upper Isortoq valley, over 80 km. long and up to 300 m. deep. Excluding the icecap, less than 2% of the area is glacierized today. Proof of former extensive ice cover rests largely upon restricted rock lichen development. When sufficient time has elapsed for complete colonization, few indications of the former existence of an ice cover will remain. This type of glacierization may have affected large areas in the high Arctic. Absence of evidence of glaciation, therefore, cannot be relied upon to delimit nunatak areas (plant refugia) during the last glaciation.--From author's abstract. AB72489.

382. Locke, C.W. and W.W. Locke, III, 1977: Little ice age snow-cover extent and paleoglaciation thresholds: north-central Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 9(3): 291-300.

On air photographs, light-colored areas representing reduced lichen cover indicate the maximum extent of permanent snow cover in the recent past. Lichen-free areas were mapped on 1:50,000, 1:250,000, and 1:1,000,000 map sheets of north-central Baffin Island using air photographs and LANDSAT-1 satellite imagery. Present ice and lakes cover 37% of the study area (97,000 km^2). During the Little Ice Age (350 to 100 yr BP), ice and lakes covered about 50% of the study area--an increase of 35%. The amount of

lichen-free area is greatest in the elevational range of 450 to 600 m a.s.l.

A limited amount of lichenometrical measurements indicate that the lichen-free areas probably represent a period of more extensive snow cover approximately synchronous with the Little Ice Age.

Paleoglaciation thresholds and paleoequilibrium-line altitudes increased in elevation toward the northeast with lowest elevations southwest of the Barnes Ice Cap. Paleoglaciation thresholds ranged from 500 to 850 m a.s.l. whereas paleoequilibrium-line altitudes ranged from 300 to 900 m a.s.l. Present glaciation thresholds and equilibrium-line altitudes ranged from approximately 100 to 400 m higher than the paleovalues. The difference between present and paleovalues is greatest over the mountainous east coast and decreases to the west. Auth.

383. Miller, G.H., 1973: Late Quaternary glacial and climatic history of northern Cumberland Peninsula, Baffin Island, N.W.T., Canada. "Part IX in a series dealing with the Quaternary history of northern Cumberland Peninsula, Baffin Island, N.W.T., Canada." Quat. Res. 3(4): 561-583.

Radiocarbon dates on molluscs in marine facies associated with glacial deposits in northern Cumberland Peninsula indicate both main fiord (Laurentide) ice and local glaciers remained at their late Wisconsin maxima until ca. 8000 BP. Essentially continuous deglaciation followed; local corrie glaciers melted out by 7100 BP and by 5500 BP fiord glaciers had receded behind the present margin of the Penny Ice Cap. The Hypsithermal warm interval probably lasted from ca. 8000 to 5000 BP. Lichenometry and radiocarbon dates on peat and buried organic horizons delimit a detailed Neoglacial chronology. Of 46 outlet and corrie glaciers investigated, the oldest Neoglacial moraines are dated lichenometrically at 3200 $\pm$ 600 BP. Subsequent advances terminated immediately prior to ca. 1650, 780, 350, and 65 yr BP, the most recent of which marked the most extensive ice coverage during the Neoglacial. The highest occurrence of lateral moraines from late Wisconsin advances of local and Laurentide ice suggest that at the late Wisconsin glacial maximum, depression of snowline varied from 450 m below present at the coast to 350 m below present level in the vicinity of the Penny Ice Cap. Moraines, surrounded by glacial ice and lying above the present steady-state ELA, suggest that during the Hypsithermal snowline was up to ca. 200 m above its present elevation. A radiometrically controlled reconstruction of relative summer paleotemperatures for the postglacial derived independently of lichenometry agrees well with the lichenometric age dating of moraines. The data suggest that between ca. 1650 and 900 BP climatic conditions were unfavorable for glacier growth, whereas the period ca. 800-65 yr BP was one of general glacial activity. During the last decade permanent snow cover has been increasing in the area. Previously reported data on climatic trends in the Canadian Arctic based on palynological analyses are similar to the chronology reported here. Auth.

384. Miller, G.H. and J.T. Andrews, 1972: Quaternary history of northern Cumberland Peninsula, east Baffin Island, N.W.T., Canada. Part VI: Preliminary lichen growth curve for Rhizocarpon geographicum. Geol. Soc. Amer. Bull. 83(4): 1133-1138.

A graph showing the relation between maximum thallus diameter of *Rhizocarpon geographicum* and age of the individual is presented as an aid to detailed chronological studies in this section of the eastern Canadian Arctic. The curve is derived from: (1) historically dated surfaces; (2) measured growth of *Alectoria minuscula* for a two year period; (3) the interspecific ratios of *A. minuscula/R. geographicum*; and (4) radiocarbon-dated surfaces associated with lichens. The size/age curve for *R. geographicum* shows an initial fast rate of growth of 0.15 mm yr^{-1} which falls off to approximately 0.03 mm yr^{-1} after the passage of 250 to 300 yrs. Extrapolation of the curve back to about 9,500 B.P., when individual maximum thalli would be 280 mm in diameter, is in accord with independent geological dating. The linear growth phase of 0.03 mm yr^{-1} is remarkably similar to rates derived from the Colorado Front Range and the St. Elias Mountains, Alaska, and prompts speculation as to whether this particular lichen species may not have a single growth curve regardless of location. Contrary evidence is also presented. Auth.

385. Miller, G.H., 1972: Quaternary history of northern Cumberland Peninsula, east Baffin Island, N.W.T., Canada, Part IX, neoglacial chronology of the eastern margin of the Penny Ice Cap and nearby glaciers. Abstract in Rocky Mountain section 25th annual meeting. Geol. Soc. Amer. Abstracts with Programs 4: 396.

Cirque glaciers here retreated from a major advance in approximately 7200 years B.P. At least five episodes of neoglacial ice expansion followed, culminating at approximately 2,900; 1650; 700; 350; and 75 years B.P. The latest of these was also the most extensive, at which time the Penny Ice Cap advanced to its greatest extent since approximately 6000 years B.P. Though the chronology is primarily based on lichenometry, it is substantiated by some C^{14} dates. Csg 1-65.

386. Miller, G.H., 1973: Variations in lichen growth from direct measurements: preliminary curves for Alectoria minuscula from eastern Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 5(4): 333-339.

Direct measurement of thallus area of the subfruticose lichen *Alectoria minuscula* from eastern Baffin Island allows construction of preliminary lichen growth curves for this area. The tracing method of determining thallus diameters is accurate within $\pm$0.5 mm, whereas the photogrammetric method is accurate within $\pm$0.1 mm and is capable of even greater precision. The form of the growth curve for *A. minuscula* is sigmoidal with an average diameter increase ranging from 0.6 to 1.0 mm $year^{-1}$. Previously published curves for this species are similar to the empirically derived curve presented here. There appears to be a decrease in the rate of growth with elevation which underlines the immediate necessity of establishing growth stations in selected localities for areas in which lichenometry is employed. With the accuracy of the photogrammetric technique, growth of even the slowest growing species (i.e., *Rhizocarpon geographicum*) should be detectable within a decade (0.3 mm diameter increase) and within two to three years for faster growing species. Auth.

387. Williams, L.D., 1978: The Little Ice Age glaciation level on Baffin Island, arctic Canada. Palaeogeogr., Palaeoclimatol., Palaeoecol. 25: 199-207.

Mapping of the perennial snow/ice cover which existed on Baffin Island about 300 years ago, by means of light-toned areas of sparse lichen cover visible on satellite photographs, has made it possible to map the Little Ice Age glaciation level (a type of snowline). Comparison with the modern glaciation level (which is 200-200 m higher) is not meaningful, for it is not necessarily in equilibrium with the present climate. However, energy/mass balance modelling gives a 1963-1972 mean "snowline" which roughly approximates the modern glaciation level, and a 1.5°C temperature decrease gives a similarly rough approximation to the Little Ice Age glaciation level. A more important observation, perhaps, is that the Little Ice Age glaciation level dipped westward, and in west Baffin Island and the Melville Peninsula it was only 100-200 m higher than extensive plateaus of the central Canadian arctic west of Baffin Island. This suggests that these plateaus would have been glacierized early in a glacial episode, and early glacierization of the central Canadian arctic (by its effect on atmospheric circulation) has been considered to be important for inception of the North American ice sheet. Auth.

388. Wright, C., 1975: Lichen-free areas an indicators of recent extensive glacierization in north-central Baffin Island, N.W.T., Canada. M.A. Thesis, Univ. Colorado, Boulder, Colorado. 107 p.

RADIOCARBON DATING AND HOLOCENE EVENTS

389. Andrews, J.T. and J.D. Ives, 1978: "Cockburn" nomenclature and the late Quaternary history of the eastern Canadian Arctic. Arctic and Alpine Res. 10(3): 617-633.

A system of end and lateral moraines, extending from near Frobisher, Baffin Island, to the west of the Penny Ice Cap, and roughly parallel to the fiord heads of the northeast coast to Bernier Bay, was identified in the 1960s and given the name "Cockburn end-moraine system." Since then the name "Cockburn" has been used in conjunction with several distinct types of stratigraphic units and landform assemblages. The three main uses are (1) Cockburn end-moraine system, Cockburn moraines, Cockburn Moraine, which are all morphostratigraphic units; (2) Cockburn Stade, which is a geologic-climatic unit; and (3) Cockburn Glacial Phase, which was originally defined as occurring between 8000 and 9000 radiocarbon years ago, and which is, therefore, a chronostratigraphic unit. Thus there is an ambiguity in present usage that has developed over the last 15 yr as knowledge of the glacial morphology and stratigraphy of the eastern Canadian Arctic has expanded. In this paper an attempt is made to reduce this ambiguity by preparing new definitions. Auth.

390. Andrews, J.T., 1976: Radiocarbon date list III, Baffin Island, N.W.T., Canada. Colorado. University. Institute of Arctic and Alpine Research. Occasional Paper No. 21. 47 p.

Eighty-five new radiocarbon dates are described and located for the coast of east Baffin Island between Latitudes 66° and 72° N. The dates are clustered in Cumberland Peninsula and in the area between Cape Henry Kater, Clyde Fiord, and Scott Inlet. The greatest number of samples are on buried soils and/or peats. The majority of these date from the Neoglacial, although a number have ^{14}C ages of between 8,000 to 11,000 BP and one is slightly older than 50,000 BP (probably a minimum age). Marine shells constitute the second major class of sample material. A significant number of these samples date between 35,000 and 48,000 BP with another subset dating between 8,000 and 10,000 BP. Samples are located by (1) 1:250,000 NTS Map Sheet, (2) latitude and longitude, and (3) UTMG reference system. This last method is based on identification within 10 x 10 km grid squares marked on the Canadian 1:250,000 map sheets. The grid location is given by a six-digit reference accurate to ±100 m. This is an easier method for locating sites than latitude and longitude coordinates. Auth.

391. Andrews, J.T., 1969: Importance of the radiocarbon standard deviation in determining relative sea levels and glacial chronology from east Baffin Island. Arctic 22(1): 13-24.

Deals with the problem of error in estimating relative sea levels and glacial chronology in a small area where radiocarbon dates provide some chronological control, but where the precision of radiometric technique does not allow a clear-cut chronology to be developed on that basis alone. An equation is presented to predict postglacial uplift which is defined as the algebraic sum of the elevation of the marine limit and the appropriate eustatic sea level correction. Using the head of Ekalugad Fiord as an example, author constructs postglacial uplift and emergence curves on the basis of the equation, and an equidistant diagram showing possible variation in relative sea level. Results indicate that glaciers lingered in the east and central Baffin Island valleys from 5700 to at least 4350 BP. Data for this study were gathered by Geographical Branch field parties during the Baffin Island Project, 1961-67. AB101812.

392. Andrews, J.T. and J.D. Ives, 1972: Late- and postglacial events (10,000 B.P.) in the eastern Canadian Arctic with particular reference to the Cockburn moraines and break-up of the Laurentide ice sheet. In: Vasari, U., Hyvärinen, and S. Hicks (eds.), Climatic changes in arctic areas during the last ten-thousand years. Acta Universitatis Ouluensis. Ser. A. Sci. rerum naturalium no. 3. Geologica 1: 149-176.

The Cockburn Moraines (morpho-stratigraphic term) of the Canadian Arctic are discussed in terms of their climatic implications at two levels: the first is their place in the late-glacial chronology of eastern Baffin Island, N.W.T.; the second is their relationship on the regional scale to the final disintegration of the Laurentide Ice Sheet and the Cochrane readvance, south of James Bay. In eastern Baffin Island an analysis of 144 radiocarbon dates from coastal sites indicates a marked peak in the number of dates between 8,500 and 7,500 B.P. and a complete absence of any dates between 10,500 and 24,000 B.P. It is now certain that several areas on the outermost coast of eastern Baffin Island were not covered by late-Wisconsin fiord glaciers, so that the

absence of ^{14}C dates in this interval is unusual. In some fiords, dates of deglaciation obtained from marine shells associated with local marine limits do not vary significantly from the fiord head to the mid-fiord areas and this suggests that in places the marine limits of ca. 8,000 B.P. were formed during an extensive transgression that is tentatively related to a readvance of the fiord glaciers during Cockburn time. In certain areas the Cockburn Moraines may even mark the greatest extent of late-Wisconsin ice. It is believed that the readvance is associated with increased precipitation during a general warming phase.

In the regional scheme the rapid disintegration of the Laurentide Ice Sheet by penetration of the sea into Hudson Bay and south to James Bay (at an estimated rate of 16 to 3.2 km yr^{-1}) is temporally (by ^{14}C dates) indistinguishable from the Cochrane and Cockburn readvances. All occurred within a few hundred years, centered on 8,000 B.P. The Cochrane readvance has been physically associated with the encroachment of the Tryell Sea and this hypothesis is attractive. Finally, the considerable difference between the Cochrane readvance, which was the final phase in fluctuations of the southern Laurentide ice margin, and the Cockburn readvance (sensu stricto), which was followed by an extensive period of slow retreat and readvances, is stressed. Auth.

393. Andrews, J.T., J.T. Buckley, and J.H. England, 1970: Late-glacial chronology and glacio-isostatic recovery, Home Bay, east Baffin Island, Canada. Geol. Soc. Amer. Bull. 81: 1123-1148.

Fossiliferous raised marine deposits occur around Home Bay, east Baffin Island, Northwest Territory. We developed a late-glacial chronology on the bases of 32 radiocarbon dates and morphostratigraphic evidence. In addition, the similarity of observed and predicted postglacial emergence curves enabled development of techniques that provided age estimates of marine limits throughout the area, and allowed construction of an isochron map for deglaciation.

Retreat of the fiord glaciers was relatively rapid (average 27 m yr^{-1}) between 10,000 and about 8000 B.P. Evidence for a major readvance of the glaciers about 8000 years ago includes moraines overlying marine clay, elevation of associated raised delta deposits relative to local marine limits, and a prominent and extensive moraine, the Ekalugad Moraine (new name). Related radiocarbon dates are similar in age to the Cockburn Moraine of Arctic Canada. Another moraine, dated about 6800 B.P., is of similar age to the Isortoq Moraine of west Baffin Island. Valley glaciers from the main interior ice sheets were still descending to near sea level only 4500 to 4000 years ago. Disappearance of the interior ice sheet west of Home Bay apparently coincided with, or at least preceded, the growth of the local mountain ice caps.

Marine limit elevations are a function of distance from the continental shelf (a measure of ice thickness) and date of deglaciation; elevations, consequently, incline inland to the outer limit of the Ekalugad Moraine (from 40 m to a maximum of 91 m) and then decline inland, thus reflecting the slow deglaciation and the importance of restrained rebound. Isobases are oriented from 140° to 320°. Glacio-isostatic recovery has led to the warping of former marine planes. Maximum tilt on the oldest strandline (8600 years old) is 1.8 m km^{-1}. Auth.

394. Andrews, J.T. and G.H. Miller, 1972: The Quaternary history of northern Cumberland Peninsula, east Baffin Island, N.W.T. Part X: Radiocarbon date list. Arctic and Alpine Res. 4(3): 261-277.

Fifty-two radiocarbon dates are reported on samples from Cumberland Peninsula and the sites, material, and significance of these deposits are discussed. The dates refer to sites between 66 and 69°N. A map of site locations is included. Auth.

395. Andrews, J.T., 1975: Radiocarbon date list II from Cumberland Peninsula, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 7(1): 77-91.

Forty-two radiocarbon dates on marine shells, bone, peats, buried soils, and marine algae from sites between southern Cumberland Peninsula and Cape Hooper are reported. A map of site location is included. Auth.

396. Andrews, J.T. and L. Drapier, 1967: Radiocarbon dates obtained through Geographical Branch field observations. Geogr. Bull. 9(2): 115-162.

Radiocarbon dates are given for samples obtained mainly in the N.W.T., and including some from eastern Baffin Island, during the period 1950-1966. Includes descriptions of samples and sampling sites. Gss 1-1.

397. Blake, W., Jr., 1966: End moraines and deglaciation chronology in northern Canada, with special reference to southern Baffin Island. Can. Geol. Surv. Pap. 66-26. 31 p.

Reports first accurate mapping of a 325 mi. long end moraine system, crossing Frobisher Bay. Another end moraine crossing Foxe Peninsula is thought to correlate with it. C-14 dates indicate that some segments of the Frobisher Bay system were forming about 8,200 BP and continued to form for several hundred years. AB94066.

398. Bryson, R.A., W.M. Wendland, J.D. Ives, and J.T. Andrews, 1969: Radiocarbon isochrones on the disintegration of the Laurentide Ice Sheet. Arctic and Alpine Res. 1(1): 1-14.

The last great event of the Wisconsin Glacial Stage in North America was the disintegration of the Laurentide Ice Sheet. This occurred between 13,000 and about 5,000 years ago and had a profound effect upon the paleogeography of the continent. Analysis of present-day distribution of fauna and flora, the archaeological record, and climatic and sea-level fluctuations are intimately bound up with ice sheet disappearance, yet there has been no systematic attempt to utilize existing radiocarbon and geological data to attempt a plot of the ice sheet perimeter at specific intervals through time. The present paper makes this attempt in the form of two maps (Figures 1 and 2), the first being an objective portrayal of isolines drawn on the radiocarbon data, the only assumption being that the ice sheet perimeter tended to parallel the coastline or, more particularly, the trend of the outer edge of the continental shelves and the southern limit of Wisconsin till on land; the second map is a subjective interpretation of the first based upon geologic field evidence and the climatic and geomorphic

intuition of the writers. Some of the immediate implications raised by the maps are discussed and a series of significant conclusions are derived: (1) The northern limit of the Laurentide Ice Sheet proper was close to the arctic mainland coast of Canada. (2) There was a dramatic change from an east-west ice barrier near latitude 60°N in late-glacial time, to a broad low corridor from the Arctic Ocean to the Great Plains in Boreal time. (3) The Laurentide Ice Sheet retained its identity as a distinct unit until about 8,400 years BP (Cockburn Stade) and had catastrophically disintegrated during Atlantic time, within a few centuries of 8,000 years BP. (4) The three remaining ice remnants centered over Keewatin, Labrador-Ungava, and Foxe Basin-Baffin Island persisted through the Atlantic climatic episode (altithermal), that on Baffin Island surviving to the present day in the form of the Barnes Ice Cap. Auth.

399. Buckley, J.D., M.A. Trautman, and E.H. Willis, 1968: ISOTOPES' radiocarbon measurements. VI. Radiocarbon 10(2): 246-294.

Includes dates for wood, peat, organic debris, mosses or other plants from seven samples in a permafrost tunnel at Fairbanks, two from Fox 10 mi. north and six from the Barrow region in Alaska; also dates for elephant tusk, wood and charcoal from northern British Columbia; eight for shells or peat at various localities on Baffin Island; and for archeological samples from the Alaska Peninsula, northern Manitoba, Mackenzie, and Keewatin Districts and Victoria Island. AB102627.

400. Craig, B.G., 1965: Notes on moraines and radiocarbon dates in northwest Baffin Island, Melville Peninsula, and northeast District of Keewatin. Can. Geol. Surv. Pap. 65-20. 7 p.

A linear belt of end moraines lies, both spatially and chronologically, midway in the sequence of deglaciation in the 400,000 mi^2 northwest quadrant of the area covered by the Wisconsin Laurentide Ice Sheet. This study presents nine new radiocarbon dates bearing on the age of these moraines, and offers a somewhat different interpretation of their significance in the deglaciation of the area from that given by G. Falconer and others, qv. C14 dates suggest the formation of these so-called Cockburn moraine segments no more than 9,000 yrs. BP, though their distribution is inadequate for reconstruction of an ice marginal position on Melville Peninsula. AB86327.

401. Crane, H.R. and J.B. Griffin, 1966: University of Michigan radiocarbon dates XI. Radiocarbon 8: 256-285.

Reports the ages of 14 samples from northeastern Greenland (72°15' N 24°15' W), which provide information for establishing glacial chronology and determining the rate and amount of local crustal uplift (p. 259-261) and of ten archeologic samples from various sites in southern Baffin Island (p. 274-279). AB94685.

402. Dyck, W., J.G. Fyles, and W. Blake, Jr., 1965: Geological Survey of Canada radiocarbon dates, IV. Radiocarbon 7: 24-46.

Includes measurements from Baffin, Ellesmere, Axel Heiberg, Bathurst, Prince of Wales, Victoria and Banks Islands, the District of Mackenzie,

Yukon Territory and Hawley Lake bog, Ontario. AB95022.

403. Dyck, W., J.A. Lowdon, J.G. Fyles, and W. Blake, Jr., 1965: Geological Survey of Canada radiocarbon dates, V. Radiocarbon 8: 96-127. Reprinted as Can. Geol. Surv. Pap. 66-48.

The sections on northern Canada (p. 114-124) include measurements of 12 samples from Yukon Territory, 12 from the Northwest Territories, one from Eric Cove, northern Quebec, six from Baffin Island, two from Somerset Island, five from Bathurst Island, three from Prince Patrick Island, and one each from Victoria and Banks Islands. AB95023.

404. Dyke, A.S., 1974: Deglacial chronology and uplift history: northeastern sector, Laurentide Ice Sheet. Colorado. University. Institute of Arctic and Alpine Research. Occasional Paper No. 12. 113 p. (Also: M.Sc. Thesis, Univ. Colorado, Boulder, Colorado.)

405. Falconer, G., J.D. Ives, O.H. Løken, and J.T. Andrews, 1965: Major end moraines in eastern and central arctic Canada. Geogr. Bull. 7(2): 137-153.

Describes a 2000 km long system of end moraines, identified by 1961-1964 field study and from air photographs. It runs parallel to the northeast coast of Baffin Island about along the line of the fiord heads; it extends down the west coast of Melville Peninsula and across northern Keewatin and marks the edge of a Wisconsin ice sheet that was centered over Foxe Basin and Hudson Bay 8000-9000 yr ago. The half dozen units of the system are described and related radiocarbon dates are discussed. The various members could be considered as approximately contemporaneous, and the name Cockburn Moraine System is suggested; the name Cockburn Phase is proposed for an important glacial phase in the late-Wisconsin history of Canada. Comments of B.G. Craig qv. on the Cockburn Phase are criticized. AB86902.

406. Falconer, G., J.T. Andrews, and J.D. Ives, 1965: Late-Wisconsin end moraines in northern Canada. Sci. 147: 608-610.

Reports a system of end moraines nearly 2240 km long identified by field investigation and aerial photography. It extends through northeastern Keewatin, Melville Peninsula, Baffin Island, and marks the border of a late-Wisconsin ice sheet over Foxe Basin and Hudson Bay eight-nine thousand years ago. AB86901.

407. Ives, J.D., 1964: Deglaciation and land emergence in northeastern Foxe Basin, N.W.T. Geogr. Bull. 21: 54-65.

Preliminary report on 1961 field work, supplemented by findings of Sim, Ives, and Andrews, dealing with the glacial geomorphology of western Baffin Island between Longstaff Bluff and Steensby Inlet, 68°55' N 75°07' W-70°15' N 78°35' W. Late-glacial marine submergence ranged 315-345 ft. Five collections of marine molluscs between 290 and 30 ft above sea level yielded radiocarbon ages ranging from 6725 $\pm$ 250 yrs to 2050 $\pm$ 170 yrs, permitting construction of an uplift curve similar to others from Canada and Greenland. Age of max marine submergence in this region, 6725 $\pm$ 250 yrs, is recent

compared with that found elsewhere in Canada. Geomorphological studies revealed glacial outwash at various levels below the marine submergence limit, indicating that Baffin Island inland ice penetrated a high-level Foxe Basin more recently than 6725 yr ago. At least 30 ft of land uplift occurred in the last 2000 yr, and is probably taking place today. AB88191.

408. King, C.A.M. and J.T. Buckley, 1967: The chronology of deglaciation around Eqe Bay and Lake Gillian, Baffin Island, N.W.T. Geogr. Bull. 9(1): 20-32.

Traces stages of deglaciation in this area by means of glacial-marine deltas which link the ice front positions with sea level. The marine limit had a height of 95 m along the northern sector of the coast; it slopes northeastward at 0.6 m/km. The sea entered Lake Gillian until about 5,200 yr ago when sea level fell below 56 m. Within the lake basin the deltas become progressively lower and younger upstream, providing evidence of the later stages of deglaciation. AB96749.

409. Lowdon, J.A. and W. Blake, 1968: Geological Survey of Canada radiocarbon dates, VII. Radiocarbon 10(2): 207-245. Also pub. as: Can. Geol. Surv. Pap. 1968-2B.

Includes, p. 228-243, some 19 dates for wood, peat, silt, gyttja, charcoal and ash from various sites in Yukon Territory; eight for shells for various localities in Northwest Territories; five for shells or organic debris in Northern Quebec and Labrador; 12 for shells or organic debris from Baffin Island; two for whalebone and shells from Ellesmere; and 14 for shells or organic debris from Bathurst, Melville and other Queen Elizabeth Islands. AB105439.

410. Lowdon, J.A., R. Wilmeth, and W. Blake, Jr., 1969: Geological Survey of Canada radiocarbon dates, B. Radiocarbon 11(1): 22-42. Also pub. as: Can. Geol. Surv. Pap. 69-2B.

Includes dates for charcoal or bone from archeological sites in British Columbia at 55°15'N 127°36'W, Porcupine River bank in Yukon Territory, Sugluk, Baffin, Victoria and Banks Islands, and at the Punyik Pt. site in the Brooks Range of Alaska. AB105421.

411. Miller, G.H., 1975: Glacial and climatic history of northern Cumberland Peninsula, Baffin Island, Canada, during the last 10,000 years. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado. 253 p.

Page 2121 in Vol. 36/05-B of Dissertation Abstracts International. Order No. 75-23623.

412. Miller, G.H., 1978: Glaciation and relative sea level movements, Hall Peninsula, southern Baffin Island, Canada. Geol. Soc. Amer. Abstracts with Programs 10(7): 457.

413. Miller, G.H., comp., 1979: Radiocarbon date list IV: Baffin Island, N.W.T., Canada. Colorado. University. Institute of Arctic and Alpine Research. Occasional Paper No. 29. 61 p.

Site descriptions and locations are presented for 79 radiocarbon dated samples from Baffin Island, N.W.T., Canada, that have not been reported in previous date lists (Andrews and Drapier, 1967; Andrews and Miller, 1972; Andrews, 1975; Andrews, 1976). The samples were collected from eastern and central Baffin Island between latitudes 62 and 72° N and longitudes 61 and 76° W. The largest percentages of dates are from sites on northern Cumberland Peninsula, Cumberland Sound and Frobisher Bay. The dates are nearly evenly divided between marine shells and plant remains, plus three dates on whale bone. Most of the shell dates fall between 8000 and 11,000 BP with an additional group between 44,000 and 51,000 BP, reflecting the predominance of marine deposits in these time ranges. The list includes multiple dates on successive leaches of a single shell collection, inter-laboratory checks and organic/inorganic carbon comparisons. Dates on plant remains are more varied and range between 0 and 10,000 BP with an additional group between 38,000 and 50,000 BP.

The dates are presented by geographic location using the 1:250,000 Canadian NTS map series. Individual samples are located both by latitude and longitude as well as the 10 x 10 km UTMG grid system. In all cases, locations are based on the most recent issue of the 1:250,000 map series. Grid locations are given by a pair of three digit figures, the first referring to 10^2 m eastings, the latter to 10^2 m northings. A separate listing of dates in chronological order is also provided. Auth.

414. Stuckenrath, R., Jr., G.H. Miller, and J.T. Andrews, 1979: Problems of radiocarbon dating Holocene organic-bearing sediments, Cumberland Peninsula, Baffin Island, N.W.T., Canada. Arctic and Alpine Res. 11(1): 109-120.

In 1973, several samples of buried organic-bearing sediments were collected from beneath and within the "layered sands" of Pangnirtung Pass and the Padle/Kingnait Pass, eastern Baffin Island, N.W.T. Radiocarbon dates on some samples yielded apparent ages in conflict with their stratigraphic position, and it was clear that contamination was present within these well-drained sediments. In 1974, three sites were revisited and larger (> 3000 g) samples were collected. Organic content varied between 2.5 and 8.2% by weight. We report the results of 28 individual age determinations, stratified according to (1) different laboratory preparations, (2) different size fractions of the organic materials, and (3) different NaOH solubility fractions. Statistical analysis of these data indicated that in no instance could we reject a null hypothesis, and hence no statistically significant trends could be outlined. Differences in age within a sample varied between 720 and 1245 yr. We suggest that the most reliable fraction for dating these sediments is the < 125-μm organic fraction which is insoluble in NaOH. However, the > 125-μm NaOH-insoluble fraction gave ages consistently younger than in the < 125-μm NaOH-insoluble fraction. These age differences might be associated with a soil residence time for the finer fraction. Auth.

415. Stuckenrath, R., Jr., W.R. Coe, and E.K. Ralph, 1966: University of Pennsylvania radiocarbon dates, IX. Radiocarbon 8: 348-385.

Reports ages of a series of seven samples from Boreal archaic sites along the southern coast of Labrador, Strait of Belle Isle (p. 360-361), seven samples from pre-Dorset and Dorset occupations at six sites on

Baffin Island (p. 362-363), and of 40 samples representing sites on Kotzebue Sound, Cape Prince of Wales, Cape Krusenstern, NW Alaska and Kodiak Island (p. 263-269). AB100451.

416. Stuiver, M., 1969: Yale natural radiocarbon measurements 9. Radiocarbon 11(2): 545-658.

Includes dates for shells from various sites on Tingin Fiord, Cape Hooper, Kangok Fiord, Loozie Bay, Cape Henry Kater, Cape Christian, Cape Aston and Middle Ingsuin Fiord of eastern Baffin Island; for charcoal from an archeological site 2 mi south of the head of Deception Bay in Northern Quebec; shells from four sites on raised beaches of Devon Island; for wood, peat, and various organic layers in terminal moraines, outwash bodies, bogs or loess near Kaskawulsh, Donjek and Fox-Hazard Glaciers, Silver and Outpost Creeks, or Kluane Lake, NE and N flank of the St. Elias Range in Yukon Territory; for peat and shells from Mesters Vig in East Greenland; for organic matter, wood and moss in a series of samples from White River valley, N flank of the Wrangell and St. Elias Mts. in Alaska; for mud or peat from St. Paul and St. George Islands; peat from Imuruk Lake, Seward Peninsula, and wood and peat from a permafrost sea cliff at Elephant Pt., Kotzebue Sound in Alaska. AB107631.

417. Trautman, M.A. and E.H. Willis, 1966: Isotopes Inc. radiocarbon measurements, V. Radiocarbon 8: 161-203.

Includes 22 samples from various sites in Alaska (p. 161-166), 10 samples from North Greenland (p. 176-179), 44 samples from Baffin Island (p. 180-187), and four samples from the Churchill River series, Labrador (p. 187-188). AB100752.

AMINO ACID METHOD AND PLEISTOCENE EVENTS

418. Andrews, J.T. and G.H. Miller, 1975: Alternative models for the Quaternary glacial chronology of the eastern Canadian Arctic; facts and fancies. In: Mahaney, W.C. (ed.), Quaternary stratigraphy symposium, Toronto, May 23-25, 1975, p. 12-16. Abstract.

419. Andrews, J.T., R.W. Feyling-Hanssen, G.H. Miller, C. Schlüchter, M. Stuiver, and B.J. Szabo, 1976: Alternative models of early and middle-Wisconsin events, Broughton Island, Northwest Territories, Canada: Toward a Quaternary chronology. In: Easterbrook, D.J. and V. Sibrava (eds.), IUGS-UNESCO Int. Geol. Correlation Program Project 73-1-24, "Quaternary glaciation in the northern hemisphere." Report No. 3. Bellingham/Washington/Prague, p. 28-61.

420. Andrews, J.T., 1974: Cainozoic glaciations and crustal movements of the Arctic. In: Ives, J.D. and R.G. Barry (eds.), Arctic and Alpine Environments. London, Methuen, p. 277-317.

The subject matter included within Cainozoic glaciations and crustal movements of the Arctic is immense both in terms of the area covered and the period of time under review. These practical difficulties are heightened

and aggravated by an overall sparsity of data and widely divergent theories, not to mention the fact that approximately half the land area lies in the USSR (fig. 6A.1) and much Russian literature is not readily accessible to Western scientists. With these provisos the scope of this chapter can be briefly outlined.

The story does not open at the Pliocene/Pleistocene boundary because it is becoming increasingly evident that glaciation in many areas preceded this time line. Consequently the first concern is with the tectonic events of the Tertiary and the arrangement of the landmasses relative to each other and to the position of the rotational pole. Miocene glaciations are then discussed together with a consideration of the causes of the glacial/interglacial periodicities that characterize the Quaternary proper. The actual number and timing of these events is then taken up largely through the detailed stratigraphic records that have been deciphered in Alaska and Siberia and from ocean cores. A more detailed treatment of events is possible for the last glacial stage - the Wisconsin or Würm. Glacials and interglacials involve a mass transfer of ice/water in response to the build-up and removal of loads. The response of the arctic regions to glacio-isostatic and eustatic crustal movements are elaborated and used to locate the main centres of glaciation in the region. Author's introduction.

421. Andrews, J.T., S. Funder, C. Hjort, and J. Imbrie, 1974: Comparison of the glacial chronology of eastern Baffin Island, East Greenland, and the Camp Century accumulation. Geology 2(7): 355-358.

Independently derived glacial chronologies from eastern Baffin Island, Canadian Arctic, and from East Greenland show essentially similar glaciologic trends that are notably different from the response of the southern margins of the Laurentide and Fennoscandia Ice Sheets. The critical aspects of both chronologies and the related extent of the ice sheets are: 1) an early and maximum glacial stade, during the early phase of the last glaciation, reaching its peak about 100,000 to 75,000 yr ago; 2) in interstadial about 70,000 B.P.; 3) an ice advance peaking about 45,000 yr ago; 4) an interval about 40,000 to 11,000 yr ago of restricted ice extent; and 5) a late glacial stadial between 11,000 and 8,000 B.P. This record shows basic agreement with a chronology of snow accumulation at the Camp Century ice core site based on a revised chronostratigraphic interpretation. Fluctuations in sea level between 120,000 and 70,000 B.P. may well be related to glacierization of high arctic land masses under conditions of heavy snowfall. The subsequent reduction of accumulation in these high arctic areas then leads to a reduction of ice volume with a dry, cold interstadial correlative in time with the 'classical' Wisconsin ice advance along the southern margins. The late glacial advance of both eastern Baffin Island and East Greenland, which extended into Holocene time, represents a brief return to high accumulation rates as the global circulation changed from a glacial to an interglacial mode. Auth.; GA 74A/1846.

422. Andrews, J.T., 1968: Late-Pleistocene history of the Isortoq Valley, north-central Baffin Island, Canada. In: Melanges de Géographie offerts à M. Omer Tulippe 1: 118-133.

Detrital plant beds situated around the perimeter of the Barnes Ice Cap record an ice-free interval on Baffin Island that is dated as > 42,000 BP. These deposits are assigned to the Flitaway Interglacial. During

this stage July temperatures were approximately 5° C warmer than today. The succeeding glacial stage, the Foxe Glaciation, possibly originated on the central plateau of the island but at the maximum ice moved east and west from a center over Foxe Basin. A possible interstadial, the Steensby, may have occurred approximately 30,000 years ago, although the evidence is slight and conflicting. Within the last 8,300 years 7 glacial substages are recognized of which the first, the Cockburn-McAlpine, occurred outside the field area and marks the perimeter of an ice cap with a 1,000 km radius. Rapid disintegration of the ice resulted in an open Foxe Basin about 6,700 years ago. From that time to the present the western margin of the Baffin Island Ice Cap retreated slowly but at least six distinct readvances are recognized within the Isortoq Valley. This history contrasts with other evidence from arctic Canada which indicates more favourable conditions in the period 5,000 to 7,000 years ago. Auth.

423. Andrews, J.T., P.E. Hare, W. Isherwood, D.R. Pheasant, and B. Szabo, 1973: Location, extent, nature, and age of raised marine deposits in eastern Baffin Island, N.W.T., > 20,000 B.P. Symposium on the Geology of the Canadian Arctic, May 23-26, 1973, University of Saskatchewan, Saskatoon, Canada. Programs and Abstracts, p. 2.

424. Andrews, J.T., B.J. Szabo, and W. Isherwood, 1975: Multiple tills, radiometric ages, and assessment of the Wisconsin glaciation in eastern Baffin Island, N.W.T., Canada: a progress report. Arctic and Alpine Res. 7(1): 39-59.

Between Narpaing and Quajon fiords, wavecut cliffs expose three glacial and three marine units. An upper till, Kivituiba'k Till, overlies marine unit 3 with shells that have a ^{230}Th and ^{231}Pa date of 137,000 $\pm$ 12,000 years and a ^{230}Th date of 100,400 $\pm$ 6,400 years. The marine unit 3 outcrops at 15 m above present sea level (a.s.l.) and is marked by an impoverished fauna with very thick shells, indicating that the marine sediments were deposited during the onset of glaciation as the ice load isostatically depressed the crust. The middle till, the Narpaing Till, overlies the marine unit 2. Marine unit 2 contains a wider diversity of thinner shell species and it outcrops 10 m a.s.l. No radiometric date is yet available on the marine unit 2. The Kangeek Point Till is the lower and oldest till; it was deposited during a considerably more extensive glaciation and overlies marine unit 1.

A review of other published dates > 20,000 BP (42 in total) and the stratigraphic setting suggest that the local glacial chronology of the Narpaing/Broughton Island area has general applicability elsewhere along the 1,200-km northeastern margin of the Laurentide ice sheet, at least as a model for further testing and refinement. Auth.

425. Andrews, J.T. and G.H. Miller, 1976: Quaternary glacial chronology of the eastern Canadian Arctic: a review and a contribution on amino acid dating of Quaternary molluscs from the Clyde cliffs. In: Mahaney, W.C. (ed.), Quaternary stratigraphy of North America. Stroudsburg, Penn., Dowden, Hutchinson and Ross, Inc., p. 1-32.

The eastern Canadian Arctic represents both a sensitive and stable area located along the northeastern margin of the Laurentide Ice Sheet. Isochrones on deglaciation show the Laurentide Ice Sheet retreating in

general to the northeast so that the last major residual ice mass lay over Baffin Island by 6700 BP. In contrast, extensive lichen-free areas on the interior plateaux testify to a major permanent snowcover during the Little Ice Age. The Quaternary stratigraphy and glacial chronology is based on a number of different approaches including relative weathering, depth of soil formation, C^{14} and U-series ages and amino acid diagenesis. Excellent but complex stratigraphy is exposed along many of the outer forelands of eastern Baffin Island. These sections vary between 10 and 50 m in height and show a sequence of glacial tills, glacio-marine units and terrestrial organic peats and mucks. Radiocarbon and U-series dates on the uppermost marine sediments are $\geq$ 40,000 BP indicating that significant areas of the outer coast were ice free during the last glaciation.

The use of amino acid diagenesis as a dating tool is illustrated from two sections along the Clyde Cliffs. The results are for the marine bivalve *Hiatella arctica* Linné and include the ratio of alloisoleucene to isoleucene for both the breakdown to free amino acids and the racemization from "L" to "D" isomers. Results indicate the usefulness and stratigraphic integrity of the allo-iso ratios. A site with a fauna including *Chlamys islandicus* has been radiocarbon dated at 40,000 $\pm$ 1700 BP and has an allo/iso (free) ratio of 0.24. This is similar to the ratio from shells at the type section for the Quajon Interstade which contains the same fauna and a U-series age of 59,000 $\pm$ 9000 BP. At two sections only 4 km apart but separated by a major river, the amino acid ratios indicate that a correlation based on a position would be incorrect with amino acid ratios (free) close to 0.9 on the upper fossiliferous units in one section and about 0.58 for a complex sequence in the upper part of the adjoining cliff some 4 km distance. The technique of amino acid diagenesis offers to be an invaluable tool in the correlation from section to section along most of the eastern coast of Baffin Island, a distance of 1200 km. "Absolute" ages may be derived after a series of heating experiments, currently underway, are completed. Auth.

426. Andrews, J.T. and G.H. Miller, 1978: Was there a Late-Wisconsin Laurentide Ice Sheet? AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 157.

427. Andrews, J.T., 1973: The Wisconsin Laurentide Ice Sheet: dispersal centers, problems of rates of retreat, and climatic implications. Arctic and Alpine Res. 5, Pt. 1(3): 185-199.

Isochrone maps on the late Wisconsin deglaciation of the Laurentide ice sheet enable estimates to be made of changes in the volume and area of the ice sheet. The average marginal recession between 12,000 and 7,000 BP is estimated as 260 m $year^{-1}$ and varies little between the northwest and southern margins. The northeastern margin retreated at 20 m $year^{-1}$ and the overall tendency was for the Laurentide ice sheet to migrate toward Baffin Island. Vertical mass loss required to produce marginal retreat of over 200 m $year^{-1}$ indicates values between 10 and 50 m of vertical ice wastage per year. Consideration of atmospheric energy sources provides approximate ablation season inputs of 60, 14, and 6 kcal $\cdot$ cm^{-2} $\cdot$ $year^{-1}$ for the south, northwest, and northeast margins compared to required totals of 72 to 360, 72 to 360, and 8 to 16 kcal $\cdot$ cm^{-2} $\cdot$ $year^{-1}$, a deficiency in the energy sources by a factor of between 1 and 17.

Attention is directed to the great extent of lacustrine and marine environments during deglaciation so that extensive sectors of the Laurentide ice sheet terminated in water; calving is considered the most likely additional ablation process that would explain both the high rates of marginal retreat and the lack of difference in retreat rates of margins at 72°N and 45°N.

Large end moraines are commonly interpreted as the response of an ice sheet to climatic change; however, the ice sheet responds to climate through the associated mass balance fluctuations. Major end moraines within the borders of the Laurentide ice sheet are frequently preserved immediately above the local marine limit or glacial lake level, suggesting that moraines may be caused by a lag in response of the ice sheet to the reduction in frontal calving, thus resulting in a limited readvance or stillstand Such moraines are not associated with climatic change. Auth.

428. Blake, W., Jr., 1976: Glacier ice cores, climate, and chronology around northern Baffin Bay. AMQUA 4th Biennial Meeting, Arizona State Univ., Tempe, Arizona, Abstracts, p. 20-21.

429. Brigham, J.K., 1979: Amino acid geochronology of Quaternary glaciomarine sediments, Broughton Island, S.E. Baffin Island, N.W.T., Canada. Geol. Soc. Amer. Abstracts with Programs 11(7): 394.

430. Craig, B.G. and J.G. Fyles, 1960: Pleistocene geology of arctic Canada. Can. Geol. Surv. Pap. 60-10. 21 p.

Contains a preliminary account, treating some areas and some parts of the record in greater detail, and omitting the Cordillera entirely. Two, perhaps three, glaciations are recognized; the interglacials are little known. Three principal ice-sheets or glacier complexes, partly coalesced at the maximum stand of the Wisconsin glaciation, are mapped. Significance of glacial features of the Wisconsin Laurentide ice-sheet, its pattern of deglaciation, and such associated features as glacial lakes and sea-level changes are discussed. Available radiocarbon data indicate that deglaciation of northern North America took place at about the same time as the retreat of the ice-sheet from southern Canada, about 7,000 yrs. B.P. AB64023.

431. Davis, P.T., W.W. Locke, III, G.H. Miller, and A. Nelson, 1976: Quaternary geology, Baffin Island. AMQUA 4th Biennial Meeting, Arizona State Univ., Tempe, Arizona, Abstracts, p. 101.

432. Dugdale, R.E., 1972: The Quaternary history of the northern Cumberland Peninsula, Baffin Island, N.W.T., Part III. The late glacial deposits of Sulung Valley and adjacent parts of the Maktak Narpaing trough. Can. Jour. Earth Sci. 9(4): 366-374.

Four moraines, including a lateral moraine of a major outlet glacier and three end moraines in corries, are recognized and dated as follows:
Lateral moraine = 43,000 ± years B.P.
Corrie moraines = 35,000 ±, 23,000 ±, and 12,500 ± years B.P. --Gsg 1-48.

433. Dyke, A.S., 1979: Glacial and sea-level history of southwestern Cumberland Peninsula, Baffin Island, N.W.T., Canada. Arctic and

Alpine Res. 11(2): 179-202.

Southwestern Cumberland Peninsula has been glacierized at various times by eastward flowing Laurentide ice, by an expanded Penny Ice Cap, and by fiord and valley glaciers fed from cirques. Two major weathering zones (A and B) and a fivefold subdivision of the younger zone (A) are recognized. The zone boundaries are marked by end and lateral moraines, some of which are related to raised marine deltas. Radiocarbon dates and amino acid age estimates on fossils from these deltas and correlations with the stratigraphic record of northern Cumberland Peninsula allow establishment of a tentative "absolute" chronology.

The oldest terrain is that glaciated before the last interglaciation. The last glaciation is subdivided locally into the Duval, Outer Usualuk and Ranger stades, named for the end and lateral moraines which mark their maximum extents. During the Duval Stade (ca. 100,000 to 60,000 yr BP), Laurentide ice filled the inner one-third of Cumberland Sound and ice from local sources filled Pangnirtung and Kingnait fiords. Relative sea level was 100 m above present at the ice margin (Duval marine limit). Retreat from the Duval stadial maximum was followed by a readvance of Laurentide ice and by coastal emergence. Much of the area was glacierized during the Outer Usualuk Stade (ca. 40,000 yr BP?) when relative sea level was 108 to 120 m above present at the ice margin (Shark marine limit). Retreat was followed by coastal emergence. During the Ranger Stade, Laurentide ice reached the head of Cumberland Sound and coalesced with the western lobe of the Penny Ice Cap, and outlet glaciers from the southern part of the ice cap reached 20 km beyond their present positions. General deglaciation from the Ranger stadial maximum and coastal emergence from the Holocene marine limit began about 8700 yr BP. Relative sea level at the Laurentide margin at that time was 88 m above present. During an early Holocene warm interval, Penny outlet glaciers receded rapidly and were at or behind their present margins by 7000 yr BP. The Laurentide ice retreated much more slowly, forming eleven recessional moraines before it uncovered the head of Clearwater Fiord at 5700 yr BP. The lowland between the head of Cumberland Sound and Foxe Basin was deglaciated between 7000 and 5700 yr BP by an eastward calving bay. After separation from Laurentide ice, the western lobe of the Penny Ice Cap readvanced about 4500 yr BP to form the Outer Penny Moraine. This was followed by recession during a warm interval which was followed in turn by several smaller advances.

The Holocene marine limit forms a synchronous strandline declining beyond the Ranger Moraine and intersects present sea level about 100 km beyond the Laurentide margin. Behind the Ranger Moraine it is a metachronous feature which dips in the opposite direction. All dates can be fitted to a series of relative sea level curves, that show glacioisostatic emergence at the head of Cumberland Sound grading to submergence at the mouth of the Sound. The zero isobase on emergence has migrated about 100 km westward since 8700 yr BP. Auth.

434. Dyke, A.S., 1977: Quaternary geomorphology, glacial chronology, and climatic and sea-level history of southwestern Cumberland Peninsula, Baffin Island, Northwest Territories, Canada. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado. 207 p.

Page 5818 in Vol. 38/12-B of Dissertation Abstracts International. Order No. 78-08895.

435. England, J.H. and J.T. Andrews, 1973: Broughton Island - a reference area for Wisconsin and Holocene chronology and sea level changes on eastern Baffin Island. Boreas 2(1): 17-32.

Broughton Island is 50 km from the eastern margin of the 6,000 km^2 Penny Ice Cap. During the early Wisconsin (> 54,000 BP) Broughton Island was only partly glaciated; sea level at that time was ca. +72 m. A younger glacial readvance is delimited by lateral moraines and glacio-marine deposits ^{14}C dated at 24,100 $\pm$ 850 BP; sea level was +18 m. During the last Wisconsin the glaciers terminated some distance inland from Broughton Island and sea level at 9,850 $\pm$ 250 BP was +5 m on Broughton Island. The head of Maktak Fiord, which presently contains a major outlet glacier from the Penny Ice Cap, was deglaciated about 6,000 BP. Auth.

436. Flint, R.F., 1951: Highland centers of former glacial outflow in northeastern North America. Geol. Soc. Amer. Bull. 62: 21-37.

Review of published literature indicating several highland regions which had local glaciers preceding and following the Laurentide ice sheet of the last ice age. Included are notes on Quebec and central Labrador, the coastal mountains of Labrador and the eastern Canadian Arctic. AB21848.

437. Flint, R.F., 1952: The ice age in the North American Arctic. Arctic 5(3): 135-152.

Contains remarks on the glacial and interglacial ages together constituting the Pleistocene epoch inaccurately termed the "ice age." Then follow sections on evidence of glaciation; distribution and types of former glaciers; growth and disappearance of glaciers; evidence of repeated glacial ages; glacial lakes; the post-glacial sea and rise of the land; chronology and causes of glaciation; glaciation and life. AB21849.

438. Funder, S., C. Hjort, and J.T. Andrews, 1974: Glacial chronology of Baffin Island, East Greenland, and Camp Century, discussion and reply. Geology 2(11): 522.

Discussion (by Funder and Hjort) of paper published by Andrews, J.T.; Funder, S.; Hjort, C.; and Imbrie, J.; for reference see Geology 2(7): 355-358.

439. Goldthwait, R.P., 1951: Deglaciation of north-central Baffin Island. Geol. Soc. Amer. Bull. 62: 1443-1444.

Abstract of paper submitted at the Society's meeting, Detroit, Nov. 8-11, 1951. AB22153.

440. Haselton, G.M., 1969: Recent history of glaciation in northeastern Baffin Island, Canada. Abstract. South Carolina Acad. Sci. Bull. 31: 54.

441. Ives, J.D., 1974: Biological refugia and the nunatak hypothesis. In: Ives, J.D. and R.G. Barry (eds.), Arctic and alpine environments. London, Methuen & Co. Ltd., p. 604-636.

442. Ives, J.D., 1963: Field problems in determining the maximum extent of Pleistocene glaciation along the eastern Canadian seaboard, a geographer's point of view. In: Löve, Á. and D. Löve (eds.), North American biota..., p. 334-354.

Discusses physical conditions of area as four sectors: maritime Newfoundland, Labrador, Baffin Island, and Devon-Ellesmere. Climate, type of coast, rock types, and other features are considered. Available evidences of glaciation in Labrador and elsewhere are presented, and correlated with Baffin Island. Conclusion is drawn that large areas in northern Labrador and Baffin remained ice-free at the maximum of the last glaciation (Wisconsin). Wide areas of the high Arctic may have been covered by only thin, stagnant ice. AB79716.

443. Ives, J.D., 1978: The maximum extent of the Laurentide Ice Sheet along the east coast of North America during the last glaciation. Arctic 31(1): 24-53.

During the last hundred years, two widely opposing views of the maximum extent of the Laurentide Ice Sheet have prevailed at different times. Between 1860 and 1940, it was assumed that ice extent along the eastern seaboard was limited and that ice-free areas persisted during the Maximum of the Last Glaciation. After 1940, this interpretation was replaced by one contending that all high coastal mountains were inundated. This view, proposed by the late R.F. Flint, was widely accepted as fact until the last few years. This paper reviews the opposing interpretations and analyses the frequently equivocal field evidence and the developments of thought responsible for them. On the basis of field work carried out over the last twenty years, it is suggested that the earlier viewpoint was the more accurate. A map is presented of the author's conclusions regarding maximum ice limits. Auth.

444. Ives, J.D. and H.W. Borns, Jr., 1971: Thickness of the Wisconsin Ice Sheet in southeast Baffin Island, arctic Canada. Zeits. Gletscherkd. Glazialgeol. Bd. VII, Heft 1-2: 167-174.

Geological and biological controversy over the Nunatak Hypothesis has continued for nearly a hundred years mainly because of dependence upon subjective and equivocal evidence. The Cape Dyer area of southeast Baffin Island is composed of distinctive suites of bedrock, particularly a Tertiary volcanic sequence overlying Precambrian granitic gneisses whose distribution provides definite evidence that the upper limit of Wisconsin ice near the outer coast did not exceed 620 m above present sea level. The general area of eastern coastal Baffin Island is recommended as a vital area for botanical investigations aimed at contributing to the location and history of possible plant refugia during the Wisconsin glaciation. Auth.

445. King, C.A.M., 1969: Glacial geomorphology and chronology of Henry Kater Peninsula, east Baffin Island, N.W.T. Arctic and Alpine Res. 1(3): 195-212.

Henry Kater Peninsula was ice covered at just between 34,000 and 10,000 BP. The ice advanced into the sea along the outer part of the peninsula, spreading a thin morainic covering over shell-bearing marine sediments. Ice

curved inland from the fiords along the margins of the peninsula, while ice from inland covered the interior. Much of this ice decayed in situ, leaving extensive dead-ice areas. The sea was relatively high as the ice withdrew. The plane of the marine limit slopes down toward 083° from 50 m in the inner part of the peninsula to 25 m at the outer coast. Planes of synchronous isobases slope down toward 052°. Deglaciation took place at about 10,000 BP at the outer coast, at about 8,500 BP in Isabella Bay on the north side, and 8,000 BP in Itirbilung Bay on the south side. The last major incursion of fiord ice into the embayments along the inner peninsula took place between approximately 8,700 and 8,000 BP. This moraine may be contemporaneous with the Cockburn moraines. The ice-cored moraines of the present glaciers in the mountain valleys have been static for several years, but it is suggested that locally generated ice was more powerful and vigorous at an earlier period. Auth.

446. Locke, W.W., III, 1978: Glaciation limits on Cape Dyer, NE Cumberland Peninsula, Baffin Island. Geol. Soc. Amer. Abstracts with Programs 10(7): 445-446.

447. Løken, O.H., 1966: Baffin Island refugia older than 54,000 years. Sci. 16(153): 1378-1380.

Reports two radiocarbon datings of marine shells from the Cape Christian and Cape Aston regions on the eastern coast of Baffin Island, of ages of greater than 50,000 and greater than 54,000 yr. They indicate the existence of unglaciated areas (refugia) between fjords occupied by outlet glaciers flowing toward Baffin Bay, from the central part of the Wisconsin ice sheet, over the Foxe Basin-Hudson Bay area. AB97607.

448. Mercer, J.H., 1956: Geomorphology and glacial history of southernmost Baffin Island. Geol. Soc. Amer. Bull. 67(5): 553-570.

This peninsula is a tilted peneplane, probably uplifted in late Pliocene, with a drowned coast along Hudson Strait and an escarpment facing Frobisher Bay. This latter coast is described from the head of the Bay to Jackman Sound near the southeast end of the peninsula; also the strand lines found up to 1425 ft. Most of the larger landforms were probably forming during the Pleistocene. In each glacial age the northwest part of the peninsula was apparently buried by an ice sheet before cirques could form, while in the southeast, cirque erosion advanced to maturity. In late Wisconsin the area was greatly depressed, then as sea level fell, the strand lines formed. Present small icecaps (Grinnell and Terra Nivea) are the rejuvenated relics of a larger ice sheet which wasted away, except on the highest parts of the peninsula, during a warm period in the recent past. AB46716.

449. Mercer, J.H., 1954: The physiography and glaciology of southernmost Baffin Island. Ph.D. Thesis, McGill Univ., Montreal, Quebec, Canada. 150 p.

Objectives of the field investigation were to study the present glacier cover of the Kingaite Peninsula (approx. 62°30' N. 68° W.), and attempt to explain the course of glaciation and deglaciation during the Pleistocene, particularly in the Wisconsin period. The Grinnell and Terra Nivea icecaps,

relic ice masses, and corrie glaciers are described. The icecaps are intermediate between the "Baffin" type and Ahlmann's Arctic Maritime type, with fairly healthy ice budgets but with a slight overall tendency toward shrinkage. "This comparative stability persists despite the wide range of seasonal air-temperature variation and seems to indicate that the icecaps respond only to longer-term climatic variations, which have probably tended toward warming." --SIPRE. The greatest elevation and most complicated physiographic feature is an escarpment along the northeast coast fronting Frobisher Bay. Pleistocene changes of level and elevated strandlines are described. The peninsula may have been covered by continental ice, but in the Wisconsin period the most elevated parts of the escarpment southeast of Cape Lawrence probably remained ice-free. In late Wisconsin the region was greatly depressed; postglacial elevation resulted in the series of abandoned strandlines. When sea level had fallen to 140-210 ft. above present level, run-off seems to have been much greater than it is today. Geomorphic evidence is discussed. AB36185.

450. Miller, G.H., 1976: Anomalous local glacier activity, Baffin Island, Canada: Paleoclimatic implications. Geology 4: 502-504.

Some local cirque glaciers on eastern Baffin Island were more extensive during the "Little Ice Age" than at any time in at least the past 34,000 yr and possibly the past 60,000 yr. The most reasonable paleoclimatic explanation of such anomalous glacier activity is that during the last glacial maximum in southern Canada, Arctic regions experienced diminished precipitation. Auth.

451. Miller, G.H., 1976: Climatic and chronological differences between the northeastern and southern Laurentide margins and their implications to ice-core correlations. AMQUA 4th Biennial Meeting, Arizona State Univ., Tempe, Arizona, Abstracts, p. 28-29.

452. Miller, G.H., J.T. Andrews, and S.K. Short, 1977: The last interglacial-glacial cycle, Clyde Foreland, Baffin Island, N.W.T.: stratigraphy, biostratigraphy, and chronology. Can. Jour. Earth Sci. 14(12): 2824-2857.

A study of the stratigraphic sequence (^{14}C and amino acid age control), marine bivalve faunal changes, and palynology of buried soils and organic-rich sediment collected from the Clyde Foreland Formation in the extensive cliff sections of the Clyde foreland, eastern Baffin Island, N.W.T., suggests the following last interglacial--Foxe (last glaciation) glacial--present interglacial sequence.

(1) Cape Christian Member (ca. 130,000 years BP?)

Consists of the Sledgepointer till overlain by the Cape Christian marine sediments. In situ molluscan fauna, collected from the marine sediments, contain a moderately warm bivalve assemblage. A well-developed soil that formed on the marine sediments (Cape Christian soil) contains an interglacial pollen assemblage dominated by dwarf birch. U-series dates of >115,000 and ca. 130,000 years BP on molluscs from the Cape Christian marine sediments suggest that they were deposited during the last interglaciation, here termed the Cape Christian Interglaciation. The development of a subarctic pollen assemblage in the Cape Christian soil has not been duplicated during the present interglaciation, suggesting higher summer

temperatures and perhaps a duration well in excess of 10,000 years for the last interglaciation.

(2) Kuvinilk Member

Consists of fossiliferous marine sediments, locally divided by the Clyde till into upper and lower units. The Clyde till was deposited by the earliest and most extensive advance of the Foxe (last) Glaciation. Kuvinilk marine sediments both under- and overlying the Clyde till contain the pecten *Chlamys islandicus*, indicating that the outlet glacier advanced into a subarctic marine environment. Amino acid ratios from in situ pelecypod shells above and below the Clyde till are not statistically different, but contrast markedly with ratios obtained from the same species in the Cape Christian Member. Organic horizons within the Kuvinilk marine sediments contain a relatively rich pollen assemblage, although 'absolute' counts are low.

(3) Kogalu Member (>35,000 ^{14}C years BP)

Sediments of the Kogalu Member unconformably overlie those of the Kuvinilk Member, but are of a similar character. The dominant sediments are marine in origin, but in places are divided into upper and lower units by the Ayr Lake till. Amino acid ratios from in situ shells above and below the Ayr Lake till are indistinguishable, but substantially less than those in the Kuvinilk Member, suggesting the two members are separated by a considerable time interval. Radiocarbon dates on shells in the Kogalu marine sediments range from 33,000 to 47,700 years BP, but these may be only minimum estimates. The sea transgressed to a maximum level 70-80 m asl, coincident with the glacial maximum. Subarctic marine fauna of interstadial-interglacial character occur within the Kogalu marine sediments.

(4) Eglinton Member (10,000 years BP to present)

A major unconformity exists between the Kogalu and Eglinton Members. Ravenscraig marine sediments were deposited during an early Holocene marine transgression-regression cycle; the oldest dates on these sediments are ca. 10,000 years BP. Locally a vegetation mat occurs at the base or within the Ravenscraig unit. Pollen from these beds is sparse, but indicates a terrestrial vegetation assemblage as diverse as that of today. There is no evidence that Laurentide Ice reached the foreland during the last 30,000 years. Eolian sands that overlie a soil developed on the marine sediments record a late Holocene climatic deterioration. Pollen in organic-rich sediments at the base of, and within, the eolian sands record a vegetation shift in response to climatic change. Auth.

453. Miller, G.H. and A.S. Dyke, 1973: Maximum extent of late-Wisconsin ice on eastern Baffin Island: a reappraisal. Symposium on the Geology of the Canadian Arctic, May 23-26, 1973, University of Saskatchewan, Saskatoon, Canada. Program and Abstracts, p. 22-23.

454. Miller, G.H. and A.S. Dyke, 1974: Proposed extent of late Wisconsin Laurentide ice on eastern Baffin Island. Geology 2(3): 125-130.

The apparent outer limit of late Wisconsin Laurentide ice on eastern Baffin Island (roughly correlative with the "classical" Wisconsin of the southern Laurentide margin) is delimited in broad terms on the distal side by the presence of undisturbed glaciomarine deposits for which associated molluscan fauna have ^{14}C ages beyond the useful radiocarbon age range. This is supported by the distribution of drowned cirques, submerged late Wisconsin glaciomarine deltas, moraines from local ice moraines. Within this maximum outer limit of late Wisconsin glaciation, only the previously

mapped Cockburn Moraine System is associated with marine deposits of finite ^{14}C age. This system forms a largely continuous and prominent end and lateral moraine overlying till showing extensive tundra polygon development, and it is associated with ice-contact raised marine features dating between 7,500 and 8,500 ^{14}C yr B.P. A map depicting the late Wisconsin ice margin based on these criteria shows that most of the eastern coastal margin of Baffin Island remained ice free throughout the last glacial stade (approximately 8,000 to 25,000? yr B.P.). This interpretation is supported by the occurrence of deposits dated more than 25,000 yr B.P., 30 to 60 km inland from the outer coast, which have not been glacially overridden; the pattern of postglacial isostatic uplift since 8,000 yr B.P.; and the complete absence of features dating between 10,500 and 25,000 yr B.P., whereas less than 8 percent are between 9,000 and 10,500 yr old. A consideration of the pattern of atmospheric circulation at the last glacial maximum suggests that few cyclonic disturbances penetrated the North American Arctic and that consequent decreased precipitation allowed only minimal glacial expansion. Auth.

455. Miller, G.H. and P.E. Hare, 1975: Use of amino acid reactions in arctic marine fossils as stratigraphic and geochronological indicators. Carnegie Institute of Washington Yearbook 74: 612-617.

456. Mode, W.N., 1979: Late Quaternary glacial and marine stratigraphy, Clyde Foreland, Baffin Island, N.W.T., Canada. Geol. Soc. Amer. Abstracts with Programs 11(7): 481.

457. Nelson, A.R., 1978: Aminostratigraphy of marine and glaciomarine Quaternary sediments, Qivitu Peninsula, northern Cumberland Peninsula, Baffin Island. AMQUA 5th Biennial Meeting, Univ. Alberta, Edmonton, Abstracts, p. 226.

458. Nelson, A.R., 1978: Quaternary glacial and marine stratigraphy of the Qivitu Peninsula, northern Cumberland Peninsula, Baffin Island, Canada. Ph.D. Thesis, Univ. Colorado, Boulder, Colorado. 331 p.

Page 5285 in Vol. 39/11-B of Dissertation Abstracts International. Order No. 79-11464.

459. Nelson, A.R., 1978: Stratigraphic evidence of ice extent during the last glaciation on Qivitu Peninsula, eastern Baffin Island. Geol. Soc. Amer. Abstracts with Programs 10(7): 462.

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The Quaternary chronology of the Narpaing and Quajon fiords is based on the delimitation of three weathering zones in the coastal highlands, the regional patterns of moraines and raised marine features, and C^{14}, uranium series and amino-acid dates. The boundary between weathering zones I and II is the upper limit of continental glaciation. Weathering zone II is characterised by strongly weathered till and lateral moraines and is associated with a glacio-marine delta amino-acid dated >100,000 B.P. Weathering zone III consists of a relatively unweathered till and contains three distinct morphostratigraphic units. These units were formed during early mid and late stades of the last glaciation, which began 100,000 to 140,000 B.P. A relatively warm interstadial 58,000 to 78,000 B.P. has been recognised. The early Wisconsin glaciation was the most extensive and the late Wisconsin glaciation was the least extensive in this area. Fiord heads were finally deglaciated about 6,000 B.P. The latest phase of mountain glaciation began <5,000 years ago and is marked by ice-cored moraines. Auth.

463. Pheasant, D.R. and J.T. Andrews, 1973: Wisconsin glacial chronology and relative sea-level movements, Narpaing Fiord, Broughton Island area, eastern Baffin Island, N.W.T. Can. Jour. Earth Sci. 10(11): 1621-1641.

Three distinct glacier advances and four major periods of adjustment of relative land and sea levels are recognized in the Wisconsin age stratigraphic and geomorphologic record of the Northern Cumberland Peninsula. The coast, which is presently undergoing submergence, is close to an isostatic equilibrium position following rapid land emergence during post-Cockburn time (ca. 8000-1000 BP). Laurentide ice advances during two earlier stades--the Alikdjuak ca. 115,000 BP and the Napiat >40,000 BP--were more extensive than the Cockburn glacier advances and a positive relationship between ice load and amount of crustal deflection at the ice margin is demonstrated. Computations based on synchronous raised marine features and known extent of the ice load indicate a crustal flexural parameter (α) of >80 km and perhaps >135 km for this area. The date of the Alikdjuak stade suggests the time transgressive nature of the early-Wisconsin maximum position of the continental ice sheet margin and supports the hypothesis that continental glaciation may well have originated in the climatically sensitive uplands of the eastern Canadian arctic/sub-arctic. Auth.

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He investigated the valley between Sam Ford Fjord and upper end of Eglinton Fjord and upper Ayr Lake in two extended foot surveys and a short flight. He comments upon the position of the Barnes Ice Cap during the deglaciation period. A comparison made between the moraines of an outflow glacier and those of mountain glaciers near the head of Eglinton Fjord showed that "when the inland ice of Baffin Island still flowed into the sea, the glaciation in the mountains was about the same as (perhaps less than) today." AB37111.

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