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GEOLOGICAL SURVEY OF CANADA RADIOCARBON DATES VI

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INTRODUCTION

Both the 2-L counter, described in GSC I, and the 5-L counter (GSC IV) were operated routinely during the past year. Approximately half of the determinations reported here were obtained from each counter. The 5-L counter was operated mainly at 1 atm.

Again all age calculations have been carried out monthly by an I.B.M. 1620 computer, and are based on a C^{14} half-life of 5568 ± 30 yr and 0.95 of the activity of the NBS oxalic-acid standard. Ages are quoted in years before 1950. Age errors include: counting errors of sample, background, and standard; error in the half-life of C^{14}; and an error term to account for the average variation of ± 1.5% in the C^{14} concentration of the biosphere during the past 1100 yr. Finite ages are based on the 2σ criterion and "Infinite" ages on the 4σ criterion (GSC II).

No changes have been made in the preparation and purification techniques described in GSC IV.

Average background and standard counting rates over the past 12 months are listed in Tables 1 and 2. The monthly average background count is made up of 4 individual daily counts. During the 12-month period, 12 different background preparations were counted in the 2-L counter, and 10 in the 5-L counter. One background count from the 2-L

TABLE 1

Monthly Background (c/m) for Period
October 1, 1965 to September 30, 1966

Month	2-L counter (2 atm)	5-L counter (1 atm)
October 1965	1.284 ± .025	2.328 ± .037
November	1.339 ± .021	2.359 ± .026
December	1.272 ± .035	2.300 ± .030
January 1966	1.190 ± .019	2.276 ± .026
February	1.240 ± .037	2.278 ± .041
March	1.185 ± .019	**2.903 ± .026
April	1.182 ± .018	2.186 ± .031
May	1.224 ± .040	2.134 ± .025
June	1.168 ± .023	2.172 ± .053
July	1.246 ± .023	2.273 ± .025
August	1.252 ± .018	2 259 ± .031
September	1.262 ± .021	2.237 ± .040

* The introductory part of this paper has been prepared by the first author, who operates the laboratory. The date list his been compiled by the second and third authors from descriptions of samples and interpretations of dates by the collectors.
** 5-L counter operating at 4 atm.

TABLE 2

Monthly Standard, N_o*, (c/m) for Period October 1, 1965 to September 30, 1966.

Month	2-L counter (2 atm)	5-L counter (1 atm)
October, 1965	20.024 ± .100	28.934 ± .134
November	19.999 ± .096	29.063 ± .117
December	19.967 ± .103	28.855 ± .122
January, 1966	19.927 ± .094	28.887 ± .115
February	19.980 ± .140	28.802 ± .187
March	20.128 ± .103	**112.212 ± .228
April	20.091 ± .191	28.966 ± .117
May	19.935 ± .108	29.186 ± .120
June	20.081 ± .126	29.142 ± .136
July	20.029 ± .095	28.938 ± .115
August	20.029 ± .091	28.888 ± .097
September	20.075 ± .137	28.787 ± .128

* N_o = 0.95 X net counting rate of the NBS oxalic-acid standard.
** 5-L counter operating at 4 atm.

TABLE 3

Tests for C^{14} contamination*

Sample No.	Fraction	Age (yr B.P.)
A. MARINE SHELLS		
GSC-463	11-100%**	8840 ± 160
GSC-463-2	51-100	8710 ± 180
GSC-553	11-55	6270 ± 140
	56-100	6590 ± 140
GSC-635	11-55	5320 ± 140
	56-100	5650 ± 140
FRESH WATER SHELLS		
GSC-492	21-60	10,700 ± 160
	61-100	10,670 ± 160
B. PEAT SAMPLES		
GSC-498	less soluble***	4460 ± 140
	more "	4550 ± 220
GSC-591	less soluble	500 ± 130
	more "	680 ± 180
GSC-628	less soluble	7590 ± 140
	more "	7870 ± 160

* Detailed descriptions of all samples appear in this date list except for GSC-635.
** Two separate preparations were made on shells from the same sample.
*** Degree of solubility refers to solubility in 2% NaOH.

counter was omitted because the result fell outside the maximum statistical error (May, 1966). The standard counting rates listed in Table 2 are the monthly averages of 3 individual daily counts. None of the oxalic-acid standard preparations (7 for each counter) and none of the daily counts were rejected.

Tests for C^{14} contamination in shell samples were continued as shown in Part A of Table 3.

Also, further tests were carried out on the problem of humic contamination of peat samples largely from permafrost areas (GSC IV). The results are listed in Part B of Table 3, and again show that contamination is absent.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Eastern Canada

GSC-582. Bideford River Estuary, Prince Edward Island — **1570 ± 130 A.D. 380**

Wood from core sample in shell layer beneath 8 ft mud and overlying sand in Bideford River estuary, NW part of Malpeque Bay, Prince Edward Island (46° 37′ N Lat, 63° 55′ W Long). Water depth 10 ft. Coll. 1965 by M. L. H. Thomas, Fisheries Res. Board of Canada, Ellerslie, P.E.I. *Comment* (M.L.H.T.): date confirms earlier date of 1980 ± 115 yr (GX-372, unpub.) obtained on mollusks from shell layer (oyster, slipper limpet, blue mussel). Together, dates indicate relative rise of sealevel during the last 1600 to 2000 yr. This rise, plus recent erosion, are probably main factors responsible for mud accumulation. Date based on one 3-day count.

GSC-497. St. Zacharie, Quebec — **2640 ± 130 690 B.C.**

Part of a plant mat, overlain by 10 cm of blue-gray clay, shelly marl and peat in exposure along a drainage ditch, in bog 4 mi E of St. Zacharie, Quebec (46° 08′ 20″ N Lat, 70° 17′ W Long) at alt ca. 1700 ft. Plant mat is associated with layer of thin rock slabs. Coll. 1965 by R. J. Mott.* *Comment* (J. Terasmae): at time of coll. plant mat was assumed to be of late-glacial age because of its association with clay unit, overlain by marl and peat. However, this part of bog apparently has developed in late-postglacial time. Date based on one 3-day count.

* All persons referred to as collectors or submitters of samples or cited as sources of data are with the Geological Survey of Canada unless otherwise specified.

11,020 ± 330

GSC-420. Barnston, Quebec **9070 B.C.**

Silty marl and gyttja from base of lacustrine deposit, 440 to 450 cm below top of sediments, water depth ca. 2 ft, in lake ca. 0.5 mi N of Barnston, Quebec (45° 06′ 45″N Lat, 71° 53′ W Long), at alt ca. 1360 ft. Organic sediments are underlain by clay. Coll. 1965 with Livingstone piston sampler by R. J. Mott. *Comment* (J. Terasmae): lake is W of Coaticook River valley in highlands S of lobed moraines near Sherbrooke. Date is minimum for deglaciation of SE part of St. Lawrence Lowland. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

GSC-507. Magog River, Quebec **> 41,500**

Fine plant material at alt 600 ft, 58 ft below surface in road cut, S bank of Magog River 1 mi downstream from Rock Forest, Quebec (45° 21′ N Lat, 71° 58′ W Long) from organic lenses up to 1 in. thick in compact non-calcareous lacustrine sandy silt. Loose, partly calcareous lacustrine sand and silt 43 ft thick overlies compact unit. Coll. 1965 by B. C. McDonald. *Comment* (B.C.M.): date suggests correlation with organic lake sediments beneath 2 tills on Ascot River 8.5 mi to E dated as > 54,000 (Y-1683, McDonald, 1967a 1967b). Section here thus appears incomplete. Organic debris probably washed into a lake from adjacent land standing as an island.

11,880 ± 180

GSC-505. L'Avenir, Quebec **9930 B.C.**

Marine pelecypod shells (mostly *Macoma* sp., some *Hiatella arctica,* and ca. 2% unidentified bivalves) coll. in gravel pit ca. 10 ft below surface in pebbly gravel and sand 2 mi NNW of L'Avenir (45° 47′ N Lat, 72° 16′ W Long), at alt ca. 400 ft. Coll. 1965 by B. C. McDonald. *Comment* (B.C.M.): gravel contains pebbles up to 2 in. diam, and well-developed cross-stratification indicates current flow to NW, parallel with flow in adjacent St. Francis River. Several articulated *Macoma* specimens indicate bivalves lived in this environment at this site. Combination of marine environment with coarse-grained substrate, strong unidirectional current, and associated river terraces suggests current was that of the ancestral St. Francis River and that deposit formed near sealevel during regression of Champlain Sea (cf. GSC-475, 11,530 ± 160, this list).

9130 ± 150

GSC-627. Valcourt, Quebec **7180 B.C.**

Gyttja from base of peat and lake-sediment sequence, at 3.05 to 3.15 m depth in bog ca. 2.5 mi N of Valcourt, Quebec (45° 31′ 45″ N Lat, 72° 21′ W Long), at alt ca. 650 ft. Gyttja is underlain by silty clay. Coll. 1965 with 2 in. piston corer by J. Terasmae. *Comment* (J.T.): organic deposit lies in a shallow depression in surface of till. Sampling site lies S of Champlain Sea Limit; hence a somewhat greater age was expected for sampled depth. However, it appears that accumulation of organic sedi-

ments was delayed at this site by ca. 2000 yr. NaOH-leach omitted from sample pretreatment.

11,530 ± 160

GSC-475. Ste.-Christine, Quebec **9580 B.C.**

Marine pelecypod shells (mostly *Hiatella arctica,* but, fragments of *Macoma* sp., *Yoldia* sp., and *Mytilus edulis*) from silt 5 ft below surface, in bottom of small, unnamed stream 0.5 mi SW of village of Ste.-Christine, Quebec (45° 36′ N Lat, 72° 26′ 30″ W Long), at alt ca. 475 ft. Shell site is 0.25 mi NW along gently sloping marine plain from beach at 510 ft. Marine limit marked by adjacent beach at 540 ft (165 m). Coll. 1965 by B. C. McDonald. *Comment* (B.C.M.): specimens of *Hiatella, Macoma,* and *Yoldia* were found articulated and in growth position; so shells probably not reworked. Shells are among highest on SE shore of Champlain Sea; they are probably related to sealevel stand at 510 ft or 540 ft. Date should indicate age of earliest marine invasion of St. Lawrence Lowland. In view of GSC-505 (11,880 ± 180, this list), however, these shells may be slightly too young due to contamination. Date based on one 3-day count.

6750 ± 150

GSC-548. Mer Bleue Bog, Ottawa, Ontario **4800 B.C.**

Basal peat at depth 8 ft from bog ca. 5 mi E of Ottawa, Ontario (45° 23′ 20″ N Lat, 75° 31′ W Long), at alt ca. 220 ft. Peat is underlain by clay. Coll. 1963 with piston sampler by J. A. C. Fortescue. *Comment* (J. Terasmae): part of Mer Bleue Bog lies in an abandoned Ottawa River channel cut into marine clay. Other evidence indicates that channel was abandoned at least 8000 yr ago. Date based on one 5-day count.

1140 ± 150

GSC-550. Green Creek, Ottawa, Ontario **A.D. 810**

Two wood fragments, one from 22.3 and one from 25.3 ft depth below surface, from borehole in apron of "flow-slide" on abandoned Ottawa River terrace 0.75 mi W of Green Creek and ca. 5 mi ENE of Ottawa, Ontario (45° 27′ N Lat, 75° 35′ 45″ W Long), at alt ca. 170 and 173 ft (terrace surface at alt ca. 195 ft). Fragments may be from one piece; they are assumed to derive from original terrace surface onto which silty-clay flowed from adjacent escarpment developed in sensitive or extra-sensitive clay (Crawford, 1961). Coll. 1960 by W. J. Eden, Div. of Building Res., National Res. Council, Ottawa. *Comment* (N.R. Gadd): date is maximum for slide and minimum for abandoned terrace. Other sections in area indicate that woody vegetation was well established on terrace; therefore terrace probably was abandoned by ancestral Ottawa River before slide occurred, suggesting that a steep slope in sensitive clay is subject to flow whether or not toe of slope is being actively eroded. Sample mixed with dead gas for counting.

7870 ± 160

GSC-628. Catherine St., Ottawa, Ontario **5920 B.C.**

Marly gyttja from base of peat and lake-sediment sequence exposed in excavation E of 400 Catherine Street, Ottawa, Ontario (45° 24′ N Lat, 75° 42′ W Long), at alt ca. 220 ft. Top of exposure disturbed; estimated thickness of organic deposits ca. 7 ft. Gyttja is underlain by sand and gravel. Coll. 1959 from fresh exposure by J. Terasmae. *Comment* (J.T.): organic sediments accumulated in a local depression and postdate early stage of Ottawa River when abandoned channels above present river were cut (cf. GSC-547, 8220 ± 150; GSC-546, 8830 ± 190, this list). Two fractions were dated (cf. Table 3, this list):

soluble in NaOH	7870 ± 160
not dissolved in NaOH	7590 ± 140

8830 ± 190

GSC-546. Gladstone Street, Ottawa, Ontario **6880 B.C.**

Marly gyttja from base of organic deposit exposed in excavation N of Queensway, between Gladstone, Preston, and Rochester Streets, Ottawa, Ontario (45° 24′ 12″ N Lat, 75° 42′ 37″ W Long), at alt ca. 200 ft. Top of exposure disturbed; gyttja is underlain by clay, sand, and limestone bedrock. Coll. 1966 from fresh exposure by R. J. Mott. *Comment* (J. Terasmae): marly gyttja accumulated after Ottawa and/or Rideau River cut below site level (cf. comments re GSC-547, 8220 ± 150, this list). Date is minimum for abandonment of higher channels. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

10,720 ± 150

GSC-623. Railway Excavation, Ottawa, Ontario **8770 B.C.**

Marine pelecypod shells (mainly *Yoldia* sp.) from stratified silty clay exposed in railway excavation parallel to and W of Preston Street and ca. 1000 ft N of Gladstone Avenue underpass, Ottawa, Ontario (45° 43′ N Lat, 76° 24′ W Long), at alt ca. 210 ft. Glacially polished and striated limestone is overlain by 1 ft of gravelly gray till, 3 ft of rhythmically banded silty clay with shell zones. Sample is from lowermost shell zone, 1.5 ft above base of silty clay and 5.5 ft above bedrock. Coll. 1966 by N. R. Gadd. *Comment* (N.R.G.): glacial-lacustrine origin of silt not proved, but existence of similar sections elsewhere in Ottawa area (Gadd, 1963) and presence of postglacial but pre-Champlain Sea varved silts in St. Lawrence valley (MacClintock and Stewart, 1965) suggest that date gives minimum age for transition from glacio-lacustrine to glacio-marine conditions at Ottawa. Similarity of date to others in Ottawa area (cf. GSC-454, 10,420 ± 150, GSC V; L-604A, 10,700 ± 200 and L-604B, 10,550 ± 200, Lamont VII; L-639B, 11,320 ± 200, Gadd, 1964) indicates relative sealevel was close to alt 600 ft at time of postulated transition. Assumed removal of an ice barrier permitted inflow of sea with no significant change in water

level. Gradational relationships at Ottawa conflict with supposed evidence of lake drainage prior to sea entry in St. Lawrence Lowland (MacClintock and Stewart, 1965). No sample pretreatment. Date based on one 4-day count.

8220 ± 150

GSC-547. Richmond Road, Ottawa, Ontario **6270 B.C.**

Woody peat from 4.5 to 6 ft depth at top of slope on N side of abandoned river channel, exposed in excavation between Queensway and Richmond Road (Hwy 15), ca. 8.5 mi W of Ottawa, Ontario (45° 21′ N Lat, 75° 48.3′ W Long), at alt ca. 235 ft. Mixture of woody peat, silt, and alluvial sand overlain by 5 ft of silt containing plant detritus. Coll. 1961 by N. R. Gadd and J. Terasmae. *Comment* (N.R.G.): deposit appears to result from filling along N bank of major abandoned river valley. Prior channel cutting relates to ancestral Ottawa River and, because of similar alt, probably corresponds to cutting of channels E of Ottawa now occupied by Mer Bleue peat bog. Silt overlying woody peat is similar in physical characteristics to silt mapped by Gadd (1963) as fluvially redeposited Champlain Sea bottom sediments. Champlain Sea episode is interpreted as having ended considerably before deposition of sample. Date is minimum for channeling by ancestral Ottawa River (cf. GSC-628, 7870 ± 160; GSC-546, 8830 ± 190; this list). Date based on one 3-day count.

7380 ± 140

GSC-624. Cochrane, Ontario **5430 B.C.**

Basal gyttja, at 600 to 620 cm depth, from bog and lake sediment sequence in bog ca. 2.5 mi SE of Cochrane, Ontario (49° 02′ N Lat, 80° 59′ W Long). Bog surface at alt ca. 850 ft. Gyttja underlain by lacustrine clay and varved clay. Coll. 1965 with 2-in. piston corer by J. Terasmae. *Comment* (J.T.): varved clay is assumed to derive from Glacial Lake Barlow-Ojibway, and overlying sediments from a small residual lake. Therefore sample age is minimum for drainage of glacial lake (cf. GSC-487, 7660 ± 140; GSC-309, 7150 ± 140; GSC V). NaOH-leach omitted from sample pretreatment.

GSC-435. Little Abitibi River, Ontario **> 43,600**

Wood from lower part of 70-ft section stratified sand overlain by 15 ft Cochrane-type clayey till and 7 ft post-Cochrane lake clay from E bank Little Abitibi River, Ontario (50° 12′ N Lat, 81° 24′ W Long), at alt ca. 350 to 400 ft. Sand areas on flats above site are believed to relate to maximum stand of Tyrrell Sea at alt ca. 550 ft. Upper half of sub-till sand unit is buff, oxidized, and bedding dips gently N; lower half is gray, locally carbonaceous, with horizontal bedding. Wood and other plant tissues found ca. 20 ft above river level. Sand unit believed similar to sub-till clay-silt beds elsewhere along Little Abitibi and Abitibi Rivers that are interpreted as interglacial and overlie shell-bearing hard-packed marine clays. Coll. 1965 by V. K. Prest. *Comment* (V.K.P.): 'old' date proves sand

unit is unrelated to kame moraine built in late Wisconsin time only 15 mi SSW. Date based on one 2-day count and one 3-day count.

5770 ± 130

GSC-347. Owen Sound, Ontario **3810 B.C.**

Hemlock from base of bay-mouth bar (crest alt ca. 630 ft) in gravel pit 4.5 mi NE of Owen Sound, Ontario, Lot 34, Con. A Sydenham Tp. (44° 37.2′ N Lat., 80° 53.1′ W Long). Sample is from plant-rich stratum ca. 1 ft thick bearing logs, bark, twigs, cones, and shells, which underlies 18 ft stratified sand and gravel and overlies till and sand. Coll. by T. J. Rutherford, RR 1 Owen Sound, Ontario. *Comment* (C.F.M. Lewis): gravel bar similar to known Nipissing shore features in area both in strength of development and in alt. Sample is believed to date burial of lagoon sediments by sand and gravel during Nipissing Great Lakes phase (cf. GSC-285, 6100 ± 160; GSC-341, 5130 ± 130; GSC V). Date based on one 3-day count.

Lake Erie series

Wood and plant detritus buried beneath silty-clay lake sediments in central and western Lake Erie. Samples were taken with piston corer (4.9 cm I.D.) by the late R. E. Deane, Univ. of Toronto, Toronto and C. F. M. Lewis, and are discussed by Lewis, Anderson, and Berti (1966).

10,200 ± 180

GSC-330. Central Lake Erie, wood **8250 B.C.**

Wood at alt 145.2 m (477 ft) from piston core site (41° 45.2′ N Lat, 81° 54.9′ W Long) ca. 33 km NW of Cleveland, Ohio; water depth 22.3 m. Sample from thin shelly bed underlying 6.2 m gray silty clay and overlying 1.6 m gray silty clay over laminated glacio-lacustrine fine sand and stiff clay. Total penetration of corer 8.5 m. Coll. 1961. *Comment* (C.F.M.L.): date is minimal for flooding and commencement of post-glacial clay sedimentation by Early Lake Erie at site. Flooding caused by differential uplift of lake outlet at Buffalo. Sample mixed with dead gas for counting.

11,300 ± 160

GSC-382. Western Lake Erie, plant detritus **9350 B.C.**

Plant detritus at alt 159.6 m (524 ft) from piston core site (41° 45.9′ N Lat, 82° 57.3′ W Long) ca. 22 km W of Pelee Island, Ontario; water depth 10.1 m. Sample from spongy plant detritus 0.2 m thick, underlying 3.9 m gray clayey silt containing pelecypods near base and overlying 1.1 m laminated gray silt, 0.1 m stratified brown clay and sand, and glacio-lacustrine stiff laminated clay with silt. Total penetration of corer 5.5 m. Coll. 1963. *Comment* (C.F.M.L.): dates episode of shallow ponds in western Lake Erie basin following drainage of Glacial Lakes Lundy and Early Algonquin. Date is maximum for subsequent flooding of site by rising waters of Early Lake Erie due to postglacial differential uplift of lake outlet at Buffalo. NaOH-leach omitted from sample pretreatment.

9620 ± 250

GSC-606. Espanola, Ontario **7670 B.C.**

Gyttja from base of organic lake sediments 1315 to 1321 cm below lake level (alt 773 ft) and ca. 618 cm below sediment surface in Wood Lake, 3.5 mi S of Espanola, Ontario (46° 12.9′ N Lat, 81° 44.1′ W Long). Lake occupies drift-veneered bedrock basin. Coll. 1965 by J. Terasmae and C.F.M. Lewis with 3.6 cm I.D. piston corer. *Comment* (C.F.M.L.): date is minimal for withdrawal of glacial lake water (possibly Sheguiandah phase of post-Algonquin group) from this site (cf. GSC-514, 8760 ± 250, this list). NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

8760 ± 250

GSC-514. Blind River bog, Ontario **6810 B.C.**

Gyttja from base of bog, surface alt ca. 714 ft, 2 mi N of Blind River, Ontario (46° 12.8′ N Lat, 82° 56.3′ W Long). Sample coll. with 3.6 cm I.D. piston sampler at depth of 390 cm where gyttja is underlain by 7 cm silty clay over fine sand. Coll. 1965 by C.F.M. Lewis. *Comment* (C.F.M.L.): bog is impounded on SW by a bar with crest alt 724 ft. Date is minimum for isolation of bog basin through drainage of glacial lake (presumably a late phase, possibly Korah?, of post-Algonquin group) responsible for formation of the bar. Because basin is underlain by pervious sand and gravel a considerable interval of time may have elapsed before inception of organic sedimentation (cf. GSC-606, 9620 ± 250, this list). NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

GSC-428. Elliott's Brick Works, Sault Ste. Marie, Ontario **3520 ± 140** **1570 B.C.**

Wood chips from unoxidized clay overlain by 7.5 ft oxidized clay and sand layers containing wood and charcoal, in clay pit of Elliott's Brick Works, Sault Ste. Marie, Ontario (46° 32′ 42″ N Lat, 84° 21′ 27″ W Long), at alt 637 ft. Coll. 1965 by S. C. Zoltai, Dept. of Lands and Forests, Maple, Ontario. *Comment* (S.C.Z): site is 300 ft S of strong 'Nipissing' bluff. Date confirms post-Nipissing age of inclosing sediments. Sample mixed with dead gas for counting. Date based on one 3-day count.

1250 ± 130

GSC-430. White Otter River, Ontario **A.D. 700**

Wood from silty clay, underlain by stratified sand and overlain by silt and fine sand containing shells of aquatic and land snails, from natural gully along logging road near White Otter River and 12.5 mi N of Hornepayne, Ontario (49° 24′ N Lat, 84° 50′ W Long), at alt 925 ft. Coll. 1965 by S. C. Zoltai. *Comment* (S.C.Z.): site lies within area occupied by glacial lakes of Lake Superior basin; wood believed to be associated with lacustrine deposits. The young date, and presence of

aquatic and land snails, suggest wood came from creek channel deposit, possibly buried by solifluction.

B. Western Canada

GSC-391. Buffalo Point, Lake of the Woods, Manitoba **9990 ± 160 8040 B.C.**

Driftwood fragments, alt ca. 1060 ft, in sand at base of wave-cut cliff on S side of Buffalo Point, Lake of the Woods, Manitoba, ca. 1200 ft W of the point, in Indian Reserve No. 36 (49° 00′ N Lat, 95° 14′ W Long). Locality described by W. A. Johnston (1915). Sample from horizontal partings of organic matter (wood, bark, clam-shell fragments) within 2.0 ft of sand, overlain in succession by 1.5 to 2 ft of clayey silt with sand partings and 4 ft of fine sandy pebble gravel, and underlain by laminated clay and till. Modern rootlets penetrate organic layer but form no more than 5% of sample. Sand and gravel overlying dated layer form wave-built terrace probably constructed from ice-contact stratified drift when water level here stood ca. 45 to 60 ft higher than Lake of the Woods (alt 1060 ft), probably during phase of Lake Agassiz represented by beach ridges at alt ca. 1105 to 1120 ft near Harris Hill, Ontario on E side of Lake of the Woods. These are on Isobase No. 6 of Johnston (1946) and appear to be his lower Campbell strandline. Coll. 1964 by J. A. Elson, McGill Univ., Montreal. *Comment* (J.A.E.): sample dates lower Campbell strandline, perhaps formed when Lake Agassiz discharged NW via Turnor Lake through Clearwater valley in NW Saskatchewan. Cf. dates from North Dakota: W-900, Grand Forks, 10,080 ± 280 (USGS VI); W-993, Fargo, 9900 ± 400 (USGS VII); W-1005, Thompson, 10,050 ± 300 (USGS VII).

GSC-383. Lonsbury Farm, Lavenham, Manitoba **10,600 ± 150 8650 B.C.**

Marl from W side of small gully tributary to Assiniboine River in NW ¼ sec., 22 tp., 9 rge. 10, W prin. mer., 2 mi S and 1.2 mi W of Lavenham, Manitoba (49° 45.8′ N Lat, 98° 45.2′ W Long), alt at top of section 1050 ± 5 ft (aneroid). Sample from middle of white marl bed 4.5-ft thick, underlying 7 ft of fine sand and silt rich in aquatic snail shells (Mozley, 1934) and overlying at least 8 ft of silt and sand. Wood layer that yielded Y-411 (10,550 ± 200, Yale III) is ca. 2.5 ft below base of marl and 5 ft below GSC-383. Coll. 1964 by J. A. Elson. *Comment* (J.A.E.): sample dated to check reliability of marl for dating Glacial Lake Agassiz. It should be slightly younger than Y-411, but age difference is well within statistical counting error; hence agreement is excellent. Note also close agreement with GSC-492 (10,670 ± 160, this list) for pelecypod shells from related deposit. Date applies to Main Campbell phase of Glacial Lake Agassiz. No sample pretreatment. Date based on one 3-day count.

10,670 ± 160

GSC-492. Holland, Manitoba **8720 B.C.**

Freshwater clam shells from terrace 50 ft above Assiniboine River flats ca. 6 mi N of Holland, Manitoba, NE ¼ sec. 28, tp. 8, rge. 11, W prin. mer (49° 36′ N Lat, 98° 54′ W Long). Shells from silt 5 ft below terrace surface, at alt 1050 ft. Coll. 1965 by R. W. Klassen. *Comment* (R.W.K.): alt indicates deposit correlates with highest Campbell Beach of Lake Agassiz II. Two fractions were dated (cf. Table 3, this list), after removal of outer 20%:

outer fraction (21-60% leach), two 1-day counts	10,700 ± 160
inner fraction (61-100% leach), one 3-day count	10,670 ± 160

2330 ± 130

GSC-579. Glenboro, Manitoba **380 B.C.**

Wood from beneath 45 ft of eolian sand forming N wall of Assiniboine River Valley ca. 8 mi N of Glenboro, Manitoba, SE ¼ sec. 26, tp. 8, rge. 14, W prin. mer. (49° 41′ N Lat, 99° 16′ W Long). Sample was within buried soil formed on highly organic, sandy alluvium 3-ft thick over varved clay. Coll. 1965 by R. W. Klassen. *Comment* (R.W.K.): eolian sand deposited on dated soil during major episode of dune formation on surface of Lake Agassiz delta of Assiniboine River.

3050 ± 140

GSC-476. The Pas, Manitoba **1100 B.C.**

Peat recovered by auger from beneath 16 ft of clayey alluvium of Saskatchewan River Delta ca. 12 mi SW of The Pas, Manitoba, SW ¼ sec. 28, tp. 54, rge. 27, W prin. mer. (53° 42′ N Lat, 101° 23′ W Long). Boreholes at sites in delta indicate ca. 50 ft of clayey alluvium overlies lake clay. Coll. 1965 by R. W. Klassen. *Comment* (R.W.K.): date indicates significant deposition over much of the delta in recent time. Pretreatment included *cold* NaOH-leach.

GSC-632. Lanigan, Saskatchewan **> 42,000**

Wood from sandy valley fill at ca. 540 ft depth during sinking of mine shaft near Lanigan, Saskatchewan, LSD 4, sec. 28, tp. 33, rge. 23, W 2nd mer. (51° 55′ N Lat, 105° 10′ W Long). Wood ca. 20 ft above bottom of buried valley, cut into bedrock. Coll. 1965 by L. L. Price; subm. by A. M. Stalker. *Comment* (A.M.S.): date supports geologic inference of interglacial or interstadial age.

7100 ± 150

GSC-539. Yellow Creek, Saskatchewan **5150 B.C.**

Silty gyttja from base of fen 2.7 mi SSE of Yellow Creek, Saskatchewan, SE ¼ sec. 3, tp. 43,rge. 23, W 2nd mer. (52° 43′ N Lat, 105° 13′ 15″ W Long); sample, from 280 to 290 cm depth, is underlain by gray silt and overlain by marly gyttja and fen peat. Coll. 1965 by R. J. Mott. *Comment* (R.J.M.): because deposit is above maximum limit of Glacial Lake Agassiz it was hoped it would provide minimum date for deglacia-

tion in area. Date was much younger than expected and only indicates time that organic accumulation started. NaOH-leach omitted from sample pretreatment.

8520 ± 170
GSC-643. 'Cycloid Lake,' Saskatchewan 6570 B.C.

Basal gyttja from lake 12 mi N of La Ronge, Saskatchewan (55° 15′ N Lat, 105° 16′ W Long), at alt ca. 1300 ft. Sample from 323 to 328 cm depth below mud/water interface; water depth 6 ft. Underlying brown organic clay grades into stiff, gray, inorganic clay at 340 cm. Coll. 1966 by R. J. Mott. *Comment* (R.J.M.): organic matter is present in clay below material used for dating. Date is minimum for deglaciation. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

4200 ± 130
GSC-494. Molonosa, Saskatchewan 2250 B.C.

Basal peat from bog ca. 3 mi N of Molanosa, Saskatchewan, tp. 64, rge. 24, W 2nd mer. (54° 33′ N Lat, 105° 32′ W Long), at alt ca. 1670 ft. Four ft of peat is exposed in drainage ditch beside Hwy 2; sample coll. at contact between peat and underlying boulders and sand. Coll. 1965 by R. J. Mott. *Comment* (R.J.M.): sample dated to provide minimum age for deglaciation; young date gives age for beginning of peat accumulation at site. NaOH-leach omitted from sample pretreatment. Date based on one 3-day count.

10,710 ± 250
GSC-618. Crestwynd, Saskatchewan 8760 B.C.

Carbonaceous material from basal part of pond sediments overlying and within till at 20 ft depth in road cut 0.5 mi W of Crestwynd and 20 mi S of Moose Jaw, Saskatchewan (50° 06′ N Lat, 105° 42′ W Long), at alt 2300 ft. Site is in area of hummocky terrain on W flank of The Coteau "Moraine". Coll. 1965 by V. K. Prest. *Comment* (V.K.P.): pond sediments, till, and sand and gravel appear to have sunk, slid and been washed into their present positions with more than one reversal of topography. Date agrees with others from S side of The Coteau "Moraine" (e.g., S-123, 10,900 ± 700 and S-128, 10,800 ± 300, Saskatchewan III; S-173, 13,000 ± 200, Saskatchewan IV; cf. Parizek, 1964 and Christiansen, 1965); it indicates a period of pond environment prior to melting of buried ice blocks. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

11,560 ± 640
GSC-648. Prince Albert, Saskatchewan 9160 B.C.

Organic sand forming basal organic sediment in lake on N bank of North Saskatchewan River 3 mi NE of center of Prince Albert, Saskatchewan, SW ¼ sec. 15, tp. 49, rge. 26, W 2nd mer. (53° 14′ 15″ N Lat, 105° 43′ 30″ W Long); lake surface at alt 1450 ft. Sample, from 590 to 620 cm depth below mud/water interface, is overlain by marly

gyttja which nearly fills lake and is underlain by sand. Coll. 1966 by R. J. Mott. *Comment* (R.J.M.): date is minimum for deglaciation. Following deglaciation a stage of Glacial Lake Agassiz covered area for unknown length of time and was followed by dune building before the first organic sediments were deposited. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

10,260 ± 170

GSC-647. Prince Albert National Park, Saskatchewan 8310 B.C.

Basal organic sediment from small lake ca. 8.5 mi S of Waskesiu, Prince Albert Natl. Park, Saskatchewan, sec. 34, tp. 55, rge. 1, W 3rd mer. (53° 48′ N Lat, 106° 04′ W Long), alt ca. 1700 ft. Sample, from 496 to 504 cm depth below mud/ water interface, is overlain by banded marl and gyttja and underlain by coarse sand and pebbles. Water depth is 9 ft. Coll. 1966 by R. J. Mott. *Comment* (R.J.M.): date is minimum for deglaciation. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

11,090 ± 160

GSC-642. Cutknife Hill, Saskatchewan 9140 B.C.

Basal organic silt and sand from lake ca. 0.5 mi W of Atten Lake and 3.5 mi ENE of Cutknife Hill, Saskatchewan, tp. 44, rge. 20, W 3rd mer. (52° 50′ 30″ N Lat, 108° 53′ W Long); lake surface at alt 1716 ft. Water depth is ca. 28 ft. Sample, from 881 to 894 cm depth below mud/ water interface, is overlain by marly gyttja and underlain by sand. Coll. 1966 by R. J. Mott. *Comment* (R.J.M.): date gives minimum age for deglaciation. As lake is in dune area and within maximum limit of a glacial lake an unknown interval elapsed between deglaciation and start of organic deposition. NaOH-leach omitted from sample pretreatment. Date based on one 4-day count.

Medicine Hat series, Alberta

28,630 ± 800

GSC-578. Medicine Hat, plant fragments 26,680 B.C.

Poorly-preserved plant fragments in ca. 150-ft deposit of alluvium and colluvium from E bank of South Saskatchewan River, ca. 4 mi N of Medicine Hat, Alberta, SE ¼ sec. 20, tp. 13, rge. 5, W 4th mer. (50° 06′ N Lat, 110° 38′ W Long), at alt ca. 2250 ft. Plant fragments are remains of vegetation that grew locally on a river floodplain or in an abandoned river channel. Sample is from ca. 30 ft below top of deposit, which is overlain by 80 ft of drift, mostly till. Coll. 1963 by A. M. Stalker.

GSC-543. Medicine Hat, wood > 46,700

Wood from E bank South Saskatchewan River, ca. 3 mi N of Medicine Hat, Alberta, NE ¼ sec. 9, tp. 13, rge. 5, W 4th mer. (50° 04′ N Lat, 110° 37′ 30″ W Long), at alt ca. 2130 ft. From log 5 in. in diam in al-

luvial sand and silt, ca. 8 ft above river, and overlain by 220 ft of sediments, including three or four till sheets. Coll. 1964 by A. M. Stalker.
General Comment (A.M.S.): wood 15 to 20 ft above GSC-578 from same unit is 24,490 ± 200 yr old (GSC-205, GSC IV); the two dates may indicate general order of rate of accumulation of alluvium and colluvium. GSC-543 is thought to be of Sangamon age. NaOH-leach omitted from sample pretreatment of GSC-578. Date for GSC-543 based on one 3-day count and one 1-day count.

Castle River series, Alberta

Bison skull from outwash on S bank Castle River, ca. 6 mi W of town of Pincher Creek Alberta in SE ¼ sec. 21, tp. 6, rge. 1, W 5th mer. (49° 29′ N Lat, 114° 03′ 30″ W Long), alt ca. 3800 ft. Skull and other bison bones occurred in gravel and coarse sand ca. 30 ft above river, beneath 60 ft of outwash, alluvial sand and eolian sand. Coll. 1959 by A. M. Stalker.

GSC-447. Castle River, bison jaw **6150 ± 140 / 4200 B.C.**

Two determinations were made:

Collagen fraction	6150 ± 140
Carbonate fraction	1100 ± 130

GSC-490. Castle River, bison teeth **6100 ± 180 / 4150 B.C.**

Two determinations were made:

Dentin fraction	6100 ± 180
Carbonate fraction	2130 ± 130

General Comment (A.M.S.): outwash appears to represent early retreat of last major Cordilleran glacier from maximum advance position, possibly of late Pinedale age (Richmond, 1965). Dates on organic fractions show good agreement; dates on carbonate fractions are unreliable (cf. Table 3, GSC V). Both fractions of GSC-490 mixed with dead gas for counting. Dates for collagen fraction of GSC-447 and for carbonate fraction of GSC-490 each based on one 3-day count.

Cochrane Terrace series, Alberta

Bones from middle terrace of three postglacial terraces of Bow River near Cochrane, Alberta. Surface of terrace lies ca. 75 ft above river and ca. 25 ft below highest terrace. Samples coll. from cross-bedded, sandy alluvium ca. 7 ft below terrace surface. Fauna includes *Bison bison, Equus conversidens, Ovis canadensis,* and *Cervus canadensis* (id. by C. S. Churcher, Univ. of Toronto).

GSC-612. Griffin Gravel Pit, Cochrane, Alberta **10,760 ± 160 / 8810 B.C.**

Bone from E. Griffin Gravel Pit, ca. 0.5 mi ESE of Cochrane, Alberta, in NE ¼ sec. 35, tp. 25, rge. 4, W 5th mer. (51° 10′ 40″ N Lat,

114° 27′ 10″ W Long). Coll. 1963, 1964, 1965 by P. Chamney, C. S. Churcher, and A. M. Stalker.

11,370 ± 170

GSC-613. Clarke Gravel Pit, Cochrane, Alberta 9420 B.C.

Bone from A. Clarke and Sons' Gravel Pit, ca. 0.3 mi SE of Cochrane, Alberta, in NW ¼ sec. 35, tp. 25, rge. 4, W 5th mer. (51° 10′ 40″ N Lat, 114° 27′ 30″ W Long). Coll. 1964, 1965 by G. Clarke of Cochrane and A. M. Stalker.

General Comment (A.M.S.): dates agree closely and provide age for fauna in this high postglacial terrace along Bow River. Date for GSC-612 based on one 3-day count.

5560 ± 130

GSC-360. Canmore, Alberta 3610 B.C.

Peat at base of 4.5 ft sec., underlying 6 in. of lake silt, from glaciated bedrock bench ca. 400 ft above Bow River, ca. 2 mi SE of Canmore, Alberta (51° 03′ N Lat, 115° 18′ 40″ W Long). Coll. 1964 by N. W. Rutter. *Comment* (N.W.R.): date is minimum for deglaciation. GSC-332 (9330 ± 170, GSC V) from up the valley (along North Saskatchewan River in Banff Natl. Park) provides age which is presumably closer to time of deglaciation. Date based on one 3-day count.

8320 ± 260

GSC-500. Headwaters of Goose River, Alberta 6370 B.C.

Basal peat in bog in LSD 14, sec. 11, tp. 66, rge. 14, W 5th mer. (54° 42′ 30″ N Lat, 116° 00′ 30″ W Long) at alt ca. 3750 ft; in small spillway at SW extremity of Swan Hills. Coll. 1965 with Hiller sampler at 410 to 420 cm depth by D. A. St-Onge. *Comment* (D.S.): date is minimum for ice retreat and gives time for beginning of muskeg development (see GSC-525, 8560 ± 170, this list). NaOH-leach omitted from sample pretreatment.

3750 ± 150

GSC-499. Pass Creek Spillway, Alberta 1800 B.C.

Peat below 7 in. of silt and organic layers in upper reaches of Iosegun River valley, S of Alberta Hwy 43 (54° 19′ N Lat, 116° 35′ W Long), at alt ca. 2700 ft. Coll. 1965 with Hiller sampler by D. A. St-Onge. *Comment* (D.S.): date indicates that a considerable time elapsed after valley ceased to operate as spillway for Glacial Lake Rycroft before organic material started to accumulate (cf. GSC-508, 12,190 ± 350; GSC-551, 6590 ± 150; this list). NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

6590 ± 150

GSC-551. Atikamek Creek, Alberta 4640 B.C.

Six in. peat within clay, 6 ft below surface, from cut bank on N side of Atikamek Creek, LSD 11, sec. 35, tp. 19, rge. 64, W 5th mer. (54° 35′ N Lat, 116° 46′ W Long) at alt ca. 2450 ft. Coll. 1965 by D. A. St-Onge. *Comment* (D.S.): material above organic layer is probably allu-

vium. Date gives time of beginning of muskeg development and is minimum for drainage of lake from locality. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-501. Goose River, Alberta **> 42,500**

Wood in cross-bedded sand on S bank Goose River, LSD 12, sec. 2, tp. 67, rge. 19, W 5th mer. (54° 46′ N Lat, 116° 47′ 30″ W Long) at alt ca. 2400 ft. Coll. 1965 from river-bank outcrop by D. A. St-Onge. *Comment* (D.S.): sand is overlain by till and alluvium. Date based on one 4-day count.

GSC-525. Marsh Head Creek, Alberta **8560 ± 170**
6610 B.C.

Basal peat in bog in LSD 2, sec. 35, tp. 59, rge. 20, W 5th mer. (54° 10′ N Lat, 116° 54′ 30″ W Long), at alt ca. 3350 ft. Coll. 1965 with Hiller sampler at 310 to 320 cm depth by D. A. St-Onge. *Comment* (D.S.): bog is in a small marginal drainage channel in side hill position. Date gives time of beginning of muskeg development and is minimum for ice retreat (cf. GSC-508, 12,190 ± 350, this list). NaOH-leach omitted from sample pretreatment.

GSC-508. Little Smoky River, Alberta **12,190 ± 350**
10,240 B.C.

Fresh-water gastropod shells in cross-bedded sand from road cut in South Kaybobs Oilfield, Alberta, LSD 14, sec. 12, tp. 62, rge. 21, W 5th mer (54° 21′ N Lat, 117° 01′ W Long), at alt ca. 2700 ft. Coll. 1965 by D. A. St-Onge. *Comment* (D.S.): sand was deposited by Little Smoky River into Glacial Lake Rycroft, then 100 to 150 ft below its highest level. No sample pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count.

Big Eddy Creek series, British Columbia

Wood from larger of two stumps, 2 and 3 ft in diam, respectively, 30 ft below and N of crest of S lateral moraine attributed to last maximum stand of glacier at head of Big Eddy Creek, Monashee Mountains, British Columbia (51° 17′ N Lat, 118° 29′ W Long), at alt 6300 ft. Rate of growth of trees decreased markedly during last 200 yr of their lives, but oldest tree cored above the moraine was ca. 300-yr old and showed no such period of marked inhibition of growth. Coll. 1963 by J. O. Wheeler.

GSC-198. Big Eddy Creek, stump core **910 ± 130**
A.D. 1050

Wood from near core of 3 ft diam stump.

GSC-571. Big Eddy Creek, stump outside **450 ± 130**
A.D. 1500

Wood from outside of 3 ft diam stump.

General Comment (J.O.W.): date of GSC-198 indicates stump is much older than trees still standing in mature timber nearby. Date of GSC-571 confirms field evidence that trees were covered by till from an advance of glacier at head of Big Eddy Creek; the advance took place ca. 450 radiocarbon yr ago (cf. Wheeler, 1964, for information on time of glacier expansion in Selkirk Mountains). Date for GSC-198 based on one 3-day count.

GSC-477. Gardom Lake, British Columbia **21,630 ± 870 / 19,680 B.C.**

Wood fragments from borehole, depth 65 to 70 ft, 1 mi N of Gardom Lake, 6 mi SE of Salmon Arm, British Columbia (50° 37′ 30″ N Lat, 119° 11′ 50″ W Long), at alt ca. 1700 ft. Log of 203 ft borehole (top to bottom): 48 ft kettled silt and sand; 4 ft gravel; 10 ft clay; 26 ft silt with abundant organic material; 25 ft silt with gravel lenses; 81 ft till; bedrock. Coll. 1965 by G. W. Smith for R. J. Fulton. *Comment* (R.J.F.): surface silt and sand was deposited during deglaciation; the 26 ft of organic silt containing dated wood was deposited before the last (Fraser) glaciation. Date is maximum for last glacial advance. Sample mixed with dead gas for counting.

GSC-479. Salmon River, British Columbia **> 22,200**

Small flecks of charcoal from soil buried 5 ft below surface in cut on abandoned road on S side of Salmon River, 6 mi SE of Falkland, British Columbia (50° 26′ 15″ N Lat, 119° 27′ 30″ W Long), at alt ca. 3200 ft. Surface till overlies gravel and silt on buried soil developed in talus and colluvium; a 2-cm bed of volcanic ash also lies within soil. Coll. 1965 by R. J. Fulton. *Comment* (R.J.F.): date is minimum for soil. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-526. Paxton Creek, British Columbia **9750 ± 170 / 7800 B.C.**

Humic-rich silty clay and fibrous organic material from 215-cm depth in bog deposit on divide between Paxton and St. Laurent Creeks, 5 mi E of Monte Lake, British Columbia (50° 32′ 30″ N Lat, 119° 45′ 10″ W Long), at alt ca. 3000 ft. Section: interbedded black muck and marl with thin beds of volcanic ash at depths of 55 and 95 cm; silty clay with organic traces continues to at least 300-cm. Coll. 1964 with Hiller sampler by R. J. Fulton. *Comment* (R.J.F.): date is minimum age for deglaciation. Pretreatment included *cold* NaOH-leach. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-79-2. Kamloops, British Columbia **24,200 ± 290 / 22,250 B.C.**

Fresh-water shells *(Margaratifera margaratifera* var. *falcata, Anodonta nuttalliana:* id by F. J. E. Wagner) from borrow pit at base of S wall of Thompson River Valley, ca. 5 mi W of Kamloops, British Columbia (50° 41′ 20″ N Lat, 120° 26′ 30″ W Long), at alt ca. 1200 ft. Shells

incorporated in 35 ft of partially oxidized clayey, silty sand deposited as alluvial fan prior to Fraser Glaciation. Coll. 1961 by R. J. Fulton. *Comment* (R.J.F.): date confirms an earlier run on sample (GSC-79, 25,200 ± 460, GSC II), and is anomalously younger than GSC-413 (>35,500, GSC V), stratigraphically higher in same exposure; it is too young to be in harmony with field relationships and regional stratigraphy. Discrepancy may result from secondary deposition of modern carbon, as GSC-79 was within coarser, more highly oxidized material than GSC-413. Only outermost 10% removed before dating. Date based on one 3-day count.

GSC-536. Coquitlam (wood), British Columbia **27,180 ± 460**
25,230 B.C.

Wood from Maryhill gravel pit, Coquitlam Municipality, Fraser Lowland, British Columbia (49° 14′ N Lat, 122° 47′ W Long) from silty clay up to 3 ft thick, above till and beneath ca. 50 ft of nonglacial sand and gravel and 100 ft of Surrey Drift (Vashon Stade). Coll. 1965 by J. E. Armstrong. *Comment* (J.E.A.): date agrees with GSC-124 (26,450 ±520, GSC III) for peaty silt within overlying nonglacial sand and gravel at same site, and permits assignment of inter-till material to Quadra sediments, formed during Olympia Interglaciation. Date based on one 3-day count.

GSC-555. Lynn Valley, British Columbia **> 52,300**

Wood from silty sand beneath 2 tills and underlain by a third till, 90 ft below surface in road cut, Lynn Valley, North Vancouver, British Columbia (49° 18′ N Lat, 123° 03′ W Long). Coll. 1960 by J. E. Armstrong. *Comment* (J.E.A.): nonglacial unit higher in same section, between top and second tills, yielded date 32,200 ± 3300 (I(GSC)-214, Isotopes II) and is assigned to Olympia Interglaciation. Date represents separate, older nonglacial interval. Date based on one 3-day count and one 1-day count in 5-L counter at 4 atm.

GSC-519. Nicomekl-Serpentine Flat, British Columbia **10,430 ± 150**
8480 B.C.

Marine-pelecypod shell fragments and worm tubes from silty clay 105 ft below sealevel in borehole in SW ¼, sec. 35, tp. 1, Surrey Municipality, British Columbia (49° 05′ N Lat, 122° 47′ 45″ W Long). Coll. 1965 by E. C. Halstead from Shelby tube sample at depth 107 to 109 ft. *Comment:* sample dates lower part of estuarine(?) valley fill here 100-ft thick, with top, below peat, ca. 20 ft below sealevel. Date based on one 3-day count.

GSC-518. Mill Bay, Vancouver Island **23,840 ± 300**
21,890 B.C.

Wood from rusty coarse gravels that overlie till in road cut at base of coastal-cliff section between Verdier and McPhail Points, Vancouver Island, British Columbia (48° 37′ N Lat, 123° 31′ W Long). Coll. 1965

by E. C. Halstead. *Comment* (E.C.H.): date supports assignment of gravel to Quadra sediments formed during Olympia Interglaciation.

Kitimat-Terrace series, British Columbia

GSC-522. Minette Bay — **9880 ± 160 / 7930 B.C.**

Shells from silty clay exposed along Minette Bay logging road, alt 125 ft, Kitimat area, British Columbia (54° 03′ N Lat, 128° 37′ W Long). Coll. 1965 by J. E. Armstrong. *Comment* (J.E.A.): shells date marine submergence following or during last Cordilleran glacier retreat. Outermost 40% removed before dating. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-535. Furlong Bay-Lakelse Lake, British Columbia — **10,420 ± 160 / 8470 B.C.**

Shells from silty clay exposed along Kitimat-Terrace road between Hatchery and Furlong Creeks, alt ca. 300 ft, Lakelse area, British Columbia (54° 21′ N Lat, 128° 31′ W Long). Ca. 600 ft W of sample area, silty clay is overlain by gravel believed glaciofluvial; ca. 1 mi N the silty clay overlies till. Coll. 1965 by J. E. Armstrong. *Comment:* see GSC-523.

GSC-523. Lakelse Lake, British Columbia — **10,790 ± 180 / 8840 B.C.**

Shells from silty clay in slide along Kitimat-Terrace road between Furlong and Williams Creeks, alt ca. 300 ft, Lakelse area, British Columbia (54° 25′ N Lat, 128° 31′ W Long). Clay is overlain by till in roadcut 100 ft E. Coll. 1965 by J. E. Armstrong. *Comment* (J.E.A.): GSC-535 and 523 date marine submergence associated with wastage of last major Cordilleran ice sheet during Fraser Glaciation. Till separating sample sites is inferred to record minor glacial fluctuation. Only outermost 10% removed before dating: Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-566. Mt. Edziza, British Columbia — **1340 ± 130 / A.D. 610**

Twigs, roots, and plant detritus from bank of dry creek, N side Mt. Edziza volcano, British Columbia (57° 47′ N Lat, 130° 35′ W Long), at alt ca. 6150 ft. Sample is from tundra covered by ca. 25 ft of basaltic ash and scoria on lee side of large cinder cone. Coll. 1965 by J. G. Souther. *Comment* (J.G.S.): plants date one of last major eruptions of Mt. Edziza. Distribution of ash indicates that prior to eruption nearby glaciers had begun to recede from inner of two end moraines.

C. Northern Canada, Mainland

Niggerhead Lake series, Yukon

Organic detritus and peat from lake bottoms in Niggerhead Lake region, Yukon Territory. Coll. 1965 with Davis sampler by V. Rampton.

6200 ± 150

GSC-544. Niggerhead Lakes, Yukon (I) 4250 B.C.

Organic detritus from N end of lake, alt ca. 2550 ft, 0.5 mi E of milepost 1190, Alaska Hwy (62° 15.5′ Lat, 140° 41′ W Long). Material overlies gravel and underlies 9 ft of silt and gyttja. Water depth at site 5.3 ft.

4550 ± 150

GSC-580. Niggerhead Lakes, Yukon (II) 2600 B.C.

Organic detritus from NE end of lake, alt ca. 2350 ft, 5 mi N of Snag Junction, along Snag Road (62° 17.5′ N Lat, 140° 35′ W Long). Material overlies pebbly sand and underlies 3.2 ft of gyttja. Water depth at site 4.6 ft.

4470 ± 140

GSC-581. Niggerhead Lakes, Yukon (III) 2520 B.C.

Peat from sedge mat beside lake, alt ca. 2350 ft, 5 mi N of Snag Junction (62° 17.5′ N Lat, 140° 36′ W Long). Material overlies a pebbly sand and underlies 12 ft of loose sedge peat.

General Comment (V.R.): dates are minimum for ice-block melting and give time for beginning of organic accumulation in depressions in morainic complex of probable late Wisconsin age. NaOH-leach omitted from pretreatment of GSC-544 and GSC-580. GSC-580 mixed with dead gas for counting. Dates for GSC-544 and GSC-581 based on one 3-day count and one 4-day count, respectively.

13,660 ± 180

GSC-495. Macauley Ridge, Yukon 11,710 B.C.

Organic silt from NW end of lake, alt ca. 2580 ft, 0.5 mi N of milepost 1192, Alaska Hwy, Yukon Territory (62° 17′ N Lat, 140° 42.5′ W Long). Organic silt overlies laminated silt and sand, and underlies 16 ft of gyttja and loose organic detritus. Coll. 1965 with Davis sampler by V. Rampton. *Comment* (V.R.): date is minimum for ice retreat from moraine representing main-Wisconsin maximum. NaOH-leach omitted from sample pretreatment.

2590 ± 130

GSC-572. Contwoyto Lake, Northwest Territories 640 B.C.

Detrital peat from within bedded sand, exposed ca. 15 ft above lake on small island near N end of Contwoyto Lake, Northwest Territories (65° 58.5′ N Lat, 111° 23.5′ W Long), at alt ca. 1475 ft. Coll. 1965 by L. P. Tremblay. *Comment* (W. Blake, Jr.): date is minimum for a former glacial lake. Sand may be eolian in part (H. H. Bostock, pers. comm.). Date based on one 3-day count.

9170 ± 160

GSC-644. Daniel Moore Bay, Northwest Territories 7220 B.C.

Whole shells and fragments of marine pelecypods (mostly *Hiatella arctica* and *Mya truncata*) in silt on ground surface 3.5 mi W of Daniel Moore Bay, Bathurst Inlet, Northwest Territories (67° 47′ N Lat, 109°

48′ W Long), at alt ca. 580 ft. Coll. 1962 by J. A. Fraser for W. Blake, Jr. *Comment* (W.B., Jr.): shells are highest coll. in outer part of Bathurst Inlet. Date, similar to GSC-125 (9120 ± 210, GSC III) from Kent Peninsula, is minimum for deglaciation (cf. Blake, 1963).

Kokavingnak Island series, Northwest Territories

Marine shells from various localities on Kokavingnak Island (Barry Islands), Bathurst Inlet, Northwest Territories. Coll. 1962 by W. Blake, Jr. and R. N. McNeely.

8360 ± 150

GSC-344. Kokavingnak Island (480 ft) *Mytilus* 6410 B.C.

Fragments of *Mytilus edulis* on ground surface and in silt and sand near SW corner of Kokavingnak Island (67° 27.5′ N Lat, 108° 12′ W Long), at alt ca. 480 ft (cf. GSC-594, below).

8220 ± 160

GSC-594. Kokavingnak Island (480 ft) *Hiatella* 6270 B.C.

Whole shells and fragments of *Hiatella arctica* on ground surface and in silt and sand near SW corner of Kokavingnak Island (67° 27.5′ N Lat, 108° 12′ W Long), at alt ca. 480 ft (cf. GSC-344, above).

7480 ± 160

GSC-224. Kokavingnak Island (335 ft) 5530 B.C.

Fragments of *Mytilus edulis* on ground surface and imbedded in sand near SE corner of Kokavingnak Island (67° 27.5 N Lat, 108° 06′ W Long), at alt ca. 335 ft.

7990 ± 150

GSC-645. Kokavingnak Island (235 ft) 6040 B.C.

Fragments of *Balanus crenatus* (id. by F. J. E. Wagner) on ground surface and in silt, SE part of Kokavingnak Island (67° 27.5′ N Lat, 108° 06′ W Long), at alt ca. 235 ft.

7730 ± 160

GSC-646. Kokavingnak Island (190 ft) 5810 B.C.

Whole shells and fragments of *Hiatella arctica* on ground surface and in silt near N end of Kokavingnak Island (67° 33.5′ N Lat, 108° 08′ W Long), at alt ca. 190 ft.

4190 ± 130

GSC-302. Kokavingnak Island (90 ft) algae 2240 B.C.

Fragments of calcareous algae (*Lithothamnion* sp., id. by W. H. Adey, Smithsonian Inst., Washington, D.C.) from ground surface and in silt and clay, N-central part of Kokavingnak Island (67° 29.5′ N Lat, 108° 08′ W Long), at alt ca. 90 ft (cf. GSC-303, below).

4110 ± 150

GSC-303. Kokavingnak Island (90 ft) shells 2160 B.C.

Fragments of *Hiatella arctica* and *Mya truncata* from ground surface

and in silt and clay, N-central part of Kokavingnak Island (67° 29.5′ N Lat, 108° 08′ W Long), at alt ca. 90 ft (cf. GSC-302, above).

4960 ± 140

GSC-610. Kokavingnak Island (70 ft) 3010 B.C.

Whole shells and fragments of *Hiatella arctica* from ground surface, SW part of Kokavingnak Island (67° 27.5′ N Lat, 108° 10.5′ W Long), at alt ca. 70 ft.

General Comment (W.B., Jr.): series dated to obtain information on rate of land uplift since deglaciation in Bathurst Inlet and to check ages of different species from same sites (GSC-344 and GSC-594; GSC-302 and GSC-303). Good internal agreement for each pair was obtained although *Mytilus edulis* and *Lithothamnion* are generally restricted to shallower water than *Hiatella arctica* and *Mya truncata* (cf. GSC-230, 8000 ± 150 and GSC-359, 8060 ± 140, GSC V). Samples GSC-645, GSC-646, and GSC-610 coll. below steep cliffs; in each case shells dated are those of animals *(Balanus crenatus* and *Hiatella arctica)* which can live in water up to ca. 300 ft deep (Bousfield, 1960). Better results were obtained with the other six samples; these included both shallow water forms and those ranging to greater depths, but in each case samples were close to highest parts of island, rather than below cliffs. Dates on *Mytilus* and *Lithothamnion* show uplift was more rapid between 8400 and 7500 B.P. than between 7500 and 4200; uplift since 4200 B.P. has been even slower (cf. Blake, 1963). Dates for GSC-645 and GSC-302 based on one 4-day count and one 3-day count, respectively. Only outermost 10% removed for GSC-303; sample mixed with dead gas for counting.

East Bathurst Inlet series, Northwest Territories

Marine-pelecypod shells from three localities on E side of northern part of Bathurst Inlet, Northwest Territories.

8070 ± 160

GSC-604. Bathurst Inlet (east I) 6120 B.C.

Fragments of *Mytilus edulis* from beach gravel ca. 30 mi E of N part of Bathurst Inlet (67° 34.5′ N Lat, 106° 31.5′ W Long), at alt ca. 500 ft. Coll. 1962 by H. H. Bostock for W. Blake, Jr.

8200 ± 140

GSC-615. Bathurst Inlet (east II) 6250 B.C.

Whole shells and fragments of *Hiatella arctica* from sand on ground surface 0.5 mi E of Bathurst Inlet (near Kanuyak Island) 67° 25′ N Lat, 107° 35′ W Long), at alt ca. 430 ft. Coll. 1962 by F. M. G. Williams and J. Barton for W. Blake, Jr.

8230 ± 140

GSC-636. Bathurst Inlet (east III) 6280 B.C.

Fragments of *Hiatella arctica* and *Mya truncata* from ground surface in silt 16 mi E of Fowler Bay, Bathurst Inlet (67° 15′ N Lat, 106°

55′ W Long), at alt ca. 490 ft. Coll. 1962 by W. B. Poole and M. Cadieux for W. Blake, Jr.
General Comment (W.B., Jr.): date for GSC-604 indicates time at which a large area, whose general level is slightly above 500 ft, emerged from sea; GSC-615 and GSC-636 give information on pattern of ice retreat. For GSC-636 only outer 10% of shell was removed before dating. Date for GSC-604 based on one 3-day count; dates for GSC-615 and GSC-636 each based on one 4-day count.

GSC-337. Perry River, Northwest Territories **7760 ± 140 5810 B.C.**

Fragments of marine pelecypod *Clinocardium ciliatum* (id. by F. J. E. Wagner) from silt area on W bank Perry River, Northwest Territories (66° 59′ N Lat, 102° 11′ W Long), at alt ca. 355 to 360 ft. Coll. 1962 by J. A. Fraser and M. Cadieux for W. Blake, Jr. *Comment* (W.B., Jr.): shells dated in attempt to obtain more information on age of MacAlpine Moraine. Sample is lower than GSC-110 (8160 ± 140, GSC III), coll. 36 mi to WSW and, as expected, date is slightly younger (cf. Blake, 1963, 1966). Outermost 30% removed before dating. Date based on one 3-day count.

Lord Lindsay River series, Boothia Peninsula, Northwest Territories

Marine shells from S side Lord Lindsay River, 0.5 mi W of Thom Bay, E side of Boothia Peninsula, Northwest Territories (70° 08′ N Lat, 92° 27′ W Long; Craig, 1964, loc 64). Coll. 1962 by B. G. Craig.

GSC-601. Lord Lindsay River, beach **7660 ± 150 5710 B.C.**

Marine-pelecypod shells fragments (*Hiatella arctica, Mya truncata*) from surface of beach terrace, alt 81 ft.

GSC-603. Lord Lindsay River, delta **7660 ± 150 5710 B.C.**

Barnacle shells (*Balanus balanus, Balanus crenatus;* id. by F. J. E. Wagner) from foreset delta beds, alt 33 ft, 9 ft below delta surface level. *General Comment* (B.G.C.): samples were dated to compare ages of delta and beach. Synchronous formation of both features would require delta surface to be under ca. 40 ft of water; it seems more likely that delta formed later than the beach, and that shells in delta were redeposited from higher level. GSC-601 indicates relative sealevel ca. 90 ft 7700 yr ago.

GSC-597. Thom Bay, Boothia Peninsula, Northwest Territories **8950 ± 150 7000 B.C.**

Marine-pelecypod shells (*Hiatella arctica, Mya truncata*) from frost boil in marine silt from uppermost of series of terraces, alt 624 ft, ca. 50 ft below marine limit, 13 mi N of Thom Bay mission, E side of Boothia Peninsula, Northwest Territories (70° 20′ N Lat, 92° 14′ W Long: Craig,

1964, loc 5a). Coll. 1962 by B. G. Craig. *Comment* (B.G.C.): sample is highest coll. large enough for dating from S Boothia Peninsula, and approximates time of ice retreat and entry of sea into area. Sample mixed with dead gas for counting. Date based on one 4-day count.

GSC-595. Little Whale River, Quebec **6420 ± 240 / 4470 B.C.**

Shell fragments of marine pelecypods (mostly *Hiatella arctica*) from clay and silt exposed in cut bank at Little Whale River, Quebec (55° 57′ N Lat, 76° 42′ W Long), at alt 177 ft. Section above river level at 151 ft comprises 26 ft sand, a thin band of clay from which shells were coll., 121 ft of marine clay, and 10 ft of sand. Top of section at alt 308 ft; limit of marine submergence in area at alt ca. 890 ft. Coll. 1965 by D. Archer, McGill Univ., Montreal. *Comment* (W.Blake, Jr.): shells dated to obtain information about time of deglaciation of E coast of Hudson Bay (cf. Lee, 1960; also GSC-27, 4740 ± 110, GSC I). Date is oldest from area and must refer to a relative sealevel above 308 ft. Older dates from James Bay area (cf. Terasmae and Hughes, 1960; Hughes, 1965; Blake, 1966) suggest highest marine features along E coast of Hudson Bay should be closer to 8000 yr old. Some shell fragments, imbedded in a cemented matrix, were recovered by heating the mass and plunging it into cold water, which caused shells to separate from matrix. No sample pretreatment. Sample mixed with dead gas for counting.

GSC-537. 'Rivière Tourbe,' Quebec **1600 ± 140 / A.D. 350**

Detrital sphagnum peat from base of section 2.3 ft thick, overlying beach shingle and marine sediments in exposure near mouth of "Rivière Tourbe," Sugluk Inlet, Quebec (62° 10′ N Lat, 75° 48′ W Long), at alt ca. 28 ft. Peat is overlain by 7 ft eolian sand with layers of organic matter. Coll. 1965 by B. Matthews, McGill Univ., Montreal. *Comment* (B.M.): result is similar to I-727 (1625 ± 175, Maycock and Matthews, 1966), a date on basal peat at alt 382 ft in a nearby valley. Together the dates suggest conditions favorable for peat growth ca. 1600 yr ago. Sample shows marked 'high' in percentage of pine and spruce pollen, suggesting that forest-tundra boundary then lay farther N in Ungava than it does today. Date indicates uplift has been slow during last 1600 yr (cf. Matthews, 1966). Date based on one 3-day count.

D. Northern Canada, Arctic Archipelago

GSC-560. Salisbury Island, Hudson Strait **6920 ± 150 / 4970 B.C.**

Shell fragments of marine pelecypods (mainly *Hiatella arctica* and *Mya truncata*) from surface of silt deposit, S side of unnamed inlet at E end of Salisbury Island, Hudson Strait, Northwest Territories (63° 25′ N Lat, 76° 43′ W Long), at alt ca. 140 ft. Coll. 1964 by R. G. Blackadar. *Comment* (W.Blake, Jr.): date is minimum for deglaciation,

although limit of marine submergence is presumed to be 300 ft or more above sample level. Older dates have been obtained from both N and S shores of Hudson Strait (Blake, 1966; Matthews, 1966).

GSC-468. Nannuk Harbour, Baffin Island > 25,900

Pelecypod shell fragments from 2 in.-thick contorted band in bedded sand, ca. 2 ft below surface of beach ad exposed in wave-cut cliff, 3.5 mi WNW of mouth of Nannuk Harbour, Baffin Island, Northwest Territories (61° 54.5′ N Lat, 66° 29′ W Long), at alt 23 to 26 ft. Coll. 1965 by W. Blake, Jr., F. M. Synge, and M. Wongkee. *Comment* (W.B., Jr.): shells were only ones found in postglacial(?) beaches in southeasternmost Baffin Island; local limit of marine submergence is at alt ca. 65 ft. Date suggests shells have been washed out of till (cf. GSC-414, 30,200 ± 1500; GSC-426, 34,800 ± 1100; this list) and incorporated in beach since ice retreat. Sample mixed with dead gas for counting. Date based on one 1-day count.

34,800 ± 1100

GSC-426. Pritzler Harbour, Baffin Island 32,850 B.C.

Marine-shell fragments (mainly *Hiatella arctica*) from till on ground surface beside unnamed pond 1 mi N of head of Pritzler Harbour, Baffin Island, Northwest Territories (62° 10′ N Lat, 67° 21′ W Long), at alt ca. 210 ft. Coll. 1965 by W. Blake, Jr. and F. M. Synge. *Comment* (W.B., Jr.): shells in this area, where limit of marine submergence is at 110 to 125 ft, occur up to at least 600 ft. Shells probably interglacial or interstadial (cf. Olsson and Blake, 1962); probably shelly till was deposited by glacier tongue in Hudson Strait impinging on S coast of Baffin Island (cf. GSC-414, 30,200 ± 1500, this list; Blake, 1966).

30,200 ± 1500

GSC-414. Barrier Inlet, Baffin Island 28,250 B.C.

Marine-shell fragments (*Hiatella arctica, Astarte* sp., and *Balanus* sp.) from till on hill 6 mi W of mouth of Barrier Inlet, Baffin Island, Northwest Territories (62° 22.5′ N Lat, 68° 58′ W Long), at alt ca. 215 to 235 ft. Coll. 1965 by W. Blake, Jr. and F. M. Synge. *Comment* (W.B., Jr.): limit of postglacial marine submergence in area is close to or above alt of shells; dating was carried out to determine if shells were 'old' or postglacial. Date, probably minimum, indicates shells are interglacial or interstadial (cf. GSC-426, 34,800 ± 1100, this list). Probably shells were transported upward to their present position by a glacier tongue in Hudson Strait impinging on S coast of Baffin Island (Blake, 1966). Sample mixed with dead gas for counting.

7980 ± 220

GSC-425. Ashe Inlet, Big Island, Hudson Strait 6030 B.C.

Shell fragments of marine pelecypods (*Hiatella arctica, Mya* sp., *Macoma* sp.) from silt and clay in shallow pond 1 mi N of head of Ashe Inlet, Big Island, Hudson Strait, Northwest Territories (62° 36′ N

Lat, 70° 40′ W Long), at alt ca. 245 ft. Coll. 1965 by W. Blake, Jr. and F. M. Synge. *Comment* (W.B., Jr.): date is minimum for deglaciation and is oldest postglacial date so far obtained along N shore of Hudson Strait. Because limit of marine submergence is ca. 115 ft above sample alt, probably area was ice-free before 8000 yr B.P. Only outermost 10% removed before dating. Sample mixed with dead gas for counting.

680 ± 180

GSC-591. Lake Harbour, Baffin Island **A.D. 1270**

Peat from layer on bedrock and under 19 in.-thick solifluction lobe 1.5 mi E of Lake Harbour, Baffin Island, Northwest Territories (62° 51′ N Lat, 69° 50′ W Long), at alt ca. 250 ft. Coll. 1965 by W. Blake, Jr. *Comment* (W.B., Jr.): considerable time elapsed after site emerged from sea (cf. GSC-433, 7880 ± 140; GSC-504, 7490 ±160; this list) before organic debris began to accumulate. Two fractions were dated (cf. Table 3, this list), and dates agree within limits of error; soluble fraction was mixed with dead gas for counting:

soluble in NaOH	680 ± 180
not dissolved in NaOH	500 ± 130

Soper Lake series, Baffin Island

Marine-pelecypod shells from three localities near Soper Lake, Baffin Island, Northwest Territories. Coll. 1965 by W. Blake, Jr. and F. M. Synge.

7880 ± 140

GSC-433. Soper Lake (210 ft) **5930 B.C.**

Fragments of *Hiatella arctica* and *Mya truncata* from silt and sand in small pool (62° 53.5′ N Lat, 69° 50.5′ W Long) ca. 0.5 mi E of head of Soper Lake, at alt ca. 210 ft.

7490 ± 160

GSC-504. Soper Lake (135 ft) **5540 B.C.**

Whole shells and fragments of *Hiatella arctica* and *Mya truncata* from silt in pond (62° 53.5′ N Lat, 69° 51′ W Long) ca. 0.2 mi E of head of Soper Lake, at alt ca. 135 ft.

3750 ± 140

GSC-596. Soper Lake (< 10 ft) **1800 B.C.**

Fragments of *Mya truncata* from silt and clay under sand and exposed in channel bottom where E arm of Soper River enters head of Soper Lake (62° 54′ N Lat, 69° 51.5′ W Long), at alt ca. 10 ft or less (highest tides probably enter Soper Lake).

General Comment (W.B., Jr.): GSC-433 is minimum for deglaciation. Deglaciation probably occurred before 8000 yr B.P., as limit of marine submergence is at ca. 305 ft, 95 ft above level of highest shells (Blake, 1966). The three dates together show that rate of uplift has decreased with time (cf. numerous dates from archaeological sites near Lake Harbour, on samples coll. by M. S. Maxwell in Michigan XI, Pennsylvania

IX). Dates GSC-433 and GSC-596 each based on one 3-day count; GSC-504 mixed with dead gas for counting and date based on one 4-day count. Date GSC-504 was inadvertently given as 7480 ± 160 in Blake (1966).

York Sound series, Baffin Island

Whole shells and fragments of marine pelecypods *Hiatella arctica* and *Mya truncata* in foreset beds of large delta at head of York Sound, Frobisher Bay, Baffin Island, Northwest Territories (62° 24.5′ N Lat, 66° 29′ W Long). Shells from fine sand and silt band at alt 65 ft; surface of delta is at ca. 125 ft. Coll. 1965 by W. Blake, Jr.

8840 ± 160

GSC-463. York Sound, first preparation 6890 B.C.

Pretreatment involved standard leach to remove outermost 20% of shell.

8710 ± 180

GSC-463-2. York Sound, second preparation 6760 B.C.

Pretreatment involved leaching of outermost 50% of shell.

General Comment (W.B., Jr.): GSC-463-2, the more reliable, is minimum for deglaciation of outermost Frobisher Bay; at that time ice must have existed in Hudson Strait to dam up lake which spilled over into York Sound and produced delta containing the shells (Blake, 1966). For both determinations sample was mixed with dead gas for counting.

190 ± 240

GSC-532. Watts Bay, Baffin Island A.D. 1760

Charcoal fragments and partially charred twigs and leaves (*Dryas*) from 0.5 to 2 in. depth under sand and turf in hearth of Eskimo tent ring on lateral moraine on E side of Watts Bay, Baffin Island, Northwest Territories (62° 39.5′ N Lat, 66° 49′ W Long), at alt ca. 35 to 40 ft. Coll. 1965 by W. Blake, Jr. *Comment* (W.B., Jr.): cirque glaciers on E side Watts Bay have extended to sealevel recently, as lateral moraines have not been modified by wave action during uplift. Sample dated to determine minimum age for moraine, but date is inconclusive. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

8230 ± 240

GSC-462. Cape Rammelsberg, Baffin Island 6280 B.C.

Shell fragments of marine pelecypods *Macoma balthica, Yoldia glacialis,* and *Hiatella arctica* from surface of silt deposit on distal (SE) side of outermost end moraine ridge, 2.5 mi S of Cape Rammelsberg, Baffin Island, Northwest Territories (63° 23.5′ N Lat, 68° 25′ W Long), at alt 275 to 285 ft. Coll. 1965 by W. Blake, Jr. and F. M. Synge. *Comment* (W.B., Jr.): shells are within 50 ft of marine limit; this date and GSC-464 (6750 ± 170, this list), bracket time of moraine formation. No sample pretreatment. Sample mixed with dead gas for counting.

440 ± 150

GSC-467. Frobisher Bay, Baffin Island **A.D. 1510**

Shell fragments of marine pelecypods *Hiatella arctica* and *Mya* sp. from surface of raised beach on peninsula ca. 2 mi SSW from Faris Island on SW side of Frobisher Bay, Baffin Island, Northwest Territories (63° 33.5′ N Lat, 68° 45′ W Long), at alt ca. 65 to 70 ft. Coll. 1965 by W. Blake, Jr., F. M. Synge, P. H. Smith and M. Wongkee. *Comment* (W.B., Jr.): shells were dated to determine time sea penetrated into inner Frobisher Bay; young date suggests shells arrived long after beach formed (cf. GSC. 464, 6750 ± 170 and GSC-533, 6440 ± 160, this list), possibly by action of wind or birds. No sample pretreatment. Sample mixed dead gas for counting. Date based on one 3-day count.

Apex Hill series, Baffin Island

Marine-pelecypod shells coll. from delta at NW side of town of Apex Hill, Frobisher Bay, Baffin Island, Northwest Territories (63° 43.5′ N Lat, 68° 27.5′ W Long).

6750 ± 170

GSC-464. Apex Hill (I) **4800 B.C.**

Fragments, mainly of *Mya truncata,* from sandy talus along E side of channel through delta E of Hudson's Bay Co. post, Apex Hill. Sample from zone at ca. 38 to 50 ft alt, but shells derive from strata close to 50-ft level. Coll. 1965 by W. Blake, Jr. and R. N. McNeely.

6140 ± 170

GSC-503. Apex Hill (II) **4190 B.C.**

Fragments of *Mya truncata, Hiatella arctica,* and *Astarte* sp. from gravel layer in delta near road leading to Frobisher from Apex Hill, at alt ca. 48 ft. Coll. 1962 by B. Matthews, McGill Univ., Montreal.
General Comment (W.B., Jr.): shells dated to determine time sea penetrated inside end moraines crossing Frobisher Bay. Although samples coll. at similar alt, GSC-464 approximates more closely the time of maximum submergence (washing limit is at ca. 100 ft). GSC-464 and GSC-462, 8230 ± 240 (this list) bracket time of moraine formation in Frobisher Bay (Blake, 1966). Neither sample pretreated. Both samples mixed with dead gas for counting. Each date based on one 3-day count.

6440 ± 160

GSC-533. Frobisher, Baffin Island **4490 B.C.**

Whole shells and fragments of marine pelecypods *Mya truncata* and *Macoma calcarea* from silty-sand in recent pit excavation in delta at Frobisher, Baffin Island, Northwest Territories (63° 45′ N Lat, 68° 32′ W Long), at alt ca. 11 ft. Shells may relate to a beach at 27 ft, but area above 30 ft has been disturbed by construction. Coll. 1962 by B. Matthews, McGill Univ., Montreal. *Comment* (B.M.): sample also contained Boreal/Warm Temperate pelecypod species, and is older than anticipated; a deposit containing similar species in northern Ungava is 3900

± 120 yr old (NPL-71, NPL III; Matthews, 1966). Possibly, sample is mixture of shells of various ages. Date supports GSC-464 (6750 ± 170, this list) as to time of marine submergence. Sample mixed with dead gas for counting. Date based on one 3-day count.

4550 ± 220

GSC-498. Amadjuak Lake, Baffin Island **2600 B.C.**

Basal organic material from filled depression exposed in wave-cut cliff on S side of unnamed island in SE bay of Amadjuak Lake, Baffin Island, Northwest Territories (64° 36′ N Lat, 70° 29′ W Long), at alt ca. 392 ft. From a bed at 36 to 38 in., depth among coarse sand and gravel, ca. 22 ft above lake level. Several such filled depressions occur along flanks of esker forming main ridge of island. Coll. 1965 by W. Blake, Jr. and F. M. Synge. *Comment* (W.B., Jr.): date is minimum for deglaciation. Two fractions were dated (cf. Table 3, this list); dates agree within limits of error. Both fractions were mixed with dead gas for counting:

soluble in NaOH	4550 ± 220
not dissolved in NaOH	4460 ± 140

6120 ± 140

GSC-561. Foxe Peninsula, Baffin Island **4170 B.C.**

Pelecypod shell fragments from ground surface beside small, unnamed lake 12 mi N of head of Andrew Gordon Bay, Foxe Peninsula, Baffin Island, Northwest Territories (64° 47.5′ N Lat, 75° 52′ W Long), at some alt between 200 and 300 ft. Coll. 1964 by T. A. P. Kwak for R. G. Blackadar. *Comment* (W.Blake, Jr.): date is minimum for withdrawal of ice from major moraines crossing western Foxe Peninsula. Local limit of marine submergence is close to 500 ft; sea probably entered area several hundred years before 6100 yr B.P. (cf. GSC-465, 6830 ± 150, this list).

Putnam Highland series, Baffin Island

Marine-pelecypod shells from surface of beach sand and gravel and from silt in centers of sorted polygons on high level beaches, N corner Putnam Highland, Baffin Island, Northwest Territories (65° 19.5′ N Lat, 73° 09′ W Long), ca. 13 mi SE of Bowman Bay, Foxe Basin. Coll. 1965 by W. Blake, Jr. and F. M. Synge.

6830 ± 150

GSC-465. Putnam Highland (330 ft) **4880 B.C.**

Fragments of *Mya truncata, Hiatella arctica,* and *Macoma* sp. at alt ca. 315 to 330 ft.

6590 ± 140

GSC-553. Putnam Highland (300 ft) **4640 B.C.**

Fragments of *Mya truncata* and *Macoma* sp. at alt ca. 285 to 300 ft. Two fractions of GSC-553 were dated after removal of outermost 10% (cf. Table 3, this list):

outer fraction (10-55% leach, two 1-day counts 6270 ± 140
inner fraction (56-100% leach), one 3-day count 6590 ± 140

General Comment (W.B., Jr.): higher shells are ca. 5 to 20 ft below limit of marine submergence; date is minimum for deglaciation. Lower shells dated as check on GSC-465 and on shell contamination. GSC-465 mixed with dead gas for counting.

GSC-466. Burwash Bay, Baffin Island **6760 ± 140**
4810 B.C.

Shell fragments of marine pelecypods *Mya truncata* and *Hiatella arctica* in beach ridges 15 to 35 ft below limit of marine submergence, ca. 7.5 mi WNW of Burwash Bay, Nettilling Lake, Baffin Island (66° 02′ N Lat, 71° 36′ W Long), at alt ca. 285 to 305 ft. Coll. 1965 by W. Blake, Jr. *Comment* (W.B., Jr.): date is minimum for deglaciation; at this time S Baffin Island was separated from N part of island by a sea connection between Foxe Basin and Cumberland Sound via Nettilling Lake. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-564. Flint Lake, Baffin Island **3100 ± 150**
1150 B.C.

Marine-pelecypod shells (*Mya truncata* and *Clinocardium ciliatum*), intact and paired in silty clay, at alt 15 to 18 m, 22 m below marine limit from head of Flint Lake, Baffin Island, Northwest Territories (69° 22′ N Lat, 73° 54′ 30″ W Long), ca. 80 km E of Foxe Basin. Coll. 1965 by J. T. Andrews, Geog. Branch, Ottawa. *Comment* (J.T.A.): marine limit at head of Flint Lake is at alt 40 to 42 m. Dates are minimum for marine incursion. Other evidence suggests that maximum age for incursion is ca. 4000 yr. Dates on outer coast (Sim, 1964; Andrews, 1966) indicate it was ice-free ca. 6700 yr ago; thus an 80-km retreat occurred within 2700 to 3700 yr. Date is added confirmation for slow retreat of inland ice cap on Baffin Island.

GSC-557. Piling Lake, Baffin Island **4000 ± 140**
2050 B.C.

Marine-pelecypod shells (*Mya truncata*) from stony clay overlain by deltaic beds at head of Piling Lake, Baffin Island, Northwest Territories (69° 06′ N Lat, 74° 48′ W Long), ca. 17 km E of Foxe Basin at alt. 2.5 m. Coll. 1965 by J. T. Andrews. *Comment* (J.T.A.): deposit contains striated pebbles and cobbles; it was thought to be glacio-marine clay. Because of position of sample E of a major moraine crossing Piling Lake, a moraine that may be synchronous with *Isortoq* phase as delimited farther N (Andrews, 1966), shells were assumed to be ca. 6000 yr old. Date refers to conditions prior to encroachment of deltaic environment; delta surface at 26 m is minimum value for sealevel alt when shells lived. This suggestion agrees with published uplift curves (Ives, 1964; Andrews, 1966).

Isortoq River series, Baffin Island

Plant detritus from 7-m section of contorted sand and silt in alluvium exposed along Isortoq River, Baffin Island, Northwest Territories (70° 21′ N Lat, 74° 59′ W Long), at alt ca. 200 m. Site is 26 km W of W margin of Barnes Ice-cap. Coll. 1962 by J. T. Andrews.

GSC-259. Isortoq River (I) **> 38,800**

Woody layer in silt from uppermost part of section, 4 m above river. Two fractions were dated:

soluble in NaOH	>36,900
not dissolved in NaOH	>38,800

GSC-427. Isortoq River (II) **> 40,700**

Plant detritus within sand from lower part of section, ca. 0.5 m above river level. Two fractions were dated:

soluble in NaOH	>34,800
not dissolved in NaOH	>40,700

General Comment (J.T.A.): dates for GSC-259 and GSC-427 obtained on identical samples as I-731 (24,600 ± 500) and I-839 (30,000 ± 1200), respectively (Isotopes V). Two other samples from same exposure also have similar dates: I-1234, >35,000, from stratigraphically highest beds in E part of section, and I-1235, >40,000, from stratigraphically lowest beds exposed in W part of section (Isotopes V; Andrews, 1967). These four dates indicate deposits are >40,000 yr old. Pollen and macrofloristic studies suggest plants lived when July mean temperature may have been 5°C higher; dwarf birch and probably alder grew in valleys (cf. Terasmae *et al.,* 1966). Beds were contorted by ice flowing W toward Foxe Basin. More soluble fraction of GSC-427 mixed with dead gas for counting; date based on one 1-day count. Dates for less soluble fractions of GSC-259 and GSC-427 each based on one 3-day count.

30,320 ± 820

GSC-528. Fellside Lake, Baffin Island **28,370 B.C.**

Marine-pelecypod shells (mainly *Mya truncata* and *Hiatella arctica)* from 244 m alt on E side of Steensby Inlet, Baffin Island, Northwest Territories (70° 03′ N Lat, 77° 30′ W Long) from carbonate-rich till ca. 100 m above local marine limit. Coll. 1963 by D. A. Harrison for J. T. Andrews. *Comment* (J.T.A.): sample is from same collection as I-1242 (19,000 ± 1000; Isotopes V), dated after removal of outer 60% by weight. GSC-528 was in part a surface-and in part an excavated sample. New date, which may be minimal, suggests also that I-725 (17,800 ± 500; Isotopes V) and I-1314 (18,700 ± 1200; Isotopes V) may be too young, despite similarity of the dates on two fractions of same sample (cf. Isotopes V; Andrews, 1967). One of the species, *Venericardia borealis* (id. by F. J. E. Wagner), indicates marine conditions then might have been slightly warmer than today. Presumably, concept of "Steensby Interstadial" (Andrews, 1965) at ca. 19,000 yr ago will have to be revised.

Clyde Fiord series, Baffin Island

Marine pelecypod shells from deposits on S side of outer Clyde Fiord, Baffin Island, Northwest Territories (70° 09′ N Lat, 68° 56′ W Long). Coll. 1965 by J. E. Smith, Geog. Branch, Ottawa.

GSC-599. Clyde Fiord (21 m) **7000 ± 150**
5050 B.C.

Shells of *Mytilus edulis* coll. *in situ* from sandy foreset beds of littoral deposit, at alt ca. 16 m. Beds containing shells believed to relate to relative sealevel at ca. 21 m; local marine limit is at 34 m.

GSC-556. Clyde Fiord (12.2 m) **7740 ± 140**
5790 B.C.

Shells of *Hiatella arctica* and *Mya truncata* from clay underlying sandy foreset beds, at alt 12.2 m.

General Comment (J.E.S.): dates contrast with one of 7940 ± 130 (I-1932; Andrews, 1967) on shells, coll. by D. M. Barnett, relating to marine limit at head of Clyde Fiord, 90 km to SW. Dates suggest possibility of a marine transgression culminating ca. 7000 yr B.P. GSC-599 mixed with dead gas for counting. Dates for GSC-599 and GSC-556 each based on one 3-day count.

GSC-654. Paquet Bay, Baffin Island **2780 ± 140**
830 B.C.

Marine pelecypod shells (*Mya truncata* and *Hiatella arctica*) from beach stratum at alt 5 ft, W side of Paquet Bay, Baffin Island (71° 53′ N Lat, 78° 20′ W Long). Coll. 1965 by Father G. M. Rousellière for G. Falconer, Geog. Branch, Ottawa. *Comment* (G.F.): sample dated in order to provide information on relative sealevel changes and Eskimo cultures. Dorset artifact found at similar alt. Other low-level shell samples from Tay Sound area are I-1317 (3660 ± 480, 50 ft) and I-1318 (4400 ± 490, 44 ft); Isotopes V. Date based on one 3-day count.

GSC-328. Milne Inlet, Baffin Island **6410 ± 150**
4460 B.C.

Marine-pelecypod shell fragments *(Hiatella arctica, Mya truncata)* from shallow excavations in emerged delta, alt 146 ft, 35 ft below delta surface and ca. 45 ft below marine limit, 3 mi S of SE corner of Milne Inlet, Baffin Island, Northwest Territories (71° 53′ N Lat, 80° 55′ W Long). Coll. 1962 by G. Falconer, Geog. Branch, Ottawa. *Comment* (B.G. Craig): date is minimum for time of withdrawal of ice from moraines of Cockburn system and entry of sea into S part of Milne Inlet, and for delta (cf. I-1246, 7930 ± 300, Isotopes V; Falconer *et al.*, 1965a, 1965b). Sample mixed with dead gas for counting.

Stanwell-Fletcher Lake series, Somerset Island

Marine shells from sites near Stanwell-Fletcher Lake, Somerset Island, Northwest Territories.

7750 ± 140

GSC-616. Stanwell-Fletcher River **5800 B.C.**

Marine-pelecypod shells *(Serripes groenlandicus)* from surface of emerged sand deposit, alt 152 ft, E side Stanwell-Fletcher River, 6 mi N of Stanwell-Fletcher Lake, Somerset Island (72° 58′ N Lat, 95° 03′ W Long; Craig, 1964, loc 58). Coll. 1962 by F. C. Taylor for B. G. Craig.

7890 ± 140

GSC-617. Stanwell-Fletcher Lake **5940 B.C.**

Marine-pelecypod shells (*Clinocardium ciliatum, Serripes groenlandicus, Mya truncata*) from surface of emerged sand deposit, alt ca. 85 ft, near E shore of Stanwell- Fletcher Lake, 2 mi N of Union River, Somerset Island (72° 46′ N Lat, 94° 30′ W Long). Coll. 1965 by J. P. Coakley, Univ. of Ottawa, Ottawa.

5960 ± 140

GSC-652. Peel Sound **4010 B.C.**

Marine-pelecypod shells (*Hiatella arctica, Mya truncata, Mya truncata* var. *uddevalensis, Macoma calcarea, Serripes groenlandicus, Astarte borealis;* id. by F. J. E. Wagner) from bedded deltaic sand exposed in river bank, alt 40 ft, 30 ft below delta terrace, near mouth of small unnamed stream on Peel Sound, 8 mi W of SW corner of Stanwell-Fletcher Lake, Somerset Island (72° 36′ N Lat, 95° 20′ W Long; Craig, 1964, loc. 74). Coll. 1962 by B. G. Craig.

General Comment (B.G.C.): samples were dated to determine time of change from marine to lacustrine environment in Stanwell-Fletcher Lake basin. Although present lake alt is ca. 25 ft, lake probably became separate from sea when relative sealevel was ca. 35 ft higher than at present (Coakley, 1967). Along with L-571A (7150 ± 350, Lamont VII; 100 ft alt) GSC-616 and GSC-652 indicate that this change would have taken place ca. 4000 yr ago. GSC-617 is older than expected from low alt of site; probably shells represent deep-water rather than shoreline deposition, or may have been redeposited from a higher site. Dates for GSC-617 and GSC-652 each based on one 3-day count.

9200 ± 150

GSC-600. Drake Bay, Prince of Wales Island **7250 B.C.**

Marine-pelecypod shell fragments (*Hiatella arctica, Mya truncata*) from ground surface of stony marine silt, alt 192 ft, ca. 200 ft below marine limit, 8 mi NW of head of Drake Bay, Prince of Wales Island, Northwest Territories (73° 23′ N Lat, 100° 40′ W Long; Craig, 1964, loc 51). Coll. 1962 by B. G. Craig. *Comment* (B.G.C.): date is minimum for withdrawal of ice and entry of sea into N end of M'Clintock Channel (cf. GSC-322, 9470 ± 150, this list). Date based on one 3-day count.

9470 ± 150

GSC-322. Lowther Island, Barrow Strait **7520 B.C.**

Shell fragments of marine pelecypod *Hiatella arctica* from ground surface of till-like material in solifluction lobe on NW coast of Lowther

Island, Barrow Strait, Northwest Territories (74° 33′ N Lat, 97° 31′ W Long), at alt ca. 370 to 390 ft. Coll. 1963 by W. Blake, Jr. *Comment* (W.B., Jr.): relation of shells to highest obvious beaches (ca. 350 ft.) suggests date approximates time of deglaciation. Sample mixed with dead gas for counting. Date based on one 3-day count.

9070 ± 190

GSC-353. Allison Inlet, Bathurst Island **7120 B.C.**

Shell fragments of *Hiatella* sp. and *Balanus* sp. from ground surface and up to 1 ft depth in beach gravel and sand on E side of innermost Allison Inlet, S coast of Bathurst Island, Northwest Territories (75° 06′ N Lat, 99° 08′ W Long), at alt ca. 340 ft. Coll. 1964 by W. Blake, Jr. and J. Jamieson. *Comment* (W.B., Jr.): shells coll. 25 ft below highest visible beaches. Date determines time of maximum marine submergence and is minimum for deglaciation. Sample mixed with dead gas for counting.

8590 ± 140

GSC-250. Dyke Acland Bay, Bathurst Island **6440 B.C.**

Shell fragments of marine pelecypods *Hiatella arctica* and *Mya* sp. from fines in sorted polygons, partly underwater in shallow pond, on S coast ca. 1 mi W of mouth of Dyke Acland Bay, Bathurst Island, Northwest Territories (74° 59′ N Lat, 98° 59′ W Long), at alt ca. 350 ft. Coll. 1964 by W. Blake, Jr. *Comment* (W.B., Jr.): shells are within 10 ft of highest beaches in area. Date gives age of maximum marine submergence along one section of S coast of Bathurst Island and is minimum for deglaciation (cf. GSC-191, 8520 ± 150, GSC IV; Blake, 1964).

Scoresby Hills series, Bathurst Island

Peat from borehole in miniature pingo in former glacial-drainage channel, S margin of Scoresby Hills, Bathurst Island, Northwest Territories (75° 45′ N Lat, 98° 18′ W Long), at alt ca. 295 ft. Coll. 1964 with SIPRE-type ice- corer by W. Blake, Jr.

1170 ± 150

GSC-402. Scoresby Hills, top peat **A.D. 780**

Peat from 9 to 12 cm depth; sample at upper limit of solidly frozen peat. Two fractions were dated (cf. Table 4, GSC V):

soluble in NaOH	1050 ± 140
not dissolved in NaOH	1170 ± 150

6510 ± 150

GSC-253. Scoresby Hills, basal peat **4560 B.C.**

Peat from 312 to 326 cm depth, above ice core in miniature pingo. Two fractions were dated (cf. Table 3, GSC IV):

soluble in NaOH	6510 ± 150
not dissolved in NaOH	6230 ± 150

General Comment (W.B., Jr.): older date shows that considerable time elapsed after deglaciation before start of organic accumulation (f. GSC-

377, 8440 ± 150, this list); younger date probably indicates little peat accumulation during last 1000 yr; or possibly some surface peat has been eroded. Internal agreement of dates suggests contamination is minimal. Both fractions of both samples mixed with dead gas for counting. Dates for less soluble fraction of GSC-402 and for both fractions of GSC-253 are each based on one 3-day count.

8440 ± 150

GSC-377. 'Muskox River', Bathurst Island, shells 6490 B.C.

Shell fragments of marine pelecypods *Hiatella arctica* and *Mya truncata* from ground surface on E side of 'Muskox River', Bathrust Island, Northwest Territories (75° 45′ N Lat, 98° 25′ W Long), at alt ca. 240 to 250 ft. Coll. 1964 by W. Blake, Jr., J. G. Fyles, L. V. Hills, and H. P. Trettin. *Comment* (W.B., Jr.): shells are highest found in central E-W valley bisecting Bathurst Island. Date is minimum for deglaciation and indicates time at which arm of sea extended across island. Sample mixed with dead gas for counting.

9780 ± 190

GSC-249. Schomberg Point, Bathurst Island 7830 B.C.

Whole shells and fragments of marine pelecypod *Hiatella arctica* from ground surface on ridge E of Schomberg Point, Bathurst Island, Northwest Territories (75° 33′ N Lat, 102° 45′ W Long), at alt 335 to 350 ft. Coll. 1964 by W. Blake, Jr. *Comment* (W.B., Jr.): shells are close to marine limit at westernmost point of Bathrust Island. Date is minimum for deglaciation. Sample mixed with dead gas for counting.

9690 ± 140

GSC-251. Carey Harbour, Bathurst Island 7740 B.C.

Shell fragments of marine pelecypod *Hiatella arctica* from ground surface along ridge on SW side Carey Harbour, NE corner of Bathurst Island, Northwest Territories (76° 32′ N Lat, 98° 16′ W Long), at alt 445 to 450 ft. Coll. 1964 by W. Blake, Jr. *Comment* (W.B., Jr.): shells are presumed to be close to marine limit. Date is minimum for deglaciation. Alt of sample supports hypothesis that former ice cap was thickest over northern Bathurst Island (Blake, 1964).

Findlay Group series

10,100 ± 150

GSC-320. Cape Rondon, Lougheed Island 8150 B.C.

Shells of *Hiatella arctica* from surface of thin drift over soft sandstone at alt 200 ft in interior of Lougheed Island, Northwest Territories, 10 mi W of Cape Rondon (77° 20′ N Lat, 105° 07′ W Long). Coll. 1964 by J. G. Fyles, Date based on one 3-day count.

10,240 ± 280

GSC-356. Edmund Walker Island 8290 B.C.

Fragments of shells of *Hiatella arctica* from dissected shale ridge at alt ca. 300 ft on E part of Edmund Walker Island, Northwest Territories

(77° 09′ N Lat, 104° 02′ W Long). Coll. 1964 by J. G. Fyles. Sample mixed with dead gas for counting. Date based on one 3-day count.
General Comment (J.G.F.): sites are probably well below local marine limit, as Pleistocene shell fragments were found at 375 ft. Dates are somewhat older than those for high marine shells from nearby islands (cf. GSC IV, V, and this list for Bathurst Island; L-643a, 8500 ± 200, St. Onge, 1965, p. 29 for Ellef Ringnes Island).

GSC-357. May Cove, Byam Martin Island **> 28,500**

Small fragments of marine shells including *Hiatella arctica* and *Balanus* sp. scattered on surface of delta, alt 315 ft, 5 mi S of May Cove and 7 mi NE of Kay Point, SW Byam Martin Island, Northwest Territories (75° 11′ N Lat, 104° 37′ W Long). Delta deposited by N-flowing meltwater, probably into small ice-marginal lake but possibly into sea. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): probably shell fragments are secondary, transported by glacial ice and meltwater. Sample mixed with dead gas for counting.

9800 ± 150

GSC-315. Kay Point, Byam Martin Island **7850 B.C.**

Shells of *Hiatella arctica* from surface of stony silt, alt 215 ft, on ridge crest 2 mi E of Kay Point, Byam Martin Island, Northwest Territories (75° 07′ N Lat, 104° 47′ W Long). Site is 15 ft above highest beach but beaches occur at 235 ft and possibly higher in surrounding area. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date is similar to dates for shells near marine limit to NE on Bathurst Island (GSC-249, 9780 ± 190, this list) and to W on S Melville Island (GSC-282, 9670 ± 150; GSC-339, 9550 ± 160, this list). Marine limit, however, becomes progressively lower from E to W between these sites (Fyles and Blake, 1965). Outer 40% of shells removed before dating.

9670 ± 150

GSC-282. Palmer Point, Melville Island **7720 B.C.**

Shells of *Hiatella arctica* from alt 130 ft in gully 0.5 mi from shore 7 mi W of Palmer Point, S coast of Melville Island, Northwest Territories (74° 57′ N Lat, 108° 18′ W Long) from stony silt beneath pebbly beach gravel. Marine limit probably not more than 20 ft above beach. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date relates to early phase of marine inundation shortly after deglaciation (cf. GSC-315, 9800 ± 150, this list). Date based on one 3-day count.

Winter Harbour Moraine series, Melville Island

Winter Harbour moraine on S coast of Melville Island, Northwest Territories, marks a stand of NW margin of Laurentide Ice Sheet, possibly at local maximum during classical Wisconsin (Fyles, 1967). Shell-bearing marine deposits occur up to ca. 200 ft alt on distal side of moraine and below 100 ft on proximal side. Coll. 1964 by J. G. Fyles.

10,340 ± 150

GSC-278. Cape Phipps ('outside' moraine) 8390 B.C.

Shells of *Hiatella arctica* from eroded surface of silt and sand a few hundred ft beyond distal (NW) margin of moraine 3 mi NW of Cape Phipps (74° 41′ N Lat, 110° 55′ W Long) at alt 180 ft. Date based on one 3-day count.

10,900 ± 160

GSC-363. Cape Phipps (edge of moraine) 8950 B.C.

Fragments of shells of *Hiatella arctica* from ground surface, alt 210 ft, on distal part of moraine 0.5 mi S of GSC-278. Shells from till, gravel, and sand possibly deposited at edge of tidal glacier.

9550 ± 160

GSC-339. Hearne Point 7600 B.C.

Shells of *Hiatella arctica* 2.5 mi W of Hearne Point (74° 44′ N Lat, 110° 40′ W Long) from gullied silt and sand alt 65 ft, 25 ft below highest marine beach (local) on proximal (SE) side of moraine. Outer 30% removed before dating.

General Comment (J.G.F.): probably glacier margin stood at moraine during period recorded by GSC-278 and 263 but had retreated SE from moraine before time represented by GSC-339.

10,920 ± 150

GSC-279. Shellabear Point, Melville Island 8970 B.C.

Shells of *Hiatella arctica* from gully in clay at alt 120 ft, 2.5 mi SW of Shellabear Point, Melville Island, Northwest Territories (74° 51′ N Lat, 113° 25′ W Long). Marine limit not clearly evident but probably at alt ca. 150 ft. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date records early phase of marine inundation. Form of deposit suggests sedimentation in narrow embayment lateral to wasting ice in Liddon Gulf. Date based on one 4-day count.

10,600 ± 150

GSC-324. Bailey Point, Melville Island 8650 B.C.

Hiatella arctica shells and fragments from surface of moraine ridge alt 130 ft, Bailey Point, Melville Island, Northwest Territories (75° 01′ N Lat, 115° 10′ W Long). Shells from "till" rather than normal marine deposit. Elevated beaches occur only to alt ca. 20 ft. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): dated "till" probably is glaciomarine or originated through mixing of pene-contemporaneous marine sediment into morainal deposit. Date is similar to others from ice-marginal marine environments in this region (GSC-279, 278, 363, this list). Date based on one 3-day count.

GSC-422. Barrow Dome, Melville Island > 38,600

Moss, 6 ft below surface of flat-topped hill, alt ca. 300 ft, standing as erosion remnant 3 mi N of Barrow Dome, Melville Island, Northwest

Territories (76° 43′ N Lat, 108° 55′ W Long) from upper part of 2.5-ft bed of moss and sand within sand and sandy gravel. Little vegetation grows in vicinity. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date supports geomorphic inference that deposits inclosing moss are older than both glaciation and dissection of adjoining lowlands. Deposit appears younger than rare, higher hilltop outliers of far-travelled gravel with wood, tentatively correlated with Beaufort Formation. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count.

GSC-262. Cape Nares, Eglinton Island **5940 ± 140**
3990 B.C.

Peat from gully wall, alt 75 ft, 5 mi NE of Cape Nares and 500 ft inland from W Coast of Eglinton Island, Northwest Territories (75° 40′ N Lat, 119° 16′ W Long,) from lowest exposed peat layer (depth 5.5 ft) in peat-colluvium succession. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date is believed to be considerably younger than deglaciation and emergence.

GSC-260. Wilkie Point, Prince Patrick Island **11,160 ± 150**
9210 B.C.

Shells of *Hiatella arctica* 1 mi upstream from mouth of river 10 mi NW of Wilkie Point, Prince Patrick Island, Northwest Territories (76° 21′ N Lat, 118° 46′ W Long) from silt and sand in river bank beneath delta terrace alt 100 ft. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): delta is highest marine feature recognized in vicinity and probably was deposited shortly after glacial retreat. Date based on one 3-day count.

GSC-352. Brock Island, 30-ft beach **10,580 ± 260**
8630 B.C.

Fragments of shells of *Hiatella arctica* from surface of pebbly beach, alt 30 ft, and from gully in same beach, SE Brock Island, Northwest Territories (77° 44′ N Lat, 113° 55′ W Long). Highest beach is at 55 ft. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date records early phase of marine inundation, presumably soon after deglaciation, and thus suggests glaciation during classical Wisconsin. Sample mixed with dead gas for counting.

GSC-323. Brock Island, ice-push beach **3650 ± 130**
1700 B.C.

Fragments of shells of *Hiatella arctica* from surface of ice-push beach ridge alt 20 ft, NE Brock Island, Northwest Territories (77° 58′ N Lat, 114° 03′ W Long) Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): comparison of date with GSC-352 (10,580 ± 260, this list) from 30-ft beach 17 mi S suggests shells relate to present sealevel rather than a former higher one and have been thrust to present alt by sea ice. Date based on one 3-day count.

38,590 ± 1340

GSC-381. Brock Island, moraine **36,640 B.C.**

Fragments of shells of *Hiatella arctica* and other marine pelecypods from surface on thrust-moraine ridge, alt 100 ft, NE Brock Island, Northwest Territories (77° 58′ N Lat, 114° 03′ W Long), ca. 500 ft W of GSC-323. Shells from inclined sheet of sand interlayered with Triassic sandstone and Beaufort (early Quaternary or late Tertiary) gravel. Coll. 1964 by J. G. Fyles. *Comment* (J.G.F.): date is probably minimal and shell-bearing sand is probably pre-classical Wisconsin. Glacial thrusting may date from classical Wisconsin (cf. GSC-352, 10,580 ± 260, this list). Date based on one 3-day count.

4060 ± 130

GSC-374. Macdonald River, Ellesmere Island **2110 B.C.**

Peat from S bank of Macdonald River 8 mi from head of Tanquary Fiord, Ellesmere Island, Northwest Territories (81° 24′ N Lat, 76° 10′ W Long), at alt 420 ft. Sample from bottom of 7-ft section of peat overlain by 14 ft of glaciofluvial sediments with some peaty layers. Coll. 1964 by G. Hattersley-Smith, Defence Res. Board, Ottawa. *Comment* (G.H-S.): conditions for peat formation exist in northern Ellesmere Island today (Radforth, 1965) and could have been more favourable at end of Hypsithermal Interval, to which period sample is assigned.

930 ± 140

GSC-376. Air Force River, Ellesmere Island **A.D. 1020**

Leaves and twigs 40 to 44 in. below surface of varved silt and sand in Air Force River valley, Ellesmere Island, Northwest Territories (81° 39′ N Lat, 76° 45′ W Long), at alt ca. 300 ft, 1200 ft from terminus of Air Force Glacier. Coll. 1964 by G. Hattersley-Smith. *Comment* (G.H-S.): date indicates that the large Air Force Glacier is close to its most advanced stand during the last 900 yr. Date is similar to I-428 (965 ± 75, Isotopes III) on plant material recently exposed beside an ice dome near Gilman Glacier to NE; there it was concluded that "ice cover was no more extensive and climate no more severe 1000 yr ago than now."

6820 ± 140

GSC-373. Tanquary Fiord, Ellesmere Island **4870 B.C.**

Marine-pelecypod shell fragments (*Hiatella arctica*) from second highest of four delta terraces of Macdonald River at head of Tanquary Fiord, Ellesmere Island, Northwest Territories (81° 24′ N Lat, 76° 55′ W Long) at alt 180 to 190 ft. Coll. 1964 by G. Hattersley-Smith. *Comment* (G.H-S.): sparsely distributed shells occur near highest definite beach level seen in area. Slightly younger dates have been obtained on two other shell samples, one from same area (I-1126, 6340 ± 200, Isotopes, Inc., unpub.) and one from Flora Island (I-1125, 6285 ± 250, Isotopes, Inc., unpub.) near mouth of Tanquary Fiord, both at alt ca. 100 ft. Tanquary Fiord ceased to be occupied by ice at least 7000 yr ago. Date based on one 3-day count.

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GSC II	Dyck and Fyles, 1963
GSC IV	Dyck, Fyles, and Blake, 1965
GSC V	Dyck, Lowdon, Fyles, and Blake, 1966
Isotopes II	Trautman and Walton, 1962
Isotopes III	Trautman, 1963
Isotopes V	Trautman and Willis, 1966
Lamont VII	Olson and Broecker, 1961
Michigan XI	Crane and Griffin, 1966
NPL III	Callow, Baker, and Hassall, 1965
Pennsylvania IX	Stuckenrath, Coe, and Ralph, 1966
Saskatchewan III	McCallum and Wittenberg, 1962
Saskatchewan IV	McCallum and Wittenberg, 1965
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