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GEOLOGICAL SURVEY OF CANADA RADIOCARBON DATES X

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INTRODUCTION†

The laboratory routinely operates two proportional counters; one 2-L (Dyck and Fyles, 1962) and one 5-L (Dyck *et al.*, 1965). CO_2 is used as the counting gas. The 2-L counter is operated mainly at 2 atm. and the 5-L counter mainly at 1 atm. On occasion the 2-L counter is operated at 1 atm. and the 5-L counter at 4 atm. No changes have been made in the CO_2 preparation and purification techniques described in previous GSC dating lists (Lowdon *et al.*, 1969; Lowdon and Blake, 1970).

Age calculations are carried out monthly by a C.D.C. 3100 computer and are based on a C^{14} half-life of 5568 $\pm$ 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 $\pm 1.5\%$ in the C^{14} concentration of the biosphere during the past 1100 yr. The error assigned to an age is always a minimum of ± 100 yr. Finite dates are based on the 2σ criterion (95.5% probability) and "infinite" dates on the 4σ criterion (99.9% probability). Unless otherwise stated in the sample descriptions, all ages are based on two 1-day counts. Only when testing the age of a sample (especially as a prelude to high pressure work) or if a sample is obviously of a far different age than expected, is a sample counted for less than two days.

Average background and standard counting rates over the past 12 months (October, 1968 to September, 1969) are listed in Tables 1 and 2, respectively. Once again, a slight seasonal variation in background and standard was noticed.

At an operating pressure of 2 atm., the 2-L monthly backgrounds are the average of 4 individual daily counts. During the 11-month period of operation at 2 atm., 1 count was omitted for statistical reasons and 7 different background preparations were used. Operating the 2-L counter at 1 atm. (April), the monthly average background is the average of 5 individual daily counts. No results had to be omitted, and 5 different preparations were used. The 5-L counter backgrounds are the average of 4 daily counts. None were omitted, and 10 different background preparations were used.

For both counters, the monthly standard counting rates consist of the average of 3 individual daily counts. For the 2-L counter operating

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† Prepared by the first author, who operates the laboratory. The date list has been compiled by the second and third authors from descriptions of samples and interpretations of dates by the collectors.

TABLE 1

Monthly Background (c/m) for Period
October 1, 1968 to September 30, 1969

Month	2-L Counter (2 atm)	5-L Counter (1 atm)
October, 1968	1.179 ± .019	2.146 ± .036
November	1.179 ± .018	2.194 ± .050
December	1.177 ± .021	2.221 ± .029
January, 1969	1.221 ± .015	2.230 ± .026
February	1.245 ± .019	2.247 ± .026
March	1.263 ± .021	2.290 ± .026
April	1.124 ± .016*	2.278 ± .026
May	1.207 ± .025	2.208 ± .033
June	1.161 ± .015	2.203 ± .035
July	1.166 ± .015	2.175 ± .025
August	1.151 ± .018	2.196 ± .030
September	1.155 ± .019	2.198 ± .023

* 2-L counter operating at 1 atm.

TABLE 2

Monthly Standard, N_o*, (c/m) for Period
October 1, 1968 to September 30, 1969

Month	2-L Counter (2 atm)	5-L Counter (1 atm)
October, 1968	20.174 ± .100	29.019 ± .125
November	20.182 ± .104	28.905 ± .133
December	20.286 ± .109	28.694 ± .131
January, 1969	20.284 ± .089	28.898 ± .109
February	20.208 ± .095	28.829 ± .115
March	20.105 ± .098	28.729 ± .118
April	9.784 ± .127**	28.637 ± .165
May	20.365 ± .270	28.495 ± .118
June	19.842 ± .120	28.678 ± .165
July	19.699 ± .095	28.797 ± .118
August	19.708 ± .100	28.555 ± .155
September	19.744 ± .098	28.488 ± .149

* N_o = 0.95 × net counting rate of the NBS oxalic-acid standard.
** 2-L counter operating at 1 atm.

at 1 atm., 2 different oxalic-acid preparations were used, and no counts were omitted. At 2 atm., 5 different oxalic-acid preparations were used, and no counts were omitted. For the 5-L counter, 7 oxalic-acid preparations were used. Two counts were omitted for statistical reasons.

In this date list, where δC^{13} measurements are available, a correction for isotopic fractionation has been applied to the date, and the δC^{13} value is reported. Related to the PDB standard, the "normal" values used for correction are $\delta C^{13} = -25.0‰$ for wood, other terrestrial organic material and bones (terrestrial and marine), and 0.0‰ for marine shells. All C^{13}/C^{12} ratios reported here were determined by Isotopes Inc. on aliquots of the same sample gas used for age determination.

Archaeologic samples (particularly charcoal) often pose more of a problem to the laboratory than any other type of material supplied for dating. Charcoal samples are often so small that they have to be mixed with "dead" gas for counting purposes, reducing accuracy of results and increasing the archaeologist's problems in correctly interpreting dates. Also, many charcoal samples from archaeologic sites are contaminated by modern rootlets, which, if visible, can be removed by hand-picking, a chore usually overlooked. Nitration and acetone leaching are partially effective in removing roots and similar plant material from charcoal, but considerable loss of sample (50% or more) occurs if used on material which is in part charred wood, rather than being pure charcoal (see Table 3). Thus, initial sample size again poses a problem.

TABLE 3
Pretreatment of Charcoal Samples

Sample no.*	Original sample weight(g)	Pretreatment	Final sample weight(g)	Uncorrected C^{14} age(yr)	δC^{13} (‰)	Corrected C^{14} age(yr)
GSC-927	9.7	Acid leach only; visible rootlets scraped off.	7.9	520 ± 140	−24.5	520 ± 140**
GSC-944	~20.0	Nitration and acetone leaching (as per Haynes, 1966).	4.5	860 ± 140	−25.8	840 ± 140**

* Both determinations were carried out on the same sample material which consisted of charcoal, wood, and charred wood, although the latter 2 materials predominated over charcoal. Detailed description of this geologic sample will appear in a future date list.

** The discrepancy between the dates probably cannot be explained solely by contamination by modern rootlets, as all visible rootlets in GSC-927 were removed. A 40% decrease in age, in this range, would require 20 to 50% contamination by modern material.

The submitter should supply material that is free from visible contamination, and he should assume that the laboratory staff will use only standard pretreatment techniques, as many laboratories are limited by time and personnel. The submitter should also supply enough sample to allow for duplicate analyses, and he should consult the laboratory staff about minimum requirements. Table 4 shows minimum amount of

sample to fill the 2-L counter to 2 atm. *without* the necessity of mixing with dead gas. *At least 3 times the minimum amount is desirable.*

TABLE 4

Sample type	Minimum amount required (g) of dry sample
Wood	5-10
Charcoal	5-10
Peat	10-25
Gyttja	10-25
Shell	30
Bone	500-1000
Organic detritus	500-1000

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I. ARCHAEOLOGIC SAMPLES

A. Eastern Canada

GSC-142. Batiscan site, Quebec **390 ± 140** **A.D. 1560**

Charcoal from Batiscan site, Champlain Co., Quebec, (46° 29′ N Lat, 72° 15′ W Long). From ca. 2 ft below surface on 35° slope ca. 3.5 ft S of Sq. 0 26. Single component Early Woodland site, yielding diagnostic Vinette 1 pottery. Est. age between 800 B.C. and 1000 B.C. (Levesque *et al.,* 1964). Coll. 1963 and subm. by R. Levesque, Sherbrooke Univ., Sherbrooke (now Quebec City). *Comments* (J.V. Wright*): sample is obviously intrusive and does not pertain to Early Woodland occupation. If sample is archaeologic and not natural, it would pertain to late St. Lawrence Iroquois occupation of area; evidence for this at Batiscan site is lacking; (W.B., Jr.) when sample subm., Levesque noted possibility that carbonized pine roots younger than cultural material might be present; (W. Dyck): 8.5 g best charcoal pieces were selected and all visible rootlets removed.

B. Western Canada

GSC-1219. Swan River, Manitoba **2320 ± 130** **370 B.C.**

$\delta C^{13} = -21.2‰$

Animal bone (525 g) from contact zone between peat and underlying lacustrine sediments at toe of Upper Campbell beach, Site FbMi-5, Swan

* All persons referred to as collectors or submitters of samples or cited as sources of data are, unless otherwise specified, with the Natl. Mus. of Man., one of the Natl. Museums of Canada.

R. valley, Manitoba (52° 12′ N Lat, 101° 25′ W Long). Due to disturbance of overlying peat through road construction, depth of sample varied, but was ca. 2 ft; type of deposit described by Ehrlich *et al.* (1962) as "Shallow Peat," ranged from 12 to 36 in. depth. Sample was part of collection of butchered bone fragments from site. Coll. 1968 by L. Pettipas, Univ. of Manitoba, Winnipeg; subm. by R. Klassen, Geol. Survey of Canada. *Comment* (W.B., Jr.): dates occupancy of site and is much younger than Upper Campbell beach, ca. 9500 yr old (Elson, 1967; cf. also Klassen, 1969). Pretreatment included 1-hour NaOH-leach. Sample mixed with dead gas for counting.

GSC-1068. Caribou Island site, Alberta, paleosol **4710 ± 150 / 2760 B.C.**

$\delta C^{13} = -20.4‰$

Humic acid (NMC-96) extracted from paleosol at Caribou I. site (GbOs-100) near Moose Lake, E-central Alberta (54° 15′ N Lat, 110° W Long). From Stratum IV, Sqs. I150 and JJ50 at 20 to 60 cm below surface. Dates period of relatively moist climatic conditions during a longer, more arid phase (Hypsithermal) of sand dune formation. Previous date (uncorrected for isotopic fractionation) on charcoal from same paleosol was 4200 ± 140 yr (GSC-660; Wilmeth, 1969; Radiocarbon, 1969, v. 11, p. 28-29). Coll. 1965 by W. Moore for A. L. Bryan, Univ. of Alberta, Edmonton; subm. by W. N. Irving. *Comments* (A.L.B.): dating of charcoal and humic acid indicates occupation occurred during and/or after soil formation. Paleosol was not well developed; therefore relatively moist phase was probably short. Active sand dune formation preceded and followed soil formation. Scattered evidence of occupation found throughout all dune deposits with greater concentration of artifacts in paleosol; (W.B.,Jr.) pretreatment consisted of placing soil sample in 5N NaOH at room temperature, stirring, and centrifuging. Supernatant liquid was neutralized with HCl, then filtered, washed, and dried at ca. 50 to 60°C; 8.8 g subm. to lab, with no further pretreatment. Sample mixed with dead gas for counting.

Site GhPh-107 series, Alberta

Charcoal from Site GhPh-107, SE shore of Calling Lake, in NE ¼ sec. 25, Tp. 71, Rge. 22, W 4, Alberta (55° 11′ N Lat, 113° 15′ W Long). Stratified camp site on old beach ridge. Cultural affiliations undetermined. Coll. 1967 by K. Hayashi and R. Gruhn, Univ. of Alberta, Edmonton; subm. by R. Wilmeth.

GSC-1034. Site GhPh-107, Sq. A10 **1190 ± 130 / A.D. 760**

$\delta C^{13} = -24.1‰$

Charcoal and charred wood (NMC-251) from Sq. A10, junction of gray sand and light gray sand zones. Should date late occupation of site, characterized by small corner-notched point, pottery, and microblades. Est. age between A.D. 0 and 1500.

GSC-1035. Site GhPh-107, Sq. D22 **1150 ± 160 A.D. 800**

Charcoal (NMC-250) from Sq. D22, yellow sand zone. Lerma-like projectile point assoc. Est. age ca. 5000 B.C.

General Comments (R.G.): GSC-1034 is acceptable, but GSC-1035 is not. Material dated in GSC-1035 most likely intrusive from overlying layers by root growth; (W.B.,Jr.) both samples contained rootlets, especially abundant in GSC-1035, a small sample (4.5 g vs. 19.6 g for GSC-1034). Rootlets were hand-picked, but some may have been missed (e.g., inside charcoal lumps). Presence of rootlets would account in part for age discrepancy of GSC-1035.

Head-Smashed-In Buffalo Jump series, Alberta

Burned bones from Head-Smashed-In Buffalo Jump (DkPj-1), Porcupine Hills, 10 mi W of Fort MacLeod, Alberta (49° 43′ N Lat, 113° 40′ W Long). Largest known buffalo jump in NW plains, 814 ft long, 200 ft wide; average depth, 20 ft; maximum depth, 40 ft. Upper deposits contain typical Late Prehistoric side-notched points. Lower levels contain Besant, Pelican Lake, and Hanna points. Lowest levels, containing wide assortment of stone and bone tools, but no projectile points, were dated at 5410 ± 300 yr (GSC-803; Radiocarbon, 1968, v. 10, p. 220). Coll. 1966 by B. Reeves and R. G. Forbis, Univ. of Calgary, Calgary; subm. by R. Wilmeth.

GSC-992. Head-Smashed-In Buffalo Jump, Cultural Layer 4 **700 ± 170 A.D. 1250**

$\delta C^{13} = -23.8‰$

Bone (NMC-167; ca. 300 g) from Test Pit Y, Cultural Layer 4, Soil Horizon 9 (solid bone, mostly burned), depth 3.8 to 4.3 ft. From Late Prehistoric horizons, dates appearance of Washita and related point types. Est. age A.D. 1500 ± 250.

GSC-983. Head-Smashed-In Buffalo Jump, Cultural Layer 5 **1040 ± 140 A.D. 910**

$\delta C^{13} = -22.9‰$

Burned bone (NMC-169; 908 g) from Test Pit Y, Cultural Layer 5, Soil Horizon 15 (AB), depth 8.3 to 8 ft. From horizon which contains nothing but Avonlea points. Will date maximum expansion of Avonlea tradition at site. Est. age A.D. 600.

General Comment (R.G.F. and B.R.): GSC-992 is acceptable but GSC-983 regarded as 3 centuries too late. Both samples mixed with dead gas for counting.

GSC-1085. Eagle Cave site, Alberta **130 ± 130 A.D. 1820**

$\delta C^{13} = -20.7‰$

Charred wood (NMC-254) from Eagle Cave site (DjPp-100), Crowsnest Lake, Alberta (49° 37′ N Lat, 114° 38′ W Long). From Sq. 5W,

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depth 124 to 127 cm below datum. Solution cavern with stratified deposits located ca. 300 ft above Crowsnest Lake near Continental Divide. Sample dates upper burned dung and twig layer containing stone and bone artifacts. Est. age ca. 1000 yr. Coll. 1967 by B. Cowan for A. L. Bryan; subm. by R. Wilmeth. *Comments* (A.L.B.): date suggests that accumulation of part of upper layer was very recent, and perhaps includes material brought in (and possibly burned) by recent cave explorers Artifacts in layer are undoubtedly older than date; (W.B., Jr.): date on 25 g sample based on one 1-day count only, as "modern" age was obviously much younger than est. age.

GSC-998. Marron Valley site, British Columbia **2130 ± 130**
180 B.C.
$\delta C^{13} = -24.5‰$

Charcoal (NMC-248) from Marron Valley site (DiQw-2), on eroded terrace spur facing creek feeding into Marron Lake, Similkameen Land Dist., British Columbia (49° 22′ 10″ N Lat, 119° 41′ 30″ W Long). Sample (7.1 g) from bottom hearth level; Excavation Unit 0 S, 6 E, depth 95 to 100 cm in Stratum 4. Hearth approx. centered in small house pit of uncertain dimensions (no more than 7 m diam.) and was basin-shaped depression excavated into sterile yellowish sand. Site apparently large chipping sta. most intensively used near single house pit. Terrace spur, ca. 0.5 acre, and terrace ca. 11 m higher were littered with chipping waste and fire-broken rocks over at least 3 to 4 acres, fronting on terrace edge and creek below. Cultural affiliation of late components probably Okanagan. Sample should provide earliest date for house pit occupation and probably terminal date for microblade manufacture. Some microblades and fragments found in edge of filled house pit probably derived from disturbance outside and pre-date house pit. Site is first well-documented occurrence of microblades and cores in Okanagan Valley. Est. age of housepit component: 1000 to 1500 yr. Coll. 1967 by G. F. Grabert, Western Washington State College, Bellingham; subm. by R. Wilmeth. *Comment* (G.F.G.): date seems reasonable and accords with date from site with similar house pits, projectile points, and very few microblades in lower Okanagan Valley, Chiliwist phase (type site at Chiliwist Creek). GSC-998 and GaK-2335 (2500 ± 100 yr) appear to bracket end of microblade techniques in N and probably S Okanagan Valley as well. In this they are comparable to Borden's Natalkuz Lake microblade component dating 2415 ± 160 B.P. (S-4; McCallum, 1955, p. 34).

GSC-1154. Potlatch site, British Columbia **120 ± 130**
A.D. 1830
$\delta C^{13} = -22.4‰$

Charcoal (NMC-307) from Potlatch site (FcSi-201), S shore of Little Anahim, Anahim Lake, British Columbia (52° 29′ 30″ N Lat, 125° 20′ 30″ W Long). From large cache pit excavated into floor in N quad of Tshandu House. Pit contained bone refuse, including 3 small dog skulls, and few bone tools. Pit extends to depth 45.7 cm below floor and 106.6 cm

below surface. Site consists of 1 large rectangular house and 4 semi-subterranean circular houses. Material from Tshandu House largely aboriginal, but includes 1 copper ring and 1 copper bracelet, thus probably representing early contact period Chilcotin, as suggested by architecture. Sample dated to verify this age and to be sure house was not constructed earlier; date of 2415 ± 160 (S-4; McCallum, 1955, p. 34; Wilmeth, 1969) was obtained on similar house at Natalkuz Lake, British Columbia. Est. age A.D. 1750 to 1800. Coll. 1968 by J. Noury, Univ. of Victoria, Victoria, for R. Wilmeth. *Comment* (R.W.): date places Tshandu House in historic period. Pretreatment of 6 g-sample included *cold* NaOH-leach.

Git-aus site series, British Columbia

Charcoal from Git-aus site (GdTc-2), Kitselas Canyon, Skeena R., British Columbia (54° 36′ 15″ N Lat, 128° 25′ 20″ W Long). Stratified fishing sta. at downstream end of canyon, site, in historic times, of a village of Kitselas tribe of Tsimshian, and briefly, of a white steamboat sta. and village. Coll. 1968 by J. Heppelwhite, D. Walker, and P. Monahan for G. F. MacDonald.

GSC-1113. Git-aus site, Level 12 — **3760 ± 140** / **1810 B.C.** / $\delta C^{13} = -23.1‰$

Charcoal (NMC-322; 15 g) from Level 12, NW quad, S 21 ft 0 in., W 7 ft 0 in., 125 in. above datum. Cross-check on Level 12 from another portion of site. Est. age ca. 2500 yr.

GSC-1141. Git-aus site, Level 12, hearth — **4100 ± 310** / **2150 B.C.** / $\delta C^{13} = -20.1‰$

Charcoal (NMC-323; 17 g) from Level 12, S 20 ft 0 in., W 7 ft 0 in., above burnt sand lens in NW quad, at 125 in above datum. Prominent hearth feature. Will date one of lower levels of site. Est. age ca. 2500 yr.

GSC-1157. Git-aus site, Level 8 — **3680 ± 130** / **1730 B.C.** / $\delta C^{13} = -22.5‰$

Charcoal (NMC-321; 29 g) from Level 8, from sand below large rock feature, at 118 in. above datum. Est. age ca. 2000 yr.

General Comment (G.F.M.): dates maximum for sample of projectile points with many Plano-like features of technology and form: long parallel sides; slightly concave base, occasionally with basal thinning; ground base edges; thin, lenticular cross section; and generally well controlled flaking. Similar points are known from numerous localities along N coast of British Columbia, including Prince Rupert Harbour and Queen Charlotte Is. where their context also suggests age of 3000 to 5000 yr. Recentness of dates indicates no direct connections with Plano industries. Other industries (cobble tools and ground stone forms) occur with points to confirm reliability of dates. Pretreatment of GSC-1141 and

GSC-1157 included *cold* NaOH-leach. GSC-1141 mixed with dead gas for counting; date based on one 3-day count.

C. Northern Canada, Mainland

GSC-942. Otter Falls site, Yukon Territory **4590 ± 150**
2640 B.C.
$\delta C^{13} = -23.6‰$

Spruce charcoal (NMC-213; id. by B. F. Kukachka, Forest Products Lab., Madison, Wisc.) from Otter Falls site (JgVf-2), Otter Falls, Aishihik R., Yukon (61° 05′ N Lat, 137° W Long). From trough-like depression extending 2 to 7 in. into basal lacustrine clays. Depth from surface, 4 to 9 in.; N 0-5, E 0-10. Very small site, affiliations with Campus site, central Alaska. Representative of Denali complex and/or Northwest Microblade tradition. Coll. 1966 by J. P. Cook, Univ. of Wisconsin, Madison; subm. by R. Wilmeth. *Comments* (W. B. Workman, Alaska Methodist Univ., Anchorage): surprisingly recent date for widespread and distinctive micro-core technology thought by many to be twice as old. This date is reinforced by stratigraphy at Village site, Healy Lake, Alaska, where similar material overlies cores of Tuktu type dated elsewhere in Alaska to ca. 6500 B.P. (Cook and McKennan, 1968). Three recent C^{14} dates on related Healy Lake material yielded dates within Christian Era: NMC-294, 1270 ± 80 or A.D. 680 (Gak-1884); NMC-295, 1260 ± 90 or A.D. 690 (Gak-1885); NMC-297, 1360 ± 80 or A.D. 590 (Gak-1887). On present evidence Otter Falls date is acceptable. Presumably it applies to a relatively late manifestation of microblade and core technology in SW Yukon. Otter Falls cores described and illustrated by Cook (1968); (W.B., Jr.): some modern(?) rootlets noticed in small sample (7.9 g); contamination may exist. NaOH-leach omitted from sample pretreatment. Sample mixed with dead gas for counting.

Chimi site series, Yukon

Charcoal samples from Chimi site (JjVi-7), ca. 1 mi N and E of Aishihik Village, Yukon (61° 36′ 30″ N Lat, 137° 30′ W Long). Site is stratified. Upper levels, above volcanic ash layer, probably represent Athabaskan complexes. Material below ash has not yet shown relation to any regional complex, although lowest level may be affiliated with Otter Falls site (JgVf-2; this list), which resembles Campus site in central Alaska. Coll. 1966 by J. P. Cook; subm. by R. Wilmeth.

GSC-940. Chimi site, 12 in. depth **2900 ± 130**
950 B.C.
$\delta C^{13} = -25.0‰$

Spruce charcoal (NMC-210; id. by B. F. Kukachka) from small bowl-shaped depression 2 to 3 in. into basal lacustrine clays and 12 in. below surface, Sq. N 0-5, W 10-15. Probably dates 1st occupation of site. May assist in dating Campus site and its affiliates such as Denali complex and/or Northwest Microblade tradition. Est. age 8000 yr. *Comment* (W.B.W.): dates beginning of main occupation of site. If correct, it

indicates ca. 4000 yr elapsed between draining of Glacial Lake Sekulmun-Aishihik and beginning of soil accumulation on slope on which Chimi is located. Enlarged sample of artifacts from 1968 excavations failed to substantiate earlier suggestions that a microblade component was present in lower portion of site. Cultural materials dated by sample are attributed to onset of Taye Lake phase occupation of site. NaOH-leach omitted from sample (15.5 g) pretreatment.

GSC-941. Chimi site, 2 in. below ash **1770 ± 710**
A.D. 180

Birch charcoal (NMC-211; id. by B. F. Kukachka) from semi-circular hearth 2 in. below ash layer, Sq. N 20-25, W 15-20, at level in which microblades are conspicuously absent, and is thus relevant for dating termination of Northwest Microblade tradition. Est. age 3000 yr. *Comments* (W.B.W.): margin of error is too large for meaningful interpretation. Generally accepted date of ash layer overlying sample suggests it is not much younger than stated midpoint of 180 A.D.; (W.B., Jr.): NaOH-leach omitted from sample pretreatment. Sample (7.6 g) produced sufficient gas for counting without mixing with dead gas. However, leakage from cylinder while sample was stored prior to counting necessitated high mixing ratio with dead gas, and resulted in large error although sample was given one 5-day count.

GSC-956. Chimi site, below ash **1190 ± 130**
A.D. 760
$\delta C^{13} = -25.1‰$

Birch charcoal (NMC-212) from thin hearth directly below volcanic ash, Sq. N 10-15, W 7-15, at level containing some bone artifacts, tentatively assigned to an Athabaskan tradition. Est. age 1750 yr. *Comments* (W.B.W.): date appears too recent, as widespread volcanic ash layer overlying sample is thought to date to ca. 1425 ± 50 B.P. in area (Stuiver *et al.*, 1964); (W.B., Jr.): GSC-956 corresponds closely with several more recent dates on E lobe of White R. ash; e.g., GSC-408 (1200 ± 140; Radiocarbon, 1968, v. 10, p. 229-230; Lerbekmo and Campbell, 1969); and GSC-748 (1160 ± 130), GSC-934 (1280 ± 130, corrected), and GSC-1000 (1300 ± 130, corrected; all in Rampton, 1969 and Radiocarbon, 1970, v. 12, p. 80). NaOH-leach omitted from sample (4.9 g) pretreatment. Sample mixed with dead gas for counting. Date based on one 3-day count.

General Comment (W.B.W.): 3 Chimi dates from 1966 excavations are in stratigraphic order, despite large margin of error for intermediate date (GSC-941). From extensive excavations at site in 1968 all 3 dates are provisionally attributed to a Taye Lake phase occupation (cf. MacNeish, 1964). Two other dates from area furnished by O. L. Hughes, Geol. Survey of Canada, are also pertinent: GSC-749 (9660 ± 150 B.P.; Radiocarbon, 1970, v. 12, p. 75) provides minimum date for retreat of glacier from a moraine belt 3.6 mi N of Aishihik Lake. GSC-755 (7170 ± 140 B.P.; *ibid.*) provides minimum date for drainage of Glacial Lake

Sekulmun-Aishihik, stony lacustrine clays of which underlie Chimi cultural deposits.

3220 ± 140

GSC-126. Little Arm site, Yukon **1270 B.C.**

Charcoal from Little Arm site (JiVs-l) Kluane Lake, Yukon (61° 25′ 30″ N Lat, 138° 58′ W Long). From S 10, W 105, Level 4. Stratified site, with occupations representing Little Arm, Gladstone, Taye Lake, and Bennett Lake phases. Sample from Gladstone component (MacNeish, 1964). Coll. 1959 by R. S. MacNeish, Natl. Mus. of Canada (now at R. S. Peabody Foundation, Andover, Mass.). *Comment* (W.D.): hardest pieces of charcoal (3.6 g) selected and visible rootlets removed. Date based on one 3-day count and one 1-day count.

2920 ± 140

GSC-127. Pelly Farm site, Yukon **970 B.C.**

Charcoal from Pelly Farm site (KfVd-2), N bank of Pelly R. ca. 3 mi above confluence with Yukon R., Yukon (62° 50′ N Lat, 137° 19′ W Long). Stratified site, with occupations representing Champagne, Little Arm, Gladstone, and Taye Lake phases. Sample from Champagne component (MacNeish, 1964). Coll. 1957 and subm. by R. S. MacNeish. *Comment* (W.D.): 6 g of best-looking charcoal pieces selected and all visible rootlets removed. Date based on one 3-day count.

420 ± 140

GSC-846. Site JcRw-3, Northwest Territories **A.D. 1530**

Burned wood, NMC-203 and 204, (*Picea* sp.), id. by E. Perem, Forest Products Lab., Ottawa, from Site JcRw-3, N end of Fisherman Lake, SW Dist. of Mackenzie, Northwest Territories (60° 21.5′ N Lat, 124° 50′ W Long). From hearth lying high in loess/silt zone in Sq. 155, coordinates 5.0 S, 4.35 W. Sample should date latest Plano horizon. Est. age 3000 to 5000 yr. Coll. 1966 by J. F. V. Millar, Univ. of Calgary, Calgary; now at Univ. of Saskatchewan, Saskatoon; subm. by R. Wilmeth. *Comments* (J.F.V.M.): archaeologic analysis of recovered artifacts showed that hearth belonged to Mackenzie complex. GSC-846 came from same hearth as Sample I-3191, 1930 ± 160; (W.B., Jr.): reason for discrepancy between dates, and re other dates at site (cf. Wilmeth, 1969; Radiocarbon, 1969, v. 11, p. 311-312) is not known. NaOH-leach omitted from pretreatment of GSC-846 due to small sample size (only 1.4 g burnt after acid pretreatment). Sample mixed with dead gas for counting.

MacLeod site series, Northwest Territories

Charcoal from MacLeod site (JcRw-8), NW corner of Fisherman Lake, SW Dist. of Mackenzie, Northwest Territories (60° 22′ N Lat, 123° 50′ W Long). Coll. 1966 (GSC-844) and 1967 by J. F. V. Millar; subm. by R. Wilmeth.

2460 ± 160

GSC-844. MacLeod site (I) **510 B.C.**

Charcoal (NMC-200) from Sq. 28, 1 S, 5 W, at contact between yellow clay and overlying yellow loess/silt. Stratified site with 2 pre-

historic occupation periods. Sample should date earlier occupation, considered middle Cordilleran, with large crude flake side and end scrapers, convex choppers, and burins. Est. age 8000 yr.

GSC-1033. MacLeod site (II) **2420 ± 130**
470 B.C.
$\delta C^{13} = -23.1‰$

Charcoal (NMC-259) from top of soil profile (soil developed on proglacial lake silts of late glacial age) in Sq. 73. Further work after subm. of GSC-844 (NMC-200) showed 3rd component; site is stratified with 1 low component below lake silts and 2 components mixed on top of soil profile. Sample should date easternmost of 2 upper components, which is probably later. Est. age 750 yr.

General Comments (J.F.V.M.): excavation during 2nd field season proved charcoal of GSC-844 was related to large hearth on top of mineral soil. Hearth is attributed to component JcRw-8-1 W. GSC-1033 appears to confirm GSC-844 for W sec. of site. Sample, from buried piece of charcoal in a disturbed area not id. until 1967 excavation, is from E hearth assoc. with JcRw-8-1 W component, tentatively considered a transitional complex between Fish Lake and Mackenzie complexes. Artifacts include small half-moon side blades, double-ended end scrapers, "strangulated blades," and small plano-convex end scrapers found with other artifacts similar to preceding Fish Lake or succeeding Mackenzie complex; (W.B., Jr.): NaOH-leach omitted from pretreatment of GSC-844, a small sample (1.6 g burned after acid pretreatment); sample mixed with dead gas for counting. Date for GSC-1033 (6.9 g burned after standard treatment on 10.2 g sample and after rootlets hand-picked) based on one 3-day count.

D. Northern Canada, Arctic Archipelago

GSC-1051. Closure site annex, Baffin Island **3390 ± 210**
1440 B.C.
$\delta C^{13} = -26.8‰$

Charred (seal?) fat from Closure site annex (KdDq-23), Cape Tanfield, Baffin I., Northwest Territories (62° 39′ N Lat, 69° 37′ W Long). Consolidated sample from Sqs. 2 and 11, depth 0.2 to 0.4 ft below surface; thin midden in gravel matrix within active permafrost zone and active sod rootlet zone at alt 60 ft above present lichen line. Est. older than 2 previously dated components of Closure site: KdDq-11-0 at 4067 ± 73 B.P. (P-707; Radiocarbon, 1966, v. 8, p. 362); and KdDq-11-6 at 4460 ± 100 yr B.P. (Gak-1281; Radiocarbon, 1969, v. 11, p. 314) at alt ca. 34 and 45 ft a.s.l., respectively. Rootlets were possible source of contamination, and shallow depth raises problem of sample being intrusive. Coll. 1967 by A. A. Dekin, Jr., Michigan State Univ., East Lansing; now at State Univ. College at Potsdam, Potsdam, New York; subm. by W. Blake, Jr. *Comments* (A.A.D., Jr.): date is too young for artifacts assoc. with sample, as they represent early pre-Dorset culture in this area rather than late pre-Dorset, as date implies. Small sample size (2.8

g) suggests possibility of contamination; (W.B., Jr.): date is minimum for pumice found in cultural horizon; cf. older dates from Closure site, where pumice also occurs (Blake, 1970). Sample mixed with dead gas for counting.

4140 ± 130

GSC-849. Shaymarc site, Baffin Island **2190 B.C.**

Charred fat (seal?) (NMC-138) from Shaymarc site (KkDn-2), Sylvia Grinnell R., Frobisher Bay, Baffin I., Northwest Territories (63° 45′ N Lat, 68° 34′ W Long). From Pit 8, surface depth 0.5 ft. Partially excavated site yielded 600 artifacts, belonging to a pre-Dorset assemblage. Typologic analysis places material early in pre-Dorset sequence. Est. age between 4067 ± 73 (P-707; Radiocarbon, 1966, v. 8, p. 362) for Closure site and 3814 ± 69 (P-708; *ibid.*) for Annawalk site. Coll. 1966 by M. S. Maxwell, Michigan State Univ., East Lansing; subm. by R. Wilmeth. *Comment* (M.S.M.): date fits well with est. age and archaeologic evidence. NaOH-leach omitted from sample pretreatment (19.0 g burned after acid pretreatment).

E. Alaska

1830 ± 170

GSC-883. Desperation Lake Site 4 **A.D. 120**

Wood charcoal (NMC-103) from Desperation Lake Site 4, S shore of Desperation Lake, Brooks Range, Alaska, ca. 0.25 mi E of prominent village site (68° 35′ N Lat, 158° 45′ W Long) (Irving, 1962). From hearth covered by slopewash from low cutbank overlooking beach. Sample accompanied by few stone implements resembling Ipiutak culture. Est. age 2000 ± 500 yr. No occupation of Brooks Range is yet known for this time range. Coll. 1962 and subm. by W. N. Irving, Natl. Museum of Canada (now at Univ. of Toronto, Toronto). *Comments* (W.N.I.): date is plausible but is earliest of all dates for Ipiutak at Point Hope and Cape Krusenstern (Rainey and Ralph, 1959). But, date at Point Hope, on antler arrowheads, may be erroneously young. Attribution of site to Ipiutak culture is tentative and needs confirmation by further excavation; (W.B., Jr.): despite possibility of rootlets in sample, NaOH-leach omitted from pretreatment because of small sample size (1.0 g burnt after acid treatment). Sample mixed with dead gas for counting. Date based on one 3-day count.

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