

UNIVERSITY OF SASKATCHEWAN RADIOCARBON DATES II

K. J. McCALLUM and W. DYCK

University of Saskatchewan, Saskatoon, Saskatchewan, Canada

This paper is a list of radiocarbon dates obtained at the University of Saskatchewan since the last report was issued (McCallum, 1955). The method used is essentially that of Suess (1954), in which the sample is counted as acetylene gas. The proportional counter has a sensitive volume of one liter and is filled with acetylene to a pressure of one atmosphere. Each sample is counted for at least two 20-hour periods. The modern standards used were obtained from softwood logs grown in Northern Saskatchewan and were either 50 or 100 years old as obtained from ring counts.

All samples were treated with acid to remove carbonates. In addition, all samples in which there might have been the slightest danger of contamination by precipitation of younger humus were boiled with a 2% sodium solution.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

S-16. Ferguson Farm, Tupperville, Ontario 6250 ± 250

Gyttja in contact with mastodon skull found at the J. Ferguson farm, 2 mi SSW of Tupperville, Ontario (42° 24' 55" N Lat, 82° 17' 18" W Long). The occurrence is in a slight depression in lacustrine sediment ca. 585 ft above sealevel. Geologic section, from top to base: gyttja and peat with bones of mastodon, 33 in.; marl with molluscs, 13 in.; blue lacustrine clay with molluscs, 22 in. Coll. June 24, 1954 and subm. by Aleksis Dreimanis, University of Western Ontario, London, Canada. *Comment*: the date of the immediately overlying gyttja is not necessarily younger than that of the mastodon, but if it is older or contemporary, this is the youngest mastodon yet dated.

S-24. Blackwell, Ontario 4650 ± 200

White-oak log, 1 ft in diam., Lake Huron shore, Blackwell, Ontario (43° 1' 30" N Lat, 82° 19' W Long). In reworked top of Lake Algonquin clay, 1 ft above lake level, covered by a beach bar, 23 ft high, of the Nipissing phase. Buried during the rise of water before beginning of the Nipissing phase. Coll. October 12, 1952 and subm. by Aleksis Dreimanis, University of

Western Ontario, London, Canada. *Comment*: probably 150 to 500 yr older than the beginning of the Nipissing phase of Lake Huron, and thus suggests the beginning of the Nipissing phase at 4300 ± 270 B.P. This has been discussed by Dreimanis (1958). Date agrees well with other published Nipissing dates.

S-25. Bright Grove, Ontario **4600 ± 210**

White-oak log at base of the Nipissing beach bar described under S-24, 8 ft above level of Lake Huron, 1 mi W of Bright Grove, Ontario ($43^{\circ} 1' 30''$ N Lat, $82^{\circ} 16'$ W Long). Coll. July 2, 1953 and subm. by Aleksis Dreimanis, University of West Ontario, London, Canada. *Comment*: slightly younger than S-24, and also younger than the beginning of the Nipissing phase, lying 15 ft below the Nipissing level.

Rodney, Ontario series

Wood and black vegetable muck from base of a layer of black carbonaceous muck 1 to 3 ft thick, on the Campbell farm ($42^{\circ} 34'$ N Lat, $81^{\circ} 4'$ W Long), Rodney, Ontario. The black muck overlay gravelly sand correlated with similar sand in a presumed Lake Whittlesey beach to the west (Russell, 1948). Coll. August 1957 and subm. by L. S. Russell, National Museum of Canada, Ontario.

S-29. Wood **$11,400 \pm 450$**

S-30. Vegetable muck **$12,000 \pm 500$**

Comment: samples were directly associated with parts of a skeleton of *Mastodon americanus*. The age of the samples and the elevation of the site are reasonably consistent with the assumption that the underlying sand belongs to Lake Warren I.

S-41. Herbert, Saskatchewan **$10,000 \pm 300$**

Willow wood from near Herbert, Saskatchewan ($50^{\circ} 25'$ N Lat, $107^{\circ} 15'$ W Long). Found in postglacial lake sediments at depth of 11 ft. Coll. summer 1956 by E. A. Christiansen and W. O. Kupsch; subm. by Kupsch, University of Saskatchewan. *Comment*: associated flora and fauna indicate quiet water of a small lake in spruce-pine parkland with a few northern broadleaved trees such as birch, willow, and probably aspen (Kupsch, 1960).

S-46. Port Talbot, Ontario **$> 34,000$**

Splinter of coniferous wood from Lake Erie shore ($42^{\circ} 37' 10''$ N Lat, $81^{\circ} 23' 10''$ W Long). Found with a mastodon tusk in a layer of ice-contact gravel, 3 to 4 ft thick, 8 ft above the lake and 600 ft NE of the type locality of the Port Talbot interstadial (sample S-7). The gravel is younger than S-7, $> 25,000$ (Saskatchewan I), older than L-185B, $28,200 \pm 1500$; L-217B, $24,600 \pm 1600$ (Lamont IV) and W-177, $27,500 \pm 1200$ (USGS II), and dates a glacial advance following the Port Talbot interstadial and preceding the Plum Point interstadial (Dreimanis, 1958). Coll. September 5, 1957 and subm. by A. Dreimanis, University of Western Ontario, London, Canada. *Comment*: another portion of the same sample was analyzed by the Lamont laboratory: L-440, $> 29,500$ (Lamont V). The suggestion of Olson and

Broecker that this sample has a finite age appears to be confirmed by an unpublished Groningen date for another portion: Gro-2580, $44,200 \pm 1500$ (private communication, Hl. de Vries to Aleksis Dreimanis, October 24, 1959).

S-64. Aldergrove Customs, Washington **3500 ± 70**
 2800 ± 90

Wood from driftwood layers in gravelly bank of Bertrand Creek, .5 mi S of Canada-U.S.A. boundary ($49^{\circ} 00' N$ Lat, $122^{\circ} 30' W$ Long). The woody layers occur within a 10-ft section of gravel underlain by glaciomarine clay and surrounded by an extensive outwash terrace. Although the lower part of the gravel may be outwash, the wood-bearing layers are postglacial alluvium. Coll. 1951 by J. E. Armstrong; subm. by Geological Survey of Canada. *Comment:* material appears to be heterogeneous in age, as duplicate measurements on each of two separate wood fragments gave different results. The gravel enclosing the wood was originally believed to be glacial outwash. Some doubt was cast upon this interpretation by pollen analysis, which indicated a modern-type forest dominated by hemlock and Douglas fir rather than the usual early postglacial forest dominated by pine. The radiocarbon date has made the original interpretation untenable, as outwash in the area cannot be younger than 9000 to 10,000 yr.

S-65. Taber, Alberta **$> 32,000$**

Small pieces of wood from W bank of Oldman River, 9 mi N of Taber, Alberta ($49^{\circ} 56' N$ Lat, $112^{\circ} 11' W$ Long). Stratigraphic position: 35 ft below surface of prairie, in pebbly sand, 15 ft thick, lying beneath till and underlain by three till layers and preglacial gravel. Coll. 1956 by A. M. Stalker; subm. by Geological Survey of Canada. *Comment:* the pebbly sand from which the wood was collected is thought to correlate with materials previously measured: L-221C ($>26,000$) (Lamont III); L-443B ($>30,000$, humic portion $>34,000$), L-455A ($>25,000$, humic portion $>37,000$) (Lamont V).

S-67. Edmonton, Alberta **200 ± 120**

Wood underlying a large slump block on the North Saskatchewan River at Edmonton, Alberta ($53^{\circ} 30' N$ Lat, $113^{\circ} 40' W$ Long). Coll. August 1958 by G. Hughes; subm. by C. P. Gravenor, Research Council of Alberta, Edmonton, Canada. *Comment:* dates the major slumping along the North Saskatchewan River.

S-68. Oldman River, Alberta **$11,000 \pm 250$**

Wood from glacial outwash along the Oldman River ($49^{\circ} 48' 30'' N$ Lat, $112^{\circ} 10' W$ Long). Position: 40 ft below the surface, in crossbedded sand deposited by an ice-margin stream. Coll. May 1958 by L. A. Bayrock; subm. by C. P. Gravenor, Research Council of Alberta, Edmonton, Canada. *Comment:* date approximates that of the Two Creeks interval.

Soulier Lake series, N. W. T.

Peat samples from a fire-scarred residual hillock of peat (approx. 100 ft by 200 ft in plan), District of Mackenzie, North West Territories, Canada ($60^{\circ} 42' 30'' N$ Lat, $110^{\circ} 19' 30'' W$ Long). The hillock is composed of fire-

truncated horizontal layers of peat, standing 23 ft above the surrounding modern bog and having an estimated combined thickness of approximately 26 ft; the peat overlies glacial-lake clay. Samples coll. July 1958 and subm. by R. S. Taylor, University of Alberta, Edmonton, Canada.

S-73. Soulier Lake, top **1800 ± 100**

Charred peat from the top .25 in. of top surface of hillock.

S-74. Soulier Lake, cave **2900 ± 100**

Peat sample from a horizontal layer of woody peat, 1 in. thick, exposed in a small fire-formed cave in the side of the hillock, 17 ft stratigraphically below and 45' NNE of S-73. *Comment:* extrapolation on the assumption of uniform rate of deposition of the peat hillock yields an estimated age of 3500 (± 500 ?) yr for the oldest peat. This is less than half the age estimated on the assumption that the lowest peat represents vegetation established on the deposits of a drained proglacial lake. No C^{14} dates in Western Canada indicate the existence of an ice sheet directly affecting this area 3500 years ago. An alternative possibility is that the vegetation became established on the lake deposits by the lowering of some local base level along the Tazin River, perhaps by removal of a barrier of glacial drift. However, as the difference between the ages of S-73 and S-74 of 1100 ± 200 indicates the extremely high accumulation rate of 17 ft of peat during 1100 yr, the age of S-74 may, for some unknown reason, be too low.

S-92. Smoky Lake, Alberta **> 31,000**

Wood from 24 ft below the surface in a water well E of Smoky Lake, Alberta ($54^{\circ} 7' N$ Lat, $112^{\circ} 30' W$ Long). Found in surface till, 40 ft thick, overlying bedrock. Coll. 1954 by J. Kachmor; subm. by C. P. Gravenor, Research Council of Alberta, and by Geological Survey of Canada. *Comment:* it is inferred (Gravenor and Ellwood, 1956) that the sample came from a tree that was destroyed during advance of the last ice sheet across the area. If the ice sheet was Wisconsin in age, the date indicates that there was only one glacial invasion of this part of Alberta during the "classical Wisconsin". Sample was previously dated at the University of Manitoba: Ma-15, $21,600 \pm 900$ (Manitoba I (where it was numbered S-15)).

S-40. Qu'Appelle Valley, Saskatchewan, 1956 **> 33,000**

Black carbonaceous material from a gravel pit in an esker overlying till in the Qu'Appelle Valley, Saskatchewan ($50^{\circ} 08' N$ Lat, $103^{\circ} 04' W$ Long). Coll. May 1956 and subm. by W. O. Kupsch and E. A. Christiansen, University of Saskatchewan. *Comment:* it is now believed that this sample is lignite and therefore does not date the sediment in which it was found.

S-42. Qu'Appelle Valley, Saskatchewan, 1957 **> 30,000**

Black carbonaceous material from the N bank of the Qu'Appelle Valley, Saskatchewan ($50^{\circ} 44' N$ Lat, $105^{\circ} 35' W$ Long), at a point 8 ft below the top of a till that is the lowermost of three known to occur in the region. Coll. 1957 and subm. by E. A. Christiansen, University of Saskatchewan. *Comment:* it is now believed that this sample is lignite and does not date the formation in which it was found.

II. ARCHAEOLOGIC SAMPLES

Vancouver shell midden series, British Columbia**S-17 bis. Vancouver shell midden, 55 to 65 in. 2350 \pm 60**

Charcoal from the Marpole district of Vancouver, B. C. (49° 12' N Lat, 123° 07' W Long). Position: 55 to 65 in. below the surface, in the lowermost 10 in. of a shell midden. Coll. July 1954 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-4). There is associated with this site a very rich culture, which represents a climax in the cultural development of the Fraser Delta. A measurement on one portion of material from this site gave an age of 2900 \pm 170, a result now presumed erroneous. Another portion was dated by the solid-carbon method to be 1950 \pm 125 (McCallum, 1955). Dr. Borden stated that the Lamont laboratory dated material from this site for the Vancouver City Museum at 144 \pm 90 B.C. (L-337, Lamont IV).

S-93. Vancouver shell midden, 41 in. 1780 \pm 60

Charcoal from the bottom of the shell midden, depth 41 in., at another location of the area described in S-17. The inferior stratum was stained but was otherwise sterile subsoil. Coll. August 1957 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-3). *Comment:* sample coll. near western extremity of the Marpole site. Much deeper and probably older portions of the site lay farther east. The date for S-93 seems reasonable considered from the overall cultural development of the Fraser Delta region.

Fraser River Delta series, British Columbia**S-18. Fraser River Delta, 10 to 12 ft 2450 \pm 160**

Charcoal from the W shore of Boundary Bay in the Fraser Delta (49° 00' N Lat, 123° 02' W Long). This material is from the lower horizon of the Whalen cultural site; depth 10 to 12 ft. Coll. 1949 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-03). *Comment:* the Whalen I culture is distinct from that of the apparently somewhat later Marpole phase (S-17 and S-93) but closely related to that of the Locarno Beach site. The dates of 2270 \pm 100 and 2340 \pm 165 (S-3, Saskatchewan I) for the latter are very close to the value for the Whalen I horizon and suggest that the two were virtually contemporaneous.

S-19. Fraser River Delta, 3 to 4 ft 1580 \pm 140

Charcoal from upper horizon at the Whalen site described under S-18; depth 3 to 4 ft. Coll. 1949 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-5). *Comment:* the Whalen II culture from the upper level contrasts sharply with that of the lower Whalen I horizon (S-18) and seems more directly ancestral to the recent Coast Salish culture of this region (see S-20). The Whalen II culture was almost certainly introduced by immigrants to the Fraser Delta.

S-20. Stselax Village, British Columbia 660 \pm 130

Charcoal from the Musqueam Indian Reserve, British Columbia (49° 13' N Lat, 123° 12' W Long). From a charcoal and black-ash layer at base of

nearly 5 ft of housefloor deposits, accumulated during the occupation of houses built and rebuilt on the same spot. Coll. spring 1951 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-6). *Comment*: date marks the approximate beginning of Stselax Village and probably also of the developed Coast Salish culture phase. Data from the strata overlying this charcoal suggest relative cultural stability until white contact around A.D. 1800.

Fraser River Canyon series, British Columbia

S-47. Fraser River Canyon, UBC-7 8150 \pm 300

Small bits of charcoal from the E bank of the Fraser River near Yale, British Columbia (49° 33' N Lat, 121° 24' W Long). From a human occupation layer embedded in sand laid down by the Fraser River when flood level was about 50 to 60 ft higher than present normal high water. The occupation layer is under 17 to 18 ft of deposit. Coll. 1956 and 1957 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada. Site is designated DjRi 3, and the sample is UBC-7. *Comment*: the date is supported by the geologic evidence, the Fraser River having deepened its bed some 50 ft since early utilization of this site. The associated cultural remains constitute the earliest evidence of human occupation in British Columbia to date. (An early riverine occupation of similar age (Y-340, 9785 \pm 220; Yale III) has been reported on the Columbia River at Five-Mile-Rapids by Dr. L. S. Cressman, University of Oregon).

S-61. Fraser River Canyon, UBC-8 7350 \pm 150

Charcoal from the same location as sample S-47. The stratum from which it was taken is the next occupation layer above the S-47 horizon and is separated from the latter by 2 to 3 ft of cemented gravel. Coll. spring 1957 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-8). *Comment*: the date determined for S-61 is in accordance with its stratigraphic position. Its age is intermediate between the date of the underlying occupation layer (S-47) and the age of a layer of volcanic ash in the gravels above the S-61 level. The ash originated from the last major eruption of Glacier Peak, an event which occurred 6700 yr ago according to carbon datings of peat in nearby bogs: L-296B, 7000 \pm 200; L-269C, 6500 \pm 200 (Lamont III); and Y-313, 5390 \pm 60 (Yale IV). (Information on the Glacier Peak ash was supplied by W. H. Mathews, Department of Geology, University of British Columbia.)

S-62. Hope, British Columbia 2270 \pm 100

Charcoal from site DiRi 1, on the left bank of the Fraser River at Hope, British Columbia (49° 23' N Lat, 121° 26' W Long). Sample coll. from a hearth at 5.5 ft below the surface, and 6 in. above sterile soil. Coll. August 1956 and subm. by C. E. Borden, University of British Columbia, Vancouver, Canada (sample UBC-9). *Comment*: thin ground-slate knives found next to the hearth which yielded the sample may have been among the first such implements used in the Fraser Valley. Similar knives begin to appear slightly earlier in sites at the mouth of the river (cf. S-3 and S-18).

The charcoal of S-62 probably antedates the beginning of the large pithouse village that existed at the site in recent times.

S-43. Haines Lake, Ontario **400 \pm 120**

Wood from what was apparently a dugout canoe found in Haines Lake ($45^{\circ} 21' N$ Lat, $79^{\circ} 56' W$ Long), at a depth of 8 to 10 ft. The canoe was 17.5 ft. long with a 2-ft beam and was about 18 in. high. The stern was imbedded in mud. Coll. 1957 by N. Ritchie and E. Galt; subm. by J. N. Emerson, University of Toronto. *Comment:* contrary to original speculations, the object is comparatively recent.

S-48. Courtenay, Vancouver Island **4550 \pm 200**

Charcoal from a site 3 mi NE of Courtenay ($49^{\circ} 43' N$ Lat, $125^{\circ} 02' W$ Long). A field, lying between the Tsolum River and Headquarters Road contains 30 low, dome-shaped mounds. The charcoal was found 6 in. beneath the floor and at the E end of one manmade dirt-and-stone mound (50 ft x 25 ft x 3 ft), which covered a unique stone border arrangement, within which the sample was located. Coll. September 1957 and subm. by K. Capes, National Museum of Canada, Ottawa. *Comment:* in 1958 much charcoal was found beneath the floor of the mound, but it was not definitely determined that it was stratigraphically related to the mound. At fire level, but not associated with the charcoal, there was found one bevelled slate fragment.

S-60. Little Sauble River, Ontario **2850 \pm 60**

Carbon sample obtained from the Archaic component of the Inverhuron site located at the mouth of the Little Sauble River ($44^{\circ} 17' 40'' N$ Lat, $81^{\circ} 35' 40'' W$ Long). Sample was removed from a hearth or cooking pit at a depth of 2 ft. No stratification was present. Coll. June 1957 and subm. by W. A. Kenyon, The Royal Ontario Museum, Toronto. *Comment:* this date can be compared with the value of 2920 ± 300 (M-363, Michigan I) for the Mattawan stratum, another late-archaic culture at the Frank Bay site on Lake Nipissing, Ontario.

Old Woman's Buffalo Jump series, Alberta

The location is a buffalo jump about 50 mi S of Calgary, Alberta ($50^{\circ} 28' N$ Lat, $113^{\circ} 53' W$ Long). Samples are from Layer 13, composed principally of decomposed and matted hair, hide, and buffalo bones resembling compressed peat in color and consistency. It contained small flecks of charcoal and small lenses of burned bone. Above and below were soil zones, each averaging ca. 1 ft in thickness. Layer 13 is ca. 7 to 8 ft under the surface. Sample S-87 coll. July 1958 by Norman Richards; S-89 October 1958 by R. G. Forbis; subm. by R. G. Forbis, Glenbow Foundation, Calgary, Canada.

S-87. Charcoal from Layer 13, square A-5 **1100 \pm 80**

S-89. Burned bone from Layer 13, square B-5 **1020 \pm 80**

Comment: dates approximate the time when the small projectile-point tradition began at the Old Woman's Buffalo Jump. This date is consistent with the estimate that the Late Prehistoric Period (of which the small point is the principal diagnostic) began about A.D. 500 (Mulloy, 1958). It is also in general agreement with the estimates of MacNeish (1958) for small points in

southeastern Manitoba. It is, however, in conflict with the estimate of Wettlaufer (1955) for the first culture containing small points at the Mortlach site in Saskatchewan.

S-66. Bergthorshvoll Farm, Iceland 920 ± 60

Charred straw and grain from the lowest cultural layer at a depth of 6 ft, found during an archaeologic investigation of this historic farm. It is located in the district of Landeyjar in SW Iceland ($63^{\circ} 39' \text{ N Lat}$, $20^{\circ} 21' \text{ W Long}$). Coll. 1927 by M. Thordarson, National Museum of Iceland; subm. 1957 by S. Fridriksson, Reykjavik. *Comment*: this farm was the home of the leading persons in the Icelandic saga "Njala", believed to describe an actual event in the 10th or 11th century, probably A.D. 1011, during which the farm was burned in a local feud (Sveinsson, 1954, p. 62). The sample was taken from the ruins of a burned house and stable containing charred straw. Material also contained seeds of barley, nettle, and chickweed. Date is consistent with the outlines of the saga.

S-45. Avonlea, Saskatchewan 1500 ± 100

Charred bone from a site near Avonlea ($50^{\circ} 01' \text{ N Lat}$, $105^{\circ} 00' \text{ W Long}$). Taken from a concentration of burned bone fragments associated with stone artifacts. Artifacts and bones are concentrated over an area 80 ft in diameter and occur between 8 and 16 in. below the surface; they are overlain by eolian fine sand. No levels of occupation occur above or below the dated material. Coll. October 1956 by B. McCorquodale; subm. 1957 by R. W. Nero, Saskatchewan Museum of Natural History, Regina, Canada.

S-44. Oxbow, Saskatchewan 5200 ± 130

Charcoal from a site in the lowest terrace of the Souris River valley near the Oxbow Dam ($40^{\circ} 13' \text{ N Lat}$, $102^{\circ} 10' \text{ W Long}$). Collected from the ashes of a large hearth located in a buried soil overlain by 9.5 ft of silt and soil. Artifacts were found in association. Coll. July 1956 and subm. by R. W. Nero, Saskatchewan Museum of Natural History, Regina, Canada. *Comment*: this is presently the oldest date for a culture-bearing deposit in Saskatchewan and one of the oldest in the Northern Plains (Nero and McCorquodale, 1958).

REFERENCES

Date lists:

- | | |
|-----------------|--|
| Lamont III. | Broecker, Kulp, and Tucek, 1956 |
| Lamont IV. | Broecker and Kulp, 1957 |
| Lamont V. | Olson and Broecker, 1959 |
| Manitoba I. | Pringle, Turchinets, Funt, and Danyluk, 1957 |
| Michigan I. | Crane, 1956 |
| Saskatchewan I. | McCallum, 1955 |
| USGS II. | Rubin and Suess, 1955 |
| Yale III. | Barendsen, Deevey, and Gralinski, 1957 |
| Yale IV. | Deevey, Gralenski, and Hoffren, 1959 |
- Barendsen, G. W., Deevey, E. S., and Gralenski, L. J., 1957, Yale natural radiocarbon measurements III: Science, v. 126, p. 908-919.
 Broecker, W. C., and Kulp, J. L., 1957, Lamont natural radiocarbon measurements IV: Science, v. 126, p. 1324-1334.
 Broecker, W. C., Kulp, J. L., and Tucek, C. S., 1956, Lamont natural radiocarbon measure-

- ments III: *Science*, v. 124, p. 154-165.
- Crane, H. R., 1956, University of Michigan radiocarbon dates I: *Science*, v. 124, p. 664-672.
- Deevey, E. S., Gralenski, L. J., and Hoffren, Väinö, 1959, Yale natural radiocarbon measurements IV: *AM. JOUR. SCI. RADIOC. SUPP.*, v. 1, p. 144-172.
- Dreimanis, Aleksis, 1958, Beginning of the Nipissing phase of Lake Huron: *Jour. Geology*, v. 66, p. 591-594.
- Gravenor, C. P., and Ellwood, B., 1956, A radiocarbon date from Smoky Lake, Alberta: Research Council of Alberta, Prelim. Rept. 56-3.
- Kupsch, W. O., 1960, Radiocarbon-dated organic sediment near Herbert, Saskatchewan: *AM. JOUR. SCI.*, v. 258, p. 282-292.
- MacNeish, R. S., 1958, An introduction to the archaeology of southeast Manitoba: *Nat. Mus. Canada Bull.* 157, p. 61-64.
- McCallum, K. J., 1955, Carbon-14 age determinations at the University of Saskatchewan: *Royal Soc. Canada Trans.*, ser. 3, v. 49, sec. 4, p. 31-35.
- Mulloy, W., 1958, A preliminary historical outline for the northwestern plains: *Univ. Wyoming Pub.*, v. 22, no. 1, p. 222.
- Nero, R. W., and McCorquodale, B., 1958, Report of an excavation at the Oxbow dam site: *The Blue Jay*, Saskatchewan Nat. History Soc., v. 16, no. 2, p. 82-90.
- Olson, E. A., and Broecker, W. S., 1959, Lamont natural radiocarbon measurements V: *AM. JOUR. SCI. RADIOC. SUPP.*, v. 257, p. 1-28.
- Pringle, R. W., Turchinets, W., Funt, B. L., Danyluk, S. S., 1957, Radiocarbon age estimates obtained by an improved liquid scintillation technique: *Science*, v. 125, p. 69-70.
- Rubin, Meyer, and Suess, H. E., 1955, U. S. Geological Survey radiocarbon dates II: *Science*, v. 121, p. 481-488.
- Russell, L. S., 1958, Post-glacial occurrence of Mastodon remains in southwestern Ontario: *Royal Canadian Inst. Trans.*, v. 27, p. 57-64.
- Suess, H. E., 1954, Natural radiocarbon measurements by acetylene counting: *Science*, v. 120, p. 5-7.
- Sveinsson, E. O., 1954, Islenzk Fornrit: Reykjavik, Hid Islenzka Fornritafelag, v. 12.
- Wettlaufer, B., 1955, The Mortlach site in the Besant Valley of central Saskatchewan: Saskatchewan Dept. Nat. Resources Anthropol. Series, no. 1, p. 81.