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# OHIO WESLEYAN UNIVERSITY NATURAL RADIOCARBON MEASUREMENTS II

J. GORDON OGDEN, III and RUTH J. HAY

Department of Botany and Bacteriology, Ohio Wesleyan University
Delaware, Ohio

## INTRODUCTION

The following is a list of dates obtained since the compilation of our first list in November, 1963. Equipment and operating procedures are the same with the exception that a gas chromatograph has been added to confirm the purity of the methane samples used for dating.

Unless noted otherwise, all samples are pre-treated with 2% NaOH and 10% HCl. Peat and gyttja samples are pulled down by suction and washed over glass fiber filter discs and then dried at 105°C before combustion. All methane samples are stored for one month to permit decay of radon.

Ages are quoted with a $1\sigma$ counting error, which includes the statistical variation of the sample count as well as that for background and the contemporary standard. The half-life value is 5568 yr, and the reference year is 1950.

## ACKNOWLEDGMENTS

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## SAMPLE DESCRIPTIONS

### I. GEOLOGIC SAMPLES—GLACIAL GEOLOGY

**OWU-75. Neotoma, Ohio** **32,660 ± 1300**
**30,710 B.C.**

Pine wood (id. by B. Bruce) from ca. 5 ft below surface of "Illinoian" terrace at Neotoma Valley, Ohio (Hocking Co., Good Hope Twp., R18W, T13N, Sec. 16, NW ¼). Coll. 1963 and subm. by G. Gilbert and J. L. Forsyth, Ohio State Univ. and Ohio Geol. Survey. *Comment* (J.L.F.): date, taken in conjunction with other Ohio $C^{14}$ dates, shows that accumulation of material below surface of this terrace was mostly during nonglacial (mid-Wisconsin) time; this is in accord with the wood identification, for pine grows there now, while spruce might have been expected, had the date been 12,000 yr younger.

**OWU-76. Adelphi, Ohio** **17,290 ± 436**
**15,340 B.C.**

Spruce wood (id. by G. W. Burns) from silts in till found in road cut along State Rte. 180, 2 mi W of Adelphi, Ohio (Ross County, Colerain twp. R20W, T10N, Sec. 11, NW ¼ of NW ¼). Coll. 1963 and subm. by J. L. Forsyth. *Comment* (J.L.F.): date is consistent with other dates near margin of late Wisconsin ice advance in Scioto Lobe.

**OWU-83. Liberty, Ohio** **14,780 ± 192**
**12,830 B.C.**

Spruce wood (id. by B. Bruce) from foundation excavation ca. 9 ft below surface in blue-gray clay till near Liberty, Ohio (Dublin 15′ quad., Delaware County, Liberty twp. T3N, R19W, Sec. 2, SW ¼, NW ¼). Coll. 1964 by A. Hobbs; subm. by J. G. Ogden, III. *Comment* (J.G.O.): date is too young for incorporation in late Wisconsin till in this area (Goldthwait, 1958). Sample may be early postglacial for this area, its position possibly a result of slumping.

**OWU-101. Heath Gravel Pit, Ohio** **3970 ± 70**
**2020 B.C.**

Ash wood (id. by G. W. Burns) from wood-bearing alluvial silt separating 3 ft of gravel above and ca. 50 ft of gravel (outwash) below in Heath Gravel Co. Pit along Ramp Creek, 3 mi S of Granville, Ohio (Licking Co., Union Twp. R13W, T1N, Sec. 1 NW ¼, SE ¼). Coll. 1964 and subm. by J. L. Forsyth. *Comment* (J.L.F.): date proves that upper thin gravel, despite its composition, is late postglacial; lower gravel is still believed to be glacial outwash (>14,000 yr).

**OWU-102. Turtle Creek, Ohio** **19,620 ± 372**
**17,670 B.C.**

Spruce wood (id. by B. Bruce), 10 ft deep in till, 100 yds N of Wisconsin boundary at intersection of Interstate 71 and Ohio State Rd. 123 (Warren County, Turtle Creek Twp., R3W, T5N, Sec. 22, NE ¼). Coll. 1963 by Dale Garner and James Ernst; subm. by J. L. Forsyth. *Comment* (J.L.F.): date strongly implies that no "Early" Wisconsin drift is present at the surface in the eastern part of Miami Lobe.

**OWU-103. Diamond Portland Cement Co., Ohio** **209 ± 91**
**A.D. 1741**

Maple wood (id. by G. W. Burns) from till-like deposit in Diamond Portland Cement Co. Pit (just N of Beesom Road E of Ohio Route 44, Stark County, Marlboro Twp., R7W, T2ON, Sec. 28, NE ¼). Coll. 1964 and subm. by J. L. Forsyth. *Comment* (J.L.F.): sample must have been incorporated in till by action of stripping machinery.

**OWU-110. Lake Erie, Ohio** **6550 ± 134**
**4600 B.C.**

Oak wood (id. by B. Bruce) from drill cuttings near shore of Lake Erie (0.4 mi NE of mouth of Portage River at Port Clinton, 0.3 mi from shore in 7 ft of water at Station 57). Sample collected from –23 ft (sediment depth). Coll. 1963 by R. Hartley; subm. by J. L. Forsyth. *Comment* (J.L.F. and R.H.): sample believed to date low-water stage of Lake Erie, associated with other deep layer of sand, shells, and organic matter.

**OWU-122. Neotoma Valley, Ohio** **3380 ± 61**
**1430 B.C.**

Oak wood (id. by G. W. Burns) from same layers as OWU-75, but believed to represent subsequent intrusion by meandering stream. Coll. 1963 and subm. by G. Gilbert and J. L. Forsyth. *Comment* (J.L.F.): age clearly indicates later deposition than OWU-75 (32,660 ± 1300, this date list) and confirms

field suspicion of undercutting of terrace by stream with subsequent deposits of oak wood, covered by marginal slump from terrace.

**OWU-126. Novelty Mastodon, Ohio** **10,654 ± 188 8704 B.C.**

Woody peat from 2.00 to 2.05 m on N wall of excavation for a mastodon (*Mastodon americanus*), approx. 1.5 mi N of Novelty, Ohio (41° 29′ 45″ N Lat, 81° 21′ 10″ W Long). Skeleton was incomplete, yielding portions of the skull, backbone, forelegs, and scapula enclosed in clay gyttja. Neither wood nor peat was found beneath the scapula which was deepest in the section of all bones recovered, indicating that the animal is probably older than the peat sample which was dated. Field evidence indicates that the bones have been somewhat tumbled and reworked. The scapula, which was only portion of the animal unexcavated when the peat sample was collected, was at 1.25 to 1.40 m. The contact of the clay gyttja with the peat was at 2.00 m. Coll. Oct 1964 by J. G. Ogden, III, G. H. Crowl, J. N. Chase, J. L. Forsyth, and W. H. Scheele; subm. by J. G. Ogden, III. *Comment* (J.G.O.): pollen data from the peat and clay gyttja show predominantly spruce (*Picea*), fir (*Abies*), Pine (*Pinus*), Sedge (*Cyperaceae*) and grass (*Gramineae*). None of the field evidence indicates that mastodon is younger than date given. Pollen data are consistent with the $C^{14}$ date.

## II. GEOLOGIC SAMPLES—LAKE SEDIMENTATION

### Krause Bog series

Samples from 4.3 m core recovered from bog on Krause Ranch in western Nebraska (Antioch 15′ quad., Sheridan Co., Reno Twp. R45W, T25N, Sec. 23, NW ¼, NW ¼). Cores were collected to determine if and when forest covered this portion of Nebraska. Coll. by P. B. Sears, H. Tourtelot, and J. G. Ogden, III; subm. by P. B. Sears.

**OWU-84. KB 3.2 120-130 cm** **4160 ± 119 2210 B.C.**

Marl $CO_2$ generated by acid hydrolysis.

**OWU-84A. KB 3.2 120-130 cm** **3140 ± 187 1190 B.C.**

Same as OWU 84, but organic fraction.

**OWU-85. KB 3.3 275-280 cm** **9200 ± 308 7250 B.C.**

Marl $CO_2$ generated by acid hydrolysis.

**OWU-85A. KB 3.3 275-280 cm** **12,080 ± 380 10,130 B.C.**

Same as OWU-85, but organic fraction.

**OWU-86. KB 3.4 336-344 cm** **13,640 ± 492 11,690 B.C.**

Marl $CO_2$ generated by acid hydrolysis. Organic fraction was too small to process.

*General Comment* (J.G.O.): although a detailed pollen analysis is to be published elsewhere, it is apparent that the region was not forested during the time

span represented by these samples. The discrepancy in the marl carbonate and organic fraction dates may be due to the presence of numerous shell fragments in the marl.

**Silver Lake series, Ohio**

The following list of dates continues the Silver Lake (40° 21′ N Lat, 83° 48′ W Long) series reported in OWU-I (1964). Sampling has been extended to include determinations from rooted aquatic plants (OWU-107 and 108) and tree rings from the upland adjacent to the lake (OWU-109).

**a. Contemporary Samples**

**OWU-107. Typha stems** $\delta C^{14}$ **+ 94%**

Stem fragments and leaves of *Typha latifolia* growing in 0.2 m water at mouth of small entering stream. Coll. Oct. 1963.

**OWU-108. Juncus stems** $\delta C^{14}$ **+ 77%**

Stems of *Juncus effusus* rooted in marl in 0.6 m water. Coll. Oct. 1963.

**OWU-109. Oak wood. 1953-1963 rings** $\delta C^{14}$ **+ 25%**

Wood leached with hot 2% NaOH, 10% HCl, and charred (350° C) in a stream of nitrogen prior to combustion to $CO_2$.

**OWU-73. S1-3:1 0-10 cm organic** **725 ± 172**
**A.D. 1225**

**OWU-31. SL-2:1 10-20 cm organic** **820 ± 84**
**A.D. 1130**

**b. Sediment Core Samples**

**OWU-46. SL-2: 260-3 120-130 cm organic** **325 ± 92**
**A.D. 1625**

Pollen: oak, hickory, beech, ash, sweet gum.

**OWU-48. SL-2: 261-1 160-170 cm organic** **950 ± 260**
**A.D. 1000**

Same as OWU-46, middle of second beech maximum.

**OWU-55. SL-2: 261-3 200-210 cm organic** **920 ± 184**
**A.D. 960**

Pollen: oak, hickory, beech, ash, elm.

**OWU-79. SL-2: 263-3 340-350 cm organic** **3280 ± 212**
**1330 B.C.**

Pollen: oak, hickory, beech + elm show minimum.

**OWU-80. SL-2: 265-1 440-450 cm organic** **590 ± 260**
**3950 B.C.**

Pollen: oak, hickory, middle of first beech maximum.

**OWU-81. SL-2: 266-2 540-550 cm organic** **7760 ± 335**
**5860 B.C.**

Pollen: oak, hickory, just above elm maximum.

*General Comment* (J.G.O.): the $\delta C^{14}$ values for OWU-107 and 108 constitute an extremely high bomb-carbon anomaly. These values are, however, in close agreement with U-336 (Uppsala VI, this date list), $\delta C^{14} = 100.5\%$. Uppsala sample was collected August 15-18, 1963.

In keeping with determinations reported in OWU-I (1964), 1200 yr is subtracted from the core sample ages (b) as an estimate of the contribution of Paleozoic carbonate to the lake system. Although detailed discussion of sedimentation rates will be reported elsewhere, it appears that sedimentation rates calculated on short core segments in the early postglacial are about 0.04 cm/yr, and increase to 0.06 cm/yr during the hypsithermal. Late postglacial (upper 2 m) sedimentation rates are about 0.25 cm/yr. Values are not corrected for sediment compaction. For comparison with sedimentation rates in a soft-water lake system, see Seth's Pond, Massachusetts Series, this date list.

### Torren's Bog series, Ohio

Initial sample determinations from a bog near eastern margin of Wisconsin glaciation in central Ohio (Utica 7.5′ quad., Burlington twp. T4N, R13W, Sec. 4, NE 1/4, SE 1/4). Bog is a kettle in a Wisconsin terrace. The deposit is being studied in more detail, but was chosen because it represents a sediment sequence from a low-lime district of approx. the same age and latitude as Silver Lake, Ohio. Sediments from which these determinations were made are at least 1 m above base of deposit. No corrections for Paleozoic carbonate have been made.

**OWU-90. TB-2: 10.45-10.55 m** — **12,820 ± 444 / 10,870 B.C.**

Greenish-gray clay gyttja (loss on ignition 13.0%) with predominantly spruce, fir, and pine pollen. Oak, and hickory pollen are present in amounts up to 5%, but decline to 1 to 3% above this zone.

**OWU-91. TB-2: 11.88-11.98 m** — **14,160 ± 483 / 12,210 B.C.**

Greenish-gray clay gyttja (loss on ignition 9.0%).

*Comment* (J.G.O.); the low levels of calcium and magnesium from these samples (less than 50 mg/g dry sediment) make it unlikely that these dates are appreciably affected by Paleozoic carbonate as the Silver Lake samples are (see OWU-31, 72, 72A, 73). Spruce, fir, and pine pollen predominate in both samples, but appreciable amounts of oak (5 to 7%) and hickory (3 to 5%) are also present. A decline to less than 1% of oak and hickory pollen above 10.45 m is interpreted to imply a readvance of ice in late Cary time.

### Seth's Pond series, Massachusetts

Gyttja from surface samples and sediment cores (collected with a 1.5 in. Livingstone piston corer from 5.23 m water) from Seth's Pond, a soft-water kettle lake 1 mi E of Lambert's Cove, Martha's Vineyard, Massachusetts (41° 18′ N Lat, 70° 46′ W Long). In contrast to the Ohio lakes and bogs, there is no detectable limestone in the till in which lake is located; therefore the following list of dates contains no correction for dilution by Paleozoic carbonate.

**OWU-111. SP 3.1: 0-15 cm organic** — **$\delta C^{14}$ + 8%**

**OWU-123. SP 5.1: 0-10 cm organic** — **$\delta C^{14}$ + 5.3%**

Sample similar to OWU-111, but collected 100 yds E, in 4.50 m water.

**OWU-125. Sp 5.2: 0-10 cm organic** $\delta C^{14} + 3.5\%$

Sample similar to OWU-111, but not pre-treated with NaOH or HCl. Near OWU-123 in 4.35 m water.

**OWU-125A. SP-5.2 0-10 cm organic** $\delta C^{14} + 2.3\%$

Same as OWU-125, but pre-treated with NaOH and HCl.

**OWU-127. Eriocaulon stems** $\delta C^{14} + 37.0\%$

Stems and inflorescences of *Eriocaulon septangulare* from 0.1 m water at E edge of Seth's Pond.

| | | | $\delta C^{14} + 1\%$ |
|---|---|---|---|
| **OWU-112.** | **SP-3.1: 32-50 cm** | **organic** | **1070 ± 156 A.D. 880** |
| **OWU-113.** | **SP-3.1: 60-70 cm** | **organic** | **1500 ± 180 A.D. 450** |
| **OWU-137.** | **SP-3.2: 120-130 cm** | **organic** | **2630 ± 190 680 B.C.** |
| **OWU-138.** | **SP-3.2: 160-170 cm** | **organic** | **1560 ± 168 A.D. 382** |
| **OWU-135.** | **SP-3.3: 220-230 cm** | **organic** | **5270 ± 232 3320 B.C.** |
| **OWU-136.** | **SP-3.4: 260-270 cm** | **organic** | **6240 ± 233 4290 B.C.** |
| **OWU-132.** | **SP-3.5: 300-310 cm** | **organic** | **7025 ± 274 5075 B.C.** |
| **OWU-133.** | **SP-3.5: 340-350 cm** | **organic** | **8150 ± 304 6200 B.C.** |
| **OWU-134.** | **SP-3.5: 370-380 cm** | **organic** | **8390 ± 240 6440 B.C.** |
| **OWU-128.** | **SP-3.5: 437-447 cm** | **organic** | **6110 ± 129 4160 B.C.** |
| **OWU-130.** | **SP-3.5: 400-410 cm** | **organic** | **9835 ± 309 7885 B.C.** |
| **OWU-129.** | **SP-3.6: 430-440 cm** | **organic** | **9740 ± 189 7790 B.C.** |
| **OWU-96.** | **SP-3.6: 510-530 cm** | **organic** | **8310 ± 267 6360 B.C.** |
| **OWU-87.** | **SP-3.7: 515-525 cm** | **organic** | **8200 ± 274 6250 B.C.** |
| **OWU-94.** | **SP-3.7: 530-540 cm** | **organic** | **10,560 ± 347 8610 B.C.** |
| **OWU-97.** | **SP-3.6: 525-535 cm** | **organic** | **10,650 ± 354 8700 B.C.** |
| **OWU-98.** | **SP-3.6: 545-555 cm** | **organic** | **10,500 ± 321 8550 B.C.** |
| **OWU-88.** | **SP-3.7: 555-565 cm** | **organic** | |

**OWU-99. SP-3.6: 565-575 cm organic** **10,190 ± 191**
**8240 B.C.**

**OWU-95. SP-3.7: 580-590 cm organic** **10,810 ± 361**
**8860 B.C.**

*Comment* (J.G.O.): relatively low but positive $\delta C^{14}$ values of surface samples from this lake may reflect mixing of post-bomb $C^{14}$ into the upper layers of the sediment by bottom-burrowing animals. Surface mixing can also account for the $\delta C^{14}$ of + 1% found for OWU-112, which should be 100 to 300 yr old on the basis of associated pollen spectra (rise in *Ambrosia* pollen and introduction of European weeds occurs at 55 cm in Seth's Pond). Incorporation of older gyttja by mixing would also account for the substantially lower values of $\delta C^{14}$ for the surface muds than for *Eriocaulon* plants rooted in the lake edge (OWU-127). Further study is needed to resolve the possible mixing of surface layers by bottom-burrowing animals.

Sedimentation rates calculated from these dates show deposition rates of .05 cm/yr during early postglacial, .04 cm/yr during hypsithermal, and .10 cm/yr in post-colonial time. Values are not corrected for sediment compaction. Stuiver, Deevey, and Rouse (Yale VIII, 1963) found rates from .016 to .133 cm/yr in Rogers Lake, Connecticut. Surface sediments from Rogers Lake have an average $C^{14}$ age of 770 yr.

### III. ARCHAEOLOGIC SAMPLES

## Voss Mound series, Ohio

Angiosperm charcoal (probably oak, id. by B. Bruce) from charred log on house floor, Sq. 5061-3, located in Mound City Natl. Monument Group (39° 22′ 35″ N Lat, 83° 0′ 10″ W Long). Coll. and subm. by R. S. Baby, Ohio State Mus., Ohio State Univ.

**OWU-92. Voss Mound 5061-3** **$\delta C^{14}$ + 3.4%**

The effect of numerous contemporary rootlets penetrating the charcoal is demonstrated by the positive $\delta C^{14}$ value. *Comment* (R.S.B.): sample expected to date 1000 ± 100 yr.

**OWU-92A. Voss Mound 5061-3** **970 ± 79**
**A.D. 980**

Additional material from the same sample was reprocessed as OWU-92A, following the rootlet removal techniques described in Arizona V (1964) for sample A-486.

*Comment* (J.G.O.). contamination of archaeologic samples by contemporary rootlets, or material brought into mounds or burials by ground-burrowing animals causes a substantial number of archaeologic samples to be rejected. Although further samples are being processed to verify the results shown in OWU-92 and OWU-92A, the technique shows great promise for samples which would otherwise be undatable. A sample loss of 35 to 40% is associated with the procedure. The age determination from OWU-92A is within $1\sigma$ of the inferred age based on cultural context of sample.

IV. CHECK SAMPLES

**OWU-119. Johnson County, Indiana** **18,911 ± 407**
**16,911 B.C.**

Sample from spruce log previously dated as OWU-8 and OWU-42 (OWU-I). Pieces of this log and other check samples are run periodically to check the operation of the equipment. *Comment* (J.G.O.): date is in good agreement with previous determinations.

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