[RADIOCARBON, VOL. 15, No. 2, 1973, P. 350-366]

OHIO WESLEYAN UNIVERSITY NATURAL RADIOCARBON MEASUREMENTS V

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INTRODUCTION

The following list of determinations is compiled from samples prepared since publication of our last date list (R., 1969, v. 11, p. 137-149) and includes sample measurements through July, 1970. The Radiocarbon Laboratory was dismantled and transported to Halifax, Nova Scotia, where it will resume operation as the Dalhousie University Radiocarbon Dating Laboratory.

Equipment and operating procedures for samples reported in this date list are the same as described earlier (R., 1964, v. 6, p. 340). Unless noted otherwise, all samples are pretreated with hot 2% NaOH and 10% HCl. Samples of archaeologic charcoal are subjected to an additional pretreatment to remove rootlet cellulose following the Haynes method (1966). Purity of sample CO_2 and CH_4 is checked with a gas chromatograph. Methane samples are stored for one month to permit decay of radon prior to counting.

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

ACKNOWLEDGMENTS

It is a special pleasure for the authors to acknowledge the advice and assistance of George H. Crowl in interpretation of geologic samples, and to George W. Burns for numerous identifications of wood samples, not only in this report, but through the years of operation of the laboratory.

Thanks are also due to William C. Hart for technical assistance in the operation and maintenance of the laboratory. The support of the National Science Foundation (GB-7485) is gratefully acknowledged.

SAMPLE DESCRIPTIONS

I. GEOCHEMICAL SAMPLES

OWU-333. Plant opal #3 **$\delta C^{14} = 105.72 \pm 1.60\%$**

Opal phytoliths extracts from surface horizon (0 to 18cm) of well-drained Brunizem soil (Warsaw silt loam) from terrace along Mad River Valley, W-central Ohio. Previous samples, OWU-317 (R., 1969, v. 9, p. 140) and I-2277 indicated that level of oxidation pretreatment was controlling factor in determining sample age. OWU-333 was pretreated with boiling 1N chromic acid, ground, and then retreated with chromic acid. Coll. and subm. by L. P. Wilding. *Comment* (J.G.O.): not signifi-

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https://doi.org/10.1017/S0033822200001260 Published online by Cambridge University Press

cantly different from OWU-317, despite increased rigor of oxidation pretreatment.

Sample Contamination Series I

First of a series of tests to determine penetrability of charcoal samples to rootlets, and possibility of contamination of archaeologic and geologic samples in the root zone of plants.

Four clay pots 20cm diam., 15cm soil depth, vol of soil 1800cm^3 were filled with a uniform mixture of screened (3.2mm mesh) soil, consisting of 50% sand, 50% Perlite by volume. Two of the pots included a layer of spruce wood charcoal (40g) of known age (OWU-398). All 4 pots were planted to a uniform density (ca. 200 seeds) with wheat (*Triticum* sp.) and placed in Dept. of Botany greenhouse on 3 March, 1969. After 6 weeks' growth, plants were harvested by clipping, and charcoal was hand-picked from root mass surrounding charcoal. Small rootlets were hand-picked from charcoal under a low power dissecting microscope. Results are shown in Table 1. *Comment* (J.G.O.): results indicate that the small pore space of gymnosperm tracheids (average 7μ) were not significantly invaded by rootlets, and confirm that carbonized charcoal is unavailable to angiosperm plants. Future experiments will include the use of ring-porous angiosperm wood (e.g., Oak, *Quercus* spp.), and limiting water such that the charcoal may provide a "reservoir" of water for plant growth. Previous studies on archaeologic samples, e.g. OWU-92 (R., 1965, v. 7, p. 172) show that rootlet penetration of archaeologic samples is a serious source of error.

TABLE 1
Sample Contamination Series I

Sample no.	Material	Age
OWU-398	Indiana spruce-charcoal	17,030 ± 550
OWU-399	Pot 1 + 2 Wheat (*Triticum* sp.) (+ Indiana wood charcoal)	δC^{14} = 158 ± 2.4%
OWU-400	Pot 3 + 4 Wheat (*Triticum* sp.) (no charcoal)	δC^{14} = 158 ± .69%
OWU-401	Indiana spruce charcoal, rootlets hand picked from Pots 1 and 2	16,870 ± 820

OWU-455. Modern Scirpus seeds **δC^{14} = 171.8 ± 4.5%**

Contemporary sample of *Scirpus robustus* seeds coll. 5 Dec., 1968 in Death Valley Nat. Monument (35° 41′ N Lat, 116° 25′ W Long) and subm. by P. J. Mehringer. *Comment* (J.G.O.): previous sample of hand-picked Scirpus seeds from 58 to 64cm in Core IV in archaeologic context gave C^{14} measurement of δC^{14} = 103.8 ± 3.8% (OWU-320). Similar sample by Isotopes, Inc. dated I-3766, 4740 ± 110, additional sample was run to check for possible isotopic fractionation by *Scirpus*. Since OWU-455 is not significantly different from winter, 1968 atmospheric

https://doi.org/10.1017/S0033822200001260 Published online by Cambridge University Press

levels of C^{14}, it is concluded that small sample size (0.22g seeds) and large sample dilution precluded accurate determination.

II. GEOLOGIC SAMPLES

13,695 ± 460
OWU-321. Akron mastodon **11,745 B.C.**

Spruce wood, new sample, id. by G. W. Burns, assoc. with partial skeleton of mastodon excavated during building construction near Akron, Ohio (40° 2′ N Lat, 81° 38′ W Long). Coll. and subm. by J. D. Speth. *Comment* (J.G.O.): sample run to test discrepancy between previous determinations from site (OWU-190, R., 1969, v. 11, p. 137) and M-1971, which showed 13,300 ± 600 yr B.P. Although all determinations are within 2σ, new date closely agrees with Michigan determination.

370 ± 105
OWU-334. Tashmoo Beach wood **A.D. 1580**

Red Maple stump, id. by G. W. Burns, ca. 20m offshore from mean high-water mark off NW coast of Martha's Vineyard, Massachusetts, with root crown ca. 120cm below mean high tide (41° 26 N Lat, 70° 38′ W Long). Coll. and subm. by J.G.O.

700 ± 110
OWU-335. Tashmoo Beach peat **A.D. 1250**

Fibrous woody peat in which OWU-334 was rooted. Pollen analysis shows typical red-maple-swamp assoc. of red maple (Acer), willow (Salix), Ericaceae, sedge, fern and *Sphagnum* spore (Ogden, 1961). *Comment* (J.G.O.): at present, nearest red-maple assoc. is 0.5km inland from sample site. Because of swift tides and exposed location subject to storms, the sea level that killed the tree was probably 20 to 30cm below level of root crown, and that preservation was due to regression of a barrier beach over site.

3830 ± 205
OWU-336. Grane Langsø, Denmark **1880 B.C.**

Core sample, Sec. 8, 157-164cm depth, from Grane Langsø, Denmark (52° 2′ N Lat, 9° 27′ E Long). Detritus gyttja, with small plant fragments. Coll. and subm. by M. Whiteside. *Comment* (M.W.): pollen and other data indicate that radiocarbon dates (OWU-336, and I.U. 58, 164 to 171cm depth) for sediments 157 to 171cm are too old. I attribute older dates to redeposition in benthos of older lake sediments exposed along lake margin during Sub-Boreal time (Whiteside, 1970, p. 109).

Lake Erie series

Part of systematic sediment sampling operation by Ohio Geol. Survey, W of Middle Bass I. Coll. by C. E. Herdendorf and subm. by C. E. H. and J. L. Forsyth.

4270 ± 210
OWU-318-bis. Station WR-31J **2320 B.C.**

Rerun of OWU-318, originally dated 4335 ± 135. *Comment*

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(J.G.O.): similarity of 2 determinations confirms probability that sample represents flooding of 13m level below present surface of Lake Erie (see R., 1969, v. 11, p. 141).

OWU-350. Station WR-33J **9940 ± 315**
7490 B.C.

Continuation of samples previously reported (R., 1969, v. 11, p. 141). Sample from 1.9m below base in 11m water.

OWU-351. Station W-34J **5087 ± 175**
3147 B.C.

Sample from 2.8m below base in 11.2m water. *Comment* (J.L.F.): all samples (OWU-318/318-bis; -319; -350; -351) come from approx. same level (−13m) below surface of Lake Erie. Stratigraphic uniformity suggests that a past near-surface position was maintained from ca. 9000 (OWU-350) to ca. 4000 (OWU-31) yr B.P. I interpret uniformity of depth of these 4 samples, throughout this time to represent a lowering of the lake level during the Xerothermic Interval, a lowering that just balanced over all postglacial isostatic rise of lake level evident before and following this time (cf. Lewis, 1969, fig. 12). With return of moister climate, lake level apparently rose rapidly (7.6m in 500 yr) in response to both climatic and isostatic changes. Return to more normal lake-level rise is documented from Point Pelee Pond (Lewis, 1969) and from Terwilliger's Pond, on S Bass I. (OWU-275, Ogden and Hay, 1969).

OWU-394. Mt. Gilead Beaver site **7590 ± 200**
5640 B.C.

Beaver-gnawed wood from commercial peat excavation, 1.07m below surface near Mt. Gilead, Ohio (40° 30′ N Lat, 83° 52′ W Long). Wood (crushed) tentatively id. as Ash (*Fraxinus*) by G. W. Burns. Coll. and subm. by G. H. Crowl.

OWU-452. Southwest Columbus **19,850 ± 765**
17,900 B.C.

Spruce wood, id. by G. W. Burns, from Intersection I-71/I-270 in SW Columbus, Ohio (39° 53′ 30″ N Lat, 83° 2′ 10″ W Long). Coll. by G. H. Crowl and W. D. Sevon, subm. by G. H. Crowl. *Comment* (G.H.C.): sample relates to same late Wisconsin events as OWU-256/257 (R., 1969, v. 11, p. 139), and OWU-488, this list. Dates are consistent with last major ice advance in region.

OWU-487. Cleveland (Lake Wayne) Beach **10,890 ± 275**
8940 B.C.

Unid. wood fragments in channel sand, below foreslope beach gravel at depth 3.7m below present lake level. Recovered from building excavation between Euclid and Chester Aves. (41° 30′ 8″ N Lat, 81° 47′ 29″ W Long). Relevant dates; I-2917 (wood, Euclid Ave.) 11,200 ± 170. Coll. by T. Lewis and subm. by R. P. Goldthwait.

OWU-488. Reeseville Moraine buried silt **19,303 ± 1080**
17,353 B.C.

Charcoal fragments in silt from Core B-9 at depth 14m in test coring for Interstate Bridge FAY-71-0205, Fayette Co., Ohio (39° 36′ 18″ N Lat, 83° 38′ 3″ W Long). Relevant dates: OWU-256, same place, within 3cm depth, 17,340 ± 390, OWU-257, 19,735 ± 475 (R., 1969, v. 11, p. 139).

OWU-489. Alaskan Hypsithermal Forest **2520 ± 90**
570 B.C.

Spruce wood, id. by G. W. Burns, from Hypsithermal deposit, Wachusett Inlet (off Muir), Burroughs Glacier (E), Glacier Bay Monument (58° 57′ 49″ N Lat, 136° 13′ 24″ W Long). Relevant dates: I-22, 1.6km E, same stratigraphy, 2735 ± 160, I-1610, 5km N, same stratigraphy, 2100 ± 115. Coll. by R. P. Goldthwait and D. Mickelson. Subm. by R. P. Goldthwait.

OWU-490. Collins Creek (Bull Run) **19,535 ± 655**
17,585 B.C.

Spruce wood, id. by G. W. Burns. N Bank, Sec. 2, in Till 4, 30 to 90cm above bedrock. Wood fragments for this determination from 30cm below contact with Till 3. Coll. and subm. by R. P. Goldthwait.

III. GEOLOGIC SAMPLES—LAKE AND BOG SEDIMENTATION

Little Round Lake series

Samples from 1.26m sediment core, in Little Round Lake (44° 48′ N Lat, 76° 41′ W Long), near Sharbot Lake is SE Ontario. Lake watershed is just S of divide between Ottawa R. drainage to U and Lake Ontario drainage to S. Pollen evidence (Ogden, unpub.) indicates that plant succession had proceeded to a closed Boreal forest by the time the lake basin began to record local pollen rain. Coll. and subm. by J. Terasmae.

OWU-322. GSC:LRL-1; 0 to 4cm **715 ± 240**
A.D. 1235

Homogeneous flocculent algal gyttja.

OWU-323. GSC:LRL-1; 10 to 14cm **965 ± 310**
A.D. 985

Homogeneous flocculent algal gyttja.

OWU-324. GSC:LRL-1; 20 to 25cm **55 ± 220**
A.D. 1895

Homogeneous black-green algal gyttja.

OWU-325. GSC:LRL-1; 30 to 35cm **750 ± 175**
A.D. 1200

Homogeneous black-green algal gyttja.

OWU-326. GSC:LRL-1; 50 to 55cm **865 ± 155**
A.D. 1085

Homogeneous black-green algal gyttja.

OWU-327. GSC:LRL-1; 60 to 75cm **2090 ± 255 140 B.C.**

Black-green algal gyttja, trace of banding.

OWU-328. GSC:LRL-1; 100 to 105cm **2740 ± 250 790 B.C.**

Brownish-black indistinct banded algal gyttja.

OWU-329. GSC:LRL-1; 120 to 125cm **2795 ± 190 845 B.C.**

Brownish-black indistinct coarsely banded algal gyttja.

Saylorsburg, Pennsylvania series

As part of a geologic and biogeographic study of late Pleistocene history of SE Pennsylvania by Pennsylvania Geol. Survey, a series of cores were obtained from 3 lakes in general area of Saylorsburg, Pennsylvania (41° 3′ N Lat, 75° 7′ W Long). The lakes differ in alt., and distance from late Wisconsin ice front. Pollen stratigraphic studies will be reported elsewhere. Coll. by J. G. Ogden, III, G. H. Crowl, W. D. Sevon, and W. C. Hart. Subm. by J. G. Ogden.

Leaps Bog

OWU-413. Core LPBG-1: 710-720cm **9560 ± 210 7610 B.C.**

Decomposed forest peat (detritus gyttja) at contact with clay, 10cm thick, overlying rock.

OWU-414. Core LPBG-2: 700-712cm **9900 ± 215 7950 B.C.**

Decomposed woody peat (detritus gyttja) from 2nd core a few m S of LPBG-1, which struck rock at 730cm.

OWU-415. Core LPBG-2: 712-719cm **12,520 ± 825 10,570 B.C.**

Decomposed woody peat (detritus gyttja) at clay contact. Stratigraphy similar to OWU-413. Small sample diluted with dead methane to fill counter. *Comment* (J.G.O.): due to small sample size, 25% of counter filling, date may not be reliable.

Echo Lake

OWU-416. Core Echo-1: 15-25cm **680 ± 120 A.D. 1273**

Flocculent green algal gyttja.

OWU-417. Core Echo-1: 40-50cm **235 ± 85 A.D. 1717**

Dark green flocculent algal gyttja. At *Ambrosia* pollen rise.

OWU-418. Core Echo-1: 145-155cm **640 ± 130 A.D. 1310**

Green algal gyttja, some plant fragments.

https://doi.org/10.1017/S0033822200001260 Published online by Cambridge University Press

OWU-419. Core Echo-1: 245-255cm **1860 ± 135**
A.D. 88

Homogeneous green algal gyttja.

OWU-420. Core Echo-1: 345-355cm **2385 ± 160**
435 B.C.

Homogeneous green algal gyttja.

OWU-433. Core Echo-2: 50-60cm **735 ± 120**
A.D. 1217

Homogeneous green algal gyttja.

OWU-434. Core Echo-2: 70-80cm **1280 ± 135**
A.D. 670

Homogeneous green algal gyttja.

Saylors Lake

OWU-437. Core SYL-1: 5-15cm $\delta C^{14} = 102.8 + 2.4\%$

Green algal flocculent gyttja.

OWU-438. Core SYL-1: 25-30cm $\delta C^{14} = 11.6 + 2.0\%$

Flocculent green algal gyttja.

OWU-439. Core SYL-1: 50-60cm **535 ± 155**
A.D. 1415

Homogeneous algal gyttja.

OWU-440. Core SYL-1: 70-80cm **250 ± 130**
A.D. 1700

Homogeneous algal gyttja. Field notes indicate possibility that borer may have opened prematurely, which would cause inclusion of younger material.

OWU-441. Core SYL-1: 120-130cm **1290 ± 175**
A.D. 660

Homogeneous green algal gyttja.

OWU-443. Core SYL-1: 240-250cm **3235 ± 155**
1285 B.C.

Homogeneous green algal gyttja.

OWU-444. Core SYL-1: 340-350cm **4800 ± 145**
2850 B.C.

Homogeneous green algal gyttja.

General Comment (J.G.O.): all cores bottomed on rock, in gravel or coarse sand. As pollen stratigraphy is determined, additional dates will be run on critical horizons. From present evidence, it would appear that lower portion of valley NW of Delaware Water Gap was not ice-free until 12,000 to 13,000 yr ago.

Fayetteville Green Lake series

Meromictic lake, presumably formed as a plunge pool (Hutchinson, 1957), in Green Lakes State Park, Fayetteville, New York (43° 01′ N Lat, 76° 00′ W Long). Lake has been subject of intensive limnologic, geologic

TABLE 2
Fayetteville Green Lake, Series A
(Ekman dredge surface sample)

Depth mm	Sample no.	Sediment composition	Total bands	Marl age Sample A	Organic age Sample B
0-2.8	OWU-345*	Gray marl band—homog	1	5690 ± 150	—
2.8-6.9	OWU-346	8 thin white marl bands	9	3870 ± 130	2570 ± 315**
(6.9-12.0)		3 gray marl bands	13		
12.0-14.3	OWU-347	4 thin white marl bands	17	4255 ± 120	—
14.3-16.3	OWU-348	Solid gray marl band	18	4975 ± 130	—
(16.3-20.0)		Gray marl band	19		
20.0-25.2	OWU-349	8 thin white bands	27	5315 ± 140	2290 ± 365**

* Mean age (OWU 345-349) 4820 ± 90
** Insufficient carbon, diluted with "dead" methane

TABLE 3
Fayetteville Green Lake, Series B
Core FAY-I

Depth cm	Sample no.	Sediment type	Marl age	Corrected age*
0-15	OWU-352A	Fine greenish laminated marl gyttja	5620 ± 140	800 ± 165
40-51	OWU-353A	Fine greenish laminated marl gyttja 2 turbidites	6390 ± 155	1570 ± 180
54-56	OWU-354A	Single marl turbidite	5520 ± 180	700 ± 200
61.5-63.5	OWU-355A	Fine grained laminated marl gyttja	4075 ± 150	—
90-93	OWU-356A	Fine grained laminated marl gyttja	6500 ± 190	1680 ± 210
94-96.5	OWU-357A	Base of large marl turbidite	6410 ± 180	1590 ± 200
121-124	OWU-358A	Fine grained greenish laminated marl gyttja	8135 ± 275	3315 ± 290
125.5-128	OWU-359A	Fine grained greenish laminated marl gyttja	8790 ± 230	3970 ± 245
138-142	OWU-360A	Fine grained greenish laminated marl gyttja	8420 ± 210	3600 ± 230
End of Core Slug 1				
145-148	OWU-361A	Fine grained greenish laminated marl gyttja	8270 ± 190	3450 ± 210
148-160	OWU-362A	Marl turbidite	9255 ± 210	4435 ± 230
160-191	OWU-363A	Fine grained laminated marl gyttja	9145 ± 225	4325 ± 240
160-191	OWU-363B	Fine grained organic		1220 ± 200 (63% sample)
191-212	OWU-364A	Homogeneous marl gyttja	9365 ± 225	4545 ± 240
191-212	OWU-364B	Organic		4022 ± 560 (32% sample)
287-292	OWU-365A	Homogeneous marl gyttja	9930 ± 240	5110 ± 255

* Marl ages corrected by subtraction 4820 yr (Mean of OWU-345–349).

https://doi.org/10.1017/S0033822200001260 Published online by Cambridge University Press

and geochemical investigations in recent years. Distinct rhythmites are apparently continuously recorded in sediment stratigraphy, and possibly annual. Narrow bands of rhythmites are separated by thicker, coarse bands (turbidites) which apparently reflect turbidity currents and possible redeposition in basin. Two series of samples are reported here to test possibility of annual deposition, and stratigraphic inversion due to turbidity currents.

In Series A, an Ekman dredge (15cm × 15cm) sample was carefully dried and sectioned with a fine saw. Thickness and sequence of bands were recorded as samples were removed by scraping for dating. Total thickness of dried sample was 30mm and contained 35 rhythmites. Dates are based on marl fractions from phosphoric acid hydrolysis. Two samples (OWU-346B and -349B) yielded a small amount of organic material which was burned and diluted with dead methane to bring the samples up to counter pressure. Because of the large dilutions (40% and 50% sample, respectively), these dates are considered less reliable. Samples were run in sequence, and data were pooled to provide a composite date (OWU-349C to estimate correction for carbonate dilution on core samples (Series B).

Series B includes dates from 2 core slugs (1.51m and 1.45m long) from a core 7.28m long. Additional samples from deeper parts of this core are available and may be processed in future. Except for OWU-363B and -346B, all dates are on marl treated with phosphoric acid. The 2 samples noted were burned and diluted with dead methane to operating counter pressure (63% and 32% sample, respectively), and are considered to be less reliable for this reason.

An age correction value (R., 1969, v. 11, p. 144) calculated from the mean value of Series A (OWU-345-349) was applied to all dates as an estimate of the contribution of Paleozoic carbonate to sediment sample ages. *Comment* (J.G.O.): surprisingly old age of surface samples (Series A) indicates that there is relatively little exchange with atmospheric CO_2 from this lake. Phytoplankton productivity must be largely restricted to recirculation within the lake waters in the absence of substantial influx of carbonate-rich runoff into the lake. Both series indicate that turbidity currents and assoc. redeposition from older deposits in the lake play a dominant role in the stratigraphy of the sediments, making close-interval sampling of doubtful value for chronologic inferences.

OWU-467. Charles Lake, Indiana **8765 ± 295**
6815 B.C.

Lake located ca. 9km E of Wyerton, Ontario (44° 45′ N, 81° 1′ W). Sample from Core CL-8:13.01-13.15m at spruce pollen decline. Coll. and subm. by R. E. Bailey. *Comment* (R.E.B.): date is acceptable for spruce pollen decline and compares well with other sites in Northern Georgian Bay areas and Bruce Peninsula (Terasmae, 1967).

Rockyhock Bay series

Rockyhock Bay, Chowan Co. N. Carolina (36° 10′ 6″ N Lat, 76° 40′ W Long). A former Carolina Bay now peat filled and forested. Coll. and subm. by D. H. Whitehead.

OWU-468. RB-66-2-B: 1.54-1.58m — **6655 ± 170** / **4705 B.C.**

Fibrous gel-mud, no carbonates present, pollen spectra dominated by oak, cypress, hickory, black gum.

OWU-469. RB-66-9-C: 2.10-2.14m — **5810 ± 145** / **3860 B.C.**

Gel-mud, no carbonates present. Pollen dominated by oak.

OWU-470. RB-66-9-E: 2.52-2.58m — **9135 ± 305** / **7185 B.C.**

Olive, mottled lake silt. Pollen dominated by pine.

OWU-471. RB-66-10-E: 3.41-3.48m — **14,300 ± 505** / **12,350 B.C.**

Olive, mottled lake silt. Spruce and pine pollen dominant.

OWU-472. RB-66-1-F: 3.66-3.73m — **13,385 ± 495** / **11,445 B.C.**

Olive mottled silt. Sample contained small fragments of crushed wood. Tentatively id. as diffuse-porous angiosperm, id. by G. W. Burns. Spruce and pine pollen dominant.

OWU-473. RB-66-11-A: 4.05-4.10m — **25,020 ± 1215** / **23,070 B.C.**

Brown organic clay, no carbonates present. Pine, oak, cypress pollen dominant.

Berry Pond series

Berry Pond, Berkshire Co., Massachusetts (42° 30′ 20″ N Lat, 73° 19′ 08″ W Long). AH. 600m, surface area 3.9ha. Coll. and subm. by D. H. Whitehead.

OWU-474. BP-68-33-B: 1.53-1.58m — **995 ± 135** / **A.D. 995**

Algal gyttja, no marl carbonates present. Pollen evidence indicates C3/C2 zone boundary.

OWU-475. BP-68-34-B: 2.53-2.57m — **2720 ± 150** / **770 B.C.**

Algal gyttja, middle of Pollen Zone C2.

OWU-476. BP-68-35-B: 3.53-3.57m — **2665 ± 115** / **715 B.C.**

Algal gyttja, lower portions of Pollen Zone C2.

OWU-477. BP-68-36-B: 4.53-4.57m — **4800 ± 200** / **2850 B.C.**

Algal gyttja, below C2/C1 pollen zone boundary.

OWU-478. BP-68-37-B: 5.53-5.57m **5400 ± 155**
3450 B.C.

Algal gyttja. Pollen Zone C1.

OWU-479. BP-68-38-B: 6.46-6.50m **7825 ± 295**
5875 B.C.

Algal gyttja. Upper pine pollen zone.

OWU-480. BP-68-39-D: 7.16-7.20m **9235 ± 230**
7285 B.C.

Algal gyttja. Border of pine/spruce pollen zones.

OWU-481. BP-68-39-C: 7.50-7.55m **12,680 ± 480**
10,730 B.C.

Clay-gyttja. Spruce pollen zone.

Round Lake series

Lake located 8km SSW of Knox, Indiana (41° 14′ N, 86° 38′ W), Starke Co., Indiana. Coll. by D. H. Whitehead and R. E. Bailey and subm. by R. E. B. *Laboratory Comment* (J.G.O.): samples accessioned as received but presented here in reverse order to preserve stratigraphic and chronologic sequence.

OWU-486. RL-69-19-A: 150.5-154.5cm **655 ± 95**
A.D. 1295

Detritus gyttja (Dy).

OWU-485. RL-69-21-A: 345.5-350.5m **3390 ± 125**
1440 B.C.

Detritus gyttja (Dy).

OWU-484. RL-69-23-A: 520.5-524.5cm **3610 ± 170**
1660 B.C.

Marly gyttja.

OWU-483. RL-69-26-A: 870.5-874.5cm **9345 ± 235**
7395 B.C.

Dark brown gyttja.

OWU-482. RL-69-27-A: 955.5-050.5cm **9415 ± 230**
7465 B.C.

Gyttja. *Comment* (R. E. Bailey): OWU-484 is consistent with pollen data and implies Xerothermic Interval in profile. Large maximum of *Cephalanthus* pollen and NAP (non-tree pollen) rise to 20-30% immediately above this zone, together with closely similar date of OWU-485, located 1.8m further up core implies possibility of rapid sedimentation due to lowering of lake level, as suggested by Ogden (1967). OWU-482 is at spruce pollen maximum and is consistent with other unpublished sites in Indiana by Bailey and by Williams. Stratigraphy and age similar to sequence at Silver Lake, Ohio (Ogden, 1966). Overlying OWU-483 may be due to rapid sedimentation.

Minard Lake, Nova Scotia series

Minard Lake, Queen's Co. Nova Scotia (44° 26′ N Lat, 65° 10′ W

Long). Small, shallow lake, 1.09ha in drumlin field near location of old ice divide of former South Mountain ice cap (Hickox, 1962; Prest and Grant, 1969). Sec. from 7.87m water. It was hoped that sediments would date dissipation of this ice cap. Coll. and subm. by J. Railton.

OWU-496. MY-1: 0.5cm **$\delta C^{14} = 108.03 + 4.30\%$**

Flocculent algal gyttja. *Betula-Pinus-Picea* dominants. AP-84%, Shrub-10% and Herb-6%.

2370 ± 165
OWU-497. MY-1: 115-120cm **420 B.C.**

Algal gyttja. *Betula-Pinus-Picea* dominants. AP-90%, Shrub-10% and Herb-3%.

2980 ± 260
OWU-498. MY-1: 244-249cm **1030 B.C.**

Algal gyttja. *Pinus-Betula-Picea* dominants. AP-79% Shrub-12% and Herb-9%.

5735 ± 220
OWU-499. MY-1: 354-359cm **3785 B.C.**

Gyttja with some clay. *Betula-Myrica-Pinus* dominants. AP-62%, Shrub-28% and Herb-10%. *Comment* (J.R.): sec. 541cm long with pollen-depositional hiatus from 370 to 395cm and 405 to 530cm. Dominants at 540cm were *Myrica-Betula-Poaceae* with AP-32%, Shrub-37%, Herb-25% and Crumpled-6%. Dates appear too young and do not agree with pollen stratigraphy.

Oak Hill Lake, Nova Scotia series

Oak Hill Lake, Lunenburg Co. Nova Scotia (44° 23′ N Lat, 64° 34′ W Long). Small lake, 0.80ha, elongated in EW direction in a drumlin field and has 3 basins. Core from deepest basin through 6.12m water. Dated to estimate time of recession of South Mountain ice cap (Hickox, 1962) from its S periphery. Coll. and subm. by J. Railton.

1005 ± 135
OWU-501. O-1: 0-7.5cm **A.D. 945**

Flocculent algal gyttja. *Betula-Picea-Pinus* dominants. AP-78%, Shrubs-14% and Herbs-8%.

4905 ± 225
OWU-502. O-1: 150-155cm **2955 B.C.**

Gyttja. *Pinus-Tsuga-Betula* dominants. AP-89%, Shrubs-7% and Herbs-4%.

6230 ± 235
OWU-503. O-1: 225-230cm **4280 B.C.**

Gyttja. *Pinus-Picea-Betula* dominants. AP-94%, Shrubs-4%, and Herbs-2%.

OWU-504. 0-1: 300-305cm **8675 ± 835**
6724 B.C.

Gyttja with some clay. *Pinus-Picea-Betula* dominants. AP-84%, Shrubs-14% and Herbs-2%.

OWU-505. 0-1: 355-360cm **8250 ± 365**
6300 B.C.

Transition from clay gyttja to clay with faint laminations of organic material. (*Lab note*: small sample, diluted with dead methane to operating counter pressure). *Myrica-Poaceae-Polypodiaceae* dominants. AP-15%, Shrubs-34% and Herbs-51%. *Comment* (J.R.): dates appear too young when compared with pollen stratigraphy. From 365 to 405cm there was a pollen-depositional hiatus. AP increased at 410 to 425cm along with some mesophytic species. Latter zone appears to be a pollen stratigraphic equivalent of the G-zone (Livingstone, 1968).

IV. MARINE SEDIMENTATION SAMPLES

Black Sea series

In Spring 1969, the Wood's Hole Oceanographic Inst. sent a team of scientists on *R/V Atlantis II* into the Black Sea for detailed geochemical, geologic, geophysical, and biologic studies. The Black Sea is the world's largest anoxic basin and an estimation of the sedimentation rates from radiocarbon dates is essential to an interpretation of the stratigraphy of the sediments. Two Kasten cores (15 × 15 × 400cm) were selected for sampling. Both cores were recovered from the central basin in more than 2000m water. Only the radiocarbon dates are reported here, as detailed mineralogic and stratigraphic analyses will be reported by the Wood's Hole Oceanographic Inst. Coll. and subm. by D. A. Ross.

OWU-456. Black Sea marl: **1410 ± 105**
1464-K, 45-51cm **A.D. 539**

Core 1464-K (43° 00′ N Lat, 35° 28′ E Long). CO_2 generated by phosphoric acid hydrolysis. Sample size 150g. Sediment laminated calcareous, marly with ca. 100 bands 1mm thick.

OWU-457. Black Sea marl: **880 ± 90**
1464-K, 74-79.5cm **A.D. 1069**

CO_2 generated by phosphoric acid hydrolysis. Sample size 200g. Sediment banded calcareous ooze, 75 to 100 bands in 5.5cm sample.

OWU-458. Black Sea marl: **2135 ± 110**
1464-L, 114.5-117cm **185 B.C.**

CO_2 generated by phosphoric acid hydrolysis, 150g sample. Sediment banded calcareous ooze, 30 to 50 laminae in 7.5cm.

OWU-460. Black Sea marl: **2180 ± 150**
1464-K, 322-325cm **320 B.C.**

CO_2 generated by phosphoric acid hydrolysis, 140g sample. Banded calcareous ooze, 35 to 50 laminae in 3cm.

OWU-461. Black Sea marl: 1464-K, 372-277cm **6740 ± 150**
4790 B.C.

Sample contained calcareous ooze/clay bands 2 to 5mm wide, indistinct. CO_2 generated by phosphoric acid hydrolysis.

OWU-462. Black Sea marl: 1462-K, 5-12cm $\delta C^{14} = 100.11 + 1.26\%$

Core (43° 00′ N Lat, 33° 00′ E Long), CO_2 generated by acid hydrolysis. Sample size 200g. Finely banded calcareous sediment with alternating light and dark laminae-top of core homogeneous gray-blue silty clay, laminae continuous to 23.5cm then blocky silt/clay to 52.5cm laminated to 71cm.

2040 ± 150
OWU-463. Black Sea marl: 1462-K, 63.5-71cm **90 B.C.**

CO_2 generated by acid hydrolysis. Sample size 200g. Coarse 1 to 2mm laminae above contact with homogeneous blue-gray silty clay (71 to 100cm in core sec.). *Comments* (J.G.O.): large amounts of sulfide made sample preparation extremely difficult. Despite pyrolysis at 500°C in a stream of Nitrogen in attempt to distill elemental sulfur from samples, several methane reactors were poisoned and no organic carbon samples were successfully prepared. (D.A.R.): except for 1 date (OWU-457), results of determinations on cores 1464K and 1462K are consistent with stratigraphy and ages of other sediment cores from Black Sea basin. A more detailed description is given in Ross *et al.* (1970).

V. ARCHAEOLOGIC SAMPLES

1735 ± 170
OWU-330. Phillips Mound No. 2, Ohio **A.D. 215**

Charcoal sample from Sq. 30; 38cm below mound surface (40° 5′ 38″ N Lat, 83° 2′ 33″ W Long). Assoc. with deposits of cremated bones in same square plane (35′ profile). Wood id. as probably ash or hickory by G. W. Burns. Coll. and subm. by R. S. Baby. *Comment* (R.S.B.): date represents construction of earth mound over site of abandoned Hopewell house and is acceptable. Although several centuries later than the date for Phillip Mound No. 1 (OWU-146: 356 B.C. ± 536) it is still within the Hopewell range. May represent slightly later Hopewell component.

2630 ± 115
OWU-331. James Mound, Ohio **680 B.C.**

Post hole in Sqs. 20L4 and 20L5 on L4, N-S line (40° 13′ 15″ N Lat, 82° 57′ 24″ W Long). Ring-porous angiosperm wood with narrow rays, probably ash or hickory, id. by G. W. Burns. Coll. and subm. by R. S. Baby. *Comment* (R.S.B.): date is acceptable. Sample from post mold of house pattern typical of Early Adena architecture. Most artifacts from mound fill are also Early Adena.

OWU-323. Mound City, Ohio **δC[14] = 106.38% + 1.83%**

Mound 23 Fl. Wood charcoal (oak, id. by G. W. Burns) from large post in SE corner of house pattern, Fl, Posthole #20 (39° 22′ 35″ N Lat, 83° 00′ 15″ W Long). Numerous rootlets hand-picked followed by Haynes (1966) treatment. *Comment* (R.S.B.): although sample obtained from post mold of Hopewell charnel house, obviously contaminated by modern disturbance, probably by Camp Sherman. Date is not acceptable.

OWU-397. Incinerator Village site **δC[14] = 154.60 + 4.94%**

Fort Ancient House site, storage pit charcoal, near Dayton, Ohio (39° 43′ N Lat, 83° 14′ W Long). Charcoal fragments id. by G. W. Burns as ring-porous angiosperm (not oak). Coll. by C. Smith and subm. by R. S. Baby. *Comment* (J.G.O.): 2 preparations of this sample indicate post-1950 A.D. age for charcoal. Date is not acceptable. Apparently sample contaminated either while it was in the ground or during coll. process.

OWU-448A. Sq. D-1, Feature 13 **δC[14] = 101.8 + 1.71%**

Area 2, Group 1, D.13, 1.37m depth. Wood charcoal fragments probably Hickory, id. by G. W. Burns.

OWU-448B. Sq. D-1, Feature 13 **555 ± 100**
A.D. 1395

Area 2, Group 1, D.13, 45 to 60cm depth. Wood charcoal fragments id. as hickory and ash by G. W. Burns.

OWU-450. Sq. C-1, Feature 12 **δC[14] = 107.50 + 3.20%**

Area 2, Group 1, 100 to 115cm. Unidentifiable wood charcoal fragments assoc. with pottery.

OWU-451. Sq. B-2, Feature 4 **δC[14] = 129.39 + 4.26%**

Composite sample of small charcoaled wood fragments including elm, id. by G. W. Burns, from 30, 35, and 40cm depths.

OWU-464. La Moreaux Mound, D1-16 **1955 ± 125**
5 B.C.

Ash wood charcoal id. by G. W. Burns, from Sq. 45-L2 (A:50L2(s) 4-80 (40° 12′ 40″ N Lat, 82° 57′ 28″ W Long). La Moreaux mound covered an irregular post hole pattern that may represent a series of screens and scaffolds rather formal house pattern. Sample yielding date came from charred log near center of mound and 26.8cm below surface of 1m high structure. Date corresponds with Middle to Late Adena artifacts scattered through mound fill. Coll. and subm. by R. S. Baby.

OWU-465. Bagley Mound, DL17 **745 ± 135**
A.D. 1205

Hickory wood charcoal id. by G. W. Burns from Sq. 35R1 (40° 10′ 26″ N Lat, 82° 58′ 12″ W Long). Sample included burnt bark of log. Bagley mound ca. 3km SW of La Moreaux mound, was also built by Adena Indians over irregular post hole pattern. Should be contemporaneous with or slightly earlier than La Moreaux site judging from artifacts recovered and unpaired post hole pattern of house discovered 120m N mound. Therefore, A.D. 1205 is not acceptable. Apparently charred log from which sample was taken was contaminated, possibly by a relic collector's excavation trench nearby.

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