The following list of dates contains all measurements made during 1973, *i.e.*, since our last list (R., 1973, v 15, p 451-468). We have installed this year a Nuclear Enterprises NIM system to be used with our 2.5L Oeschger-type proportional counter (Philips), in addition to our 6L and 1L proportional counters which have worked consistently with Beckman Lowbeta electronics. The Philips counter has been calibrated relative to the Beckman electronics and we are now calibrating it relative to the NIM system.

Age calculations are based on 95% activity of the NBS oxalic acid standard computed from the Libby half-life of 5570 \( \pm \) 30 yr. Background samples are synthesized from Welsh anthracite. Errors quoted refer only to the standard deviation (1\( \sigma \)) calculated from a statistical analysis of sample, background, and standard count rates.

\(^{13}\)C/\(^{12}\)C ratios are measured directly on all methane gas samples as previously described (R., 1973, v 15, p 451) and ages are corrected for \(\delta^{13}\)C deviations.

Sample preparation and pretreatment continue as before (R., 1969, v 11, p 263). Where sample size was insufficient for full pretreatment, details of procedure accompany the result. For bone samples, we use the extraction method based on the solubility of collagen in slightly acidic hot water of Longin (1971).

**ACKNOWLEDGMENTS**

We particularly wish to thank Lina Salvini for routine sample preparation and pretreatment. Sample descriptions are based on information provided by submitters and collectors.

**SAMPLE DESCRIPTIONS**

**I. GEOLOGIC SAMPLES**

**A. British Isles**

**Ellerby series, Holderness, Yorkshire**

Birm-351.

Highest organic bed from ca 0.6m deep.

Birm-390.

Middle organic bed from ca 1.0m deep.

General Comment (GDG): lowest organic bed from ca 1.2m deep dated at 10,040 ± 210 (Birm-304; R, 1973, v 15, p 5). Date of lowest horizon and kettle hole structure suggest hollow originated as subsidence feature due to melting, at start of Flandrian climatic amelioration, of ice buried deep enough to have survived transient late Devensian amelioration(s).

Birm-381. Sugworth Farm, Abingdon Bypass, Berkshire >47,700

Wood, unid, from tree trunk ca 4.0m deep and ca 3.0m below plateau drift gravel in road cut for bridge foundation at Sugworth Farm, Abingdon Bypass, Berkshire (51° 42’ N, 1° 15’ W, Grid Ref SP 512018). Coll Nov 1972 by P J Osborne; subm by F W Shotton. Comment: date consistent with interglacial interpretation.

Aston Mill series, Worcestershire

Wood and moss washed from current bedded sand and fine gravel with lenses of gray silty clay overlying Lower Lias at Aston Mill, SW of Bredon Hill, Worcestershire (52° 01’ 00” N, 2° 04’ 45” W, Grid Ref SO 94355). Coll Dec 1971 and subm by P F Whitehead, Dept Geol, Univ Birmingham.

Birm-410. Field 3, Site 25

Wood from ca 0.5m deep.

Birm-411. Field 3, Site 14

Wood (Alnus glutinosa) id by D F Cutler, Plant Pathol Dept, Kew Gdns, London, from ca 2.43m deep in gray blue silty marl.

Birm-382.

Moss washed from organic deposit with coleoptera and plant seeds at ca 6.20m deep at base of gravel immediately overlying Lower Lias. Comment: Birm-382 indicates date at end of middle Devensian, agreeing with contained fauna and flora and also with date of 27,650 ± 250 (R, 1973, v 15, p 5) from similar terrace gravel at Beckford, 4km E. Birm-110
and Birm-411 indicate Neolithic date and there may be a substantial break between upper and lower parts of gravel sequence.

**Cletwr Pingo series, Cardiganshire**

Gray clay interbedded with peat overlying 14 cm gray clay at Cletwr pingo 10 km SSE of New Quay, Cardiganshire (52° 07' 25" N, 4° 19' 30" W, Grid Ref SN 412499). Coll July 1972 and subm by Edward Watson, Dept Geog, Univ College Wales, Aberystwyth.

**Birm-389. Pingo K, Sample W4**

8260 ± 300

6310 BC

\[ \delta^{13}C = -24.9\% \]

"Russian" auger peat from 3.55 to 3.59 m below bog surface, 10 m S of foot of N rampart on profile line (Watson, 1972, written commun).

**Birm-388. Pingo K, Sample W3**

10,170 ± 220

8220 BC

\[ \delta^{13}C = -26.5\% \]

"Russian" auger peat from 3.50 to 3.56 m below bog surface, 9 m S of N rampart, offset 1 m W of profile line. Comment: sample size excluded alkali pretreatment.

**General Comment (EW): Birm-389 younger than expected. Probably due to contamination by younger material when auger drawn up. Birm-388 earlier than basal organic material in Cledlyn pingo (Birm-368: 9380 ± 340, R, 1973, v 15, p 461) and compatible with much shallower form of Cletwr basin in which ice lens expected to melt out more quickly and undisturbed organic sedimentation to begin earlier.**

**Tattershall Castle pit series, Lincolnshire**

Vegetable matter washed from peat and silt lenses at large gravel pit near Tattershall Castle, Lincolnshire (53° 05' N, 0° 12' W, Grid Ref TF 210570) where Devensian gravel which overlies Ipswichian peat (Birm-260: >42,000, R, 1973, v 15, p 4) includes numerous bones of bison, reindeer and other mammals and a number of horizons of organic silt containing abundant insect assemblages. Two of these horizons referred to provisionally as the Lower Silt (Birm-398 and -408) and the (newer) Anodonta Bed (Birm-341 and -409) are stratigraphically assoc above Ipswichian peat. Devensian gravel is overlain by clay, peat, and gravel of Flandrian age. Coll 1973 and subm by FWS, G R Coope, R B Angus, and Maureen Girling, Dept Geol, Univ Birmingham.

**Birm-409.**

42,200 ± 1000

40,250 BC

\[ \delta^{13}C = -26.2\% \]

Finely divided organic material from Lower Silt, ca 5.0m deep, and 0.5m above Ipswichian peat.

Plant debris washed from Lower Silt, ca 4.0m horizontal distance from Birm-398.

General Comment: ages of these 2 beds very similar, with Lower Silt only slightly earlier than Anodonta Bed, despite marked alteration of climate indicated by insect assemblages.

Comminuted plant debris washed from 1.90 to 2.10m deep, from organic silt bed with Anodonta, extending with decreasing organic content to 1.20m below surface. Overlain by gravel and underlain by at least 1.40m sand and gravel. A marked paleosol at top of silt bed, truncated by Upper gravel (see Birm-451, below). (a) after alkali pretreatment, (b) humate extract.

Rootlets washed from large volume of silty clay, 1.20 to 1.40m deep, highest part of palaeosol referred to above. (a) and (b) are independent determinations on separate samples.

General Comment: visual evidence indicates that some rootlets at least penetrate from overlying gravel, and that date may underestimate age of palaeosol. Young date for Birm-448 (expected on faunistic grounds to be closer to 40,000, cf Birm-409) suggests penetration of these roots into Birm-448.
Birm-450.

Plant debris from small lens of organic silt, with Anodonta and rich insect assemblage, 4.55m deep in gravel underlying chalky till (no intervening Ipswichian peat here).

Birm-447.

Piece of Pinus wood from base of peat in Flandrian succession of 1.25m alluvial silt and clay, on ca 1m black peat with large pieces of wood, on ca 0.5m angular flinty gravel with roots, resting on Devensian gravels.

(a) 3270 ± 120
1320 BC
δ¹³C = -28.7‰

(b) 3500 ± 130
1550 BC
δ¹³C = -27.9‰

Birm-393. Newport Pond, Newport, Essex

Humified and structureless fen peat from 4.50 to 4.90m deep in Borehole C19 at Newport Pond, Newport, Essex (51° 58' 30” N, 0° 13’ 00” E, Grid Ref TL 52403327). Coll Nov 1972 and subm by C A Baker, Dept Geog, Kings College, Univ London. *Comment*: sample (a) after alkali pretreatment, (b) humate extract. Date confirms pollen analysis as Zone VIIb.

Birm-400. Trawling Ground, Pembrokeshire

Peat from 2.55 to 2.60m below ocean bed, -21.55 to -26.60m alt, from hydrocore Site ZZ27 at Trawling Ground 4.8km NE of Newquay, Pembrokeshire (52° 14’ 12” N, 4° 18’ 24” W). Coll Aug 1972 during Whitethorn project, Inst Geol Sci; subm by R A Garrad, Dept Geol, Univ College Wales, Aberystwyth. *Comment*: date is maximum for Flandrian transgression at site.

(a) 10,550 ± 340
8600 BC
δ¹³C = -25.0‰

(b) 10,700 ± 210
8750 BC
δ¹³C = -27.2‰

Birm-404. Brimfield, Herefordshire

Plant material washed from stratified sand and silt at 2.50 to 2.80m deep from low terrace of R Teme ca 1km E of village of Brimfield, Herefordshire (52° 18’ 32” N, 2° 40’ 35” W, Grid Ref SO 53886814). Coll July 1972 and subm by Peter Cross. *Comment*: terrace postdates
R Teme’s E diversion to the R Severn by Wye Glacier ice (Cross, 1971). Acid pretreatment only on (a), 1% NaOH for “humate” extraction on (b).

Roos Bog series, Yorkshire


<table>
<thead>
<tr>
<th>Date</th>
<th>Sample</th>
<th>Depth</th>
<th>Carbon Isotope</th>
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</thead>
<tbody>
<tr>
<td>Birm-405</td>
<td>R-192 to R-197</td>
<td>10,120 ± 180</td>
<td>δ13C = −31.3%</td>
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<tr>
<td></td>
<td></td>
<td>From 9.20 to 9.25m deep.</td>
<td></td>
</tr>
<tr>
<td>Birm-406</td>
<td>R-25 to R-29</td>
<td>11,220 ± 220</td>
<td>δ13C = −28.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From 10.91 to 10.95m deep.</td>
<td></td>
</tr>
<tr>
<td>Birm-407</td>
<td>R-12 to R-15</td>
<td>11,450 ± 230</td>
<td>δ13C = −27.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From 11.02 to 11.05m deep.</td>
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</tbody>
</table>

General Comment: insufficient sample for alkali pretreatment. Previous dates from this site: Birm-318: 11,500 ± 170 (11.10 to 11.15m deep) and Birm-317: 18,050 ± 270 (11.33 to 11.40m deep); R, 1973, v 15, p 454.

Birm-412. Docking Common, NW Norfolk

Upper humic layer of a paleosol profile ca 1 to 2m thick overlain by ca 3m cryoturbated flint gravel and underlain by involuted gravels on shallow dry valley floor at Docking Common, NW Norfolk (52° 53’ 30” N, 0° 40’ 00” E, Grid Ref TF 790357). Coll Jan 1973 and subm by Allan Straw, Dept Geog, Univ Exeter. Alkali pretreatment for contamination impossible as sample completely soluble in 1% NaOH and had to be reprecipitated. Comment (AS): older than previous determination on similar soil Birm-350: 19,300 ± 300 (R, 1973, v 15, p 459), suggests minimum age and soil formed well before Late Devensian advance to Holderness.

<table>
<thead>
<tr>
<th>Date</th>
<th>Sample</th>
<th>Depth</th>
<th>Carbon Isotope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birm-414</td>
<td>Caisteal-nan-Gillean, Ornsay, Scotland</td>
<td>24,000 ± 550</td>
<td>δ13C = −27.2%</td>
</tr>
<tr>
<td>(a)</td>
<td></td>
<td>3990 ± 130</td>
<td>2040 BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>δ13C = +0.7%</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td>4080 ± 120</td>
<td>2130 BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>δ13C = +0.5%</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td>4110 ± 130</td>
<td>2160 BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>δ13C = +0.4%</td>
<td></td>
</tr>
</tbody>
</table>

Inner (a), middle (b), and outer (c) fraction of limpet shells from
emerged beach on SE coast of I of Oronsay in Inner Hebrides, Argyllshire, Scotland (56° 00' N, 6° 14' W, Grid Ref NR 359880). Coll July 1972 and subm by W G Jardine, Dept Geol, Univ Glasgow. Comment (WGJ): dates are considerably younger than those for Arctica islandica from same horizon of emerged beach (7020 ± 140: Birm-363, R, 1973, v 15, p 457). Hard-water effect may be greater for Arctica islandica than for Patella because of different habitat. Dates for Patella are younger than date for Patella in lower layers of adjacent Mesolithic shell midden (5850 ± 310: Birm-348, R, 1973, v 15, p 456). This supports suggestion of excavators in 1914 that sea had not retreated far before midden areas were occupied.

Birm-415. Palnure Borehole, Scotland

Sample at +6.38m alt from base of thick peat ca 4.73m deep, overlying gray clay (carse deposit) in Palnure Borehole, Newton Stewart, Kirkcudbrightshire, Scotland (54° 56' N, 4° 25' W, Grid Ref NX 4500-6367). Coll Aug 1969 and subm by WGJ. Comment: Birm-189: 6240 ± 240 (R, 1971, v 13, p 144) wood assoc with peat from same junction of carse deposit.

Birm-418. Grimstock Hill, Warwickshire

Peat between +89.9 and +91.4m alt, overlain by 0.9m silty peat and 2.7m gravelly solifluction and underlain by at least 13m gravel, sand and silty clay, in sequence predating valley of R Tame and its terraces at Grimstock Hill, Coleshill, Warwickshire (52° 30' 30'' N, 1° 43' 00'' W, Grid Ref SP 19259033). Coll 1973 and subm by P J Markham, Dept Geol, Univ Birmingham. Comment: palynology indicates an interglacial, possibly Hoxnian.

Birm-443. Craigazle Bog, Galloway, Scotland

Sphagnum peat from 0.70 to 0.75m deep in auger hole at Craigazle Bog, Silver Flowe Nature Reserve, Galloway, Scotland (55° 05' N, 4° 24' W, Grid Ref NX 476812). Coll April 1973 and subm by P D Hulme, Dept Botany, Univ Hull. Comment: dates start of major phase of pool system development.

Birm-444. Hornsea Old Mere, Yorkshire

Plant fragments from detritus mud with shells 12.52 to 12.73m deep at Hornsea Old Mere, E Riding, Yorkshire (53° 54' N, 0° 10' W, Grid Ref TA 210476). Coll May 1973 and subm by S C Beckett, Dept Geog, Univ Hull. Comment: sample dated as control on pollen zonation of late Glacial period. Large error as sample was small.
Birm-449. Stubbers Green, Staffordshire

Wood (? Pinus) from borehole at ca 7m deep in peat, beneath 2.5m made ground and 4m coarse, medium sand and gravel, in drift filled channel at Stubbers Green, Staffordshire (52° 35' N, 2° 00' W, Grid Ref SK 045010). Coll April 1973 and subm by PJM. Comment (PJM): base of peat contains early interglacial type pollen (Betula, Pinus), 40cm higher in peat sequence more temperate pollen types found (Alnus, Corylus, Picea, Pinus). Date consistent with interglacial interpretation.

Birm-452. Wicken Water, Newport, Essex

Macroflora remains (Betula twigs, reeds, and seeds) washed from clayey fen peat 7.20 to 7.50m deep in Hiller auger Borehole C23 at Wicken Water, Newport, Essex (51° 59' N, 0° 12' E, Grid Ref TL 51573418). Coll Aug 1973 and subm by CAB. Comment: dates start of sedimentation in postglacial infills in area.

Birm-458. Howth Demesne, Co Dublin, Ireland

Peat at 1.50 to 1.60m deep from bed at 1.30 to 1.80m deep, between 2 calcareous tills at Howth Demesne, Co Dublin, Ireland (53° 23' N, 6° 04' W, Grid Ref O 283384). Coll Aug 1973 and subm by G F Mitchell, Trinity College, Dublin. Comment: date younger than expected but verified by date on separate sample from same horizon by Teledyne Isotopes (I-7433: 12,020 ± 175, unpub).

Birm-461. Lochar Water, Scotland

Wood fragments at +9.20m alt from top of peat 1.97m thick underlining 1.99m silty clay (? lake deposit) and overlying 6.65m marine sand (+0.58 to +7.23m alt), directly above fluvioglacial gravels at Sandyknowe Bridge, Lochar Water, Dumfriesshire, Scotland (55° 05' N, 3° 32' W, Grid Ref NY 017776). Coll Sept 1973 and subm by WGJ. Comment: dates change from peat formation to overlying inorganic sediment. GU-65: 7426 ± 136; R, 1969, v 11, p 51, dates wood from base (+0.58m alt) of underlying marine sand.

Birm-466. Little Rissington, Gloucestershire

Collagen from elephant tusk (? Mammuthus primigenius) from 3.66m deep in ochreous oolite terrace gravel of R Dikler at Little Rissington near Bourton-on-the-Water, Gloucestershire (51° 53' N, 1° 44' W, Grid Ref SP 182203). Coll 1973 by H E O'Neil; subm by FWS. Comment: previously recorded fauna (Richardson and Sandford, 1961) sug-
gests possible correlation with No 2 Terrace of R Avon, confirmed by Middle Devensian date.

500 ± 120

Birm-467. Cosford Pumping Station, Shropshire  AD 1450

Twigs (Betula) washed from gray-brown clay, 0.60m thick, 3.96m deep from borehole NW of Wolverhampton at Cosford Pumping Sta, Shropshire (52° 38' 15" N, 2° 19' 20" W, Grid Ref SJ 781045). Coll 1973 and subm by P D Triccas, Westhill College Educ, Birmingham. Comment: recent deposition of river alluvium.

B. Miscellaneous Geologic Samples

Atlantic volcanic island series


2040 ± 120

Birm-394. Locality 1, S56

Carbonized tree branches from discrete carbon layer between 2 basaltic ashes at road cut near center of Terceira I, Azores (38° 44' N, 27° 16' W).

19,680 ± 330

Birm-395. Locality 91, S228

Carbonized tree trunk or large branch at base of nonwelded basal zone of Saõ Mateus ignimbrite on cliffs at old church of Saõ Mateus, Terceira I, Azores (38° 41' N, 27° 17' W).

18,600 ± 650

Birm-396. Locality 29, S43


+1580

Birm-417. S7

Carbonized wood from near base of thin ignimbrite in Orotaua Valley, ca 2km W of Puerto de la Cruz, Tenerife I, Canary Is (28° 26' N, 16° 30' W). Comment: Birm-180 (a): >25,200 (R, 1971, v 13, p 150) sample assoc with latest explosive eruption of Tenerife volcano.
General Comment: dates form part of tephrochronologic study of volcanic sites of N Atlantic Ocean by G P L Walker, Imperial College, London.

Birm-399. Jebel Idwa, W Sudan


Aavatsmokbreen series, Vestspitsbergen


(a) 10,500 ± 280
8550 BC
$\delta^{13}C = +0.5\%$

(b) 11,030 ± 310
9080 BC
$\delta^{13}C = +0.0\%$

Birm-421. S114, +3.3m alt

Inner (a) and middle (b) fraction of shells (Hia galicena).

(a) 12,670 ± 250
10,720 BC
$\delta^{13}C = -0.3\%$

(b) 11,730 ± 230
9780 BC
$\delta^{13}C = +0.6\%$

Birm-422. S112, +8.8m alt

Inner (a) and middle (b) fraction of shells (Hia galicena).

Birm-423. S110, +12.2m alt

11,160 ± 140
9210 BC
$\delta^{13}C = +1.5\%$

Middle fraction of mixed shells (Hia galicena and Mya truncata).

(a) 10,520 ± 180
8570 BC
$\delta^{13}C = +1.0\%$

(b) 10,350 ± 170
8400 BC
$\delta^{13}C = +1.4\%$

Birm-424. S63, +15.8m alt

Inner (a) and middle (b) fraction of mixed shells (Hia galicena and Mya truncata).
Birm-425. S108, +18.4m alt

Inner (a) and outer (b) fraction of shell fragments (unid).

(a) $13,420 \pm 460$
   $11,470$ BC
   $\delta^{13}C = +2.4\%$

(b) $14,600 \pm 240$
   $12,650$ BC
   $\delta^{13}C = +1.1\%$

Birm-426. S65, +24.8m alt

Inner (a) and outer (b) fraction of mixed shells (*Hiola gilica*, *Mya truncata* and *Macomacarea*).

(a) $14,900 \pm 300$
   $12,950$ BC
   $\delta^{13}C = +1.7\%$

(b) $13,730 \pm 290$
   $11,780$ BC
   $\delta^{13}C = +1.4\%$

Birm-427. S64, +41.7 to +43.2m alt

Collagen extracted from whale bone. Comment: where sufficient sample was available 3 fractions were evolved, the outer discarded, determinations were done on the inner and middle fractions. For the smaller samples only 2 fractions were evolved and dated as Inner and Outer. Inner fraction of Birm-423 was lost.

*General Comment*: dating is part of crustal uplift study of Spitsbergen area. Discordation between date and beach height may be due to hard water-effect or some isotopic replacement. Whale bone on highest beach obviously intrusive, and, in view of hard-water error, could be recent.

Qaleragdlit imâ series, S Greenland

Shells and cemented calcite concretions washed out from small outcrop of marine silty sand (+3.5m alt) 2km from glacier calving into head of fjord at entrance to Marrait tributary valley on SW side of Qaleragdlit imâ fjord, S Greenland (60° 58' 24" N, 46° 39' 06" W). Coll July 1973 and subm by M R Kelly, Dept Environmental Sci, Univ Lancaster.

(a) $7980 \pm 150$
   $6030$ BC
   $\delta^{13}C = -0.3\%$

(b) $7640 \pm 150$
   $5690$ BC
   $\delta^{13}C = -0.5\%$

(c) $7790 \pm 150$
   $5840$ BC
   $\delta^{13}C = +0.8\%$

Inner (a), middle (b), and outer (c) of lamellibranchs (*Mya truncata*).
Calcite cemented concretions of silt containing fragments of lamellibranchs (*Mytilus edulis*). Cementation probably by solution of shells (similar to Birm-455).  

**General Comment** (MRK): evidence from Qaleragdit imá and adjacent areas shows parts of margin of S Greenland ice sheet in mid postglacial times was well behind present or “little ice age” maximum positions. Shell dates agree well with indirect age of 8000 to 6000 from shoreline evidence. Calcite cement date indicates formation from different carbonate system and δ¹³C measurements show isotopic fractionation occurred in recrystallization process.

**Emuruangogolak volcano series, Kenya**

Wood (？*Acacia*) from tree molds in lava of 2nd youngest basalt flow of Emuruangogolak volcano, Kenya (1° 27' N, 36° 20' E). Coll May 1973 and subm by S D Weaver, Dept Geol, Univ Birmingham.

**General Comment** (SDW): older lavas of Emuruangogolak (Chapman *et al.*, 1974) intercalate with Suguta valley sediments which were probably deposited in a “greater Lake Rudolf”.

### II. Archeologic Samples

#### A. British Isles

**Birm-377. Bidford-on-Avon, Warwickshire**

Wood, unid, from pile with iron tip, in bed of R Avon at Roman ford, Bidford-on-Avon, Warwickshire (52° 09' N, 1° 51' W, Grid Ref SP 101508). Coll 1970 and subm by W J Ford, Co Mus, Warwick. **Comment** (WJF): later date than expected. Site some distance downstream from previously assumed river crossing and may represent alternative or replacement ford. Dates site within Theodosian re-organization of late 4th century AD.

**Stretton-on-Fosse series, Warwickshire**

Collagen of human bones from Romano-British and ? Saxon cemeteries at Stretton-on-Fosse, Warwickshire (52° 25' N, 1° 41' W, Grid Ref SP 221383). Coll between 1949 and 1971, and subm by WJF.
Birm-383. Cemetery 1, ST 1949
AD 250
$\delta^{13}C = -17.7\%$

1700 ± 180
AD 150
$\delta^{13}C = -18.6\%$

Birm-384. Cemetery 3, F16, SF71

1800 ± 190

Tibia.

Birm-385. Cemetery 3, F11, SF71
AD 380
$\delta^{13}C = -18.8\%$

1570 ± 150

Tibia. Comment: this date and Birm-384 represent 2 phases of same cemetery.

Birm-386. Cemetery 2, Grave 4, F88
AD 470
$\delta^{13}C = -19.6\%$

1480 ± 170

Tibia from ca 1m deep in believed Anglo-Saxon cemetery (Grid Ref SP 220383).

Birm-439. Cemetery 2, F61, ST68
AD 420
$\delta^{13}C = -20.2\%$

1530 ± 100

Tibia.

Birm-440. Cemetery 2, F101, ST68
AD 400
$\delta^{13}C = -20.0\%$

1550 ± 110

Tibia.

Birm-441. Cemetery 2, F1, ST68
AD 320
$\delta^{13}C = -19.8\%$

1630 ± 110

Rib bones from sand pit.

Birm-442. Cemetery 2, F6, ST68
AD 290
$\delta^{13}C = -18.7\%$

1660 ± 130

Femur.

General Comment (WJF): dates from Cemetery 2 too early for Anglo-Saxon period but further archaeologic study indicates assoc shield is of late Roman army type found on the continent (particularly in the Danube frontier area) and not of normal Anglo-Saxon type. Dates useful in suggesting sequence of use of burial ground over 3 centuries.

Skaill series, Orkney Islands, off NE Scotland

Hearth charcoal under sequence of humus 0.31m, Iron age cobbiling 0.15m, and mixed earth and stones with Lower Bronze age pottery 0.20m, and overlying paving of Lower Bronze age at Skaill, Deerness, on the Orkney Is, off NE Scotland (58° 56' 45'' N, 2° 42' 50'' W, Grid Ref HY 588064). Coll July 1972 and subm by P S Gelling, Dept Ancient Hist and Archaeol, Univ Birmingham.
Birm-397.

Bulk sample given acid pretreatment only. CH\(_4\) not as pure as normal due to ruthenium catalyst being poisoned.

\[ \text{Birm-397.} \]
\[ 2100 \pm 100 \quad 150 \text{ BC} \]
\[ \delta^{13}C = -20.5\% \]

Birm-413.

Small pieces of charcoal washed from bulk sample. Pretreatment included mild NaOH (1%).

General Comment: sample redated due to incomplete conversion to CH\(_4\) in Birm-397 and differences in \(\delta^{13}C\) values reflect differing degrees of isotopic fractionation. Dates confirm Iron age, and overlying earth and stones must be disturbed ground.

York series


\[ \text{Birm-401. LB IV/2b top} \]
\[ 1030 \pm 100 \quad \text{AD 920} \]
\[ \delta^{13}C = -26.0\% \]

Small wooden stakes from beneath cellar floor of bank. Highest surviving wood material in 5m succession of floors and rough timber walls.

\[ \text{Birm-402. LB IV/F10 middle} \]
\[ 990 \pm 100 \quad \text{AD 960} \]
\[ \delta^{13}C = -24.6\% \]

Leather from 1.5m below Birm-401. Comment: no NaOH pretreatment.

\[ \text{Birm-403. LB IV/24 bottom} \]
\[ 1070 \pm 100 \quad \text{AD 880} \]
\[ \delta^{13}C = -27.2\% \]

Plant debris, mostly reeds, from 5m below Birm-401.

General Comment: dates fit chronology of Anglo-Danish cultures which precede Norman invasion of York.

Lonan series, Isle of Man

Charcoal (\textit{Quercus}) from cooking sites at Clay Head Cairns, Lonan, I of Man (54° 12' N, 4° 23' W, Grid Ref SC 440807). Coll 1961 and subm by A M Cubbon, Manx Mus, I of Man.
Birm-416. Clay Head I, S1

$2800 \pm 120$
$850 \text{ bc}$
$\delta^{13}C = -24.2\%$

Sample from within stone-lined trough of cooking site.

Birm-476. Clay Head I, S4

$3330 \pm 120$
$1380 \text{ bc}$
$\delta^{13}C = -25.1\%$

Birm-429. Clay Head III, S3

$3800 \pm 150$
$1850 \text{ bc}$
$\delta^{13}C = -23.9\%$

Mixed sample from cairn of burned stones and ash forming cooking site.

Birm-475. Clay Head III

$3480 \pm 100$
$1530 \text{ bc}$
$\delta^{13}C = -24.7\%$

**General Comment:** “Clay Head III finds 3 and 4 might suggest a late Neolithic or early Bronze age date. The fragment of corroded bronze from the lower layer of burnt material at Clay Head I indicates that the primary period of that site cannot be older than the Bronze age” (Cubbon, 1963, p 589). Dates, though they differ by 1000 yr, are not incompatible with evidence from elsewhere.

Birm-419. Broxbourne gravel pit, Hertfordshire

$8120 \pm 160$
$6170 \text{ bc}$
$\delta^{13}C = -26.4\%$

Wood from below Mesolithic site at Broxbourne gravel pit, Hertfordshire ($51^\circ 45' 25'' \text{ N}, 0^\circ 00' 30'' \text{ E}, \text{ Grid Ref TL 379082}$). Coll 1972 and subm by Raymond Bonnet, Dept Chem, Queen Mary College, London. **Comment:** sample, together with previous determinations from this site; Birm-342: $7830 \pm 520$ and Birm-343; $8700 \pm 170$ (R, 1973, v 15, p 465), predate Mesolithic industry. Dates involved in Bonnet’s study of chemical changes in wood constituents with age.

Birm-420. Shepperton, Middlesex

$1520 \pm 120$
$\text{ AD 430}$
$\delta^{13}C = -27.4\%$

Wood from group of stakes pointed at top and bound with wicker work, crossing bed of old stream at gravel pit ca 6.8km SE of Staines, at Shepperton on the Thames, Middlesex ($51^\circ 23' 30'' \text{ N}, 0^\circ 26' 30'' \text{ W}, \text{ Grid Ref TQ 097166}$). Coll Feb 1973 and subm by D G Bird, Surrey Archaeol Soc. **Comment:** predates gravel as stakes below several layers of clean water-laid gravel underlying 2 soil layers.

Birm-428. Moreton-in-Marsh, Gloucestershire

$1110 \pm 110$
$\text{ AD 840}$
$\delta^{13}C = -18.1\%$

Collagen from human *femur* from skeleton ca 23cm beneath floor

**Quernmore Coffin Ship series, Lancaster**

Wood (Quercus) from hull of coffin ship buried in peat bed 28cm thick and overlying gray clay with decayed gritstone at Quernmore, Lancaster (54° 00' 36" N, 2° 01' 30" W, Grid Ref SD 543574). Coll March 1973 and subm by Brian Barnes, Bolton Inst Technol.

- **Birm-430. Cl-B₂**
  - AD 610
  - $\delta^{14}C = -24.3\%$
  - $1340 \pm 110$

- **Birm-474. Cl-A₂**
  - AD 650
  - $\delta^{14}C = -26.1\%$
  - $1300 \pm 100$

**General Comment:** archaeologically, indicates Bronze age, but 2 determinations disprove this.

**Beckford series, Worcestershire**

Charcoal from very large earthwork that stratigraphically predates extensive habitation site of early Pre-Roman Iron age at Beckford, Worcestershire (52° 01' 30" N, 2° 01' 30" W, Grid Ref SO 983363). Coll March 1973 and subm by W J Britnell, Rescue Archaeol Group.

- **Birm-431.**
  - 3360 ± 200
  - 1410 BC
  - $\delta^{14}C = -21.6\%$

**Comment (WJB):** sherd from single vessel within same layer of fill are without precise parallel; formerly attributed to late Bronze age early Iron age transition but date is middle Bronze age. Dates for similar type of ditch and pottery, Birm-202: 3130 ± 132; Birm-192: 3080 ± 115 (R, 1971, v 13, p 154). A terminus ante quem for ditch is Birm-432 (below) from succeeding Iron age settlement which partly cuts into upper layers of fill of this ditch.

- **Birm-432.**
  - 2110 ± 120
  - 160 BC
  - $\delta^{14}C = -24.2\%$

**Comment (WJB):** bulked sample from primary fill of L-shaped rubbish pit in ditched enclosure and containing pottery of “Duck-Stamped” type described by Peacock (1968). Comment (WJB): pit contemporary with enclosure which produced hoard of 10 “currency bars”.

**Skara Brae series, Orkney Islands, NE Scotland**

Bone samples (Bos) from tenacious midden material composed of
large numbers of animal bone, marine shells and stone, bone and pottery artifacts of Neolithic occupation site on S edge of Bay of Skail at Skara Brae, Orkney Is, off NE Scotland (59° 02' 50" N, 3° 20' 40" W, Grid Ref HY 231187). Coll July 1972 and subm by D V Clarke, Natl Mus Antiquities, Edinburgh, Scotland.

**Birm-433. Trench 1, Sec B, S 2A**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3830 ± 110</td>
<td>1880 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -21.1%$</td>
<td></td>
</tr>
</tbody>
</table>

**Birm-434. Trench 1, Sec B, S 2B**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4020 ± 110</td>
<td>2070 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -21.2%$</td>
<td></td>
</tr>
</tbody>
</table>

**Birm-435. Trench 1, Sec B, S 10A**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
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<tbody>
<tr>
<td>3870 ± 100</td>
<td>1920 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -21.1%$</td>
<td></td>
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**Birm-436. Trench 1, Sec B, S 10B**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>4040 ± 110</td>
<td>2090 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -22.2%$</td>
<td></td>
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</table>

**Birm-437. Trench 2, Sec C, S 12A**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>3780 ± 110</td>
<td>1830 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -21.4%$</td>
<td></td>
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</tbody>
</table>

**Birm-438. Trench 2, Sec C, S 12B**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
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<tbody>
<tr>
<td>4140 ± 120</td>
<td>2190 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -20.6%$</td>
<td></td>
</tr>
</tbody>
</table>

General Comment (DVC): dates midden, constituting final observable Neolithic occupation of site; for detailed description see Childe, 1931. Dates disprove Watson’s hypothesis “that it is more probable that the Skara Brae cattle are post-Roman than that they are of earlier date . . .” (Childe, 1931, p 202).

**Birm-445. Coombe Hay, Somerset**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2650 ± 120</td>
<td>700 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -23.9%$</td>
<td></td>
</tr>
</tbody>
</table>

Charcoal from ca 1m deep at Bronze age site in Coombe Hay, ca 3.22km S of Bath, Somerset (51° 21' N, 2° 23' W, Grid Ref ST 739613). Coll April 1973 and subm by P A Rahtz, Hist School, Univ Birmingham. Comment: sample assoc with extensive range of younger Bronze age pottery and saddle-queren.

**Birm-453. Blackstone Excavation, Worcestershire**

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2180 ± 100</td>
<td>230 BC</td>
</tr>
<tr>
<td>$\delta^{13}C = -24.4%$</td>
<td></td>
</tr>
</tbody>
</table>

Wood charcoal (Quercus) id by C A Keepax, Dept Environment Lab, London from post-hole beneath topsoil in sand and gravel of river terrace at Blackstone Edge, 200m W of Brant Farm, Bewdley, Worcestershire (52° 21’ 30” N, 2° 18’ 20” W, Grid Ref SO 7904273533). Coll Aug

B. Miscellaneous Archaeologic Samples

Isoya series, W Nigeria

Vegetable matter from levels of midden at Isoya in Ife Div W State of Nigeria (7° 22' N, 4° 33' E). Coll 1972 and subm by Omotoso Eluyemi, Centre W African Studies, Univ Birmingham.

Birm-373. Level 5

Charcoal from 0.92m deep.

$\delta^{14}C = -9.2 \pm 8.2\permil$

Modern

$\delta^{13}C = -24.7\permil$

Birm-375. Level 7

Carbonized banana from 1.62m deep.

$\delta^{14}C = +8.4 \pm 8.2\permil$

Modern

$\delta^{13}C = -22.4\permil$

Birm-372. Level 9

Carbonized yam from 1.70m deep.

$\delta^{14}C = +4.4 \pm 17.1\permil$

Modern

$\delta^{13}C = -22.2\permil$

Birm-374. Level 10

Wood from 2.06m deep.

$\delta^{14}C = +16.3 \pm 17.5\permil$

Modern

$\delta^{13}C = -23.3\permil$

Birm-376. Level 12A

Wood from 2.18m deep.

General Comment: hoped that samples would date assoc archaeologic artifacts. Clearly modern except Birm-374. Evidence of recent animal disturbance observed at Level 7.

Birm-391. Lake Chad, Nigeria

Wood (Acacia nilotica) from submerged stumps near W shore of Lake Chad almost adjacent to Niger/Nigeria border (ca 13° 00' N, 14° 15' E). Coll 1972 and subm by P R Reid, Ministry of Nat Resources, Maiduguri, W Africa. Comment: tree grew during last recession period when lake was at very low level, was submerged ever since only to reappear in ca last 7 yr. Diam of stump ca 8cm, outer ca 0.5cm sampled for dating.

$\delta^{14}C = -24.8\permil$

Modern

$\delta^{13}C = -24.8\permil$

570 ± 240

AD 1380
(a) \[ \delta^{14}C = +1.9 \pm 11.0\% \]

Modern
\[ \delta^{14}C = -23.2\% \]

(b) \[ \delta^{14}C = +18.5 \pm 12.0\% \]

Modern
\[ \delta^{14}C = -25.9\% \]

**Birm-392. Lebena, Crete**

Wood charcoal from ca 0.75m deep near center of circular stone-built tomb (diam ca 3.20m) at Yerokampos, Lenda on SE coast of Crete (34° 56’ N, 24° 55’ E). Coll June 1969 by S Alexiou; subm by P M Warren, Dept Ancient Hist Archaeol, Univ Birmingham. Comment: imported XI-XIIth Dynasty Egyptian scarab contained in upper burial level (Daux, 1960, p 845). Sample was thought to be from an early Minoan II level but 2 preparations from separate parts of sample ([a] and [b]) prove it is clearly intrusive.

**References**


