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CAMBRIDGE UNIVERSITY NATURAL RADIOCARBON MEASUREMENTS V

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The dates and activity measurements given below have been obtained during the year 1961, and have been made with CO_2 at 3 atmospheres pressure in a proportional gas counter as described in previous contributions from this laboratory.

We have maintained our policy of directing our assays largely toward particular projects under investigation in the University Sub-department of Quaternary Research. In particular we concentrated during 1961 on the dating of sequences of samples from raised bogs where pollen-zone boundaries, stratigraphic horizons and the levels of important anthropogenic effects upon the countryside are all registered.

We particularly wish to acknowledge the help of R. J. F. Burleigh, Technical Assistant in the Radiocarbon Dating Laboratory.

SAMPLE DESCRIPTIONS

BRITISH ISLES

A. Coastal series, Fenland Basin

Shippea Hill series, Cambridgeshire

We have already described (Cambridge III) the stratigraphic sequence at Shippea Hill, Cambridgeshire (52° 26′ 10″ N Lat, 0° 23′ 52″ E Long), where a Neolithic occupation layer was excavated from the middle of a thick peat bed underlying the brackish-water Fen Clay of the Fenland basin. To the nine dates already published we now add three more that continue the sequence to a greater depth. Samples were secured from the same peat monolith that yielded the previously published dates, and were taken so as to date important pollen zones.

Q-586. Shippea Hill, 90 cm depth **6695 ± 150**

Black crumbly fen peat with some sand, in the early part of Pollen Zone VIIa with 40% *Alnus*, 30% *Tilia*.

Q-587. Shippea Hill, 100 cm depth **7610 ± 150**

Black amorphous peat with abundant coarse sand, in the later part of Pollen Zone VI with 80% *Pinus* pollen. This sample falls right within the black sandy layer shown by earlier excavations (Clark, Godwin & Clifford, 1935) to correspond with the local Mesolithic occupation of the river bank.

Q-588. Shippea Hill, 130 cm depth **8620 ± 160**

Black crumbly peat with coarse sand and some small wood, from the mid-

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dle or lower part of Pollen Zone VI with *Ulmus* and *Quercus* in approximately equal frequency, and close to base of the channel at this point.

General comment: The three samples now dated make a consistent extension backward in time from the nine already reported (Cambridge III). Q-587 dates the Mesolithic flint industry originally described as Late Tardenoisian, but now considered as having affinities with the French Sauveterrian, itself of Epi-gravettian character. The date is a perfectly acceptable one. The two samples Q-586 and Q-587 were chosen to bracket the transition between Pollen Zones VI and VII (i.e. the Boreal/Atlantic transition). Although only 10 cm apart their ages differ by ca. 1000 yr and it may be guessed that a hiatus separates the two samples, possibly a phase of arrested peat growth or erosion such as is already known from other sites in the Late Boreal Zone VIc pollen.

The date of 8620 ± 160 B.P. for Q-588 falls within the age limits of Zone VI as determined at Scaleby Moss (Cambridge I). For more detailed description of the recent re-excavation of Shippea Hill with archaeological, palynologic and C^{14} results see Clark and Godwin, 1962.

B. Coastal series, Northern Ireland

On the NW shore of Strangford Lough, Co. Down (54° 30′ N Lat, 5° 41′ W Long), is the site of Ringneill Quay where archaeological layers associated with the 25-ft raised beach have been very carefully excavated (Stephens and Collins, 1960) and where M. E. S. Morrison (1961) reported the results of pollen analysis of associated clay layers. The boulders and shingle that form the beach pass down into a sandy, shelly layer containing marine shells, bones, charcoal and flint artifacts. This archaeological layer rests upon grey "lagoon clay" at ca. + 16 ft OD, taken to represent a stage just preceding building of the beach in the later stages of the eustatic rise of ocean level.

Morrison has referred the Lagoon Clay to Pollen Zone VI with a preference for Sub-zone VIc, that is the latest phase of the Boreal. Charcoal sent us in 1957 from the original excavations was unfortunately lost in processing, but in June 1961, Dr. E. H. Willis, together with Dr. A. G. Smith and Dr. A. E. P. Collins of Queen's Univ. Belfast, revisited the site and secured for C^{14} assay samples including those listed below.

Q-632. Ringneill Quay, Co. Down, Lagoon Clay, 8-10 cm
7345 ± 150
7500 ± 150

Brackish-water clay. *Comment*: the two dates yielded by this sample are in fair agreement with palynologic evidence, since a number of C^{14} dates of the Zone VI/VII transition in western Europe fall close to 7500 B.P. The most direct comparison is with the peat below the Northern Irish raised beach at Ballyhalbert, where Morrison had also inferred a Zone VIc age: Q-214, 8120 ± 135 (Cambridge II). This peat now lies at less than + 7.0 ft OD and as a freshwater formation might well represent an earlier stage in the raised-beach formation than the Ringneill Quay Lagoon Clay.

Q-633. Ringneill Quay, Co. Down, Occupation Layer 3680 ± 120

Charcoal from the occupation layer. Coll. June 1961 by A. E. P. Collins, the original excavator. *Comment*: the flints afforded no decisive guide to the age of the occupation layer. On the evidence of the bone fragments it has been thought to be of Neolithic rather than Mesolithic age. The C^{14} age is unexpectedly young and entirely excludes the possibility that it was an occupation of Mesolithic people. It carries the generally unacceptable implication that the uppermost 5 or 6 ft of the heavy beach gravel was deposited after 3680 B.P. (see below).

Q-635. Ringneill Quay, Co. Down, Midden shells 2660 ± 110

Shells from midden resting upon the crest of the beach. *Comment*: this sets a limit to the possible age of the close of beach, but other evidence (Q-373, Cushendun, 4740 ± 110, Cambridge III and Q-533, Flander's Moss, 5492 ± 130, Cambridge V) suggests a date around 5000 B.P. for the end of the eustatic rise of sealevel (Godwin, 1960).

C. Coastal series, SW Scotland

Earlier we reported a series of determinations aiming to procure absolute dates for the formation of the "25 ft raised beach" of Northern Britain, a structure built when the decelerating eustatic rise of ocean level was for a time approximately equalled by isostatic uplift (Cambridge III). Dates then obtained suggested that the beach was formed between ca. 8000 and 5000 B.P.

Drs. W. W. Bishop and W. G. Jardine of the Geol. Dept., Glasgow Univ. are presently re-examining the geology of the raised beach at various sites in SW Scotland. Samples Q-637 to Q-643 were collected by them during 1961 and forwarded to us with the accompanying notes on provenance.

Q-637. Redkirk Point, Dumfriesshire (A) 8135 ± 150

Wood (Grid Ref. 35/302652; 54° 58′ N Lat, 3° 5′ W Long), cut from tree stump *in situ* upon peaty bed, here 9 in. thick, now 3 to 4 ft below normal HWL, on coast of the Solway Firth. Peat overlain by ca. 12 ft of carse-type grey clay with rhizomes, mapped by Geol. Survey as the lowest (10-15 ft) raised beach. Coll. 1961 by W. W. Bishop. *Comment*: the date gives a lower age limit for the Carse Clays, and agrees with the samples from Ballyhalbert (Q-214, 8120 ± 135), Airth Colliery (Q-281, 8421 ± 157), Eastfield of Dunbarney (Q-421, 8421 ± 157), and Broombarns (Q-422, 8354 ± 143) (Cambridge III).

Q-638. Lochar Moss, Dumfriesshire (B) 6645 ± 120

Peat (Grid Ref. 35/056680; 54° 59′ N Lat, 3° 28′ W Long), taken by 3 in. auger from 6 ft to 7 ft 3 in. below surface of the large raised bog Lochar Moss near Netherlochar Woods plantation. This moss rests on the flat surface of the "Carse Clays" which are here represented by micaceous fine sands proved to a depth of 11 ft (+ 19 ft OD). Coll. 1961 by W. W. Bishop. *Comment*: whereas this date certainly gives an upper limit for the end of the 25 ft beach deposition, it is somewhat older than that for the basal wood peat sitting upon the Carse Clays at Flander's Moss, Stirlingshire (Q-533 5942 ± 130).

Q-639. Newton Stewart, Wigtownshire (C) **6159 ± 120**

Wood (Grid Ref. 25/416640; 54° 57′ N Lat, 4° 28′ W Long), embedded in sediments forming the right bank of the River Cree at sharp bend one mi S of Newton Stewart. Laminated silts, 8 ft thick, overlay the sample at ca. 17 ft OD and it was underlain by similar deposits. These silts are mapped as part of the 25-ft beach by the Geol. Survey but suggest still-water deposition. The height above OD lends support to the view that the sample should fall within the time of beach formation (assuming the wood is indeed contemporary with the silt: it is clearly allochthonous). Coll. 1961 by W. G. Jardine. *Comment*: the date agrees with the dates already considered if accepted as representing a late stage in the beach formation.

Q-640. Girvan, Ayrshire (D) **9020 ± 1**

Wood fragments (Grid Ref. 25/191987; 55° 15′ N Lat, 4° 51′ W Long), from a layer of carbonaceous silty fine sand in the left bank of the Water of Girvan, 700 yd N of Girvan railway station. This layer, 1 ft thick, contains wood fragments, seeds and nuts of hazel (*Corylus avellana*). It is overlain by 15 ft of sediments (mainly sands) extending to + 22 ft OD and mapped by the Geol. Survey as deposits of the 25-ft raised beach, and is underlain by horizontally bedded sands and gravel. Sample, at + 6.20 ft OD, should give a date for an early stage in formation of the beach. Coll. 1961 by W. G. Jardine and W. W. Bishop. *Comment*: this date suggests an earlier onset for beach formation than hitherto recorded.

Q-641. Girvan, Ayrshire (E) **9362 ± 150**

Peat (Grid Ref. 25/204994; 55° 16′ N Lat, 4° 49′ W Long), from 900 yd N of Enoch Farm house, 1 mi E of Girvan. The peat, 11 in. thick, was sampled by 3-in. auger. It lies at + 16.9 ft OD, is overlain by 8 ft of sands and clays mapped as deposits of the 25-ft raised beach, and underlain by at least 3.5 ft of clay, some of it laminated. The sample precedes at least the later stages of beach formation. Coll. 1961 by W. G. Jardine and W. W. Bishop. *Comment*: the date agrees with that for Q-640.

Q-642. Irvine, Ayrshire (F) **9620 ± 150**
9530 ± 150

Wood (Grid Ref. 26/337373; 55° 36′ N Lat, 4° 38′ W Long), from a bed of woody peat 1 to 2 ft thick in bank of Dundonald Burn, 1000 ft N of Shewalton Bridge, 2.5 mi SE of Irvine. The peat occurs at +20 ft OD upon gravelly blue-grey boulder clay. It is overlain by beach sands and gravels with a flat top ca. 43 to 44 ft OD, attributed by the Geol. Survey to the 40-ft raised beach. Coll. 1961 by W. W. Bishop. *Comment*: as the peat rests on boulder-clay it can only provide a linking date for the yr of the beach that rests upon it.

General comment: Samples Q-637, 638 and 639 accord well with previous results that suggest the 25-ft raised beach accumulated broadly between 8000 and 5000 B.P.

The older dates of the three Ayrshire coast deposits (Q-640, 641, 642) might be attributed to the fact that the beds on which the samples rest merely

antedate the beach deposits and were not themselves laid down as part of the beach formation. It would not be safe to conclude from these results that beach formation began earlier on the Ayrshire coast than in Northern Ireland and in the region of the Carse Clays and Solway.

D. Archaeologic Samples

Mother Grundy's Parlour series, Derbyshire

During September 1960, Dr. C. B. M. McBurney, Cambridge Univ., Dept. of Archaeol. and Anthropol., excavated the talus slope in front of the cave known as Mother Grundy's Parlour, in the Magnesian Limestone at Creswell Crags, Derbyshire. The cave had originally been excavated by Boyd Dawkins, and part of the talus slope by L. A. Armstrong. The caves of this area are the type sites of the famous Creswellian Culture. The talus had yielded a Late-glacial mammal fauna as well as Creswellian artifacts and it was the expectation that an Older Dryas or early Allerød date would be obtained. The stratigraphic sequence of layers in the terrace was:

Overburden—recent	ca. 4 ft
Layer C—red sand and stone with artifacts	ca. 2 ft
Layer B—sharp limestone rubble with artifacts	ca. 2 ft

In each instance the dated material was charcoal partly picked out and partly sieved from the mineral soil, and afterward carefully leached of all carbonate.

Q-551. Mother Grundy's Parlour, Layer B **8800 ± 300**

Charcoal from the sharp limestone rubble of Layer B. To permit dating, the initial sample was diluted with inactive CO_2.

Q-552. Mother Grundy's Parlour, C/B interface **7602 ± 140**

Charcoal from the transition between Layers B and C.

Q-553/4. Mother Grundy's Parlour, Layer C **6915 ± 140**
6705 ± 140

Charcoal sample obtained by combining material collected separately from the upper and lower halves of Layer C. Two separate assays of this sample were made.

General comment: the dates obtained follow the stratigraphic sequence, but they are much more recent than had been supposed. Present knowledge of the dates of British pollen zones would place Q-551 in Zone VI (Boreal), Q-553 and 554 in Zone VII (Atlantic) and Q-552 near the transition between Zones VI and VII. This corresponds with the fact that the charcoal from all levels included recognizable remains of the shells of hazel nuts (*Corylus avellana*) a shrub characteristically abundant in the Boreal of the British Isles but not present, or very rare, before this.

If the flint artifacts and charcoal are contemporary, the culture at this site shows persistence after the Mesolithic of Star Carr (Clark *et al.*, 1954), and as late as the Mesolithic at Shippea Hill (Q-587, see p. 57). One may wonder whether the Late-glacial mammal bones found by Armstrong and including *Elephas primigenius, Hyaena spelaeus, Rangifer tarandus* and *Equus caballus*

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really belonged primarily to Layer C. Bones found in the more recent excavation are as yet undetermined, although those of horse certainly occurred from the top of C to the base of B (*fide* excavator).

Q-598. Ashcott Heath, Somerset, yew bow **4625 ± 120**

Sphagnum peat (51° 9′ 32″ N Lat, 2° 46′ 47″ W Long). During peat digging close to the Eclipse Peat Company's works on the Meare-Ashcott Road, a broken bow of *Taxus* wood was discovered within the dark brown highly humified *Sphagnum-Calluna-Eriophorum* peat at depth from the original bog-surface estimated to be 5 ft 8 in. The sample for C^{14} assay was taken from peat adherent to the bow. Pollen analyses place the bow in the first half of Zone VIIb, which corresponds well with the horizon of Peterborough pottery found previously in the same peat bog 250 yd away. Coll. June 1961 by Harry Godwin. *Comment*s the C^{14} date makes the Neolithic age of the bow quite certain and accords with the pollen-zonation and also with the frequent presence of pollen of plants indicative of forest clearance (Dewar and Godwin, 1962). It is very close to the date for the Neolithic polished stone axe found on Shapwick Heath nearby (Q-430, 4540 ± 130, Cambridge II).

Q-646. Meare Heath, Somerset, yew bow **4650 ± 120**

Sphagnum peat (51° 9′ 34″ N Lat, 2° 48′ 6″ W Long). In June 1961 during peat digging in Mundy's Field, Meare Heath, just N of the old Glastonbury Canal, half a wooden yew bow was found. It is of a type not hitherto known in Britain with a lanceolate flattened bow-stave with transverse leather bands (Dewar and Godwin, 1962). The bow was in the dark brown highly humified *Sphagnum-Calluna-Eriophorum* peat. From a piece of this, bearing the impress of the bow-stave, were taken both the C^{14} samples and samples for pollen analysis. The short sequence of pollen analyses can be matched in several diagrams from the vicinity and is referable to the middle or later part of Zone VIIb. Coll. June 1961 by Harry Godwin. *Comment*: the C^{14} date confirms the Neolithic age of the bow presumed on the pollen-zonation and the presence of clearance indicators in the herbaceous pollen component.

E. Raised Bogs

Raised bogs or raised mosses are ombrogenous peat mires which develop in oceanic climates when a high rainfall/evaporation ratio permits the upward growth of domed peat structures to heights of many meters above general water levels of areas in which they occur. They are sustained almost wholly by direct precipitation. Consequenctly they are highly acidic, poor in plant nutrients and sustain very characteristic plant communities in which bog mosses of the genus *Sphagnum* play a dominant role as peat formers. For several reasons they are of particular importance in the study of postglacial Quaternary history. They are naturally sensitive to changes of climate, the big range of humification and variety of recognizable plant remains in their thick peat deposits allow recognition of past phases of wetness and dryness, especially those phases of resumed active bog growth after arrest which are known as recurrence-surfaces (Godwin, 1954). The raised bogs are extremely useful sources

of vertical series of samples for pollen analysis. They seldom carry trees themselves and their pollen records the vegetation on surrounding upland. It is possible to dig out from them vertical monoliths of peat which can be pollen analyzed in the laboratory. From carefully chosen horizons thin slices of the peat can then be cut out for C^{14} assay (cf. Scaleby Moss, Cambridge I). Reworking and secondary incorporation of material is infrequent and the rapid upward growth of the bog usually makes downward root penetration an unimportant source of error.

Chiefly through Miss J. Turner, the Sub-dept. of Quaternary Res., Cambridge has concerned itself with the examination, along these lines, of the upper layers of several raised bogs in the British Isles. These investigations have been much concerned with the recognition (pollen-analytically) of phases of prehistoric forest clearance and the initiation of agriculture. Many C^{14} samples have been chosen to date these phenomena.

A series of dates has been obtained for a precisely similar investigation carried out at Fallahogy, Northern Ireland by Dr. A. G. Smith, a former member of the Cambridge Sub-dept.

Q-644. Shapwick Heath, Neolithic axe site, 72-74 cm 3975 ± 115

Highly humified *Sphagnum-Calluna-Eriophorum* peat (51° 9′ 13″ N Lat, 2° 38′ 37″ W Long). This is the site from which samples Q-430 and Q-423 have been dated. This type of peat extends from 48 to 130 cm with the stone axe at a presumed depth of 120 cm (age 4540 ± 130). A close series of pollen samples worked out by Miss Turner showed a big decline in the frequency of *Tilia* and *Ulmus* pollen at the 72-74 cm level, associated with clear evidence of woodland clearance afforded by increases in the pollen of open-habitat herbaceous plants and spores of bracken (*Pteridium aquilinum*). *Comment*: evidently this is a late Neolithic forest clearance a millenium or so after that marked by the *Ulmus* decline in earliest Neolithic.

Q-645. Shapwick Heath, Neolithic axe site, 74-76 cm 3880 ± 115

Highly humified *Sphagnum-Calluna-Eriophorum* peat (51° 9′ 13″ N Lat, 2° 38′ 37″ W Long). This sample came from immediately below Q-644 and is intended as a check upon it. *Comment*: dates support one another; they are also fully conformable with the stratigraphic and palynologic evidence in this region and with the sequence of C^{14} dates already obtained there (Godwin, 1960b).

Q-467. Whixall Moss, Shropshire, site 3, 87-88 cm 3238 ± 115

Highly humified *Sphagnum* peat (52° 55′ N Lat, 2° 46′ W Long), from the site at which the pine stump layer has been dated. Miss Turner's pollen analysis of a close series of samples has demonstrated a big change in vegetational composition at this level, with decreases in forest tree frequency (*Tilia, Ulmus, Quercus* and *Fraxinus*) and increases in clearance indicators (*Gramineae, Plantago, Betula,* and *Pteridium*). *Comment*: sample is 30 cm below the pine stump layer (Q-383, 2307 ± 110); it indicates that this clearance phase, characterized by the considerable *Tilia* decline, was in the middle Bronze Age.

Q-477. Thorne Waste, Yorks site 1, 18-19 cm 1855 ± 120

Highly humified *Sphagnum-Calluna-Eriophorum* peat (53° 37′ 15″ N Lat, 0° 54′ 15″ W Long). This sample lies at a prominent recurrence surface displayed by contact between a lower highly humified *Sphagnum-Calluna-Eriophorum* peat and overlying fresh *Sphagnum cuspidatum-Scheuchzeria palustris* peat. The sample is ca. 10-12 cm above a strong *Tilia* pollen decline associated with a sudden rise in indicators of agriculture. Coll. 1960 by J. Turner. *Comment*: result suggests an Iron Age date for the *Tilia* decline (See also comment after Q-487).

Q-482. Thorne Waste, Yorks site 2, 96-97 cm 2942 ± 115

Humified *Sphagnum* peat. At this site Miss Turner demonstrated pollen-analytically a series of vegetation changes interpreted as woodland clearance and spread of agricultural activity. Samples Q-481 and Q-482 are jointly chosen to represent the beginning of this activity which is characterized by the first stages of a *Tilia* decline. Coll. 1960 by J. Turner.

Q-481. Thorne Waste, Yorks site 2, 95-96 cm 3170 ± 115

Humified *Sphagnum* peat from immediately above Q-482. Coll. 1960 by J. Turner. *Comment*: reasonably in agreement with Q-481; together they indicate a middle-to-late Bronze Age date for this stage of local woodland clearance.

Q-479. Thorne Waste, Yorks site 2, 83-84 cm 2329 ± 110

Humified *Sphagnum* peat. This sample was taken 8 cm above Q-481. Miss Turner's pollen analyses show this to be the level of final disappearance of *Tilia* from the region along with renewed clearances. Coll. 1960 by J. Turner. *Comment*: it is surprising that 700 yr should separate Q-479 from Q-481 and Q-482. The three dates jointly suggest clearance beginning in the middle or late Bronze Age, the maintenance of clearance until the early Iron Age, and then extension of clearance.

Hatfield Moors series, Yorkshire

Q-483. Hatfield Moors, 31-32 cm 1384 ± 110

Peat (53° 32′ 20″ N Lat, 0° 55′ 15″ W Long), part of a series of five C^{14} samples (Q-483-487) intended to date three consecutive recurrence surfaces, A, B and C, and to relate them with those recognized by A. G. Smith (1958b) from both Hatfield and Thorne Wastes. Q-483 lies directly over the uppermost recurrence surface A. Coll. 1960 by J. Turner.

Q-483. Hatfield Moors, 31-32 cm 1384 ± 110

Fresh *Sphagnum* peat, directly over the uppermost recurrence surface A.

Q-484. Hatfield Moors, 32-33 cm 1392 ± 110

Humified *Sphagnum-Calluna* peat immediately below Q-483. Coll. 1960 by J. Turner. *Comment*: date agrees closely with that of Q-483. A recurrence surface ca. A.D. 400 was recognized by Granlund.

Q-485. Hatfield Moors, 53-54 cm **1381 ± 110**

Fresh *Sphagnum* peat from directly above recurrence surface B. Coll. 1960 by J. Turner.

Q-486. Hatfield Moors, 54-55 cm **1381 ± 110**

Humified *Sphagnum* peat from immediately below Q-485. Coll. 1960 by J. Turner. *Comment*: Q-485 and Q-486 have precisely the same measured activity, and although 20 cm deeper than the samples Q-483 and Q-484 are not significantly older. It is likely that both RY 'A' and RY 'B' are expressions of one and the same climatic effect upon the hydrology and vegetation of the bog and can be regarded as a single recurrence episode.

Q-487. Hatfield Moors, 82-83 cm **2215 ± 110**

Fresh *Sphagnum* peat from directly above recurrence surface C. Coll. 1960 by J. Turner. *Comment*: this date indicates a great difference in age from the overlying surfaces A and B.

General comment: A. G. Smith (1958a) had already described four main recurrence surfaces at Hatfield Moors albeit somewhat variously developed in different parts of the bog. The oldest of these he placed at the pollen-zone boundary VIIa/VIIb where a considerable *Tilia* decline occurred. The uppermost he tentatively placed at the end of Romano-British time (say 1500 B.P.) and one of the intermediate ones at the opening of the Iron Age (say 2500 B.P.). This intermediate one was also accompanied by a strong and, in this case, final decline of *Tilia*, as a phase of very extensive agricultural activity began. Unfortunately detailed pollen-analyses were not repeated at Hatfield and it is impossible to relate decisively Miss Turner's C^{14} dates to Smith's pollen diagrams and stratigraphy. Probably his two uppermost flooding surfaces represent RY A and RY B now both dated to ca. 1400 B.P. Smith's third from the top presumably corresponds with RY C, now dated ca. 2200 B.P., a conclusion borne out by the dates for the final *Tilia* decline now dated at Thorne Waste to ca. 2300 B.P. (Q-479). What is left is a recurrence surface at Thorne Waste of ca. 1850 B.P., apparently unrepresented in Hatfield Moors, and the much earlier flooding surface accompanied by a strong *Tilia* decline that Smith attributed to the VIIa/VIIb boundary (a presumed age therefore of ca. 5000 B.P.), but which might conceivably nonetheless be of the 3000-yr age shown by Q-481 and Q-482 for a correspondingly big *Tilia* decline at Thorne Waste.

Q-596. Tregaron, Cardigans, SE bog, 82-84 cm **2354 ± 110**

Sphagnum peat (50° 15′ N Lat, 3° 55′ W Long), from a sample well below the retardation layer and part of a pollen series analyzed by Miss J. Turner. This sample is at the beginning of a phase of increased agricultural activity associated with a change from temporary clearance to more permanent pasture as witness a big rise in pollen frequency of *Plantago* and Gramineae. Coll. March 1959 by J. Turner. *Comment*: date places this clearance phase in the early part of the Iron Age.

Q-458. Llan Llwych, Carmarthens, no. 1 **3230 ± 110**

Sphagnum peat (51° 51′ N Lat, 4° 23′ W Long) from 1 to 2.5 cm above the one consistent and pronounced recurrence surface that occurs in this raised bog. The contact is clearly related to three detailed pollen diagrams by Dr. K. Thomas (unpub.). Coll. October 1959 by K. Thomas, Hatfield Tech. College, Herts. *Comment*: see Q-459.

Q-459. Llan Llwych, Carmarthens, no. 2 **3178 ± 100**

Sphagnum peat taken 1 to 2.5 cm below the same recurrence surface as Q-458. Coll. October 1959 by K. Thomas. *Comment*: dates for Q-458 and Q-459 are in good agreement. It is noteworthy they fall near 1200 B.C., the date of one of Granlund's main recurrence surfaces (RY IV), which seems to be represented in some other British peat bogs.

Flander's Moss series, Stirlingshire

Flander's Moss (56° 8′ 20″ N Lat, 4° 11′ 50″ W Long), is part of an extensive system of raised bogs that originated on the surface of the Carse Clays that extended between the Firths of Forth and Clyde during the last stages of the postglacial eustatic rise of ocean level. The moss is essentially intact and peat growth continues at the active bog surface today. Miss J. Turner has been investigating the upper layers of the bog surface. In August 1959 digging allowed the extraction of a peat monolith (series 1) which encompassed a humified "retardation" layer between 50 and 57 cm from the bog surface. In August 1960 a large diameter borer was used to secure samples (series 2) for both pollen analysis and C^{14} dating, alongside the former dug pit from a depth of 1 m to the top of the Carse Clay at 412 cm. This series included a second recurrence surface at 110 cm depth and a third, considered to be the main one, at 225 cm depth.

Q-570. Flander's Moss, series 1, 50-53 cm **1858 ± 110**

Sphagnum peat from the upper half of the younger retardation layer (RY I). Coll. August 1959 by J. Turner and J. Dickson.

Q-571. Flander's Moss, series 1, 54-57 cm **1765 ± 110**

Sphagnum peat from lower half of the younger retardation layer (RY I), immediately below Q-570 and collected with it. *Comment*: the two dates are in good agreement; cf. uppermost recurrence surface at Thorne Waste (Q-477, 1855 ± 120).

Q-575. Flander's Moss, series 2, 112-114 cm **1731 ± 120**

Sphagnum peat from just below the second retardation layer (RY II). Coll. August 1960 by J. Turner and J. Dickson. *Comment*: it is difficult to see why this sample yields a date similar to that of the upper retardation 60 cm above it.

Q-577. Flander's Moss, series 2, 323-325 cm **4570 ± 120**

Humified *Sphagnum* peat, the layer 0-2 cm above the level of the *Ulmus* decline which is shown palynologically. Coll. August 1960 by J. Turner and J. Dickson.

Q-578. Flander's Moss, series 2, 325-327 cm { **5192 ± 120** / **5014 ± 120**

Humified *Sphagnum* peat, the layer 0-2 cm below the level of the *Ulmus* decline and immediately underneath Q-577. Coll. August 1960 by J. Turner and J. Dickson. *Comment*: the three combined determinations point to a date for the *Ulmus* decline ca. 5000 B.P. This corresponds with dates elsewhere obtained for the first Neolithic forest clearances in Britain (cf. Shippea Hill Q-525 and 526, 527 and 528, 583, 584 (Cambridge V); Scaleby Moss, Q-171, 172, 173 (Cambridge I); Holme Fen, Q-406, etc. (Cambridge II)).

Q-533. Flander's Moss, series 2, 400-402 cm **5492 ± 130**

Wood peat lying 10 to 12 cm above upper surface of Carse Clay and below humified *Sphagnum-Calluna-Eriophorum* peat. Coll. August 1960 by J. Turner and J. Dickson. *Comment*: this dates the cessation of deposition of the Carse Clays, just as the beginning of their deposition appears to have been ca. 8400 B.P. (Q-281, Airth Colliery; Q-421, Eastfield of Dunbarney; Q-422, Broombarns). The date for Q-533 corresponds with that at Tealham, Somerset (Q-120) for the surface of Estuarine Clay, and that at Dalkey Island (D-38, Dublin I) for a settlement upon the 25-ft raised beach.

Q-541/2/3. Flanders Moss, series 2, 225-227 cm **2712 ± 120**

Humified *Sphagnum* peat, 0-2 cm below the main recurrence surface, which borings have shown to extend across the moss. Coll. August 1960 by J. Turner and J. Dickson. *Comment*: date corresponds reasonably well with that of the main recurrence surface at Tregaron (Q-388, 2669 ± 110 and 2664 ± 110) and the main flooding horizon in Somerset peat bogs (Godwin, 1960b).

Fallahogy series, Co. Derry, Northern Ireland

Dr. A. G. Smith, Nuffield Quaternary Res. Unit, Queen's Univ., Belfast (Smith, 1958a, 1958b) published the results of stratigraphic investigations and detailed pollen analyses in a large bog in Fallahogy Townland (54° 54′ 30″ N Lat, 6° 33′ 5″ W Long), ca. 3 mi S of Kilrea. Deep peat cuttings allowed direct examination of peat stratigraphy and sampling to depth of 250 cm; deeper samples were obtained by a Hiller peat sampler. The detailed pollen diagram covers a depth of ca. 1 m and displays an extremely well-defined first "occupation" or land-clearance phase divisible into three stages, as with the classical instances worked out by Iversen. The diagram finally shows the resumption of minor clearance at a level at which the stratigraphy also records a pronounced recurrence-surface. Coll. 1957 by A. G. Smith.

Of the six C^{14} samples collected in close relation to the pollen-analysis sequence, nos. 2 and 5 were initially dated by Trinity College, Dublin (Dublin I) but they were subsequently dated by us, as other samples indicated a need for remeasurement.

Q-555. Fallahogy, no. 1 { **5335 ± 120** / **5120 ± 120**

Highly humified *Sphagnum-Eriophorum* peat at depth of 277 cm (diagram pub. by Smith and Willis, 1962) at beginning of *Ulmus* fall and grass pollen rise of the first occupation phase.

Q-653. Fallahogy, no. 2 **5276 ± 120**, **5200 ± 120**

(*Sphagnum*)-*Eriophorum* peat with *Calluna* at depth of 272 cm just above Q-555 at end of *Ulmus* decline, and taken as dating the Irish pollen-zone boundary VII/VIII, rising grass and *Urtica* frequency. Part of same sample as D-23, 3290 ± 140.

Q-556. Fallahogy, no. 3 **5300 ± 120**

Highly humified *Sphagnum-Eriophorum* peat at depth of 267 cm. Low *Ulmus* frequency, high grass and *Rumex*, rising *Corylus* and maximum of *Plantago lanceolata* pollen. (Stage 2 of first occupation)

Q-557. Fallahogy, no. 4 **5265 ± 120**

Highly humified *Sphagnum-Eriophorum* peat at depth of 263 cm. Falling frequencies of *Plantago* pollen, maximum of *Corylus*. (Stage 3 of first occupation)

Q-654. Fallahogy, no. 5 **4871 ± 120**

(*Sphagnum*)-*Eriophorum* peat with *Calluna* at depth of 245 cm. First appearance of continuous curve for *Fraxinus*, secondary maximum of *Ulmus* and disappearance of indicators of open ground (recolonization by woodland after first occupation). Part of the same sample as D-24, 3070 ± 140.

Q-558. Fallahogy, no. 6 **4552 ± 120**, **4492 ± 120**, **4398 ± 120**

Rather fresh *Sphagnum* peat at depth of 227 cm immediately above main recurrence surface and at beginning of second clearance phase.

General comment: if we consider the 10 Cambridge datings as a whole their self-consistency is very pronounced. Duplicate and triplicate assays are concordant and stratigraphic sequence is not violated. It appears that something like 800 yr was occupied in building the 50 cm of peat covered by the analyses. This is not very different from the rate that has to be assumed for building the 225 cm of peat between Q-558 and the present bog surface.

The first occupation clearly covers only a period of some 300 yr and provides an important stratigraphic marker, useful in interpreting the vegetational changes involved. The date of the *Ulmus* decline is vouched for by the six determinations of Q-555, Q-653 and Q-556, and lies about 5300 B.P. There is every reason to regard this as the time of first Neolithic settlement in this region. The date agrees well not only with other Irish dates (Watts, 1960) but with others from western Europe, including the rest of the British Isles (Godwin, 1960a; Waterbolk, 1960).

In the face of the internal consistency of the Cambridge results and their agreement with the general pattern of early Neolithic dating, it is extremely hard to understand the (double checked) results of the Dublin laboratory (at whose request samples D-23 and D-24 were redetermined).

F. Late-glacial and full-glacial deposits

Q-618. Brook, E Kent, no. 2 **11,900 ± 160**

Organic marsh soil (51° 9′ 30″ N Lat, 0° 57′ 30″ E Long), S of Wye, E Kent. A spread of solifluxion material has been demonstrated by Dr. M. P. Kerney (Imperial College, London) and Dr. E. H. Brown (Univ. College, London) to have spread out from the coombes in the chalk escarpment, over a wide area of Gault Clay. This solifluxion material is divided into two by a dark grey organic horizon containing pollen and Mollusca indicative of marsh conditions. Dr. Kerney is inclined to regard this organic layer as Zone II (Allerød) in age, as in the comparable situations at such other sites on the Kentish Chalk as Dover Hill and Holborough (Q-463, Q-473, Cambridge III). Sample from 4-in. auger core. Coll. November 1960 by M. P. Kerney. *Comment*: date corresponds closely with that from Dover Hill (Q-463, 11,944 ± 210) and confirms the expectation that the layer represents the Allerød oscillation. It strengthens previous conclusions on the reality of the Late-glacial climatic oscillation in Southern England (Godwin, 1960).

NORTH AFRICA

Q-656. Wadi Ganima, Libya **614 ± 100**

Charcoal (32° 42′ N Lat, 14° 4′ 30″ E Long), Grid ref. 321450 on 1/100,000 Tripoli map, sheet Fondugh En, Naggaza and Homs. A large lens of charcoal from the alluvial terrace, 10 ft high, on right bank of the Wadi Ganima, Tripolitania. Terrace consists of pink silt with occasional bands of sub-rounded limestone gravel and includes Roman potsherds. Similar terraces, 6 to 25 ft high, are found in many Tripolitanian wadis, and incorporate fragments of Roman dams as well as pottery. Coll. 1961 by C. Vita Finzi, Univ. Dept. of Geog., Cambridge. *Comment*: this date suggests the terrace is equivalent to a similar formation in Morocco dated by Gigout (1960) to 800 ± 200 B.P. It also strengthens the case for the theory it was caused by the devegetation begun at the time of Arab invasions in the 11th century (C.V.F.).

GREECE

Q-655. Nea Nicomedeia, W Macedonia **8180 ± 150**

Charcoal (40° 39′ N Lat, 22° 18′ E Long), from archaeological excavations at Nea Nicomedeia, near Verroia, western Macedonia. Site index NN, LX1, D5/4. Sample is from the Neolithic culture near the original ground level of a low settlement mound. Archaeological material consists of fine painted wares, finger-nail impressed ware, polished stone axes, and other tools of flint and bone. Excavations carried out under the auspices of the British School of Archaeol., Athens, and Dept. of Archaeol. and Anthropol., Cambridge Univ. under the direction of Professor J. G. D. Clark and R. J. Rodden, Jr. Coll. 1961 by J. G. D. Clark. *Comment*: result agrees with the view that this site represents earliest movement of Neolithic culture into Europe from the Middle East (Waterbolk, 1960).

ISRAEL

Q-621. Bar Kochba Cave **1649 ± 100**

Shroud material impregnated with blood and flesh. From the cave at Nahal Hever in the western desert of Judea. Professor Yigael Yadin of the Hebrew Univ., Jerusalem, established that the followers of Bar Kochba, leader of the Jewish revolt of A.D. 135, perished in this cave. It appears the cloth was used to cover the dying. In addition to cloth and skeletons a large amount of written material was present. The cave has not been occupied since the insurrection. Pottery is being dated by thermal luminescence. Coll. 1960 by Yigael Yadin. *Comment*: if the date were recalculated using the revised half life of C^{14} correspondence with the historic date would be very close indeed.

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