

## ISOTOPES' RADIOCARBON MEASUREMENTS X

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### INTRODUCTION

The measurements presented below were made during 1970-71 by techniques described in R., 1968, v. 10, p. 246, and 1970, v. 12, p. 87. Errors associated with the de Vries effect and the uncertainty of the half-life are not included. In November 1971 a new low level, quartz-lined 1/2L counter designed by M. Stuiver was put into operation. It has allowed routine measurements with the samples representing 500mg to 1g pure carbon.

### ACKNOWLEDGMENTS

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### SAMPLE DESCRIPTIONS

#### I. GEOLOGIC SAMPLES

##### *A. United States*

**10,980  $\pm$  190**

**I-5872. La Nacion Fault, San Diego, California 9030 B.C.**

Basal organic alluvium offset by La Nacion Fault in Otay (32° 36' N Lat, 117° 02' W Long), San Diego, California. Maximum thickness of alluvium is 7m, upper 2 to 3m are unaffected by fault (Artim and Pickney, mss. in preparation). Coll. and subm. 1971 by E. R. Artim, Woodward-Gizienski Assoc., San Diego, California. *Comment* (E.R.A.): fault mapped through 32km and shows vertical displacement of at least 65m since deposition of mid-Pleistocene sediments.

**2100  $\pm$  95**

**I-4492. Long Creek L-4-1, Mississippi 150 B.C.**

Cypress wood from Long Creek (34° 11' 43" N Lat, 90° 0' 19" W Long), ca. 5.6km SW of Pope, SE 1/4, Sec.23, T.10S, R.8W, Panola Co., Mississippi. From log at base of old channel filling, exposed at water level in right cut bank, 6m depth from top of bank. Coll. and subm. 1969 by S. C. Happ and G. S. Stanford. *Comment* (S.C.H.): date indicates approx. age of 5m flood-plain sediment, capped by dark topsoil that was at surface when country was settled ca. 1840.

**10,230  $\pm$  150**

**I-5843. Carter-1, Ohio 8280 B.C.**

Wood (*Picea* sp.) from peat layer in Drake Co. (40° 12' N Lat, 84° 40' W Long) Ansonia, Ohio. Assoc. with mastodon rib and adjacent to

bones from the moose-elk (*Cervalces scotti Lydekker*), ca. 1.5m below datum plane. Coll. and subm. 1971 by R. S. Mills, Dayton Mus. Nat. Hist.

### Dry Cave series, New Mexico

Samples from Dry Cave, Eddy Co., SE  $\frac{1}{4}$ , Sec.22, T.22S, R.24E, NMPM (32° 22' 25" N Lat, 104° 28' 55" W Long), New Mexico. Alt. 1400m (Harris, 1970; Holman, 1970; Metcalf, 1970). Coll. and subm. 1971 by A. H. Harris, Univ. Texas at El Paso.

#### I-6199. A.H.H. 5104

**3135 ± 165**

**1185 B.C.**

Charcoal flecks from 80 to 100cm depth, Grid A in entrance deposits. *Comment* (A.H.H.): human remains at ca. 2.75m depth and Pleistocene-Recent contact ca. 3.5m.

#### I-6200. S.M.B. 94

**10,730 ± 150**

**8780 B.C.**

Collagen from *Bison* and *Equus* bones in youngest deposits in a closed sink. Assoc. with camel and microtine rodent remains.

#### I-6201. Charlies Parlor

**15,030 ± 210**

**13,080 B.C.**

Bone collagen from entrance fissure ca. 7m depth. *Comment* (A.H.H.): dates opening of entrance fissure and beginning of deposition from outside cave.

### Continental shelf series, New York

Peat from inner continental shelf S of Long Island, New York. Coll. 1968 by Alpine Geophysical Assoc. for Coastal Engineering Res. Center, U.S. Army Corps of Engineers, Washington, D.C.; subm. 1971 by N. Kumar.

#### I-5880. CERC-C 73B

**7585 ± 125**

**5635 B.C.**

From peat bed 15cm thick in Core 73 (40° 44' 36" N Lat; 72° 45' 22" W Long), 1.55m below water/sediment interface.

#### I-5881. CERC-C 67F

**7750 ± 125**

**5800 B.C.**

From peat bed 5cm thick in Core 67 (40° 39' 45" N Lat, 73° 00' 06" W Long), 4.5m below water/sediment interface.

*General Comment* (N.K.): peat formed in tidal marsh when sea level was -16m. Dates indicate that, during the last 7500 yr as sea level rose, the Long Island chain of barriers migrated landward at least 2.4km (Kumar and Sanders, 1970).

#### I-5503. Lost Creek Dam site, Oregon

**6930 ± 115**

**4980 B.C.**

Sycamore (*Platanus racemosa*) from Lost Creek Dam site (42° 41' N Lat, 122° 40' W Long), NE  $\frac{1}{4}$  NW  $\frac{1}{4}$  SE  $\frac{1}{4}$ , Sec.23, T.33S, R.1E, Jackson Co., Oregon. From 21m depth in gleyed boulder clay, beneath

14m Mazama pumice and 7m of cinder-ash. Coll. 1970 by R. C. Herri-  
man, A. J. Gerig, and R. B. Parsons; subm. 1970 by R. B. Parsons,  
USDA Soil Conservation Serv., Corvallis, Oregon. *Comment* (R.B.P.):  
date is maximum for Alco soil, possible minimum for Carney-like soil,  
and several episodes of geomorphic interest.

*B. Canada*

**Cowichan Head series, British Columbia**

Marine shells (incl. *Nucula* and *Macoma*) from exposure ca. 26m  
above high-tide level in cliff face, W shore Cordova Channel (48° 34'  
N Lat, 123° 22' 30" W Long), ca. 3.1km S of Cordova Spit, Saanich  
Peninsula, British Columbia. From 8.3m layer blue-gray glacio-marine  
clay (lowest unit of Quadra sediments). Coll. and subm. 1969 by H. D.  
Foster, Univ. Victoria.

**I-4452. (I) 0.2m from top of clay bed** **33,750 ± 2000**  
**31,800 B.C.**

**I-4453. (II) 0.9m from top of clay bed** **34,900 ± 2300**  
**32,950 B.C.**

*General Comment* (H.D.F.): confirms presence of Quadra intertill sedi-  
ments on Saanich Peninsula. Elsewhere in area similar poorly varved  
glacio-marine sediments overlie Dashwood tills. If varves are annual,  
Dashwood Glaciation of S Vancouver I. must have terminated ca. 41,200  
yr B.P. (Armstrong *et al.*, 1965; Fyles, 1963).

**I-5921. Bagotville, Quebec, Canada** **8550 ± 140**  
**6600 B.C.**

Marine shells (*Mya arenaria*) from fresh cut in terrace 1m below  
surface, Bagotville (Grand-Anse) (48° 19' 10" N Lat, 70° 50' 25" W  
Long), Chicoutimi Co., Quebec, Canada. From intertidal sand and mud  
overlying marine gray clay, many shells *in situ*. Coll. 1969 and subm. 1971  
by J. C. Dionne, Laurentian Forest Research Center, Quebec, Canada.  
*Comment* (J.C.D.): date valuable for last phase of marine invasion of  
Lake St. Jean (LaSalle, 1965; LaSalle and Rondot, 1967).

**I-5922. Saguenay River, Quebec, Canada** **10,400 ± 150**  
**8450 B.C.**

Marine shells (*Macoma balthica*) from fresh road cut along main  
road between Todoussac and Chicoutimi-nord (48° 11' 50" N Lat, 69°  
43' 35" W Long), Sacre-Coeur-de-Saguenay, Saguenay Co., Quebec,  
Canada. From marine varved clay 8m below surface. Coll. 1970 and  
subm. 1971 by J. C. Dionne. *Comment* (J.C.D.): postglacial marine sub-  
mergence of area of Tadoussac is known to have reached 140m; hence  
date is minimum for marine invasion (LaSalle, 1965; LaSalle and Rondot,  
1967).

## C. Ecuador

**I-6043. El Junco 5, Galapagos Islands, Ecuador** **>34,000**

Organic gyttja core sample from Crater lake, El Junco, on Isla San Cristobal (Chatham) (0° 5' S Lat, 89° 35' W Long), Galapagos Is., Ecuador. From band of organic material 0.5m thick, 8.5m from top of 15.4m core. Red clay lies above and below organic layer. Coll. 1966 by P. A. Colinvaux; subm. 1971 by E. K. Schofield, Ohio State Univ., Columbus, Ohio. *Comment* (E.K.S.): pollen and spore content show presence of water plants not now known on islands. We postulate that these plants became extinct during 20,000 yr drought (Colinvaux, 1968; 1971; Schofield and Colinvaux, 1969).

**I-6044. Livingstone I, Galapagos Islands, Ecuador** **6615 ± 110**  
**4665 B.C.**

Organic gyttja (black) from Livingstone I, Bog 4, Isla Santa Cruz (0° 40' S Lat, 91° 22' W Long), Galapagos Is., Ecuador. From domed *Sphagnum* bog at base of crater near summit of island, depth 105 to 109cm, from 1st sec. of gyttja under 90cm *Sphagnum*. Coll. 1966 by P. A. Colinvaux; subm. 1971 by E. K. Schofield. *Comment* (E.K.S.): 1 of 4 bogs sampled in same area. Pollen and spores were counted and data is being analyzed to produce model of bog formation in an equatorial site (Colinvaux, 1968).

## D. Europe

**I-5116. Abernethy Forest, Carn a' Chnuic** **685 ± 90**  
**Soil Profile III** **A.D. 1265**

Fine fraction of raw humus (Mor) from Abernethy Forest, Inverness-shire (57° 12' 30" N Lat, 3° 37' W Long), Scotland. At H/F2 contact of podsol beneath open callunetum (heathland). Coll. 1968; subm. and pretreated 1970 by P. O'Sullivan, Dept. Geog., New Univ. Ulster, Ireland. *Comment* (P.O'S.): pollen analyses at this level indicate site supported open heath. Another date from site indicates heath was established at ca. A.D. 600 (UB-395: R., v. 13, p. 116). Sample part of study of dynamics of Scots Pine forest.

**I-5117. Abernethy Forest, Faesheallach Burn** **1505 ± 150**  
**soil profile** **A.D. 445**

Charcoal from Abernethy Forest, Inverness-shire (57° 12' N Lat, 3° 34' 30" W Long), Grid Ref. NJ (38) 053143, Scotland. From mineral horizon of podsol at depth 24cm. Coll. 1969; subm. and pretreated 1970 by P. O'Sullivan. *Comment* (P.O'S.): pollen analyses of mineral horizon containing sample indicate existence of birch-dominated woodland.

**I-5069. W Preston, Kirkcudbrightshire, Scotland** **1850 ± 95**  
**A.D. 100**

Peat from base of low cliff N shore Solway Firth, 1km S of W Preston farm, Nat. Grid Ref. NX 952 553 (54° 53' N Lat, 03° 38' W Long), Kirkcudbrightshire, Scotland. From basal 5cm of 1m thick peat

bed, underlain by sand. Coll. 1966 and subm. 1970 by W. G. Jardine, Univ. Glasgow, Scotland. *Comment* (W.G.J.): date is minimum for formation of lowest raised marine terrace of area.

**I-5513. Moss of Cree, Wigtownshire, Scotland** **4000 ± 100**  
**2050 B.C.**

Wood from Moss of Cree, 500m S of Carsenestock farm, Wigtownshire (54° 55' N Lat, 4° 25' W Long), Nat. Grid Ref. NX445 614, Scotland. From edge of truncated peat bog at junction of peat and underlying gray carse deposits, 8.35m above Newlyn. Coll. and subm. 1970 by W. G. Jardine. *Comment* (W.G.J.): dates local commencement of peat growth and minimum age for end of Flandrian marine transgression in Wigtown Bay area (I-5070: 4290 ± 100, unpub., for Dumfriesshire coast of Solway Firth).

**I-5514. Carseminnoch, Scotland** **6325 ± 120**  
**4375 B.C.**

Wood from N bank R. Cree, 500m S of Carseminnoch farm, Kirkcudbrightshire (54° 56' N Lat, 04° 26' W Long), Scotland. From outer layers of tree branch embedded in estuarine laminated sand and silt, 4.30m above Newlyn. Coll. 1967 and subm. 1970 by W. G. Jardine. *Comment* (W.G.J.): age agrees with Q-639, (6159 ± 120: R., v. 4, p. 60) at Newton Stewart, 3km WNW, 4.26m and BIRM-189, (6240 ± 240: R., v. 13, p. 144) at Palnure, 1km NE, 6.38m and substantiates chronology suggested by Shotton (R., v. 13, p. 144-145).

*E. Greenland*

**Erfalik series, West Greenland**

Shells (*Mya truncata*) from Erfalik, S side of entrance to Ikertoq Fjord (66° 25' N Lat, 53° 37' W Long) W Greenland. Coll. 1967 and subm. 1970 by A. Weidick, Geol. Survey Greenland, Copenhagen, Denmark.

**I-5415. No. 88962** **7010 ± 125**  
**5060 B.C.**

From shell horizon, +1.7m in 4 to 5m cliff of marine deposits. Other species include *Cardium echinatum*, *Tellina* sp., *Serripes groenlandicum*.

**I-5416. No. 88959** **8480 ± 130**  
**6530 B.C.**

From top of terrace of No. 88962, ca. +8m.

**Scoresby Sund series, East Greenland**

Shells from Scoresby Sund, East Greenland, dated to study relative sealevel changes and disappearance of some shellfish (Funder, 1971). Coll. and subm. 1970 by Svend Funder, Geol. Survey Greenland, Copenhagen, Denmark.

**21,020 ± 430****I-5419. Heden, Jameson Land, Scoresby Sund 19,070 B.C.**

*Mya truncata* from 50m cliff of gray marine silt (70° 46' N Lat, 24° 07' W Long) Heden. From +42 to 45m, some shells *in situ*. *Comment* (S.F.): area believed covered by ice during last glaciation. Older marine deposits above silt at 75m. It seems likely that great age of sample is result of mixing of interglacial material with postglacial shells. *Lab. Comment*: 62% of shell carbonate removed with acid washes before dating.

**24,300 ± 700****I-5419C. Resample of I-5419****22,350 B.C.**

*Lab. Comment*: 37% of shell removed with acid washes before dating.

**6650 ± 125****I-5420. Edge of Eielson Gletscher****4700 B.C.**

*Mya truncata*, *Hiattella arctica*, and *Macoma calcarata* at edge of Eielson Gletscher, Rypefjord, (71° 09' N Lat, 27° 50' W Long). From gray silt +30m, containing fragments of *Mytilus edulis*. *Comment* (S.F.): dates time when terminus of Eielson Gletscher was upstream from its present limit and presence of now-extinct *Mytilus* in area. *Lab. Comment*: 69% of shell removed with acid washes before analysis.

**7140 ± 130****I-5421. North shore of Harefjord****5190 B.C.**

*Mya truncata* from N shore (70° 57' N Lat, 28° 09' W Long) Harefjord. From surface of silt layer, +42 to 46m. *Comment* (S.F.): believed to date relative sea level at +50m, the local marine limit. *Lab. Comment*: 60% of shell removed with acid washes before dating.

**6450 ± 120****I-5422. Moraenepynt in Fønffjord****4500 B.C.**

*Mya truncata* and *Hiattella arctica* from (70° 25' N Lat, 27° 49' W Long) Moraenepynt. From surface of silt, +20 to 22m. Fragments of now extinct *Mytilus edulis* found in deposit. *Comment* (S.F.): probable date of marine shoreline at +25m. *Lab. Comment*: 55% of shell removed by acid washes before dating.

**6840 ± 125****I-5423. Elvdalen, Denmark****4890 B.C.**

*Mya truncata*, *Hiattella arctica*, *Astarte borealis*, and *Astarte elliptica* from (70° 27' N Lat, 26° 12' W Long) Elvdalen. From surface of silt, +1.5 to 3m. Fragments of *Mytilus edulis*, now extinct in area, were present. *Comment* (S.F.): shells may be related to a boulder shoreline at +6m. *Lab. Comment*: 63% of shell removed by acid washes before dating.

**Frederick E. Hyde Fjord series, North Greenland**

Driftwood from Frederick E. Hyde Fjord, Peary Land (83° 05' N Lat, 32° 15' W Long), N Greenland. Wood id. by J. D. Møller, Bot. Inst., Univ. Copenhagen. Coll. 1969 by P. Dawes, subm. 1970 by A. Weidick.

**I-5591. GGU No. 100658** **1935 ± 90**  
**A.D. 15**  
*Picea* sp. partially buried in gravel beach ridge +15.1m.

**I-5592. GGU No. 100659** **4645 ± 115**  
**2695 B.C.**  
*Picea* sp. partially buried in gravel beach ridge + 15.1m.

**I-5593. GGU No. 100660** **4815 ± 115**  
**2865 B.C.**  
*Larix* sp. partially buried in gravel beach ridge 18.5m above mean sea level.

*General Comment* (A.W.): dated for relative sea level changes.

*F. Africa***Nakuru Basin series, Kenya**

Charcoal and carbonate samples from S of Lake Nakuru, Kenya. Three sedimentary units (A, B, and C) deposited during large expansions of Lake Nakuru. They are separated by 2 widespread disconformities (Washbourn, 1967; Washbourn-Kamau, 1970). A prolonged period of low lake level separate Units A and B. Unit A includes evidence of 3 high lake stands. The area is type for "Gamblian Pluvial" and "Makalian and Nakuru post Pluvial" wet phases (Leaky, 1931), but relationship between climatostratigraphic divisions and lithostratigraphic units is still not clear. Coll. and subm. 1969-1970 by G. L. Isaac and Univ. Calif., Berkeley.

**I-5062. Base of Unit B** **12,160 ± 170**  
**10,210 B.C.**

Charcoal from Site GsJi 2/T, Enderit Drift near Elmenteita (0° 31' S Lat, 36° 05' E Long). A rubble lens of occupational debris interstratified with lacustrine deposits at base of most recent 185m high lake episode. Assoc. industry includes backed blades and very delicate obsidian awls. *Comment* (G.L.I.): date agrees closely with N-822 (R., v. 14, p. 228).

**I-5063. Lacustrine member, Unit A** **21,030 ± 420**  
**19,080 B.C.**

Lobate and botryoidal carbonate concretions 20 to 40m diam. from Makalia Bend Drift (0° 29' 30" S Lat, 36° 05' 30" E Long). Concretions may be contemporaneous with surrounding clay or secondary. Adjacent outcrops yielded "Middle Stone age" artifacts.

**I-5064. Lacustrine strata in Unit B****3810 ± 110****1860 B.C.**

Lobate and branching carbonate concretions up to 25mm diam. from S of Makalia Bend (0° 29' 30" S Lat, 36° 05' E Long). From poorly consolidated siltstones with hematitic laminae traceable to 153m above existing lake. Underlies Makalia ash dated at  $3540 \pm 120$ , N-821 (R., v. 14, p. 227). *Lab. Comment*: 50% of sample removed with acid washes before dating.

**I-5064C. Split of I-5064****3400 ± 100****1450 B.C.**

*Lab. Comment*: 45% of sample removed with acid washes before dating. *Comment* (G.L.I.): stratum correlates with Gambles Cave high stand for Lake Nakuru but date appears too young. Carbonate concretions could be secondary emplacements.

**I-5447. East Rudolf, Kenya (ER 70-06a-0000)****9360 ± 135****7410 B.C.**

Shell (*Unio*, *Corbicula*, *Melanoides*) from 8km SSE of Heret Police Post, Marsabit Dist., E Region (04° 15' N Lat, 36° 14' E Long), Kenya. From ca. 2km E of present shoreline of Lake Rudolf represents stand 60m above existing lake. Coll. and subm. 1970 by G. D. Johnson, Dartmouth Coll., Hanover, New Hampshire. *Comment* (G.D.J.): air photos show continuity of deposit along NE shore. Unit correlates with number IVa Kibish Fm., Lower Omo Basin, Ethiopia (Butzer and Thurber, 1969; Leaky, 1970; Vondra, 1971).

*G. Australia***Lake Callabonna series, South Australia**

Samples from SE portion of Lake Callabonna (29° 48' S Lat, 140° 10' E Long), S Australia. Coll. 1970 by C. Ray and R. Emry; subm. 1971 by R. H. Tedford, Am. Mus. Nat. History, N.Y.

**I-5479. SIAM 86****>39,900**

Wood from base of laminated clay containing *Diprotodon* and other large vertebrates. Disarticulated skeletons of giant wombat (*Phascolonus*) and extinct kangaroo (*Protemnodon*) found *in situ* in immediately overlying clay (Stirling and Zietz, 1899). *Comment* (R.H.T.): date confirms NZ-205 (>40,000) from plant remains in abdominal region of *Diprotodon* skeleton and contradicts date of NZ-206 from *Diprotodon* dentine (R., 1963, v. 5, p. 143).

**I-5733. SIAM 28****2375 ± 95****425 B.C.**

Bulk sample of disseminated charcoal in sand, not treated for removal of humic acids. From a succession of gypsiferous clay and sand lenses disconformably overlying *Diprotodon*-bearing clay of I-5479.



**2080  $\pm$  100****I-5730. SIAM 25****130 B.C.**

Carbonate portion of egg shell from nesting site for shore birds, same horizon as I-5733. *Lab. Comment*: outer 23% of shell removed with acid washes before dating.

## II. ARCHAEOLOGIC SAMPLES

*A. United States***Nunivak Island series, Alaska**

Charcoal and wood from Nunivak I., W bank Mekoryuk R. (60° 15' N Lat, 166° 8' W Long), ca. 4.8km S of Mekoryuk, Alaska. Coll. and subm. 1969 and 1970 by M. Nowak (except where noted), Dept. Anthropol., Colorado College (Nowak, 1970).

**310  $\pm$  95****I-4485. MK2—Housepit 2, Level 1****A.D. 1640**

Charcoal from floor of Housepit 2, Level 1, .84 to .87m depth. *Comment* (M.N.): dates most recent of 3 recognizable occupations. Assoc. artifacts represent Norton-like culture.

**1925  $\pm$  95****I-4486. MK2—Housepit 1, Level 8****A.D. 25**

Charcoal from floor plank of Housepit 1, Level 8, 1.58m depth. *Comment* (M.N.): assoc. artifacts from Norton-like culture.

**670  $\pm$  95****I-4487. MK4—Housepit 2, Level 4****A.D. 1280**

Charcoal from floor of only house in Housepit 2, Level 4, .80 to .87m depth. *Comment* (M.N.): assoc. artifacts indicate Nukleet-like culture.

**2100  $\pm$  95****I-4488. MK2—Housepit 1, Level 9****150 B.C.**

Wood from 1 of 4 structural posts in Housepit 1, Level 9, 1.80m depth. *Comment* (M.N.): date of house probably younger due to use of driftwood in building. Assoc. with Norton-like materials.

**1360  $\pm$  95****I-5303. MK2—Housepit 1-D, Level 2****A.D. 590**

Charcoal from Housepit 1-D, Level 2, 1.35 to 1.40m depth. *Comment* (M.N.): date indicates time of change from fiber-tempered, to later sand-tempered, check-stamped pottery. Artifacts indicate Norton-like culture.

**955  $\pm$  90****I-5304. MK4—Housepit 6, Level 4****A.D. 995**

Charcoal from floor of house in Housepit 6, near hearth at 1.10m depth, Level 4. Coll. 1970 by J. Anderson. *Comment* (M.N.): dates house of Nukleet-like culture.

**I-6304. Ground Hog Bay—Site #2, Alaska** **9130 ± 130**  
**7180 B.C.**

Charcoal from Ground Hog Bay, Icy Strait area (58° 14' N Lat, 135° 15' W Long), W of Juneau, Alaska. From depression in reddish sands overlying till of terminal Wisconsin, depth 220 to 224cm below datum. Assoc. with lithic debitage. Coll. 1971 by D. Brauner; subm. 1972 by R. E. Ackerman, Washington State Univ., Pullman, Washington. *Comment* (R.E.A.): dates occupation of area in early Holocene times, soon after general glacial retreat. This is oldest dated horizon for SE Alaska (Ackerman, 1971).

**I-5938. Mrn—170 #2, California** **1350 ± 95**  
**A.D. 600**

Adult human femur from near town of Ignacio (38° 04' 25" N Lat, 122° 32' W Long), ca. 37km N of San Francisco, 0.8km N of Hamilton Air Force Base, California. From 120cm below present ground surface lying on sterile bedrock. From tightly flexed burial assoc. with *Olivella* modified saddle-type beads, red ocher, steatite ear plug, bone "wand" and large incised and perforated *Halotis* ornaments (Burial #108-120) (Henn and Jackson, mss. in preparation). Coll. 1971 by W. Henn and T. L. Jackson; subm. 1971 by M. J. Moratto, Treganza Anthropol. Mus., San Francisco State College.

**Shantok Cove series, Connecticut**

Charcoal from Shantok Cove site (41° 28' 50" N Lat, 72° 4' 38" W Long), Fort Shantok State Park, Montville, New London Co., Connecticut. A multi-component site excavated 1967 to 1970 by field parties from New York Univ. Coll. and subm. B. Salwen, N.Y.U. Dept. Anthropol., N.Y.

**I-5615. Shantok Cove, base of midden** **1110 ± 95**  
**A.D. 840**

From concentration of dark earth and small charcoal fragments ca. 30cm depth, at base of 15cm thick shell midden zone. Early Windsor pottery recovered in immediate vicinity.

**I-5616. Shantok Cove, midden** **1035 ± 150**  
**A.D. 915**

From above and adjacent to 2.5cm thick ash layer, ca. 10cm above base of thick midden zone. Depth 25cm.

**I-5617. Shantok Cove, Feature 7** **845 ± 125**  
**A.D. 1105**

From lowest part of Feature 7, a pit, originating in mottled earth "living floor" adjacent to shell midden. Floor depth 27cm, pit extended down 27cm into sandy orange subsoil, containing ca. 1/4 ceramic vessel previously unrecognized in this area. The new type, Shantok Cove Incised, has straight sides, interior brushing, exterior fabric-marking, and incised decoration in geometric patterns. This type assoc. in midden with

Early Windsor pottery. *Comment* (B.S.): date may indicate that new-type pottery continued in use longer than others.

**1190 ± 115**

**I-5618. Shantok Cove, Fireplace A**

**A.D. 760**

From small hearth, marked by red burned sand in orange sand zone directly below shell midden, depth 27cm. No assoc. artifacts.

*General Comment* (B.S.): dates form consistent series of occupation of oyster-shell midden zone, marked by presence of Levanna projectile points, Early Windsor pottery types, and newly identified Shantok Cove Incised pottery. First RC dates for Early Windsor complex of S Connecticut and Long Island.

**Oahu Island series, Hawaii**

Charcoal from 14.1km from S coast of Oahu I., Hawaii; upper section of Kamana-nui Valley, Moanalua. Valley runs N-S on S side of island (Ayres, 1970). Coll. and subm. 1970 by W. S. Ayres, Bernice P. Bishop Mus., Honolulu.

**445 ± 90**

**I-5269. Site 50-0A-A7-41**

**A.D. 1505**

From firepit, 22cm depth. *Comment* (W.S.A.): dates use of firepit at time preceding construction of stone shrine. Shrine consisted of small paved area with one upright stone.

**I-5270. Site 50-0A-A7-45**

**<185**

From layer of scattered fragments of charcoal within layer of mixed clay and pebbly decomposing rock. Beneath superficial wall of low terrace, depth 20 to 40cm. *Comment* (W.S.A.): dates utilization of area for swidden type agriculture before low terrace was built.

**335 ± 90**

**I-5271. Site 50-0A-A7-66**

**A.D. 1615**

From thin layer of charcoal and burned earth, 23cm depth. *Comment* (W.S.A.): date reflects use of firepit assoc. with walled house site.

**410 ± 90**

**I-5272. Site 50-0A-A7-24**

**A.D. 1540**

From firepit, 39cm depth near suspected floor level of house structure. *Comment* (W.S.A.): date within predicted age range for use of low-walled house structure on terrace.

**Henderson Island series, Hawaii**

Charcoal from Henderson I. (24° 25' S Lat, 128° 19' W Long), Hawaii. Coll. 1970 and 1972; subm. 1972 by Y. H. Sinoto, Bernice P. Bishop Mus., Honolulu, Hawaii.

**495 ± 105**

**I-6343. HENRC-6**

**A.D. 1455**

From Test Pit 7, 18 to 21cm depth, top Layer II. Coll. 1970.

**I-6344. HENRC-8** **790 ± 110**  
**A.D. 1160**

From Test Pit 7, 50cm depth in Layer III. Coll. 1972.

*General Comment* (Y.H.S.): 1st dates on Henderson site. Evidence of Polynesian occupation prior to European discovery of island.

**Loyola Retreat series, Maryland**

Charcoal from Loyola Retreat oyster shell midden, Site 18CH58, on bank of Potomac R. between mouth of Port Tobacco R. and Popes Creek (38° 25' 02" N Lat, 77° 02' W Long), Charles Co., Maryland. Coll. and subm. 1970 by W. M. Gardner and C. W. McNett, Jr., Catholic Univ. America, Washington, D.C.

**I-5246. Loyola I** **1135 ± 95**  
**A.D. 815**

From lower portion of topmost of three cultural and natural levels. Assoc. with heavily shell-tempered pottery referred to as Mockley ware by R. L. Stephensen (1963).

**I-5247. Loyola II** **2440 ± 95**  
**490 B.C.**

From middle of 2nd cultural and natural level. Assoc. with sand and grit-tempered, thick net-marked pottery called Popes Creek by W. H. Holmes (1903).

**I-5524. McCulley site, New York** **5730 ± 110**  
**3780 B.C.**

Charcoal from McCulley site on Charlotte Creek (42° 27' 31" N Lat, 74° 53' 15" W Long), Davenport Twsp., Delaware Co., New York. Combined charcoal from 2 adjoining features in thin Archaic living floor, buried in alluvial silt below plow line. Assoc. artifacts included Otter Creek type points, end scrapers, net sinkers, hammerstones and pitted stones. Coll. 1970 by H. Hoagland and R. E. Funk; subm. 1971 by R. E. Funk, New York State Mus. and Sci. Service. *Comment* (R.E.F.): date close to age anticipated for Otter Creek Points on basis of stratigraphic data (Funk, 1965).

**I-5987. Stalag 17, Dry Cave, New Mexico** **11,880 ± 250**  
**9930 B.C.**

Charcoal from Stalag 17, Dry Cave, (32° 22' 25" N Lat, 104° 28' 55" W Long), SE ¼ Sec. 22, T.22S, R.4E, NMPM, SE New Mexico. From flecks gathered ca. 3.8 to 4.0m below surface of entrance deposits. Coll. and subm. 1971 by A. H. Harris. *Comment* (A.H.H.): assoc. with limb elements of *Camelors* (Harris, 1970).

*B. Canada*

**I-4973. Narrows site (KeNo-2), Canada** **880 ± 130**  
**A.D. 1070**

Bone collagen from E end Great Slave Lake, N.W.T. (62° 47" N Lat, 108° 56' W Long) Canada. From buried hearth, 35cm depth, in 2nd highest terrace on old delta formation. Cultural zones lie 8m above

present level of Great Slave Lake. Coll. and subm. 1969 by W. C. Noble, Dept. Anthropol., McMaster Univ., Hamilton, Ontario. *Comment* (W.C.N.): Narrows site is middle period component of Taltheilei Shale tradition, which terminates with historic Yellowknife Indians. Date complements GAK-1258, A.D. 940 (unpub.)

**1565 ± 90**

**I-5821. Waldon River (KfNt), Canada**

**A.D. 385**

Charcoal from N shore McLeod Bay (62° 56' 15" N Lat, 110° 35' W Long), NE Great Slave Lake, W shore of entrance of Waldon R., Canada. From buried hearth, depth 13cm from rock hollow of Area A. Coll. 1968 and subm. 1971 by W. C. Noble. *Comment* (W.C.N.): assoc. artifacts of Waldon R. complex of Taltheilei Shale tradition (Noble, 1971b).

**740 ± 160**

**I-5822. Taltheilei Point (KdNw-2), Canada**

**A.D. 1210**

Charred spruce twigs and charcoal from point jutting from bay forming NW short of Taltheilei Narrows (62° 35' 45" N Lat, 111° 32' W Long), E Great Slave Lake, Canada. Depth 13cm on Beach 14, in series of 14 former beach terraces rising above lake. Area disturbed by erection of former Geol. Survey Canada cabins. Coll. 1968 and subm. 1971 by W. C. Noble. *Comment* (W.C.N.): much charcoal suggests forest fire rather than hearth burning. Surrounding artifacts are typologically earlier, belonging to Waldron R. complex of Taltheilei Shale tradition (Noble, 1971b).

**790 ± 120**

**I-5823. Pethei Peninsula (KdNw-4), Canada**

**A.D. 1160**

Charcoal and burnt twigs from 1.3m diam. hollow, 17 to 20m above lake level on N side of rock butte of Pethei (Owl) Peninsula (62° 36' N Lat, 111° 31' W Long), diagonally across Taltheilei Narrows, E Slave Lake, Canada. Coll. 1968 and subm. 1971 by W. C. Noble. *Comment* (W.C.N.): dates former forest fire, date in close accord with I-5822 (this list) from Taltheilei Point (Noble, 1971b).

**410 ± 90**

**I-6514. Cleveland site (AhHb-7), Canada**

**A.D. 1540**

Charcoal from Cleveland site (43° 12' 30" N Lat, 80° 12' 45" W Long), 4 acre village, overlooking Fairchild Creek, Lot 46, Con. 1 of Brantford Twp., Brant Co., Ontario, Canada. From Pit 14 within long-house in Area E, at 23cm depth. Coll. 1971 and subm. 1972 by W. C. Noble. *Comment* (W.C.N.): first RC date of Neutral Iroquois village in SW Ontario, presence of small iron bar celt and 4 brass beads place it within early protohistoric period (Noble, 1971a).

## C. Central and South America

**I-6107. Maya Codex** **720 ± 130**  
**A.D. 1230**

Bark paper from several unpainted pages attached to a Maya codex of unknown provenience. Coll. and subm. 1971 by M. D. Coe, Yale highest terrace on old delta formation. Cultural zones lies 8m above Univ., New Haven, Conn. *Comment* (M.D.C.): codex consists of 11 pp. of a Venus calendar which originally had 20 pp. Date congruent with painting style of codex, which is Post-Classic Maya with strong Mixtec influence. Style of day glyphs suggests it can be chronologically placed between Dresden codex and the Madrid codex, a 13th century date is highly probable. The manuscript provides new data about the gods presiding over different parts of the Venus cycle. Radiocarbon date confirms its authenticity as 4th Maya codex to survive from pre-Spanish times.

**Tlapacoya series, Mexico**

Charcoal from Zohapilco (19° 17' 55" N Lat, 98° 54' 34" W Long), Tlapacoya, Mexico. Coll. 1969 C. B. Niederberger; subm. 1970 by J. L. Lorenzo, Inst. Nac. Antropol. Historia, Moneda, Mexico.

**I-5241. Tlapacoya IV, A-14, VIIIb** **2595 ± 100**  
**645 B.C.**

From lakeside part of Zohapilco trench (Pit A-4), uppermost layer of clay and organic material, (Gen. Layer 7), below sandy lenses (Gen. Layers 5 and 6) (Niederberger, 1969).

**I-5242. Tlapacoya IV, AA-25, VIIIb** **2990 ± 100**  
**1040 B.C.**

From hillside part of Zohapilco trench in lower middle part of thick sediment of sand with numerous stones of andesite (Gen. Layers 8 and 9).

**I-5243. Tlapacoya IV, AA-25, Vb** **3005 ± 100**  
**1055 B.C.**

From hillside Zohapilco trench (Pit AA-25) with layer of sandy textured sediment (Gen. Layer 5) and clay lenses.

*General Comment* (J.L.L.): dates for I-5241 and I-5242 agree well with relative position of sediment within stratigraphic sequence and with cultural context. I-5243 is too old, does not fit sequence.

**Casita de Piedra series, Panama**

Charcoal from Casita de Piedra site, close to confluence of Rio Casita de Piedra and Rio Chiriqui (8° 47' N Lat, 82° 17' W Long), alt. 700m, Dist. Boquete, Prov. Chiriqui, Panama (de Sapir and Ranere, 1971).

**I-6278. #119** **6560 ± 120**  
**4610 B.C.**

From lowest stratum which contained evidence of human occupation, Layer G, 130 to 140cm depth. Charcoal was scattered throughout

occupation layer and not from an identifiable hearth. Coll. 1971 and subm. 1972 by A. J. Ranere, Smithsonian Tropical Research Inst., Balboa, Canal Zone. *Comment* (A.J.R.): dates earliest preceramic occupation.

**I-5765. #115**

**5795  $\pm$  105**

**3845 B.C.**

From base of Layer E, 100 to 110cm depth. Charcoal scattered in 1 x 1m excavation unit (Block 6) in level 10cm thick. Coll. 1971 and subm. 1972 by A. J. Ranere. *Comment* (A.J.R.): dates 2nd preceramic occupation.

**I-5764. #107 and 114 combined**

**5680  $\pm$  105**

**3730 B.C.**

From lowest stratum which contained evidence of human occupation, Layer G, 130 to 160cm depth, Block 5 (1 x 2m). Charcoal scattered throughout excavation unit was combined with charcoal from pit which appeared to originate in Layer G and extend below it. Coll. and subm. 1971 by A. J. Ranere. *Comment* (A.J.R.): date in closer agreement with date for Layer E (I-5675, this list) indicating that pit originated from Layer E instead of Layer G.

*D. Ireland*

**I-5067. Sutton Kitchen-midden, Co. Dublin**

**5250  $\pm$  110**

**3300 B.C.**

Charcoal from hearth in shell-midden at ca. 6m, Burrow Townland (53° 23' N Lat, 6° 5' W Long), Sutton, Co. Dublin, Ireland. Coll. and subm. 1970 by G. F. Mitchell, School Bot., Trinity College, Dublin. *Comment* (G.F.M.): midden contained both implements of Mesolithic type and Neolithic polished stone axes (Mitchell, 1956). Midden lay on shore storm beach, presumably thrown up at maximum of postglacial marine transgression.

**Cushendun series, Antrim, Ireland**

Charcoal and peat from Cushendun archaeol. site (55° 8' N Lat, 6° 2' W Long), mouth of Dun R., Cushendun, Co. Antrim, Ireland. Coll. 1934 by K. Jessen and H. L. Movius; subm. 1970 by G. F. Mitchell.

**I-5134. Cushendun charcoal**

**7670  $\pm$  140**

**5720 B.C.**

Charcoal with bone and vegetable debris embedded in brackish water sandy estuarine silt at 2.40m in beach bar; silt below charcoal horizon contained Mesolithic flint implements (Mitchell, 1955). *Comment* (G.F.M.): date corresponds with another Mesolithic site at Toome Bay, Co. Londonderry, on shore of Lough Neagh, 50km SW Cushendun. Here charcoal with assoc. Mesolithic implements in a mud that accumulated in Boreal period, Pollen Zone VIb, had C<sup>14</sup> age of 7680  $\pm$  110 yr B.P. (Y-95).

**I-5135. Cushendun peat****8410  $\pm$  140****6460 B.C.**

*Phragmites* peat at 2.15m lies below beach bar of estuarine silt and gravel built up to 11.50m; silt and gravel contains Mesolithic flint implements (Movius, 1940; Jessen, 1949). *Comment* (G.F.M.): date indicates that peat formed in fresh water in Boreal period, Pollen Zone VIb, before postglacial marine transgression flooded valley.

**I-5323. Rockmarshall Midden 3, Co. Louth****5470  $\pm$  110****3520 B.C.**

Charcoal from hearth in shell midden, Rockmarshall Townland (54° 0' N Lat, 6° 15' W Long), near Dundalk, Co. Louth, Ireland. Assoc. with Mesolithic implements, midden on top of low morainic ridge which formed part of shoreline at maximum of postglacial marine transgression (Mitchell, 1949). Coll. and subm. 1970 by G. F. Mitchell. *Comment* (G.F.M.): early Mesolithic material in NE Ireland is dated to ca. 5700 B.C. (Y-95; I-5134, this list), Mesolithic material on Leinster coast is later (D-38; I-5067, this list).

*E. Israel***Ein Aqev series, Israel**

Charcoal from 150m N of spring at Ein Aqev in branch wadi S of main Nahal Zin (30° 49' 02" N Lat, 34° 48' 39" E Long), Israel. Coll. 1970 and subm. 1971 by A. E. Marks, Dept. Anthropol., Southern Methodist Univ., Dallas, Texas.

**I-5494. E 22 D31/A****16,900  $\pm$  250****14,950 B.C.**

From hearths 15 to 20cm below surface.

**I-5495. E 22 D31/B****17,510  $\pm$  290****15,560 B.C.**

From 20 to 30cm below surface.

*General Comment* (A.E.M.): site contains Levantine-Aurignacian artifacts and dates indicate terminal phase of this culture in Central Negev.

**I-5496. E 22 G7/C Nahal Horesha, Israel****13,090  $\pm$  200****11,140 B.C.**

Charcoal from E edge of Nahal Horesha (30° 30' 50" N Lat, 34° 34' 40" E Long), E of Har Harif, Israel. From small pockets of midden deposit 25 to 40cm depth. Assoc. with lithic materials of Natufian affinity. Coll. 1970 and subm. 1971 by A. E. Marks.

**Har Harif Plateau series, Israel**

Charcoal from E edge Har Harif Plateau, central Negev (30° 31' 32" N Lat, 34° 33' 08" E Long), Israel. Alt. 1000m. Coll. 1970 and subm. 1971 by A. E. Marks.



**I-5498. E 22 G12/E** **9970 ± 150**  
**8020 B.C.**  
From 15 to 25cm below surface of midden deposit at Abu Salem site.

**I-5499. E 22 G12/F** **10,230 ± 150**  
**8280 B.C.**  
From 25 to 30cm below surface of midden deposit.

**I-5500. E 22 G12/G** **10,230 ± 150**  
**8280 B.C.**

From 45 to 55cm below surface of midden deposit. Assoc. artifacts: ground stone, faunal remains, and small village with oval stone walls (Marks, in press). *Lab. Comment*: humic acid pretreatment abbreviated due to sample solubility and size.

#### **Midrasha Sde Boker series, Israel**

Charcoal from S and SE of Midrasha Sde Boker, Israel. Coll. 1970 and subm. 1971 by A. E. Marks.

**I-5501. E 22D1/H** **8620 ± 140**  
**6670 B.C.**

From S edge of present stream bed of Nahal Zin (30° 50' 30" N Lat, 34° 47' 13" E Long). From charcoal lens 60 to 63cm below surface at base of fire pit. Assoc. with points, burins, denticulates, and faunal remains. *Comment* (A.E.M.): date disagrees with Tx-1123, 6220 ± 180 (unpub.) but correlates with other dates from similar assemblages.

**I-5497. E 22D5/D** **13,170 ± 230**  
**11,220 B.C.**

From remnant 20m above N edge of present stream bed of Nahal Zin (30° 50' 29" N Lat, 24° 46' 36" E Long). Scattered small pieces of charcoal recovered over 5 sq.m. Assoc. with Kebaran assemblage of geometric type and small faunal remains (Marks, in press). *Comment* (A.E.M.): date suggests temporal overlap between Natufian-like assemblages and late Kebaran. Another small sample from same site dated 13,870 ± 1730 (Tx-1121, unpub.)

#### *F. India*

**I-6277. Sonkh excavation, Painted Grey** **2570 ± 85**  
**Ware-level, India** **620 B.C.**

Charcoal from Sonkh, Mathura dist. (77° 22' N Lat, 27° 26' E Long) India. From Level 35, Sq. So 3 I 11, 50. Representing Painted Grey Ware-level (Hartel, 1968; 1969; 1970). Coll. 1971 and subm. 1972 by H. Hartel, Mus. Indische Kunst, Berlin, Germany. *Comment* (H.H.): date fits archaeologic results.

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