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ISOTOPES' RADIOCARBON MEASUREMENTS VII

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ISOTOPES—A Teledyne Company, Westwood, New Jersey

The following list presents dates on a portion of the samples measured at ISOTOPES during 1967 and 1968 and measurements made previously for which either complete sample data has been recently received, or, in some cases, deferred due to the editorial load in preparing the definitive list.

Samples were analyzed by the same methods as stated in Radiocarbon, 1968, v. 10, p. 246-294, with each sample being assayed twice in different counters and on different days. Sample preparation procedures and age calculation methods have been described in an earlier published date list (Radiocarbon, 1966, v. 8, p. 161-203). The errors associated with the age determinations in this list are calculated by combining the standard deviations calculated for total counts of the standard, background and actual sample. The counting time used for the calculation of errors of the background and standard is the same as that used for the sample. The error associated with the De Vries effect and the uncertainty in the half-life are not included.

ACKNOWLEDGMENTS

It is recognized that data obtained at this laboratory remain the sole property of our clients. Nevertheless we encourage our clients to submit these dates for publication and we are indebted to those who have consented to have their data published here and particularly to those supplying informative comments.

The laboratory operations have been supervised throughout by Mr. James Buckley, with assiduous technical support in the laboratory supplied by Mr. J. Bonicos and Miss P. Kondratick. We would particularly like to thank Mrs. J. Buckley for her assistance with the diverse mass of data associated with this listing, and Mrs. J. Barker for her careful attention to the manuscript preparation.

I. GEOLOGIC SAMPLES

A. Western United States

Adams Inlet series, Alaska

Samples from different locations on Adams Inlet, Alaska. Coll. and subm. 1966 by G. D. McKenzie, Inst. Polar Studies, Ohio State Univ. (Haselton, 1966; Goldthwait *et al.*, 1966).

I-2394. C 58-3 **1980 ± 100**
30 B.C.

Wood from S side Adams Inlet, E end (58° 53′ N Lat, 135° 47′ 54″ W Long), Alaska. From tree (in growth position) buried by 25 cm sandy silt beneath 85 cm medium, weathered gravel. Tree with 5-cm forest duff rests on 250 cm poorly varved gray silt and clay. Elev. 19 m. *Com-*

ment (G.D.McK.): tree is part of forest covered by gravel. Another forest bed overlies gravel containing lower dated forest bed. All units are part of Middle Van Horn Formation.

10,940 ± 155
8990 B.C.

I-2395. 67-6

Peat from Granite Canyon, whirlpool sec. (58° 55′ N Lat, 135° 50′ 4″ W Long), Adams Inlet, Alaska. Strat. sequence from bottom to top: 110 cm marine clay, 60 cm sandy silt, 4 cm peat, 10 cm silt, 19 m gravel. Elev. 32 m. *Comment* (G.D.McK.): comparable to date reported by Haselton, 1966 (10,400 ± 260, I-1615) on wood between Forest Creek Formation and Muir Till at upper Forest Creek.

11,170 ± 225
9220 B.C.

I-2396. G 7-1

Vegetation and spruce cone from N side Forest Creek (58° 56′ 40″ N Lat, 136° 02′ 52″ W Long), Adams Inlet, Alaska. From thin black organic layers within shell-bearing Forest Creek marine clay, 60 cm from top of formation. Elev. 30 m. *Comment* (G.D.McK.): date provides check of age obtained from Forest Creek Formation shells (Haselton, 1966, 10,000 ± 220, I-1303).

1700 ± 100
A.D. 250

I-2687. C 58-2

Outer part of tree stump from buried upper forest bed SE corner of Inlet (58° 53′ N Lat, 135° 48′ W Long). Elev. 24 m. Strat. sequence from bottom to top: lower buried forest bed dated 1980 ± 100 (I-2394, this date list) 1.1 m weathered gravel and sandy silt, upper buried forest bed, 10 m rhythmic clay of Adams formation. *Comment* (G.D.McK.): dates beginning of main phase of lake (Goldthwait, 1966; McKenzie, G. D., Glacial geology of Adams Inlet, Glacier Bay, Alaska: Ohio State Univ. Research Found., Inst. of Polar Studies, rept. 25, as mss. in preparation.

3850 ± 110
1900 B.C.

I-3068. 66-7

Twig from peat deposit in Granite Canyon (58° 55′ N Lat, 135° 50′ W Long). Strat. sequence from bottom to top: Granite Canyon till of Wisconsin age, peat, upper till, buried forest bed dated as 1770 ± 100, I-3069s.

1770 ± 100
A.D. 180

I-3069s. 66-5

Wood from buried forest bed at base of Adams formation in Granite Canyon. Elev. 90 m.

1750 ± 100
A.D. 200

I-3150. 69 A-1

Wood from topset gravels of Berg formation, S side Adams Inlet, Adams Valley (58° 51′ N Lat, 135° 52′ W Long). Elev. 230 m.

I-3151. 78-4 **1535 ± 100**
A.D. 415

Wood from peat layer in upper gorge, S side of Casement Glacier (58° 56′ N Lat, 135° 56′ W Long). Elev. ca. 120 m. Strat. sequence from bottom to top: gravel, 0.3 m weathered till, woody peat, 8-m lacustrine clay. *Comment* (G.D.McK.): dates beginning of lake at this level.

I-3398. Muir Inlet, Quill B-4, Alaska **2390 ± 110**
440 B.C.

Wood from W side Muir Inlet opposite entrance to Adams Inlet (58° 50′ N Lat, 136° 02′ W Long), Alaska. Strat. sequence from bottom to top: wood on bouldery gravel, laminated clay and sand, gravel, gravel and Glacier Bay till. Coll. 1965 by R. P. Goldthwait and subm. 1968 by G. D. McKenzie. *Comment* (G.D.McK.): lithology of gravel below and above clays suggests local westerly source (A. T. Ovenshine, pers. commun.) (Haselton, 1966).

I-2287. 672-10, California **7030 ± 130**
5080 B.C.

Charcoal and charred wood from Emerald Lake, Mammoth Lakes (37° 35′ N Lat, 118° 59′ 42″ W Long), Mono County, California. From 33cm below surface of till at base of oxidized zone. Till overlain by 31cm recent volcanic ash and pumice, which is overlain by pre-Hypsithermal rock glacier or landslide deposits. Site 1.3km from source of till in cirque headwall. Coll. and subm. 1966 by Robert Curry (Univ. of California, California). *Comment* (R.C.): date suggests a post-Tioga (classical Wisconsin), pre-Hypsithermal glacial advance because sample is from till of pre-Hypsithermal age.

Lily Lake series, California

Peat (sedge, *Carex rostrata*) from Lily Lake cirque basin, near base of Meyers Grade, Hwy 50, on Echo Summit grade, S of Lake Tahoe (38° 50′ N Lat, 120° 01.5′ W Long), California. Elev. ca. 6840 ft. Coll. and subm. 1966 by J. F. Gustafson, San Francisco State College, California.

I-2341. 2 m **1550 ± 105**
A.D. 400

I-2342. 3 m **2280 ± 125**
330 B.C.

I-2343. 4 m **2840 ± 115**
890 B.C.

General Comment (J.F.G.): taken as part of survey of peat locations in central Sierra.

I-2959. La Jolla Submarine Canyon LJF-116H **2630 ± 95**
680 B.C.

Kelp (probably *Macrocystis pyrifera*) from La Jolla Submarine Canyon fan (32° 42′ 75″ N Lat, 117° 40′ 36″ W Long). From 12-cm layer

predominantly kelp, overlain by alternating sand and silt in flat open fan deposit. Coll. 1966 by F. P. Shepard; subm. 1967 by J. R. Curray. (Scripps Inst. of Oceanog., Univ. of California, La Jolla, California.) *Comment* (J.R.C.): to determine correlation with other occurrences and sedimentation rate in fan environments.

2240 ± 105

I-2383. Indian Ranch Road, Nevada **290 B.C.**

Peat (sedge, *Carex rostrata*) from Indian Ranch Rd., alongside Foothill Rd., 2.8 mi N of Dressler Lane (38° 51′ N Lat, 119° 49′ W Long), NW Carson Valley, Nevada. Elev. ca. 4720 ft, depth 3½ m. Coll. 1965 and subm. 1966 by J. F. Gustafson. *Comment* (J.F.G.): taken as part of survey of peat locations in central Sierra.

2360 ± 120

I-2424. Boulder County, Colorado **410 B.C.**

Lichen (*Rhizocarpon geographicum* thalli) from colluvium 1.4km E of Arapaho Glacier, alt 3500m (40° 01′ 30″ N Lat, 105° 38′ W Long), Boulder Co., Colorado. Depth 39 to 41 cm, from lowest 2 cm of colluvium under mudflow debris, above proglacial-lake sediments. Coll. and subm. 1966 by J. B. Benedict, Inst. Arctic and Alpine Res., Univ. of Colorado, Nederland, Colorado. *Comment* (J.B.B.): dated as part of study of lichen growth rates in Colorado Front Range.

1000 ± 90

I-2562. Arapaho Rock Glacier, Colorado **A.D. 950**

Windblown plant fragments from Arapaho rock glacier, E of S Arapaho Peak (40° 01′ 13″ N Lat, 105° 38′ 27″ W Long), Boulder County, Colorado. Melted from ablation surfaces in ice core of rock glacier. Ice overlain by sandy rubble, loose cobbles, and boulders. Coll. 1966 by J. B. Benedict and Hans Fugelrud; subm. 1967 by J. B. Benedict. *Comment* (J.B.B.): date supports lichen measurements which suggest this part of rock glacier was deposited during final phase of Arikaree stage of Neoglaciation (Benedict, Recent glacial history of an alpine area in the Colorado Front Range, U.S.A., pts. I and II, as mss., in preparation).

7900 ± 130

I-2574. Eldora peat bog, Boulder County, Colorado **5950 B.C.**

Peat from Eldora bog, 0.9 mi W of Lake Eldora, 0.5 mi S of Ute Mt. (39° 56′ 10″ N Lat, 105° 34′ 50″ W Long), Boulder County, Colorado. Elev. 9355 ft, from depth of 250 to 270 cm. Coll. 1966 by R. B. Bennett and W. Mullenders; subm. 1967 by S. E. White, Ohio State Univ. *Comment* (R.B.B.): date represents minimum age for withdrawal of late Pinedale ice from tributary valley 600 ft above main Middle Boulder Creek Valley.

Lake Waiau series, Hawaii

Sediment (largely volcanic ash and plankton debris) from Lake

Waiau, alt. 3970 m, Mauna Kea (19° 49′ N Lat, 155° 29′ W Long), Hawaii. Coll. 1966 and subm. 1967 by A. H. Woodcock, Univ. of Hawaii, Honolulu, Hawaii.

I-2636. **9080 ± 220**
7130 B.C.
Ca. 3.4 m below lake bottom.

I-2634. **7540 ± 220**
5590 B.C.
Ca. 3.0 m below lake bottom.

I-2633. **7790 ± 270**
5840 B.C.
Ca. 2.5 m below lake bottom.

I-2635. **5910 ± 170**
3960 B.C.
Ca. 2 m below lake bottom.

I-2637. **4130 ± 135**
2180 B.C.
Ca. 1.5 m below lake bottom.

General Comment (A.H.W.): dates present reasonably consistent age/depth pattern, which facilitates estimate of age of ash layers (Woodcock *et al.*, 1966).

B. Central and Eastern United States

Hebron Bog series, Kossuth County, Iowa

Organic carbon from SW ¼ NW ¼ sec. 27, T100 N, R27 W, Hebron Bog (43° 27′ N Lat, 94° 1′ W Long), Kossuth County, Iowa. Stratigraphic sequence from bottom to top: Cary till, 5 ft lower silt, 1 ft lower peat, 4½ ft upper silt, 2 ft upper peat. Coll. 1965 by P. H. Walker and L. H. Durkee; subm. by R. V. Ruhe, Iowa State Univ., Ames, Iowa.

I-1856. Hebron Bog, No. 1 **3340 ± 110**
1390 B.C.
From upper silt 25 to 28 in. depth in core.

I-1857. Hebron Bog, No. 2 **8880 ± 140**
6930 B.C.
From upper silt above lower peat 6.25 to 6.5 ft.

I-1858. Hebron Bog, No. 3 **27,990 +1100 −1000**
26,040 B.C.
From lower silt 9.25 to 9.5 ft.

+1500
30,300
—1300

I-1859. Hebron Bog, No. 4 **28,350 B.C.**

From base of lower silts, 12.25 to 12.5 ft.

General Comment (R.V.R.): ages of I-1858 and I-1859 are anomalous for lower organic-mineral phase of bogs on Des Moines lobe.

Sumner Bog series, Bremer County, Iowa

Peaty material from SW ¼ NW ¼ sec. 13, T93 N, R11 W, Sumner Bog (42° 52′ N Lat, 92° 5′ W Long), Bremer County, Iowa. Stratigraphic sequence from bottom to top: Alluvium, 0.5 ft lower silty muck, 1.75 ft lower peaty muck, 3.25 ft interbedded peaty and silty muck, 2 ft peat. Coll. 1965 by P. H. Walker and W. L. Jackson; subm. 1965 by R. V. Ruhe.

2930 ± 110

I-1860. Sumner Bog, No. 1 **980 B.C.**

From base of surface peat, grass-deciduous tree pollen zone, 2.25 to 2.5 ft depth in core.

6130 ± 120

I-1861. Sumner Bog, No. 2 **4180 B.C.**

Tree-grass transition pollen zone, 4.5 to 4.75 ft depth in core.

11,880 ± 170

I-1862. Sumner Bog, No. 3 **9930 B.C.**

Larch wood from lower silty muck, conifer pollen zone, 7.25 to 7.5 ft depth in core.

I-1863. Mill Creek, Cherokee County, Iowa **>39,900**

Spruce wood from lower till in E stream cut in center of Mill Creek, sec. 32, T93 N, R40 W (42° 49′ N Lat, 95° 35′ W Long), Cherokee County, Iowa. Depth 49 ft. Stratigraphic sequence, bottom to top: Pre-Wisconsin till, sand, gravel, and silt, Tazewell till, sandy loess. Coll. 1954 by W. D. Frankforter; subm. 1965 by R. V. Ruhe.

23,750 ± 600

I-1865. Wapello, Louisa County, Iowa **21,800 B.C.**

Peat from N road cut in E center sec. 5, T74 N, R3 W, Wapello (41° 14′ N Lat, 91° 13′ W Long), Louisa County, Iowa. From 17 to 17.5 ft depth. Coll. 1965 by R. V. Ruhe and P. H. Walker; subm. 1965 by R. V. Ruhe. See also OWU-167, 23,050 ± 820 (Radiocarbon, 1967, v. 9, p. 319).

18,400 ± 310

I-2329. 4-Mile Creek, Tama County, Iowa **16,450 B.C.**

Organic carbon and wood fragments from alluvium in tributary valley of 4-Mile Creek, SW ¼ sec. 35, T86 N, R15 W (42° 13′ N Lat,

92° 34′ W Long), Tama County, Iowa. From 14- to 15-ft depth in core. Coll. 1966 by W. P. Dietz and R. V. Ruhe; subm. 1966 by R. V. Ruhe.

34,900 +2100

I-2330. Elma, Howard County, Iowa **32,950 −1700 B.C.**

Organic carbon from buried A horizon, SE ¼ SW ¼ sec. 7, T97 N, R13 W, Elma (43° 14′ N Lat, 92° 24′ W Long), Howard County, Iowa. From 8.7- to 9.3-ft depth in core. Stratigraphic sequence from bottom to top: calcareous sandy clay, leached sandy clay, buried B horizon, buried A horizon, silt. Coll. 1966 by W. P. Dietz; subm. 1966 by R. V. Ruhe.

I-2331. Davis Corners, Howard County, Iowa **>39,900**

Organic carbon from silts between tills, SW ¼ NW ¼ sec. 33, T99 N, R12 W, Davis Corners (43° 21′ N Lat, 92° 16′ W Long), Howard County, Iowa. From 11 to 11.8 ft depth in core. Coll. 1966 by W. P. Dietz; subm. 1966 by R. V. Ruhe.

Alburnett Paha series, Linn County, Iowa

Organic carbon and spruce wood from SE ¼ NW ¼ sec. 14, T85 N, R7 W, Alburnett Paha (42° 10′ N Lat, 91° 38′ W Long), Linn County, Iowa. Coll. 1966 by W. P. Dietz, T. E. Fenton and R. V. Ruhe; subm. 1966 by R. V. Ruhe.

I-2332. Alburnett Paha, No. 1 **20,700 ± 500 18,750 B.C.**

Organic carbon from base of Wisconsin loess, 42.5- to 43.5-ft depth in core. Upper 6 ft of core was leached.

I-2333. Alburnett Paha, No. 2 **12,700 ± 290 10,750 B.C.**

Spruce wood from peat from base of fan alluvium at N basal slope of paha, 7- to 8-ft depth in core.

I-2334. Centerville, Appanoose County, Iowa **1830 ± 100 A.D. 120**

Red-elm long beneath alluvium of Chariton R. floodplain, W center sec. 27, T69 N, R17 W, Centerville (40° 44′ N Lat, 92° 48′ W Long), Appanoose County, Iowa. Coll. 1966 by T. E. Fenton and J. D. Highland; subm. 1966 by R. V. Ruhe.

Onion Key series, Florida

Clam shells (*Mercenaria campechiensis*) from Onion Key, Everglades Natl. Park (25° 36′ 42″ N Lat, 81° 08′ 02″ W Long), Monroe County, Florida. Coll. and subm. 1964 by J. W. Griffin, Natl. Park Service, Richmond, Virginia.

I-1431. Test Pit B, 12- to 18-ft depth **935 ± 115 A.D. 1015**

Comment (J.W.G.): date indicates Glades IIb period.

1270 ± 140
I-1432. Test Pit B, 24- to 30-ft depth **A.D. 680**

1160 ± 110
I-1433. Test Pit B, 36- to 42-ft depth **A.D. 790**

Continental shelf series, S of New England

Shells and shell fragments from various locations on continental shelf S of New England. Coll. 1963 to 1966 by L. E. Garrison; subm. 1967 by L. E. Garrison, Grad. School of Oceanog., Univ. of Rhode Island, Kingston, Rhode Island (Garrison and McMaster, 1966).

13,420 ± 210
I-2473. TR-009, C-147 **11,470 B.C.**

Shells (*Mesodesma arctatum*) (40° 08.7′ N Lat, 70° 29.4′ W Long), depth in core 107 to 117cm, ca. 1 m below sediment-water interface, water depth 122m. From coarse sand overlain by sandy silt.

10,850 ± 150
I-2474. TR-027, C-206 **8900 B.C.**

Shells and shell fragments (*Mesodesma arctatum, Echinorachnius parma, Astarto* sp.) (40° 10.4′ N Lat, 71° 26.0′ W Long), depth in core 63 to 83 cm, ca. 75 cm below sediment-water interface, water depth 86m. From surface of Block Delta.

9150 ± 220
I-2475. TR-034, C-307 **7200 B.C.**

Shell fragments (*Ensis ensis*) (40° 50′ N Lat, 70° 52.5′ W Long), depth in core 55 to 65cm, ca. 60cm below sediment-water interface, water depth 55m. From coarse sand.

14,850 ± 250
I-2544. TR-027, C-203 **12,900 B.C.**

Shells (*Mesodesma arctatum*) (40° 05.8′ N Lat, 70° 32.2′ W Long), depth in core 98 to 113cm, ca. 1 m below sediment-water interface, water depth 130m. From coarse, well-sorted sand apparently deposited in near-beach environment.

13,200 ± 210
I-2545. TR-027, C-228 **11,250 B.C.**

Shell fragments (*Placopecten magellanicus*) (39° 37.4′ N Lat, 72° 07.5′ W Long), depth in core 46 to 63cm, ca. 50cm below sediment-water interface, water depth 147m. From mixture of coarse sand and clay pebbles at base of "Nichols shore".

General Comment (L.E.H.): shells occurred in coarse sand in a near beach environment.

1890 ± 100
I-2464. Lehigh River, Pennsylvania **A.D. 60**

Charcoal from W bank of Lehigh R. 2 mi W of Palmerton (40° 47′ 28″ N Lat, 75° 39′ 15″ W Long), Kittatinny, Pennsylvania. From sandy

clay above bouldery gravel and beneath sand. Coll. and subm. 1966 by W. D. Sevon, Commonwealth of Pennsylvania, Bur. of Topog. and Geol. Surv., Harrisburg, Pennsylvania. *Comment* (W.D.S.): occuring at horizon of significant sedimentary change, date may indicate change in regimen of Lehigh R.

Glovers Pond series, NW New Jersey

Core samples from Glovers Pond, 1¼ mi SW of Johnsonburg (40° 56′ 30″ N Lat, 74° 53′ 30″ W Long), Warren County, NW New Jersey. Coll. 1966 and 1967 by J. M. Erickson, F. D. Holland Jr., and J. A. Anderson; subm. 1967 by J. M. Erickson and F. D. Holland Jr., Univ. of North Dakota, Grand Forks.

I-2792. C-IV-1a **2080 ± 100**
130 B.C.

Reed and sedge peat from SW bog 10 ft from edge of Glovers Pond, base of peat, 1.2-m depth.

+850
11,560
—750

I-2793S. C-I-1k **9610 B.C.**

Wood from NE bog 375 ft from edge of Glovers Pond, base of marl, 3.4-m depth. *Comment* (J.M.E.): marl overlies calcareous organic-rich silt and oligotrophic lake clay. This post-glacial lacustrine sequence overlies glacial lake clay and till.

North Carolina continental shelf series

Carbonate sediments from several locations on continental shelf off coast of North Carolina.

I-3284. WHOI-1847, total **25,450 ± 850**
23,500 B.C.

Oolite from depth 33m (34° 09′ 06″ N Lat, 76° 44′ 00″ W Long). Coll. 1964 by Woods Hole Oceanog. Inst. and subm. 1968 by J. D. Milliman, Woods Hole Oceanog. Inst., Massachusetts.

+1050
27,650
— 950

I-3285. WHOI-1847, inner **25,700 B.C.**

Leach inner portion of oolite from I-3284.

I-3286. WHOI-1806, total **24,200 ± 700**
22,250 B.C.

Oolite from depth 25m (33° 20′ 18″ N Lat, 77° 30′ 18″ W Long). Coll. 1964 by Woods Hole Oceanog. Inst. and subm. 1968 by J. D. Milliman (Milliman, J. D., Pilkey, O. H., and Blackwelder, B. W., 1968, Carbonate sediments on the continental shelf, Cape Hatteras to Cape Romain: Southeastern Geol., in press).

12,270 ± 190
10,320 B.C.

I-3287. Duke-8200

Algal limestone (33° 58′ 24″ N Lat, 76° 22′ 24″ W Long). Coll. 1967 by I. Macintyre and subm. 1968 by J. D. Milliman (Menzies *et al.*, 1966).

26,250 ± 900
24,300 B.C.

I-3288. Duke-8193

Algal limestone (33° 37′ 48″ N Lat, 76° 50′ 06″ W Long), depth 64 to 94m. Coll. 1967 by L. Macintyre and subm. 1968 by J. D. Milliman.

C. Canada

9590 ± 160
7640 B.C.

I-2477. Cape Breton Island, Nova Scotia

Organic silt with wood fragments from shore bluff, 100 yds W of Northern Head, 2.5 mi E of Donkin, Victoria County (46° 10′ 55″ N Lat, 59° 49′ 10″ W Long), Cape Breton Is., Nova Scotia. Shore bluff recession exposes beaver-pond deposits in ground-moraine swale. From basal 3 in. of organic silt with twig fragments. Stratigraphic sequence, bottom to top: till, gleyed clay, organic silt, woody peat. Beaver gnawed wood in organic silt and peat. Coll. 1965 by K. N. H. Greenidge and E. H. Muller; subm. 1966 by K. N. H. Greenidge and E. H. Muller, Dept. of Geol., Syracuse Univ., Syracuse, New York.

6290 ± 250
4340 B.C.

I-2778. North Saskatchewan River, Alberta

Charcoal from N Saskatchewan R. (50° 30′ N Lat, 113° 33′ W Long), Edmonton, Alberta, Canada. From thin, discontinuous bed within calcareous loam, 7 ft below top of lowermost terrace; 1½ ft below charcoal horizon is volcanic ash. Coll. 1966 and subm. 1967 by J. A. Westgate, Univ. of Alberta. *Comment* (J.A.W.): date is minimum for ash. Deposits of lowermost terrace of N Saskatchewan R. valley indicated to be ca. 6000 to 7000 yrs old.

Revelstoke series, British Columbia

Charcoal from 83 mi N of Revelstoke (52° N Lat, 118° 30′ E Long), British Columbia. Coll. 1967 by H. L. Minch; subm. 1967 by F. H. Mylrea, Caseco Consultants Ltd., Vancouver, British Columbia.

6190 ± 120
4240 B.C.

I-3158. No. 1

From ca. 2-ft depth, directly overlying ash layer.

7670 ± 220
5720 B.C.

I-3159. No. 2

From ca. 4-ft depth, ca. 1 ft below ash.

General Comment (F.H.M.): purpose to estimate age of ash between charcoal layers (Nasmith *et al.*, 1967).

Belmont Site series, Manitoba

Limnic sediment from nameless lake near Belmont, Manitoba (49° 26′ N Lat, 99° 26′ W Long), Canada. Coll. and subm. 1967 by J. C. Ritchie, Trent Univ., Ontario, Canada.

I-3156. Belmont, BT-22 **3570 ± 130**
1620 B.C.

Core depth 195cm at transition of grass-herb assemblage to oak-birch assemblage.

I-3157. Belmont, BT-115 **9430 ± 160**
7480 B.C.

Core depth 610cm at transition of spruce-pollen zone to grassland zone.

St. Jean Vianney series, Quebec

Wood samples from podzol soil involved in landslide. From St. Jean Vianney (48° 27′ 15″ N Lat, 71° 11′ 40″ W Long), Quebec. Coll. and subm. 1967 by Pierre LaSalle, Dept. Nat. Resources, Quebec, Canada.

I-3141. St. Jean Vianney 1 **560 ± 90**
A.D. 1390

I-3142. St. Jean Vianney 2 **420 ± 90**
A.D. 1530

General Comment (P.L.): age of wood at time of landslide unknown. Dates are maximum for the landslide (LaSalle, Pierre, and Chagnon, J. Y. Can. Jour. Earth Sci., in press).

I-3143. Ste. Monique, Quebec **6950 ± 135**
5000 B.C.

Peat from bottom of bog in former channel of Peribonka R. (48° 42′ 35″ N Lat, 71° 53′ 10″ W Long), Quebec. Elev. ca. 400 ft. Coll. and subm. 1967 by Pierre LaSalle. *Comment* (P.L.): date is minimum for retreat of water below 400-ft level following deglaciation (LaSalle and Rondot, 1967).

I-3144. St. Ludger, Quebec **7750 ± 135**
5800 B.C.

Organic mud from bottom of kettle in bog near St. Ludger (45° 56′ 55″ N Lat, 71° 51′ 22″ W Long), Quebec. Elev. ca. 625 ft. Coll. and subm. 1967 by Pierre LaSalle. *Comment* (P.L.): date is minimum for deglaciation of area just N of Lac St. Jean Basin (LaSalle and Rondet, 1967).

D. Europe

I-2838. Houghton Grange, England **3400 ± 100**
1450 B.C.

Wood (*Fraxinus excelsior*) from 200 yd W 35° of Houghton Grange, Houghton-le-Spring (54° 50′ 50″ N Lat, 1° 29′ 50″ W Long), County

Durham, England. Natl. Grid Ref. 3346 4963. From temporary exposure 4 ft below surface as rafted fragments in sand and peaty clay. Coll. 1965 and subm. 1967 by D. B. Smith, Inst. of Geol. Sci., Leeds, England.

Bridgewater Bay series, England

Peat from borings at Bridgewater Bay (51° 13′ N Lat, 3° 07′ W Long), Somerset, England. Coll. 1966 and subm. 1967 by C. Kidson, Dept. of Geog., Univ. College of Wales, Wales.

I-2688. No. 6J1—25 ft relative to Ordnance Datum — **7060 ± 160 / 5110 B.C.**

I-2689. No. 6P1—20 ft relative to Ordnance Datum — **6890 ± 120 / 4940 B.C.**

I-2690. No. 6P2—30 ft relative to Ordnance Datum — **7360 ± 140 / 5410 B.C.**

General Comment (C.K.): pollen analysis indicates peats were formed at same elev. relative to sea level. Considering similar tidal range then, and elev. relative to O.D. of similar peats forming now, rise in sea level of 48 ft since 7360 B.P., 44 ft since 7060 B.P., and 37 ft since 6890 B.P. is indicated.

Irish Sea Basin series, British Isles

Various materials from Irish Sea Basin area relating to climatic conditions during Middle Würm, Interstadial and Main Würm maximum glaciation on continent.

+1660
31,840
—1360

I-2939. Buildwas, B. Shropshire — **29,890 B.C.**

Mixed shell fauna from quarry in kame complex opposite Buildwas Abbey at entrance to Ironbridge Gorge (52° 38′ N Lat, 2° 31′ 24″ W Long), Shropshire. Coll. 1966 by M. J. F. Brown, I. D. Ellis-Gruffydd, and H. D. Foster; subm. 1967 by I. D. E-G., Dept. of Geog., Univ. College London, England. *Comment* (M.J.F.B.): date supports glaciation postdating 31,840 B.P. referable to Main Würm. Ice extended at least as far S as Wolverhampton-Church Stretton moraine.

+2100
33,740
—1800

I-2803. Moel Tryfaen, Caernarvonshire — **31,790 B.C.**

Mixed shell fauna exposed in Alexander Slate Quarry on summit of Moel Tryfaen (53° 4′ 45″ N Lat, 4° 12′ 13″ W Long), Caernarvonshire. From gravel overlying 6 to 8 ft till and underlying 40 ft similar till. Coll. 1967 by H. D. Foster; subm. 1967 by I. D. Ellis-Gruffydd. *Comment* (M.J.F.B.): date indicates glaciation postdated 33,740 B.P. and strati-

graphy indicates contemporaneity of Welsh and Irish Sea glaciations during Main Würm. Sample alt. of 1350 ft suggests that shelly drifts at alts. between 900 to 1400 ft along N Welsh coastlands and borderlands are referable to same glaciation.

I-2802. Banc-y-Warren, B, Cardiganshire **>39,900**

Organic silt from same location as I-2559, quarry operations altered stratigraphy. Collected 1967 by E. H. Brown, M. J. F. Brown, I. D. Ellis-Gruffydd, and H. D. Foster; subm. 1967 by I. D. Ellis-Gruffydd. *Comment* (M.J.F.B.): pollen analysis by W. H. Zagwijn Haarlem, considered pollen to be Tertiary or Oligocene age.

16,830 $^{+970}_{-860}$

I-2801. Bryncir, Caernarvonshire **14,880 B.C.**

Organic silt from fluvio-glacial deposit exposed in Clynnog Fawr-Bryncir moraine 11½ mi S of Caernarvon (52° 58′ 30″ N Lat, 4° 16′ 55″ W Long), N. Wales. Isolated nodules of organic silt scattered throughout 35 ft sand and gravel sequence. From 15 to 20 ft below top of sec. Coll. 1967 by H. D. Foster; subm. 1967 by I. D. Ellis-Gruffydd. *Comment* (M.J.F.B.): date supports readvance at Irish Sea and Welsh ice, post 16,830 B.P., which deposited Bryncir-Clynnog Fawr moraine. Referred to as Scottish Readvance of Zone Ia of Late Glacial sequence (John, 1965; Synge, 1964; Embelton, 1964; Brown *et al.*, 1967).

26,270 $^{+2170}_{-1710}$

I-2800. Ellesmere, Shropshire **24,320 B.C.**

Organic silt from kame complex 4 mi W of Ellesmere (52° 54′ 20″ N Lat, 2° 59′ 25″ W Long), Shropshire. From silt nodules in fluvio-glacial sands and gravels (Middle Sands), capped by till, forming part of Bar Hill-Wrexham moraine. Coll. 1967 by M. J. F. Brown, I. D. Ellis-Gruffydd, and H. D. Foster; subm. 1967 by I. D. Ellis-Gruffydd. *Comment* (M.J.F.B.): date suggests that glaciation responsible for till and fluvio-glacial material occurred at or after 26,270 B.P.

31,800 $^{+1400}_{-1200}$

I-2559. Banc-y-Warren A, Cardiganshire **29,850 B.C.**

Organic silt from kame complex at Banc-y-Warren (52° 5′ 55″ N Lat, 4° 38′ 5″ W Long), Cardiganshire, Stratigraphy: stratified sand, overlain unconformably by gravel and sand. Sample found as discontinuous horizon in gravel, 70 ft below top of sec. Coll. 1966 by M. J. F. Brown, I. D. Ellis-Gruffydd, and H. D. Foster; subm. 1967 by I. D. Ellis-Gruffydd. *Comment* (M.J.F.B.): date supports extensive Main Würm glaciation in Irish Sea Basin as advocated by B. S. John (1965).

18,500 ± 400
16,550 B.C.

I-3372. Holderness, England

Fossil moss (*Bryum* sp.) from Dimlington interstadial silts at base of cliff (ca. 10 ft O.D.), 200 yds ESE of Cliff Farm, Out Newton, Holderness (53° 40′ 45″ N Lat, 0° 06′ 02″ E Long), E Yorkshire, England. From silt and sand filled basin on surface of basement till, overlain by drab till. Coll. 1968 by L. F. Penny; subm. 1968 by J. A. Catt, Rothamsted Experimental Sta., England. *Comment* (J.A.C.): date indicates Dimington silts were deposited at early stage of Main Würm Interstadial complex (Catt and Penny, 1966).

1280 ± 95
A.D. 670

I-3399. Geescroft Field, England

Topsoil from Geescroft Field, farm attached to Rothamsted Experimental Sta., Harpenden Hertfordshire (51° 48′ 07″ N Lat, 0° 21′ 33″ W Long), England. From experimental field used for continuous cultivation of beans, 1847 to 1883; 0- to 9-in. depth. Composite, 2 samples from Plot 3 and 2 from Plot 4. Coll. 1883 by Sir Henry Gilbert; subm. 1968 by J. A. Catt. *Comment* (J.A.C.): date agrees closely with radiocarbon measurements made on other Rothamsted top-soils (Jenkinson, 1966).

Chesil Beach series, England

Peat from Chesil Beach, Dorset (50° 37′ 30″ N Lat, 2° 30′ 30″ W Long), England. Strat. sequence from bottom to top: bedrock at depth 44 ft, sand, silt, peat, silt, and surface shingle. Coll. 1967 by R. Gleason and subm. 1968 by A. P. Carr, Natural Environmental Res. Council, The Nature Conservancy, Wareham, England.

4980 ± 120
3030 B.C.

I-3429. SY 6050, 8104 (a)

From top of peat layer 12-ft depth.

5410 ± 115
3460 B.C.

I-3431. SY 6050, 8104 (b)

From base of peat layer 15.5-ft depth.

7010 ± 130
5060 B.C.

I-3430. MPBW/50 Oxford, Suffolk, England

Humified peat from Oxford, Suffolk (52° 05′ 55″ N Lat, 1° 35′ 25″ E Long), England. From 31.0- to 32.5-ft depth, overlying bedrock and overlain by pebbles and silt. Coll. 1968 by Ministry of Public Building and Works; subm. 1968 by A. P. Carr. *Comment* (A.P.C.). foraminifera of sample characteristic of brackish water (*Elphidium excavatum*), indicating sea level of 7010 B.P. at −33.0 to −35.5 ft.

24,050 ± 650
22,100 B.C.

I-3268. N.I.D.D.1, N Ireland

Marine shells from Glastry claypit, Ards peninsula, Co. Down (54° 29′ N Lat, 5° 29′ W Long), N Ireland. From small sand lens 3 m below

surface, in lower of 2 till sheets. Coll. 1966 and subm. 1968 by A. R. Hill, Dept. of Geog., The Queen's University, Belfast, Ireland. *Comment* (A.R.H.): date indicative of last glaciation, oldest till found in NE Down. (Hill, A. R. and Prior, D. B., Proc. Roy. Irish Acad., in press).

33,750 $^{+2500}_{-1900}$ 31,800 B.C.

I-2564. Cil-Maenllwyd, W Wales

Wood fragments from Cil-Maenllwyd (formerly Banc-y-Warren) (52° 05′ 40″ N Lat, 4° 37′ 50″ W Long), British Natl. Grid reference: SN 205479, NE of Cardigan, W Wales. From layer of organic lenses, 17 to 18 ft below top of thick outwash. Coll. 1966 and subm. 1967 by B. S. John, Univ. of Durham. *Comment* (B.S.J.): date supports theory of fluctuating interstadial in Irish Sea, and for Main Würm glaciation of W Wales and St. George's Channel (John, 1965; Brown *et al.*, 1967).

11,200 ± 160 9250 B.C.

I-3120. Aberaeron Cliff, Wales

Organic silt lenses in base of 10-ft cliff 0.5 mi N of Aberaeron, W coast of Cardiganshire (52° 14′ N Lat, 4° 15′ W Long), Wales. Coll. 1967 by E. Watson, J. A. Taylor, R. T. Smith; subm. 1967 by J. A. Taylor, Univ. College of Wales, Wales. *Comment* (J.A.T.): pollen analyses support C-14 date of cliff sec. being postglacial.

Raised Bog series, Ireland

Peat from different locations in raised bogs in Ireland. Objective was to date transition from fen peat to acid peat formation. Coll. 1966 by R. F. Hammond; subm. 1966 by W. A. Watts, Univ. of Dublin, Ireland.

7540 ± 125 5590 B.C.

I-2498. Blackriver Bog, Sample B

Non-*sphagnous* mossy fen peat from Blackriver Bog, Killinthomas Townland (53° 6′ N Lat, 70° 0′ W Long), Co. Kildare, Ireland. From 120 cm to 122 cm above bog floor.

1550 ± 95 A.D. 400

I-2499. Ballydermot N Bog, Sample D

Birchwood/fen peat transitional to acid *sphagnum/Calluna* peat from Ballydermot N Bog, Clonmel Townland (53° 6′ N Lat, 7° 3′ W Long), Co. Offaly, Ireland. From 50 cm to 53 cm above bog floor.

4930 ± 115 2980 B.C.

I-2500. Lullymore Bog, Sample J

Birchwood/fen peat transitional to *sphagnous* peat from Lullymore Bog, Lullymore Townland (53° 6′ N Lat, 6° 57′ W Long), Co. Kildare, Ireland. From 52 cm to 54 cm above bog floor.

General Comment (W.A.W.): dates agree well with anticipated dates from pollen data.

9260 ± 180
7310 B.C.

I-1571. Kittilä, Finnish Lapland

Carex-Bryales peat from Hautavuoma Bog, +192.6 m (67° 28′ N Lat, 24° 35′ E Long), Kittilä, Finnish Lapland. Depth 6.45 m to 6.50 m. Coll. and subm. 1964 by Martti Salmi, Geol. Survey of Finland, Otaniemi. *Comment* (M.S.): pollen analysis indicates sample belongs to lower part of *Betula* period.

Lake Pappilanlampi series, Pielisjärvi, E Finland

Lake sediment from Lake Pappilanlampi, Louhivaara (63° 18′ N Lat, 30° 55′ E Long), Pielisjärvi, E Finland. Coll. and subm. 1966 by K. Tolonen, Univ. of Helsinki, Finland.

9200 ± 150
7250 B.C.

I-2269. 1-Lou

Coarse detritus from depth 310 to 315 cm. *Comment* (K.T.): pollen analysis indicates IV/V zone border.

9670 ± 160
7720 B.C.

I-2270. 2-A,B Lou

Fine detritus from depth 340 to 345 cm. *Comment* (K.T.): pollen analysis indicates III/IV (local) zone border.

10,100 ± 300
8150 B.C.

I-2377. 5-Lou

Fine ooze from depth 350 to 358 cm. *Comment* (K.T.): pollen analysis indicates mid Zone III.

11,200 ± 470
9250 B.C.

I-2271. 3-A,B,C Lou

Clay and varved sediment from depth 365 to 380 cm. *Comment* (K.T.): pollen analysis indicates sample taken just below II/III zone border.

20,800 ± 1300
18,850 B.C.

I-2385. 6-Lou

Varved sediment from depth 395 to 410 cm. *Comment* (K.T.): pollen analysis indicates Zone II, but sample may contain redeposited interglacial material (Tolonen, 1967).

10,060 ± 140
8110 B.C.

I-2452. Mustasuo bog, E Finland

Silt from Mustasuo bog (62° 23′ N Lat, 30° 57′ E Long), Ilomantsi, E Finland. Lowest layer on bog floor. Coll. and subm. 1966 by Reino Repo and Risto Tynni, Univ. of Finland, Geol. Dept., Otaniemi, Finland. *Comment* (R.R.): according to pollen analysis formed during Younger Dryas.

290 ± 90
A.D. 1660

I-2553. 1/Lyj, N Finland

Humus from beneath lake rampart on W shore of Lake Lylykkäänjärvi ca. 20 km E of Oulu (65° 02′ 30″ N Lat, 25° 52′ 30″ E Long),

Küminki, N Finland. From landward side of ice rampart, under ca. 50 cm sand. Coll. and subm. 1966 by Juhani Hult, Univ. of Oulu, Finland. *Comment* (J.H.): to date beginning of formation of ice rampart.

Kapp Linné series, W Spitsbergen

Peat from W shore Kapp Linné (78° 03′ N Lat, 13° 36′ E Long), W Spitsbergen Exposition–SW. Coll. and subm. 1966 by B. Ohlson, Univ. of Turku, Finland.

I-2365. K.L. 1-S **230 ± 100**
A.D. 1720

Peat (*Campylium polygamum*) from shore 10 m from water line and 2 m above present sea level. Represents surface 0- to 5-cm depth, of 18-cm thick peat layer buried under 80 to 100 cm cover of littoral shingle. *Comment* (B.O.): date indicates time of death and burying of moss surface under wave accumulated shingle and sand. Continuous abrasion process of this buried peatlayer supports opinion of Jahn (1959), that uplift of land relative to sea may have ceased at present time (Blake *et al.*, 1965).

I-2366. K.L. 2-B **1980 ± 100**
30 B.C.

Peat (*Hygrohypnum* sp.) from bottom of peat layer of I-2365. On humus-impregnated rock-split soil. *Comment* (B.O.): date indicates time of beginning peat formation with *Hygrohypnum* sp. growing in wet conditions, probably pool. Curve presented by Feyling-Hanssen and Olsson (1959-1960) and Olsson and Blake (1961-1962) indicates rate of land uplift has not exceeded 1 mm a yr on average relative to sea.

E. Africa

I-3292. Pilkington Bay, Lake Victoria, Uganda **10,670 ± 160**
8720 B.C.

Lake sediment from Pilkington Bay near Jinja (0° 18′ N Lat, 33° 20′ E Long), Uganda. In 5 m of water, core 64-4 from 9.36-to 9.56-m depth. Coll. 1964 by D. A. Livingstone and P. D. Weigl; subm. 1968 by R. L. Kendall, Duke Univ., Durham, North Carolina. *Comment* (R.L.K.): sample dates beginning of organic sedimentation in shallow portion of bay. Below dated horizon lies unsorted sand and bedrock. Surface sediments in bay have apparent age of 400 yr (Stuiver, 1968).

I-3293. Kome Channel, Lake Victoria, Uganda **7730 ± 150**
5780 B.C.

Lake sediment from Kome Channel near Sese Is., S of Entebbe (0° 15′ S Lat, 32° 30′ E Long), Uganda. In 34m of water, Kullenberg core from 6.28-to 6.48-m depth. Coll. 1960 by H. A. Osmaston, J. L. Richardson and R. L. Kendall; subm. 1968 by R. L. Kendall.

F. Asia

Kurkar series, Israel

Eolianite sand composed of quartz and calcareous (skeletal) grains, weakly cemented by calcite from Israel. Taken from surface of exposed

consolidated dunes considered to be Late Glacial and overlying youngest local "Hamra" bed (Itzhaki, 1961). Coll. 1964 and subm. 1966 by G. M. Friedman, Rensselaer Inst. of Tech., Troy, New York.

10,060 ± 180
8110 B.C.

I-2462. Kurkar G.M.F.-64-Ku-3

From below Sheraton Hotel, at shore of Mediterranean (32° 04′ N Lat, 34° 46′ E Long), Tel Aviv, Israel.

7620 ± 125
5670 B.C.

I-2463. Kurkar G.M.F.-64-Ku-9

Near shore of Mediterranean (32° 20′ N Lat, 34° 51′ E Long), Natanya, Israel.

12,390 ± 180
10,440 B.C.

I-3465. Red Sea core: CHAIN 61-127P

Foraminifera and pteropod tests with syngenetically precipitated aragonite from central Red Sea (21° 22′ 24″ N Lat, 38° 02′ 54″ E Long). Water depth 2106 m. Core depth 783 cm to 790 cm. Coll. 1966 aboard R/V CHAIN, Cruise 61; subm. 1968 by E. T. Degons, Woods Hole Oceanog. Inst.

>39,900

I-2221. Sabah, Malaysia

Wood from terrace gravel, Baiayo R., crossed by Keningau to Apin Apin Rd. (5° 24′ N Lat, 116° 13′ E Long), Sabah, Malaysia. From boulder gravel at base of terrace 30 ft above recent alluvium. Coll. 1966 by Mr. Panchatcharasivam, Dept. of Geol., Univ. of Malaya; subm. 1966 by Geol. Survey, Sabah (sample registered J 2629). *Comment* (G.E.W.): age in accord with possible mid-Pleistocene age ascribed to terrace on morphologic grounds by Liechti, *et al.* (1960) (Collenette, 1965).

2170 ± 105
220 B.C.

I-2433. Sungai Manila Road, Malaysia

Wood from Sungai Manila Rd., 1¾ mi N of Labuk Rd. near Sandakan (5° 55′ N Lat, 118° 00′ E Long), Sabah, Malaysia. From 3 ft beneath surface of recent alluvium. Coll. 1966 by G. E. Wilford; subm. 1966 by Geol. Survey, Sabah (sample registered J 2848). *Comment* (G.E.W.): date indicates slight submergence in Sandakan area ca. 2000 yrs ago.

Klias Peninsula series, Malaysia

Marine shells and wood from coast 1 mi NW of Menumbok Village, SW end of Klias Peninsula (5° 19′ N Lat, 115° 21′ E Long), Sabah, Malaysia. From base of marine terrace at +6 ft. Coll. and subm. 1966 by G. E. Wilford, Geol. Survey, Jesselton, Sabah.

4400 ± 110
2450 B.C.

I-2515. Marine shells

I-2487. Wood **4790 ± 115**
2840 B.C.

General Comment (G.E.W.): dates indicate that in Brunei Bay ca. 5000 yrs ago relative sea level was higher than at present (Wilson, 1964).

I-2871. Mount Kinabalu, Malaysia **+2200**
34,300
—1800
32,350 B.C.

Wood from tilloid sediment on S slope of Mt. Kinabalu, ¼ mi below Kamborangoh power sta., Kinabalu Natl. Park (6° 1′ 52″ N Lat, 116° 32′ 45″ E Long), Sabah, Malaysia. Coll. 1967 by J. Newton-Smith; subm. 1967 by Esso Production Research Co. *Comment* (J.N.S.): if sediment is till, date indicates late Pleistocene glaciation (Collenette, 1958).

I-3242. J 3394, Sabah, Malaysia **1800 ± 100**
A.D. 150

Wood from bank of Garinono R., Sandakan (5° 48′ 43″ N Lat, 117° 49′ 20″ E Long), Sabah. Wood layer covered by 4 ft soil. Coll. 1967 by D. T. C. Lee and subm. by G. E. Wilford (Wilford *et al.*, 1967).

Lake Biwa-Ko series, Japan

Sediment from 5 cm diameter core in center of Lake Biwa-Ko (35° 15′ N Lat, 136° 05′ E Long), Japan. Coll. 1965 and 1966 by Shoji Horie; subm. 1967 by Shoji Horie, Kyoto Univ., Japan. Water depth 70 m at sampling point.

I-2742. Biwa-Ko, 80 cm **1430 ± 95**
A.D. 520

I-2844. Biwa-Ko, 360 cm **3650 ± 105**
1700 B.C.

Pacific Islands series, Micronesia

Coral and shells from various islands in Marshall and Caroline Is. groups, Pacific Is. (Shepard, F. P. *et al.*, Evidence for Holocene sea level changes in Micronesia: Science, in press). All samples subm. 1967 by J. R. Curray, Scripps Inst. of Oceanog., CARMARSEL Exped.

I-2810. CRS 143 **<195**

Coral from Kubar Is., S tip of Ailinglapalap Atoll (07° 18′ 18″ N Lat, 168° 50′ 36″ E Long), Marshall Is. From blasting reef rock beneath "algal ridge" at ocean side of reef flat. Coll. 1967 by P. Crampton. *Comment* (J.R.C.): date to test hypothesis that coral rubble beneath continental reef flat is of recent origin.

I-2811. CRS 155A **2660 ± 100**
710 B.C.

Coral from Japwan, Ailinglapalap Is., Ailinglapalap Atoll (07° 16′ 36″ N Lat, 168° 48′ 12″ E Long), Marshall Is. From blasting conglomerate platform on lagoon side, 30 in. beneath flat surface of platform,

ca. 3 to 4 ft above contemporary reef flat. Coll. 1967 by P. Crampton. *Comment* (J.R.C.): date to test hypothesis that coral conglomerate platform was formed at sea level higher than now.

2880 ± 100
930 B.C.

I-2812. CRS 600

Coral from Falas Is., NE side Truk lagoon (07° 32′ 06″ N Lat, 151° 45′ 30″ E Long), Caroline Is. From 18-in. depth in coral conglomerate ledge 100 ft long and 5 ft wide. Ledge 1 ft above mean tide, 2 to 3 ft above reef flat, ca. 100 ft inside reef margin and 300 to 400 ft from is. Coll. 1967 by J. I. Tracey. *Comment* (J.R.C.): date to test hypothesis that conglomerate platform was formed at higher sea level, and that flat represents former reef flat.

2050 ± 95
100 B.C.

I-2813. CRS 608

Coral from Ollan Is., N coast Truk (07° 13′ 18″ N Lat, 151° 38′ 30″ E Long), Caroline Is. From large coral colony, just exposed above sea level (low tide), appears *in situ*. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): date to test hypothesis that corals grew when sea level higher than now.

1880 ± 100
A.D. 70

I-2814. CRS 616

Coral from Sapumur Is., E end Lukunor Atoll (05° 29′ 36″ N Lat, 153° 47′ 42″ E Long), Caroline Is. From surface of conglomerate platform, 1 to 2 ft above continental reef flat. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): date to test hypothesis that platform was formed at higher sea level.

4350 ± 110
2400 B.C.

I-2815. CRS 620

Coral from Takai Is., W side Pingelap Atoll (06° 13′ 18″ N Lat, 160° 40′ 54″ E Long), Caroline Is. From conglomerate platform, 1 to 2 ft above contemporary reef flat. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): dates coral conglomerate.

3250 ± 105
1300 B.C.

I-2816. CRS 622

Coral from Kusai Is., NE coast (05° 21′ N Lat, 163° 01′ E Long), Caroline Is. From remains of conglomerate platform surface ca. 4 ft above continental reef flat. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): date to test hypothesis that conglomerate platform was formed at higher sea level.

2580 ± 100
630 B.C.

I-2817. CRS 628

Coral from Ebon Is., Ebon Atoll (04° 34′ 36″ N Lat, 168° 43′ 12″ E Long), Marshall Is. From surface of conglomerate platform, lagoon side, ca. 4 to 5 in. above contemporary reef flat. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): same as for I-2816.

I-2818. CRS 629 **2920 ± 100**
970 B.C.

Tridacna shell, same location and strat. position as I-2817. Coll. 1967 by H. Veeh. *Comment* (J.R.C.). same as for I-2816.

I-2819. CRS 636 **2830 ± 100**
880 B.C.

Coral from small islet off lagoon shore of Ebon Is., Ebon Atoll (04° 34′ 36″ N Lat, 168° 42′ 48″ E Long), Marshall Is. From surface of conglomerate platform, ca. 5 ft above present lagoon reef flat. Coll. 1967 by H. Veeh. *Comment* (J.R.C.): same as for I-2816.

I-2820. CRS 637 **4475 ± 105**
2525 B.C.

Coral from Jabor Is., Sydney Pier, Jaluit Atoll (05° 54′ 30″ N Lat, 169° 38′ 42″ E Long), Marshall Is. From bottom layer of 3 layers of coral conglomerate. Coll 1967 by H. Veeh.

I-2821. CRS 638 **2730 ± 105**
780 B.C.

Coral from same location as I-2820. From middle layer of 3 layers of coral conglomerate. Coll. 1967 by H. Veeh.

I-2822. CRS 639 **2290 ± 95**
340 B.C.

Coral from same location as I-2820. From upper layer of 3 layers of coral conglomerate. Coll. 1967 by H. Veeh.

I-2823. CRS 641 **260 ± 95**
A.D. 1690

Coral (*Acropara*) from Kubar Is., NE corner, Ailinglapalap (07° 18′ 24″ N Lat, 168° 50′ 36″ E Long), Marshall Is. From contemporary reef flat, ca. halfway between shore and outer edge of reef flat (ocean side). Coll. 1967 by H. Veeh. *Comment* (J.R.C.): date indicates that recent corals are being added and incorporated into reef flat.

I-2824. CRS 643 **2785 ± 100**
835 B.C.

Tridacna shell from Japwan, Ailinglapalap, Ailinglapalap Atoll (07° 16′ N Lat, 168° 48′ E Long), Marshall Is. From surface of conglomerate platform on lagoon side, 3 to 4 ft above present reef flat. Coll. 1967 by H. Veeh.

I-2825. CRS 817 **3450 ± 105**
1500 B.C.

Coral from Ebon Is. Ebon Atoll (04° 34′ N Lat, 168° 43′ E Long), Marshall Is. From blasting reef rock beneath contemporary reef flat. Coll. 1967 by H. Veeh.

G. Central and South America

New Providence Core series, Bahamas

Calcareous peat from New Providence Is., Bahamas. Coll. 1966 by Peter Garrett; subm. 1966 by E. B. Hebard, New York City.

530 ± 95

I-2381. 66 NP 95 PG **A.D. 1420**

From middle of marsh, E of Lake Cunningham (25° 03′ N Lat, 77° 24′ W Long), 25-cm depth, from bottom of core.

620 ± 95

I-2382. 66 NP 96 PG **A.D. 1330**

From W shore of Lake Killarney (25° 03′ N Lat, 77° 28′ W Long), 35 cm depth, from bottom of core.

General Comment (E.B.H.): plant material, Foraminifera Ostracoda and small mollusks are abundant. Sedimentation rate is ca. 0.5 mm per yr.

New Providence Island series, Bahamas

Nonmarine land snails, *Cerion* from 2 locations on New Providence Is., Bahamas. Coll. and subm. 1967 by E. B. Hebard.

22,340 ± 550

I-2912. N.E. New Providence Island **20,390 B.C.**

Shell carbonate from Collin's Ave. roadcut (25° 04′ N Lat, 77° 20′ W Long), New Providence Is., Bahamas. Alt. +60 to +90 ft.

28,440 ± 1160

I-2913. W. New Providence Island **26,490 B.C.**

Shell carbonate from Lyford Cay roadcut (25° 01′ N Lat, 77° 32′ W Long), New Providence Is., Bahamas. Elev. +20 to +50 ft.

General Comment (E.B.H.): shells from uncemented sands in dune bioturbite layers. Dates place samples in Iowan phase of Wisconsin glacial when lowered sea level created extensive land areas for *Cerion* to inhabit.

24,900 ± 1200

I-3606. J-139, Ecuador **22,950 B.C.**

Charcoal (carbonized fossil wood) from ca. 44 km S of Gualaceo township, on rd. to Gualaquiza, part of Cordillera Cordoncillo of Cordillera Real of Andean chain (3° 11′ S Lat, 78° 49′ W Long), Ecuador. From cavity within volcanics of andesitic composition which lie unconformably over Palaeozoic or Mesozoic shists. Coll. 1967 by J. O'Rourke; subm. 1968 by U. N. Mineral Survey Proj., Quito, Ecuador.

II. ARCHAEOLOGIC SAMPLES

A. Western United States

640 ± 95

I-2617. The Birches site, Alaska **A.D. 1310**

Charred spruce wood from rim of birchbark basket found on N shore of W arm of Lake Minchumina (63° 50′ N Lat, 152° 20′ W Long),

Alaska. From below 7-in. loess layer inside Housepit 5. Coll. 1966 and subm. 1967 by E. Hosley, Univ. of Alaska. *Comment* (E.H.): assoc. cultural materials appear to be of Denetasiro tradition of R. S. MacNeish. Implements were small, but microblades, burins, and pottery are lacking.

I-3131. Duchikmiut, DT1, Alaska **680 ± 95** **A.D. 1270**

Charcoal from burned timber from W bank of mouth of Duchikmiut R., S side Nunivak Is. (59° 52′ N Lat, 166″ 20′ W Long), Alaska. From 885 cm depth, assoc. with Norton Check Stamped pottery. Coll. and subm. 1967 by Michael Nowak, Colorado College, Colorado Springs, Colorado. *Comment* (M.N.): first date on aboriginal occupation of Nunivak Is., dates Norton-like culture (Oswalt, 1955; Van Stone, 1954).

I-3132. Nash Harbor 1, Alaska **350 ± 95** **A.D. 1600**

Charcoal from burned post in semisubterranean housepit, in large bay on NW coast Nunivak Is., Nash Harbor (60° 18′ N Lat, 166° 58′ W Long), Alaska. Coll. and subm. 1967 by Michael Nowak. *Comment* (M.N.): assoc. with rubbed slate and Yukon lined and plain pottery (Oswalt, 1955; Van Stone, 1954).

I-3176. Pedro Bay site, Alaska **4320 ± 115** **2370 B.C.**

Charcoal from Pedro Bay site, Iliamna Lake (59° 45′ N Lat, 154° W Long), Alaska. From Pit 22, charcoal band ca. 18-in. depth on 25-ft lake terrace. Assoc. with ground slate blades and chipped basalt points. Coll. and subm. 1967 by J. B. Townsend, Univ. of Manitoba, Winnipeg, Canada. *Comment* (J.B.T.): charcoal date as well as assoc. artifacts closely relate to Ocean Bay materials recovered by Clark (1966) on Kodiak Is. (Townsend and Townsend, 1961).

I-2352. Gunther Island, California **1070 ± 100** **A.D. 880**

Charcoal from fire pit, Gunther Is. shell mound, Site 67 (40° 48′ 50″ N Lat, 124° .09′ 50″ W Long), Humboldt Bay, NW California. From 1st discernible occupation strata (Loud, 1918) (Elsasser and Heizer, 1964). Coll. and subm. 1966 by T. S. Hannah, Field Research Dir., Clarke Memorial Mus., Eureka, California.

I-3168. 4-But-S182, California **335 ± 85** **A.D. 1615**

Carbonized grapevine from floor of Structure 2, W bank Feather R., N of Oroville (39° 32′ N Lat, 121° 32′ 45″ W Long), California. From within take line of Thermalito Diversion Reservoir. Coll. 1964 and subm. 1967 by W. H. Olsen, Dept. of Parks and Recreation, State of California Resources Agency, Sacramento. *Comment* (W.H.O.): date compatible with archaeol. context and indicates that protohistoric pattern in foot-

hills was fully developed by 1500 to 1600 A.D. as indicated by various trade items from Central Valley of California (Jewell, 1963; Olsen and Riddell, 1963).

Copsey Creek series, Lake County, California

Charcoal from NW bank of Copsey Creek in Excelsior Valley, 2 mi S of Lower Lake (38° 52′ 58″ N Lat, 122° 36′ 26″ W Long), Lake County, California. Coll. 1961 and subm. 1967 by D. A. Frederickson, Univ. of California, Dept. of Anthropol., Davis.

I-2754. 4-Lak-261—1A **3690 ± 130 / 1740 B.C.**

From hearth, Feature 11, depth ca. 90 in. in buried A soil horizon. *Comment* (D.A.F.): earliest component from this site, believed to represent phase of Borax Lake complex slightly later than type site of Harrington (1948).

I-2791. 4-Lak-261—2 **2100 ± 150 / 150 B.C.**

From hearth, Feature 10, Unit S-L-21, depth 48 to 60 in. *Comment* (D.A.F.): representative of unnamed middle component 12 to 18 in. below Burials 3 and 4 which are protohistoric on basis of clam shell disk beads and Haliotis ornaments.

General Comment (D.A.F.): Site 4-Lak-261 is stratified vertically and horizontally with 3 distinguishable cultural components: early protohistoric, unnamed with large lanceolate projectile points and grinding mortar, and early with slab milling stones and indented-base projectile points (Antevs, 1952).

I-3165. Oroville, 4-But-S157, California **1220 ± 100 / A.D. 730**

Charcoal from within boundary of Oroville Reservoir, ca. 2 mi NE Oroville (39° 32′ 28″ N Lat, 121° 30′ 40″ W Long), Butte Co., California. Composite of fragments from 30 to 36 in. level Unit L-24, Trench C. Coll. 1964 and subm. 1967 by W. H. Olsen. *Comment* (W.H.O.): date falls in upper phase of site's occupancy, equivalent to early Late Horizon Phase I period in central California.

Rodriguez site series, California

Charred wood from remains of burned house, Rodriguez site (CA-Las-194), lower Surprise Valley (40° 10′ N Lat, 122° 02′ W Long), Lassen Co., California. Coll. 1966 and subm. 1967 by R. D. Ambro and J. F. O'Connell, Univ. of California, Dept. of Anthropol., Berkeley.

I-3208. SV-36B **1050 ± 100 / A.D. 900**

From Feature 1, depth 20 in. *Comment* (R.D.A.): dates period characterized by Rose Spring and Eastgate series projectile points (O'Connell and Ambro, 1968).

I-3209. SV-791 **2150 ± 100**
200 B.C.

From Feature 24, depth 46 in. *Comment* (R.D.A.): dates period characterized by Elko series projectile points (O'Connell and Ambro, 1968).

I-3380. Death Valley, California **990 ± 110**
A.D. 960

Woodrat (*Neotoma* sp.) dung from small cave in alluvial gravels near Bennett's Well, Death Valley (36° 15′ 52″ N Lat, 116° 45′ 39″ W Long), California. Coll. 1968 by P. J. Mehringer and R. Hooke; subm. 1968 by P. J. Mehringer, Univ. of Arizona, Tucson. *Comment* (P.J.M.): plant remains in woodrat midden included *Eucnide urens, Atriplex hymenelytra, Larrea divaricata* and *Euphorbia parishii,* all species growing at site today (Wells and Berger, 1967).

I-2423. Mount Albion site, Colorado **1360 ± 180**
A.D. 590

Charcoal from Mount Albion site, elev. 11,150 ft (40° 02′ 19″ N Lat, 105° 35′ 48″ W Long), Boulder Co., Colorado. Scattered flecks on floor of Pit 15, beneath 24 to 40 cm colluvial fill. Coll. and subm. 1966 by J. B. Benedict. *Comment* (J.B.B.): pit fill contained single triangular, side-notched point.

I-3382. Vanderbloom Mound (21ML1), Minnesota **1800 ± 100**
A.D. 150

Charred wood from Vanderbloom Mound, NW ¼—NW ¼ sec. 25, T42 N, R27 W, SW shore Lake Onamia (46° 15′ N Lat, 93° 34′ W Long), Mille Lacs County, Minnesota. Overlying central burial area of conical mound which contained secondary burials on original soil surface. Coll. 1952 by L. A. Wilford; subm. 1968 by Elden Johnson, Univ. of Minnesota. *Comment* (E.J.): dates what Wilford (1955) called Malmo focus.

B. Central, Eastern United States, and Canada

I-1559. Grundel Mastodon site, Missouri **25,100 ± 2200**
23,150 B.C.

Charcoal from Grundel Mastodon site, SE ¼ NW ¼ sec. 27, T63 N, R40 W (40° 14′ 40″ N Lat, 95 ° 24′ 5″ W Long), Holt County, Missouri. From gravel pit on Russell Grundel farm, at base of incipient soil developed on early Wisconsin loess. Horizon 13 ft above Sangamon soil and ca. 40 ft below present surface. Coll. 1963 by M. G. Mehl; subm. 1964 by Missouri Geol. Survey and Water Resources, Rolla, Missouri. *Comment* (M.G.M.): assoc. with mastodon remains. Date places soil and underlying loess in Farmdalian stage (as mss. rept.; pub. by Missouri Geol. Survey and Water Resources).

I-1781. Pi-7, Feature 17, Kentucky **1530 ± 105**
A.D. 420

Charred wood from montane region of E Kentucky (37° 24′ 07″ N Lat, 82° 20′ 38″ W Long), Pike County. Side on bottomlands of Big

Sandy R., 100 ft E of juncture Sim's Creek and Levisa Fork, ca. 9 air mi from Pikeville, Kentucky. From Feature 17, earth oven, 8.5 cm depth (Dunnell, 1965). Coll. 1965 by R. C. Dunnell and M. A. Hoffman; subm. 1965 by D. W. Schwartz, Univ. of Kentucky, Lexington, Kentucky.

3840 ± 120
1890 B.C.

I-1782. Pi-11, Feature 4, Kentucky

Charred wood from montane region of E Kentucky, N bank Levisa Fork of Big Sandy R., ca. 200 ft W of mouth of Jonican Creek (37° 26′ 02″ N Lat, 82° 24′ 18″ W Long), Pike County, Kentucky. From Feature 4, earth oven in Zone 2 (heavy midden band), depth from surface 127 cm, depth 0 to 10 cm from top of Zone 2 (Dunnell, 1965). Coll. 1965 by M. A. Hoffman; subm. 1965 by D. W. Schwartz.

3500 ± 110
1550 B.C.

I-2552. Combs site, F4, Kentucky

Charcoal (wood) from Combs site, Kt-6, (37° 14′ N Lat, 83° 00′ W Long), Knott County, Kentucky. From Feature 4 (firepit) at 17-cm depth. Coll. 1966 by B. L. Purrington; subm. 1967 by D. W. Schwartz and B. L. Purrington. *Comment* (B.L.P.): non-ceramic site, stone tool assemblage includes diagnostic Archaic, Woodland, and Fort Ancient artifacts (Purrington, 1967).

350 ± 100
A.D. 1600

I-1362. Cedar Statue, W Virginia

Wood from cedar statue, found 1891 in crevice in face of 90-ft cliff near Lewiston, W Virginia, on Kanawha R. Preserved in W Virginia State Mus. at Charleston, W Virginia. From center of base of statue, where wood retained greatest density, well beyond point reached by bore holes. Coll. 1964 by C. H. Hapgood and students, Keene State College, Keene, New Hampshire; subm. 1965 by James Hupp. *Comment* (C.H.H.): statue thought to be modern, date indicates it is assoc. with Fort Ancient Indian culture (1400 to 1600 A.D.). Subject, woman holding baby bison, has connotations for religious beliefs of people, may be 1st definite evidence of such beliefs (Hale, 1897).

Wells site series, Pennsylvania

Charcoal from Wells site, Asylum Township (41° 42′ N Lat, 76° 20′ W Long), Bradford County, Pennsylvania. Coll. 1961 by Catherine McCann and Gene McCracken; subm. 1966 by Catherine McCann, Pennsylvania Hist. and Mus. Comm., Harrisburg.

970 ± 100
A.D. 980

I-2488. Sample A. (36Br59)

From lower part of Feature 6 (hearth), assoc. with pottery. *Comment* (C.McC.): date seems reasonable.

880 ± 100
A.D. 1070

I-2489. Sample B. (36Br59)

From upper part of Feature 6 (hearth), assoc. with pottery. *Comment* (C.McC.): date reasonable, good overlap with I-2488.

Hilton Head Island series, South Carolina

Samples from various locations on Hilton Head Is., Beaufort Co. South Carolina. Coll. and subm. 1967 by Alan Calmes, Univ. of South Carolina.

I-2847. Sea Pines site, No. 1 **3110 ± 110**
1160 B.C.

Conch shells from Sea Pines Shell-Ring site (32° 07′ 50″ N Lat, 80° 47′ 15″ W Long), Sea Pines Plantation. From top, Level 1, 0 to 6 in. through shell-ring rim.

I-2848. Sea Pines site, No. 2 **3400 ± 110**
1450 B.C.

Clam shell from same location as I-2847. From bottom, Level 4, 20 to 26 in. through shell-ring rim. *Comment* (A.C.): dates for I-2847 and I-2848 represent last occupation on shell-ring mounds for Hilton Head Is., dates in accordance with expected termination of Stalling's Island Early Savannah River culture (Fairbanks, 1941; Ford, 1966).

I-2849. Skull Creek site, No. 1 **3120 ± 110**
1170 B.C.

Oyster shell from Skull Creek shell-ring site (32° 14′ N Lat, 80° 45′ W Long). From layer of periwinkle shells 27 in. from rim of 7-ft high shell-ring. Assoc. with Stalling's Is. type potsherd. *Comment* (A.C.): date represents near termination of Stalling's Island Early Savannah River focus.

I-2850. Skull Creek site, No. 2 **3585 ± 115**
1635 B.C.

Charcoal 56 to 57 in. from surface of shell-ring rim, Level 9, same location as I-2849. *Comment* (A.C.): date represents ca. mid-point Stalling's Island Early Savannah River focus. Sherds mixed, sand-tempered and fiber-tempered, predominance of sand tempering.

I-3047. Skull Creek site, No. 3 **3890 ± 110**
1940 B.C.

Charcoal from bottom, Level 4, 18 to 24 in. from surface of small shell-ring adjacent to and partially underlying larger shell-ring (I-2849 and I-2850). Location same as I-2849. *Comment* (A.C.): date indicates this is oldest sec. of site, earliest radiocarbon date for decorated Stalling's Island pottery. Decorations are predominantly carefully executed punctuation and finger-nail markings. Potsherds are coarse sand-tempered. Dates exist for earlier Stalling's Island type pottery (Stoltman, 1966) but they are for plain fiber-tempered ware.

I-2851. Jenkins Island **1370 ± 100**
A.D. 580

Charcoal from oyster shell refuse pit 6 to 31 in. from surface (32° 13′ 15″ N Lat, 80° 45′ 45″ W Long), Jenkins Is. Assoc. with Wilmington

Heavy Cord marked pottery. *Comment* (A.C.): date substantiates Caldwell's (1952) placement of Wilmington in lower Savannah R. region ceramic chronology.

615 ± 95
A.D. 1335

I-2852. Green's enclosure

Charcoal from 12- to 18-in. level within shell ridge (32° 13′ 15″ N Lat, 80° 45′ 30″ W Long), Green's Shell-ridge enclosure. *Comment* (A.C.): shell ridge composed of loosely packed oyster shell, potsherds, and other refuse. Date fits Caldwell's (1952) ceramic sequence which places pottery in Irene period.

Martha's Vineyard Island series, Massachusetts

Charcoal from Peterson site on Squibnocket Pond, Chilmark, Martha's Vineyard (41° 19′ 34″ N Lat, 70° 46′ 42″ W Long), Massachusetts. Coll. and subm. 1967 by W. A. Ritchie, New York State Mus., N.Y. State Educ. Dept., Albany.

385 ± 90
A.D. 1565

I-3100. Peterson site

Charcoal from Feature 45, Sec. W10 S10, shell-filled earth oven 11 in. below ground surface. *Comment* (W.A.R.): date indicates Late Woodland occupation, in agreement with archaeol. evidence.

2540 ± 105
590 B.C.

I-3101. Peterson site

Charcoal from area of refuse-filled sand in Sec. W10 N10, 22 to 24 in. below surface, in lower part Stratum 2B. *Comment* (W.A.R.): date indicates Early Woodland complex with Vinette 1 pottery, related to Lagoon complex.

2310 ± 100
360 B.C.

I-3102. Peterson site

Charcoal from stone hearth, Feature 23, Sec. W5 N20, 24 to 26 in. below surface, related to lower part Stratum 2A. *Comment* (W.A.R.): ceramics from Stratum 2A show transition from late Early Woodland to early Middle Woodland.

4020 ± 115
2070 B.C.

I-3103. Peterson site

Charcoal from hearth occupying bowl-shaped pit, Feature 11, Sec. W15 NO, 31 in. below surface. *Comment* (W.A.R.): date represents Late Archaic stage at Peterson site.

1010 ± 100
A.D. 940

I-2594. Armstrong Mound, Ontario

Charcoal from Armstrong Mound, Long Sault Indian Reserve Nos. 12 and 13, Chapple Township (48° 38′ 48.4″ N Lat, 94° 04′ 22.5″ W Long), Rainy R. Dist., Ontario, Canada. Mound 7, portion of charred

cribbing log from top old sod line on which mound was built. Mound assigned to Middle Woodland Laurel culture. Coll. 1966 by W. A. Kenyon; subm. 1967 by Roscoe Wilmeth, Natl. Mus. of Canada. *Comment* (W.A.K.): date indicates Middle Woodland culture may have persisted to later date than expected.

I-2947. Monks Mound, Illinois R-24 **760 ± 95** **A.D. 1190**

Charcoal from 1st terrace Monks Mound, Cahokia site (38° 39′ 36″ N Lat, 90° 04′ 27″ W Long), Madison Co., Illinois. Sample from 131 to 136 cm below surface on sandy layer in Pit 137. Coll. 1967 by Freimuth and Porter; subm. 1967 by N. Reed. *Comment* (N.R.): major construction of 1st terrace was completed by this date, and compares favorably with M-1636, A.D. 1110 (Radiocarbon, 1966, v. 8, p. 268).

C. Europe

I-2556. Llantwit Major, Wales **550 ± 95** **A.D. 1400**

Oak (*Quercus* robur) from Col-hugh Point, O.S. map reference SS 957663, Llantwit Major (51° 23′ 30″ N Lat, 3° 29′ 49″ W Long), Glamorgan, S Wales, U.K. Remains of piles of breakwater. Coll. 1966 by W. H. Davies; subm. 1967 by C. Kidson, Univ. College of Wales. *Comment* (C.K.): piles believed to be Roman but date indicates they are medieval. Date is of significance in terms of occupation of Roman Villa at Llantwit Major; rates of eustatic fluctuations of sea level and rates of coastal erosion.

I-3130. Mende, MEN-1, Hungary **27,200 $^{+1400}_{-1100}$** **25,250 B.C.**

Charcoal from firepit loesswall in Mende, ca. 40 km E of Budapest (47° 25′ N Lat, 19° 25′ E Long), Hungary. From 10m beneath present floor, 3rd fossil soil horizon from above. Coll. 1967 by Matti Seppälä; subm. 1967 by Birger Ohlson, Univ. of Turku. *Comment* (B.O.): date indicates 3rd fossil soil horizon formed at end of Middle Würm age (Pécsi, 1965; 1966).

I-3153. Las Pajucas Cave, Spain **3710 ± 130** **1760 B.C.**

Human bones from Las Pajucas Cave near village of Lanestosa, 63 km from Bilbao (43° 13′ 22″ N Lat, 0° 14′ 56″ E Long), Spain. From interior of cave at bottom of Eneolithic layer. Coll. 1966 by J. Mª. Apellániz Castroviejo; subm. 1967 by E. Nolte y Aramburu, Ministerio de Educ. Nacional, Servicio Nacional de Excavaciones, Bilbao. *Comment* (E.N.A.): assoc. with microlithic flint-points, flint scraper, ovoid-and troncoconic-shaped vessels.

3090 ± 100
1140 B.C.

I-3197. Cueva Guerrandijo, Spain

Human bones from Lanestosa, Vizcaya province, Basque (43° 24′ 09″ N Lat, 1° 01′ 3″ E Long), Spain. From beneath 40 cm soil in layer considered late Eneolithic. Coll. 1966 by J. M. Apellaniz; subm. 1967 by E. Nolte y Aramburu. *Comment* (E.N.A.): assoc. with globular ceramics, leaf laurel flint points and perforated beads of steatite. Date appears considerably younger than artifacts.

800 ± 95
A.D. 1150

I-3584. Finström, Åland Islands

Wood borings (resinous pine, *Pinus sylvestris*) from carving of human head on end of pole, Parish church. Einström (60° 15′ N Lat, 20° E Long), Åland Islands. From vaulted ceiling of church (Dreijer, 1963). Coll. 1968 by Arnold Simons; subm. 1968 by Matts Dreijer, Ålands Mus., Finland. *Comment* (M.D.): wooden sculpture cannot have been made to be walled up in arch of church, presumably it belonged to older wooden church of same type as Norwegian stave churches with posts supporting roof, upper ends of post terminating with sculpture of human head. Date supports estimated age of sculpture.

D. Africa

490 ± 90
A.D. 1460

I-2693. W Mellah, Morocco

Charcoal from gray-brown alluvial silt at Wadi Mellah (33° 37′ N Lat, 7° 24′ W Long), Morocco. From 1.5m below surface of 5m alluvial fill. Coll. 1964 and subm. 1967 by C. Vita-Finzi, Univ. College, London. *Comment* (C.V.F.): deposit equated with Rharbian phase of Morocco and attributed to Flandarian transgression by Beaudet *et al.*, (1960). Date agrees with medieval age postulated by Vita-Finzi (1964).

1500 ± 100
A.D. 450

I-3250. Western Desert of Egypt

Shells of *Helix* sp. (land gastropod) from N rim of Qattara depression near terminus of rd. which leads S from El Alamein (30° 25′ N Lat, 28° 33′ E Long), W Desert of Egypt. Site called Munqar abu dweis, shown on Maghra Sheet on topographic map Scale 1:100,000, Survey of Egypt, 1934. From flash flood deposits on floor of wadi. Coll. and subm. 1967 by R. H. Slaughter and W. J. Gealy, S Methodist Univ., Dallas.

Egyptian series

Samples from various excavations in Egypt. Subm. 1968 by Fred Wendorf, S Methodist Univ. (Wendorf and Said, 1967).

17,590 ± 300
15,640 B.C.

I-3415. Egypt 1

Shell (*Unio*) from Site 67/5C, near Isna (25° 22′ N Lat, 32° 28′ E Long), Egypt. From top of Ballana sand and reworked into top of

lower silt. Coll. 1968 by C. V. Haynes and A. Gautier. *Comment* (F.W.): assoc. with new unnamed microlithic flake and blade industry with double-backed perforators, backed bladelets, truncations, denticulates, notches, and scrapers.

I-3416. Egypt 2 **18,020 ± 330**
16,070 B.C.

Shell (*Unio*) from Site 67/5A. Location same as I-3415, from top of Ballana sand. Coll. 1968 by C. V. Haynes, F. Wendorf, and A. Gautier.

I-3417. Egypt 3 **17,800 ± 330**
15,850 B.C.

Shell (*Unio*) from Site 67/2A near El Kilh (25° 04′ N Lat, 32° 48′ E Long), Egypt. From lower silt, equivalent to Dibera Jer formation. Coll. 1968 by C. V. Haynes. *Comment* (F.W.): assoc. with 2 new unnamed industries, 1 with significant percentage Levallois technique, 1 without. Predominantly blade industries including end scrapers, burins, truncations, backed blades, and notches.

I-3418. Egypt 4 **17,450 ± 300**
15,500 B.C.

Shell (*Unio*) from Site 67/2A, Trench 3. Location same as I-3417, top of lower silt. Coll. 1968 by C. V. Haynes.

I-3419. Egypt 5 **17,600 ± 300**
15,650 B.C.

Shell (*Unio*) from Site 67/2A, Trench 1. Location same as I-3417, top of lower silt. Coll. 1968 by C. V. Haynes.

I-3420. Egypt 6 **16,830 ± 290**
14,880 B.C.

Tufa from Site 9X, near Isna (25° 23′ N Lat, 32° 29′ E Long), Egypt. From contact between lower silt and overlying fluvial sand. Coll. 1968 by C. V. Haynes. *Comment* (F.W.): dates calcareous replacement of vegetation which occurs in fluvial sand. Site assoc. with new undescribed Lithic industry.

I-3421. Egypt 7 **12,690 ± 240**
10,740 B.C.

Carbonaceous sand from Site 67/14A, Trench 1, near Isna (25° 23′ N Lat, 32° 29′ E Long), Egypt. From between upper and lower silt. Coll. 1968 by C. V. Haynes. *Comment* (F.W.): date appears slightly too recent.

I-3422. Egypt 8 **9330 ± 160**
7380 B.C.

Snail shell, *Lanistes carinatus*, from Site 67/10, near Isna (25° 23′ N Lat, 32° 29′ E Long), Egypt. From top of upper silt. Coll. 1968 by C. V. Haynes and F. Wendorf. *Comment* (F.W.): although date agrees with I-3428 and I-3421, results appear too recent in view of stratigraphic position.

I-3423. Egypt 9 **>39,900**

Marl from Site 68/8, near Dandara (26° 08′ N Lat, 32° 37′ E Long), Egypt. From 1m below eroded top of old silt (Dandara formation). Coll. 1968 by C. V. Haynes. *Comment* (F.W.): Dandara formation is true Nile deposit, overlain by gravel containing Sangoan and Lupemban industry. Date implies Nile is more than 39,000 yrs old.

I-3424. Egypt 10 **12,500 ± 230**
10,550 B.C.

Carbonaceous sand from Kum Belah site, between Bullas and Luxor (25° 57′ N Lat, 32° 44′ E Long), Egypt. From base of upper silt. Coll. 1968 by C. V. Haynes. *Comment* (F.W.): date refers to widespread brush fire between Isna and Nag Hammadi, and may be important chrono-stratigraphic marker.

I-3426. Egypt 12 **2360 ± 190**
410 B.C.

Charcoal from Roman hearth, Luxor Temple (25° 43′ N Lat, 32° 38′ E Long), Egypt. Coll. 1968 by R. Dubois.

I-3427. Egypt 13 **16,830 ± 300**
14,880 B.C.

Shell (*Unio*) from Site 68/6E near Dandara (25° 54′ N Lat, 32° 43′ E Long), Egypt. From hearth in dune sand (Ballana formation). Coll. 1968 by C. V. Haynes. *Comment* (F.W.): date appears too old.

I-3428. Egypt 14 **10,400 ± 470**
8450 B.C.

Charcoal from Site 67/10 near Isna 25° 23′ N Lat, 32° 29′ E Long), Egypt. From top of upper silt. Coll. 1968 by C. V. Haynes and Fred Wendorf.

I-3440. Egypt 15 **13,380 ± 770**
11,430 B.C.

Charcoal from Site 68/9A, near El Makadma (26° 11′ N Lat, 32° 38′ E Long), Egypt. From contact between lower slope wash and upper silt. Coll. 1968 by C. V. Haynes. *Comment* (F.W.): date refers to brush fire over 200 sq km and serves as chrono-stratigraphic marker.

I-3248. Area 1, 67/2A **16,950 ± 300**
15,000 B.C.

Shell (*Unio*) from Site 67/2A, Trench 2, Area 1, near El Kilh (25° 04′ N Lat, 32° 48′ E Long), Egypt. From 5 to 20 cm below surface in old silt. Coll. 1967 by F. Wendorf and D. Lubell.

I-3249. Area 2, 67/2A **17,250 ± 300**
15,300 B.C.

Shell (*Unio*) from Site 67/2A, Trench 6, Area 2, near El Kilh (25° 04′ N Lat, 32° 48′ E Long), Egypt. From old silt equivalent to Dibera Jer formation. Coll. 1967 by F. Wendorf and D. Lubell. *Comment* (F.W.): date agrees with I-3417-19 and I-3248.

Ate Ogu Mound series, N Nigeria

Wood charcoal from Ate Ogu Mound (7° 6′ N Lat, 6° 43′ E Long), Idah, N Nigeria. Coll. 1966 by S. G. H. Daniels; subm. 1966 by Thurstan Shaw, Univ. of Ibadan, Nigeria.

I-2262. Ate Ogu, H **455 ± 95** **A.D. 1495**

Cutting VIII H, Level 3, depth 0.80m to 1.20m, below highest point of mound.

I-2263. Ate Ogu, G(S) **410 ± 95** **A.D. 1540**

Cutting VIII G(S), Levels 13 and 14, depth 4.80m to 5.60m, below highest point of mound.

General Comment (T.S.): trial excavation in large mound said by local tradition to be construction made by one of early Kings of Idah suggested not only that this was so but that there might have been 2 periods of construction. Apparent inversion of dates is not regarded as significant (Stuiver and Suess, 1966). Both samples indicate mid-15th century date.

Daima Mound series, N Nigeria

Charcoal and animal bones from Daima Mound, Daima, Dikwa Emirate, (12° 12.5′ N Lat, 14° 27.5′ E Long), Bornu, N Nigeria (Connah, Archaeological work in Bornu 1964-1966 with particular reference to the excavations at Daima Mound, as mss., in preparation). Coll. 1966 by G. E. Connah; subm. 1966 by Thurstan Shaw.

I-2368. Daima 1 **1140 ± 90** **A.D. 810**

Charcoal, Cutting VIII, Spits 13 and 14, depth 2.40m to 2.80m.

I-2369. Daima 2 **970 ± 90** **A.D. 980**

Charcoal, Cutting VIII, Spits 15 and 16, depth 2.80m to 3.20m.

I-2370. Daima 3 **1470 ± 270** **A.D. 480**

Animal bones, Cutting VIII, Spits 31 and 32, depth 6.0m to 6.40m.

I-2371. Daima 4 **1500 ± 670** **A.D. 450**

Animal bones, Cutting VIII, Spits 33 and 34, depth 6.40m to 6.80m.

I-2372. Daima 5 **2400 ± 95** **450 B.C.**

Charcoal, Cutting VIII, Spits 47 and 48, depth 9.37m to 9.82m.

General Comment (T.S.): site of Daima is mound of stratified occupation material 10.63m high, late Stone Age material is in lowest levels, earliest iron is at 6.50m depth below surface, 8.0m below highest point of

mound. Results from I-2368 and I-2369 taken together seem to indicate that levels in Cutting VIII, depths 2.40m to 3.20m, represent period of 9th/10th centuries A.D. The apparent 'inversion' between these 2 samples is not regarded as important (Stuiver and Suess, 1966). Results from I-2370 and I-2371 taken together seem to indicate 5th century A.D. date for levels in Cutting VIII, depths 6.0m to 6.80m. Statistical error, due to mineralization of bone (I-2371), was so large that alone date would be meaningless, but in set of five block dates it contributes to consistent picture. Result from I-2372 depth 9.37m to 9.82m (not very bottom of mound), is consistent with late Stone Age industry of ground stone axes, bone points, and harpoons which are prolific below 7.60m depth below highest point of mound.

2630 ± 120
680 B.C.

I-2721. Benin City, UI-6623, Nigeria

Charcoal from Benin City, Clerk's Quarters site (6° 20′ N Lat, 5° 37′ E Long), Nigeria, Africa. From Cutting III, Layer 14, lowest level of palace sec. Coll. and subm. 1963 by G. E. Connah, University of Ibadan, Inst. of African Studies, Ibadan. *Comment* (G.E.C.): date in general agreement with other chronological evidence (Connah, 1965).

E. Australia, Japan, Iran

3240 ± 160
1290 B.C.

I-1506. Hokkaido #1, Japan

Charcoal from Pit House 30 at entrance to Tosanporo Bay, Nemuro (43° 15′ N Lat, 145° 35′ E Long), Hokkaido, Japan. Carbonized remains of timbers used in construction of dwelling. Roulette-stamped pottery found in site, considered Proto-Jomon. Coll. 1964 by Ichiro Yawata; subm. 1964 by C. S. Chard, Univ. of Wisconsin, Madison, Wisconsin. *Comment* (C.S.C): other types of Proto-Jomon pottery from Kojohama and Hokkaido (I-550, I-551) dated 7680 ± 200 and 7700 ± 200, considered consistent with general chronologic picture. Tosanporo is evidently mixed site with later dwelling dug into earlier occupation.

330 ± 105
A.D. 1620

I-3214. Khorramabad, Iran

Charcoal, charred twigs and charred seeds from 3 mi N of Khorramabad (on Harsin Rd.), left bank of ravine cutting through bahada rising toward E (33° 30′ N Lat, 48° 22′ E Long), Iran. From younger of 2 fills forming bahada, sample dispersed but there were traces of hearth. Coll. and subm. 1967 by C. Vita-Finzi. *Comment* (C.V-F.): date supports archaeol. evidence from other parts of Iran that main alluvial valley fill, which is Würm age, was first gullied, and then filled by alluvium during Middle Ages. Alluvial sequence duplicates that of Mediterranean basin (Vita-Finzi, The Mediterranean Valleys: Cambridge Univ. Press, in press).

Puntutjarpa Rockshelter series, W Australia

Charcoal from hearths at Puntutjarpa rockshelter, The Brown Range (26° 20′ S Lat, 126° 36′ E Long), W Australia. Coll. 1967 and subm. 1968 by R. A. Gould, Am. Mus. of Nat. History, New York.

I-3386. Puntutjarpa, 6″ **<185**

From large, elongated hearth 6-in. depth, on sandy slope in front of entrance to rockshelter. Shape and size of hearth are identical with present-day aboriginal kangaroo earth ovens. *Comment* (R.A.G.): date indicates recent, possibly ethnographic hearth (Gould, 1967).

I-3387. Puntutjarpa, 28″ to 30″ **6740 ± 120**
4790 B.C.

From large, thick hearth 28 to 30 in. depth, inside rockshelter. Assoc. with microlithic stone tools. *Comment* (R.A.G.): important transitional occupation-level, earliest date so far reported from Australia for Microlithic tools (Mulvaney, 1966).

I-3388. Puntutjarpa, 43″ **6590 ± 140**
4640 B.C.

From small hearth 43-in. depth, inside rockshelter. *Comment* (R.A.G.): dates same occupation as I-3387.

I-3389. Puntutjarpa, 60″ to 62″ **3810 ± 160**
1860 B.C.

From small hearth directly on talus outside entrance to rockshelter, 60 to 62 in. depth. Hearth lay in sandy soil, depth attributed to rapid wind-deposition of sand.

F. Central and South America

I-2485. Grande Anse, Lesser Antilles **+2300**
33,200
−1800
31,250 B.C.

Organic material from Grande Anse Test B, 3½ ft depth (14° 22″ N Lat, 60° 53′ 13″ W Long), NE coast of St. Lucia, Lesser Antilles. Coll. and subm. 1966 by R. P. Bullen, Florida State Mus., Univ. of Florida, Gainesville.

I-2486. Chancery Lane, Lesser Antilles **1570 ± 95**
A.D. 380

Charcoal from Chancery Lane (13° 3′ 30″ N Lat, 50° 29′ 30″ W Long), SE coast of Barbados, Lesser Antilles. From pit below Indian midden at 48-in. depth. Coll. and subm. 1966 by R. P. Bullen. *Comment* (R.P.B.): dates middle phase of early ceramic or Caribbean Saladoid complex, when classic white-on-red painting and fine hatching on inner lips and button-shaped adornos had nearly disappeared, and emphasis was on interior incised bowls, and heavy flanged vessels with boldly decorated necks (early post-Pearls).

1990 ± 110

I-2678. Caballito Blanco, Oaxaca, Mound 1-S **40 B.C.**

Charcoal on bedrock beneath adobe block structure, ca. 100m N of Pan American Hwy., 578 km (17° 31′ N Lat, 97° 06′ W Long), Oaxaca, Mexico. Assoc. with fragments of Monte Albán II-style brazier and pottery. Coll. 1959 by E. C. Rattray; subm. 1967 by J. Paddock, Univ. of the Americas, Mexico City. *Comment* (J.P.): date of related Monte Albán II material C-425, 273 B.C. and O-1300, 240 B.C.

1230 ± 100

I-2679. Lambityeco, Oaxaca, Mound 195 **A.D. 720**

Charcoal from pyramid 50m S of Pan American Hwy., 573.1 km (17° 31′ N Lat, 97″ 06′ W Long), Oaxaca, Mexico. From within body of pyramid covered by original adobe blocks and earth in alternating layers. Assoc. with centerline offering and ceramics which appear late Monte Albán IIIb or early IV. Coll. 1967 by E. R. Rabin; subm. 1967 by John Paddock. *Comment* (J.P.): pottery and *greca* decorative mosaics classify building as contemporary, with abandonment of Monte Albán (Paddock, 1966).

Lambityeco series, Oaxaca

Charcoal from inside pyramid 50m S, 573.2 km of Pan American Hwy., between Oaxaca and Tlacolula (16° 57′ N Lat, 96° 27′ W Long), Mexico. Coll. 1967 by P. Morrissey and subm. 1968 by J. Paddock (1966).

1220 ± 100

I-3257. Mound 195, No. 5059 **A.D. 730**

From undisturbed earth-gravel fill, enclosed by adobe walls of construction cell.

1250 ± 95

I-3258. Mound 195, No. 5330 **A.D. 700**

From center line of W face in upper body of pyramid.

General Comment (J.P.): assoc. ceramics from terminal Monte Albán III-b or early IV. Another sample from same pyramid, I-2679, dated A.D. 720.

1630 ± 100

I-3259. Yucuñudahui, No. 6305A, Oaxaca **A.D. 320**

Wood from Tomb I, ca. 10 km N of Pan American Hwy. at 435 km, between Yanhuitlan and Nochistlan (17° 29′ N Lat, 97° 17′ W Long), Mexico. From govt. guard at site, said to be original beam of tomb excavated by Alfonso Caso in 1937 (Caso, 1938). Coll. 1966 by R. M. Spores and subm. 1968 by John Paddock. *Comment* (J.P.): assoc. ceramics mark period when culture of Mixteca Alta is diverging from Monte Albán. Subm. sample was only very hard sec. or heartwood, not from exact center of tree. Fragment of beam from this tomb (C-426) was dated by solid carbon process as 1652 ± 185, A.D. 298.

Tehuacan series, Mexico

Samples from various sites in Tehuacan Valley, ca. 60 mi long and 15 mi wide, major city is Tehuacan (18° 30′ N Lat, 97° 30′ W Long), Puebla, Mexico. The following dates were determined for "Tehuacan Chronology Project" (dir. 1961 to 1964 by Frederick Johnson) subsidiary to "The Tehuacan Archaeol.-Bot. Inv. of the Devel. of Agriculture and Concomitant Rise of Civilization in Mesoamerica," dir. by R. S. MacNeish. Objective of dating project was to establish chronology of archaeologic sequences in Valley (Johnson, Frederick, 1968, Prehistory of the Tehuacan Valley, in press.) Samples were subm. 1961 to 1964 by Frederick Johnson, R. S. Peabody Found. for Archaeol., Andover, Massachusetts. Comments by Frederick Johnson.

I-457. Coxcatlan, Tc 50-5 **7000 ± 220**
5050 B.C.

Charcoal powder and probably organic material from Coxcatlan Cave, Zone K (XIII), Sq. S2 W4, S of Tehuacan. Coll. 1961 by R. S. MacNeish. *Comment*: this horizon includes earliest wild corn.

I-458. Coxcatlan, Tc 50-7 **7700 ± 250**
5750 B.C.

Charcoal from Coxcatlan Cave, Zone XVI, Sq. S2 W4, S of Tehuacan. Coll. 1961 by R. S. MacNeish. *Comment*: this layer contains earliest squash seeds.

I-459. Coxcatlan, Tc 50-3 **6325 ± 200**
4375 B.C.

Charcoal from Coxcatlan Cave, Zone XI, Sq. S2 W4, S of Tehuacan. Zone I at point between S2.7 and S2.9 and W4 to W4.20 horizontally. Coll. 1961 by R. S. MacNeish. *Comment*: averaged with M-1089, I-664 and I-567 (this list) to provide date 4121 ± 96 B.C. for Zone XI, component in Coxcatlan phase.

I-460. Coxcatlan, Tc 50-10 **7150 ± 200**
5200 B.C.

Charcoal from Coxcatlan Cave, Zone S (XXIV), Sq. S2 W4, 2.10m depth, S of Tehuacan. Coll. 1961 by Antoinette Nelken.

I-461. Coxcatlan, Tc 50-8 **8550 ± 250**
6600 B.C.

Charcoal from Coxcatlan Cave, Zone Q (XVIII), Sq. S2 W4, 1.87m depth, S of Tehuacan. Coll. 1961 by Antoinette Nelken. *Comment*: averaged with I-769 (this list) to provide date 6513 ± 186 B.C. for Zone XVIII, component in El Riego phase.

I-567. Coxcatlan, Tc 50-11 **6925 ± 200**
4975 B.C.

Charcoal from Coxcatlan Cave, Zone I (XI), Sq. W4, 83 cm depth, S of Tehuacan. Mainly charcoal ash floor. Coll. 1962 by R. S. MacNeish. *Comment*: same as for I-459.

8625 ± 220
6675 B.C.

I-571. Coxcatlan, Tc 50-16

Charcoal from Coxcatlan Cave, Zone T (XXV), Sq. N1 E3, Level 3, S of Tehuacan. Coll. 1962 by Frederick Johnson.

7800 ± 250
5850 B.C.

I-574. Coxcatlan, Tc 50-19

Charcoal from Coxcatlan Cave, Zone Q (XVI), Sq. W6, Floor 9, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: averaged with I-675 (this list) to provide date 5265 ± 195 B.C. for Zone XVI, component III El Riego phase.

5150 ± 220
3200 B.C.

I-593. Coxcatlan, Tc 50-33

Charcoal from Coxcatlan Cave, Zone VIII, Sq. S2 E10, Level 9, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: averaged with I-653 (this list) to provide date 3010 ± 140 B.C. for Zone VIII, component of Abejas phase.

4950 ± 200
3000 B.C.

I-594. Coxcatlan, Tc 50-34

Charcoal from Coxcatlan Cave, Zone IX, Sq. S2 E10, just below I-593, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: averaged with I-652, I-766 (this list) to provide date 3183 ± 112 B.C. for Zone IX, component of Abejas phase.

6700 ± 180
4750 B.C.

I-651. Coxcatlan, Tc 50-54

Charcoal from Coxcatlan Cave, Zone XV, Sq. S1 E12, Level 13, S of Tehuacan. Coll. 1962 by Melchor Silva. *Comment*: sample was divided and subm. as I-651 and I-668. Average of 2 provides date 4787 ± 134 B.C. for Zone XV, component of El Riego phase.

5200 ± 180
3250 B.C.

I-652. Coxcatlan, Tc 50-44

Charcoal from Coxcatlan Cave, Zone IX, Sq. S2 E11, Level 10, S of Tehuacan. Assoc. with primitive maize cob. Coll. 1962 by Robert Chadwick. *Comment*: same as for I-594.

4770 ± 175
2820 B.C.

I-653. Coxcatlan, Tc 50-65

Charcoal from Coxcatlan Cave, Zone VIII, Sq. S1 E15, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: same as for I-593.

5025 ± 180
3075 B.C.

I-654. Coxcatlan, Tc 50-46

Charcoal from Coxcatlan Cave, Zone J (X), Sq. S2 E11, Level 12, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: component in Abejas phase.

I-655. Coxcatlan, Tc 50-57 **7050 ± 190**
5100 B.C.

Charcoal from Coxcatlan Cave, Zone XVII, Sq. S2 E13, Level 15, S of Tehuacan. Coll. 1962 by R. S. MacNeish.

I-656. Coxcatlan, Tc 50-63 **1770 ± 100**
A.D. 180

Charcoal from Coxcatlan Cave, Zone VI, Sq. S1 E15, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: averaged with I-921 (this list) to provide date A.D. 93 ± 112 for Zone VI, component of Palo Blanco phase.

I-659. Coxcatlan, Tc 50-39 **1050 ± 100**
A.D. 900

Charcoal from Coxcatlan Cave, Zone III, Sq. S2 E11, Level 4, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: component in Venta Salada phase.

I-660. Coxcatlan, Tc 50-51 **7520 ± 250**
5570 B.C.

Charcoal from Coxcatlan Cave, Zone XXI, Sq. S1 E11, Level 18, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: component in El Riego phase.

I-661. Coxcatlan, Tc 50-50 **6500 ± 200**
4550 B.C.

Charcoal from Coxcatlan Cave, Zone XX, Sq. S1 E11, Level 17, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: component of El Riego phase.

I-662. Coxcatlan, Tc 50-101 **1050 ± 120**
A.D. 900

Charcoal from Coxcatlan Cave, Zone II, Sq. S2 E11, Level 2, Floor 27, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: sample was divided and subm. as I-662 and I-672. Average of 2 provides date A.D. 1100 ± 78 for Zone II, component of Venta Salada phase.

I-663. Coxcatlan, Tc 50-40 **1625 ± 150**
A.D. 325

Charcoal from Coxcatlan Cave, Zone IV, Sq. S2, E11, Level 5, S of Tehuacan. Coll. 1962 by M. L. Fowler. *Comment*: component of Palo Blanco phase.

I-664. Coxcatlan, Tc 50-26 **5475 ± 230**
3525 B.C.

Charcoal from Coxcatlan Cave, Zone K (XI), Sq. S2 E8, Level 11, Floor 14, S of Tehuacan. Coll. 1962 by Antoinette Nelken. *Comment*: same as for I-459.

I-668. Coxcatlan, Tc 50-103 **6775 ± 200**
4825 B.C.

Duplicate run on sample I-651.

1625 ± 120
I-671. Coxcatlan, Tc 50-102 **A.D. 325**

Charcoal from Coxcatlan Cave, Zone V, Sq. S2 E11, Level 6, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: sample was divided and subm. as I-671 and I-673, and averaged to date A.D. 187 ± 96 for Zone V, component in Palo Blanco phase.

650 ± 100
I-672. Coxcatlan, Tc 50-37 **A.D. 1300**

Duplicate run on sample I-662.

1900 ± 150
I-673. Coxcatlan, Tc 50-41 **A.D. 50**

Duplicate run on sample I-671.

775 ± 100
I-674. Coxcatlan, Tc 50-38 **A.D. 1175**

Charcoal from Coxcatlan Cave, Zone II, Sq. S2 E11, Level 3, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: component in Venta Salada phase.

7350 ± 300
I-675. Coxcatlan, Tc 50-36 **5400 B.C.**

Wood from Coxcatlan Cave, Zone XVI, Sq. S1 E10, Level 14, Floor 9, S of Tehuacan. Coll. 1962 by Robert Chadwick. *Comment*: same as for I-574.

8150 ± 340
I-676. Coxcatlan, Tc 50-9 **6200 B.C.**

Charcoal from Coxcatlan Cave, Zone XXIII, Sq. S2 W4, S of Tehuacan. Coll. 1962 by Antoinette Nelken.

7950 ± 250
I-763. Coxcatlan, Tc 50-25 **6000 B.C.**

Charcoal from Coxcatlan Cave, Zone IX, Sq. W7, Level 6, S of Tehuacan. Coll. 1962 by Frederick Johnson.

8425 ± 250
I-764. Coxcatlan, Tc 50-68 **6475 B.C.**

Charcoal from Coxcatlan Cave, Zone XXII, Sq. S1 E14, Level 20, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: component in E1 Riego phase.

5250 ± 200
I-766. Coxcatlan, Tc 50-34 **3300 B.C.**

Charcoal from Coxcatlan Cave, Zone IX, Sq. S2 E10, Level 10, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: same as for I-594.

8375 ± 275
I-769. Coxcatlan, Tc 50-29 **6425 B.C.**

Charcoal from Coxcatlan Cave, Zone Q (XVIII), Sq. S1 E8, Level 16, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: same as for I-461.

I-770. Coxcatlan, Tc 50-30 **4800 ± 200**
2850 B.C.

Charcoal from Coxcatlan Cave, Zone VII, Sq. N4 W5, Level 5, S of Tehuacan. Coll. 1962 by M. L. Fowler.

I-921. Coxcatlan, Tc 50-73 **1945 ± 200**
A.D. 5

Cloth from Coxcatlan Cave, Zone VI, Burial I, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: same as for I-656.

I-565. Purron, Tc 272-9 **3330 ± 170**
1380 B.C.

Charcoal from Purron Cave, Zone J, Sq. N1 (small pit), 1.10- to 1.15m depth, N1.70 to 1.90 and WO.30 to 0.45, S of Tehuacan. Assoc. with potsherds and mano. Coll. 1962 by A. Garcia Cook.

I-568. Purron, Tc 272-14b **2200 ± 150**
250 B.C.

Charcoal and burnt bone from Purron Cave, Zone H in center of E side of Sq. S4 E1, 0.90- to 0.99m depth, S-N 0.40 to 0.60 along wall E1 to ca. E0.45, S of Tehuacan. Assoc. with potsherds and obsidian blades. Coll. 1962 by Frederick Johnson. *Comment*: sample was divided and subm. as I-568 and I-575 (this list), and averaged to date 445 ± 101 B.C. for Zone H, a component of Santa Maria phase.

I-570. Purron, Tc 272-13 **3450 ± 175**
1500 B.C.

Charcoal from Purron Cave, Zone K1, Sq. N2, 1.22m depth, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: averaged with I-753, I-670 and I-666 (this list) to provide date 1531 ± 175 B.C. for Zone K1, component of Purron phase.

I-572. Purron, Tc 272-3a **4725 ± 190**
2775 B.C.

Rotted fragments of tree branch in Purron Cave, Zone L, Sq. N1 E2, Level 9, 1.85m depth, N1 to N1.25 and E1.30 to E1.40±, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: averaged with I-755 to provide date 2750 ± 136 B.C. for Zone L, component of Abejas phase.

I-575. Purron, Tc 272-14a **2590 ± 150**
640 B.C.

Duplicate run on I-568.

I-665. Purron, Tc 272-32 **2675 ± 180**
725 B.C.

Charcoal from Purron Cave, Zone T, Sq. S6 E1, Level 21, 4.75 to 4.80m depth, S of Tehuacan. Assoc. with fragments of manos and 2 metates. Coll. 1962 by A. Garcia Cook.

3375 ± 200
1425 B.C.

I-666. Purron, Tc 272-22

Charcoal from Purron Cave, Zone K1, Sq. S6 E1, Level 9, 1.42- to 1.47-m depth, S of Tehuacan. Coll. 1962 by A. Garcia Cook. *Comment*: same as for I-570.

3375 ± 170
1425 B.C.

I-670. Purron, Tc 272-23

Charcoal from Purron Cave, Zone K1, Sq. S6 E1, Level 10, 1.53- to 1.64-m depth, S of Tehuacan. Coll. 1962 by A. Garcia Cook. *Comment*: same as for I-570.

3725 ± 180
1775 B.C.

I-753. Purron, Tc 272-16

Charcoal and wood from Purron Cave, Zone K1, Sq. N2 E1, Level 10, S of Tehuacan. Coll. 1962 by A. Garcia Cook. *Comment*: same as for I-570.

5800 ± 220
3850 B.C.

I-754. Purron, Tc 272-1

Charcoal from Purron Cave, Zone Q1, Sq. S3 E1, Level 19, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: averaged with I-768 to date 3897 ± 197 B.C. for Zone Q1, component of Coxcatlan phase.

4675 ± 200
2725 B.C.

I-755. Purron, Tc 272-3b

Fragments of tree trunk from Purron Cave, Zone L, Sq. N1 E2, Level 9, 1.85m depth, S of Tehuacan. Coll. 1962 by Frederick Johnson. *Comment*: same as for I-572.

3850 ± 190
1900 B.C.

I-757. Purron, Tc 272-24

Charcoal from Purron Cave, Zone K, Sq. S7 E2, 1.70- to 1.80-m depth, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: averaged with I-762 (this list) to date 1925 ± 131 B.C. for Zone K, component of Purron phase.

4300 ± 200
2350 B.C.

I-760. Purron, Tc 272-21

Charcoal from Purron Cave, Zone J and lower part of Zone I, Sq. S6 E1 from exposed surface of trench, S of Tehuacan. Coll. 1962 by A. Garcia Cook.

6350 ± 230
4400 B.C.

I-761. Purron, Tc 272-19

Charcoal from Purron Cave, Zone Q, Sq. S1 E4, Burial 2, S of Tehuacan. Assoc. with human bones. Coll. 1962 by A. Garcia Cook.

I-762. Purron, Tc 272-25 **3900 ± 180**
1950 B.C.

Charcoal from Purron Cave, Zone K, Sq. S7 E2, 1.65m depth, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: same as for I-757.

I-768. Purron, Tc 272 **5895 ± 200**
3945 B.C.

Fragments of tree trunk, Zone Q1, Sq. S1 E4, Level 5, S of Tehuacan. Coll. 1962 by A. Garcia Cook. *Comment*: same as for I-754.

I-771. Purron, Tc 272-6 **3280 ± 500**
1330 B.C.

Wood fragments and small bits of vegetable material from Purron Cave, Zone G, Sq. N2 A1 S and SE portion, 0.71m depth, S of Tehuacan. Coll. 1962 by Frederick Johnson.

I-1390. Purron, Tc 272-33 **4130 ± 90**
2180 B.C.

Vegetable material (including chewed cud), Zone D, Sq. N6 E2, S of Tehuacan. Coll. 1964 by R. S. MacNeish, D. Johnson, F. Johnson, and Fred Gorman.

I-1391. Purron, Tc 272-34 **4760 ± 140**
2810 B.C.

Vegetable material (including chewed cud), Zone D, Sq. N6 E2, S of Tehuacan. Coll. 1964 by R. S. MacNeish, D. Johnson, F. Johnson, and Fred Gorman.

I-658. Abejas, Tc 307-3 **7925 ± 250**
5975 B.C.

Charcoal from Abejas Cave, Zone D2, Sq. S2 E3, 1.35m depth, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: averaged with I-765 (this list) to date 5850 ± 175 B.C. for Zone D, component of E1 Riego phase.

I-667. Abejas, Tc 307-10 **6600 ± 190**
4650 B.C.

Charcoal, ashes, and earth from Abejas Cave, Zone B1, Sq. S4 E3, 0.80m depth, S of Tehuacan. Coll. 1962 by Arturo Arvide.

I-669. Abejas, Tc 307-4 **6975 ± 190**
5025 B.C.

Charcoal from Abejas Cave, Zone B1, Sq. S2 E2, 0.67m depth, S of Tehuacan. Coll. 1962 by Arturo Arvide.

I-756. Abejas, Tc 307-6 **3260 ± 150**
1310 B.C.

Charcoal from Abejas Cave, Zone B, Sq. S3 E3, Level 2, S of Tehuacan. Coll. 1962 by Arturo Arvide.

7990 ± 300
6040 B.C.

I-758. Abejas, Tc 307-12

Charcoal from Abejas Cave, Zone G, Sq. S4 E3, Level 12, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: component in E1 Riego phase.

7990 ± 225
6040 B.C.

I-759. Abejas, Tc 307-2

Charcoal from Abejas Cave, Zone F, Sq. S1 E2, Level 7, S of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: component in E1 Riego phase.

7675 ± 250
5725 B.C.

I-765. Abejas, Tc 307-11

Charcoal from Abejas Cave, Zone D, Sq. S4 E3, Level 7, S of Tehuacan. Coll. 1962 by Arturo Arvide. *Comment*: same as for I-658.

7160 ± 275
5210 B.C.

I-772. Abejas, Tc 307-9

Charcoal from Abejas Cave, Zone B, Sq. N1 E1, Level 2, S of Tehuacan. Coll. 1962 by Arturo Arvide.

2975 ± 200
1025 B.C.

I-566. San Marcos, Tc 254-4b

Grass, fibers, and sticks from San Marcos Cave, Zone C, Sq. N1 E1, Floor 2, 10- to 20- cm depth, W of Tehuacan. From floor of cave, assoc. with medium small corncobs, 2 preceramic artifacts and a potsherd. Coll. 1962 by R. S. MacNeish. *Comment*: component of Ajalpan phase.

5250 ± 250
3300 B.C.

I-569. San Marcos, Tc 254-2

Palm leaves, fibers, and wood from San Marcos Cave, Zone D, Sq. N1 E1, Level 4, Floor 3, 35 cm depth, W of Tehuacan. Assoc. with small corncobs. Coll. 1962 by R. S. MacNeish. *Comment*: component of Abejas phase.

6100 ± 200
4150 B.C.

I-573. San Marcos, Tc 254-1

Chewed quid and sticks from San Marcos Cave, Zone E, Sq. N1 E1, Level 5, Floor 4, 50- to 61-cm depth, W of Tehuacan. Assoc. with small corncobs and 2 scraper planes. Coll. 1962 by A. Garcia Cook. *Comment*: component of Coxcatlan phase.

1650 ± 130
A.D. 300

I-657. San Marcos, Tc 254-5

Corn cobs and corn leaves from San Marcos Cave, Zone B, Sq. N1 E1, Floor 1, W of Tehuacan. Coll. 1962 by R. S. MacNeish. *Comment*: component of Palo Blanco phase.

I-595. Ajalpan, Ts 204-3 **2575 ± 160**
625 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone H, Sq. S5, Trench 55, 1.7m depth, S of Tehuacan. Coll. 1962 by F. A. Peterson.

I-752. Ajalpan, Ts 204-4 **3000 ± 350**
1050 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F1, Sq. E3, Trench 55, 1.45m depth, S of Tehuacan. From under pebble floor of Feature 1 of 55 trench. Coll. 1962 by F. A. Peterson. *Comment*: averaged with I-924 and I-927 (this list) to date 980 ± 157 B.C. for Zone F1, component of Ajalpan phase.

I-767. Ajalpan, Ts 204 C-2 **2850 ± 190**
900 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone above F1 probably above E, Sq. E at bottom of bell-shaped pit 1.75m depth, S of Tehuacan. From base on which skeleton was found, also assoc. with Olmec-like figure. Coll. 1962 by D. S. and D. H. Byers. *Comment*: pit is component of Ajalpan phase.

I-895. Ajalpan, Ts 204-30 **3525 ± 180**
1575 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone G1, Sq. E4, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-901 (this list) to provide date 1218 ± 108 for Zone G1, component of Ajalpan phase.

I-901. Ajalpan, Ts 204-32 **2810 ± 120**
860 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone G1, Sq. E6, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-895.

I-912. Ajalpan, Ts 204-34 **700 ± 200**
A.D. 1250

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone H, Sq. E4, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson.

I-920. Ajalpan, Ts 204-13 **2585 ± 140**
635 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F, Sq. E1, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson.

I-923. Ajalpan, Ts 204-24 **2865 ± 130**
915 B.C.

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F, Sq. E2, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-935 (this list) to date 972 ± 92 B.C. for Zone F, component of Ajalpan phase.

2750 ± 130
800 B.C.

I-924. Ajalpan, Ts 204-21

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F1, Sq. E2, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-752.

2600 ± 150
650 B.C.

I-926. Ajalpan, Ts 204-17

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone G, Sq. E5, S of Tehuacan. Coll. 1963 by Frederick and Dorothy Johnson.

3040 ± 300
1090 B.C.

I-927. Ajalpan, Ts 204-11

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F1, Sq. E1, S of Tehuacan. Coll. 1963 by Frederick and Dorothy Johnson. *Comment*: same as for I-752.

3220 ± 130
1270 B.C.

I-929. Ajalpan, Ts 204-27

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone H, Sq. E7, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Ajalpan phase.

3100 ± 140
1150 B.C.

I-934. Ajalpan, Ts 204-33

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone G, Sq. E9, S of Tehuacan. Coll. 1963 by Frederick and Dorothy Johnson. *Comment*: component of Ajalpan phase.

2980 ± 130
1030 B.C.

I-935. Ajalpan, Ts 204-28

Charcoal from Ajalpan, SE of present village of Ajalpan, Zone F, Sq. E4, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-923.

2475 ± 120
525 B.C.

I-894. Coatepec, Ts 368-3

Charcoal from Coatepec, Zone C1, S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-907 (this list) to date 608 ± 83 B.C. for Zone C1, component of Santa Maria phase.

2750 ± 150
800 B.C.

I-896. Coatepec, Ts 368-39

Charcoal from Coatepec, Zone I, Sq. S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Frederick and Dorothy Johnson. *Comment*: averaged with I-928, I-900, and I-909 (this date) to date 766 ± 68 B.C. for Zone I, component of Santa Maria phase.

2980 ± 190
1030 B.C.

I-897. Coatepec, Ts 368-25

Charcoal from Coatepec, Zone G, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Frederick and Dorothy Johnson.

I-898. Coatepec, Ts 368-9 **2750 ± 150**
800 B.C.

Charcoal from Coatepec, Zone D, Sq. N1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-905 (this list) to date 718 ± 112 B.C. for Zone D, component of Santa Maria phase.

I-900. Coatepec, Ts 368-26 **2725 ± 130**
775 B.C.

Charcoal from Coatepec, Zone I, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-896.

I-903. Coatepec, Ts 368-24 **2865 ± 130**
915 B.C.

Charcoal from Coatepec, Zone H, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-904 and I-925 (this list) to date 842 ± 75 B.C. for Zone H, component of Santa Maria phase.

I-904. Coatepec, Ts 368-28 **2925 ± 130**
975 B.C.

Charcoal from Coatepec, Zone H, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-903.

I-905. Coatepec, Ts 368-13a **2585 ± 130**
635 B.C.

Charcoal from Coatepec, Zone D, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-898.

I-906. Coatepec, Ts 368-15 **2865 ± 140**
915 B.C.

Charcoal from Coatepec, Zone E, S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-913 and I-922 (this list) to date 765 ± 77 B.C. for Zone E, component of Santa Maria phase.

I-907. Coatepec, Ts 368-11 **2640 ± 140**
690 B.C.

Charcoal from Coatepec, Zone C1, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-894.

I-908. Coatepec, Ts 368-32 **2640 ± 130**
690 B.C.

Charcoal from Coatepec, Zone K1, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-914 and I-916 (this list) to date 708 ± 71 B.C. for Zone K1, component of Ajalpan phase.

2640 ± 130
690 B.C.

I-909. Coatepec, Ts 368-31

Charcoal from Coatepec, Zone I, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-896.

2640 ± 130
690 B.C.

I-910. Coatepec, Ts 368-17

Charcoal from Coatepec, Zone F, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-919 (this list) to date 775 ± 92 B.C. for Zone F, component of Santa Maria phase.

2640 ± 130
690 B.C.

I-913. Coatepec, Ts 368-19

Charcoal from Coatepec, Zone E, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-906.

2695 ± 120
745 B.C.

I-914. Coatepec, Ts 368-38

Charcoal from Coatepec, Zone K1, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-908.

2695 ± 120
745 B.C.

I-915. Coatepec, Ts 368-37

Charcoal from Coatepec, Zone J, Sq. N1 and S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-931 (this list) to date 803 ± 89 B.C. for Zone J, component of Ajalpan phase.

2640 ± 120
690 B.C.

I-916. Coatepec, Ts 368-40

Charcoal from Coatepec, Zone K1, Sq. N1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-908.

1995 ± 100
45 B.C.

I-918. Coatepec, Ts 368-6

Charcoal from Coatepec, Zone B1, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Santa Maria phase.

2810 ± 130
860 B.C.

I-919. Coatepec, Ts 368-22

Charcoal from Coatepec, Zone F, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-910.

I-922. Coatepec, Ts 368-16 **2640 ± 130**
690 B.C.

Charcoal from Coatepec, Zone E, Sq. S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-906.

I-925. Coatepec, Ts 368-36 **2585 ± 130**
635 B.C.

Charcoal from Coatepec, Zone H, Sq. S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-903.

I-928. Coatepec, Ts 368-35 **2750 ± 130**
800 B.C.

Charcoal from Coatepec, Zone I, Sq. N1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-896.

I-930. Coatepec, Ts 368-10 **3100 ± 150**
1150 B.C.

Charcoal from Coatepec, Zone C, Sq. S2 E4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson.

I-931. Coatepec, Ts 368-34 **2810 ± 130**
860 B.C.

Charcoal from Coatepec, Zone J, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-915.

I-932. Coatepec, Ts 368-29 **3100 ± 150**
1150 B.C.

Charcoal from Coatepec, Zone G, Sq. S1, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson.

I-933. Coatepec, Ts 368-14 **2585 ± 130**
635 B.C.

Charcoal from Coatepec, Zone C2, Sq. S2 E5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Santa Maria phase.

I-893. Las Canoas, Ts 367-14 **2530 ± 120**
580 B.C.

Charcoal from Las Canoas, Zone D1, Sq. N2, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Santa Marie phase.

I-899. Las Canoas, Ts 367-15 **2865 ± 150**
915 B.C.

Charcoal from Las Canoas, Zone C, Sq. N4, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: averaged with I-902 (this list) to date 775 ± 106 B.C. for Zone C, component of Santa Maria phase.

2585 ± 150
635 B.C.

I-902. Las Canoas, Ts 367-7

Charcoal from Las Canoas, Zone C, Sq. N5, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: same as for I-899.

2585 ± 130
635 B.C.

I-911. Las Canoas, Ts 367-11

Charcoal from Las Canoas, Zone D2, Sq. N3, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Santa Maria phase.

2585 ± 130
635 B.C.

I-917. Las Canoas, Ts 367-9

Charcoal from Las Canoas, Zone D1, Sq. N3, SE of present village of Ajalpan, S of Tehuacan. Coll. 1963 by Dorothy and Frederick Johnson. *Comment*: component of Santa Maria phase.

Quiani series, Chile

Samples from Quiani (18° 31′ S Lat, 70° 20′ W Long), 3 km S of Arica, Chile. Coll. 1959 by Grete Mostny; subm. 1964 by J. B. Bird, Am. Mus. of Nat. Hist., New York, New York.

6170 ± 220
4220 B.C.

I-1348. Quiani 1

Charred fish and bird vertebrae, charcoal (shrubs or branches), ash, and fine particles charcoal. *Comment* (J.B.B.): sample from upper part of oldest occupational strata yielding artifacts of Shell Fishhook culture (Bird, 1966).

5630 ± 143
3680 B.C.

I-1349. Quiani 2

Charcoal and charred fishbone from midden deposit 30 cm above sample I-1348, samples separated by nearly sterile layer of sand and dirt. *Comment* (J.B.B.): cultural assoc. of sample is with 2nd preceramic fishing culture in area, when shellhooks were no longer used (Bird, 1966).

4720 ± 120
2770 B.C.

I-3125. Rio Grande of Nazca, V. 527 A, Peru

Wood and vegetal remains from inside house at mouth of Rio Grande of Nazca (15° 59′ S Lat, 75° 28′ W Long), S coast Peru. From Site 15B-VII-19. Coll. and subm. 1967 by Frederic Engel, Natl. Agrarian Univ., Lima, Peru. *Comment* (F.E.): beans were found in house, sample will help date early bean agriculture on S coast.

715 ± 95
A.D. 1235

I-3107. O. 7978, Village 854, Peru

Fabric from refuse pile outside group of houses in village 854, Chilca valley (12° 31′ 32″ S Lat, 76° 43′ 00″ W Long), central coast of Peru. From Site 12B-VII-854, Level 1, Cut II. Coll. and subm. 1967 by Frederic Engel.

"Tres Ventanas" series, Peru

Samples from "Tres Ventanas" in upper Chilca canyon (12° 13′ 14″ S Lat, 76° 22′ 23″ W Long), central coast Peru. Elev. 3950m. From Site 12B-VI-450.

I-3127. V. 2553, CI-200 **2070 ± 90 / 120 B.C.**

Ash sample from refuse in terrace outside Cave I, Level 200. Coll. and subm. 1967 by Frederic Engel.

I-3106. V. 2554, CI-1000 **8140 ± 130 / 6190 B.C.**

Vicuña skin, reed string, and plant remains from Level 1000, lowest occupational level in Cave I. Coll. and subm. 1967 by F. Engel and B. Ojeda. *Comment* (F.E.): part of circular hut remains standing at this level.

I-3108. V. 2563, CIIF1 **8030 ± 130 / 6080 B.C.**

Piece of reed mat found over funeral bundle containing child wrapped in fur coat from Cave II. Grave dug into level containing ground sloth bones. Coll and subm. 1967 by F. Engel and B. Ojeda.

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