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ISOTOPES' RADIOCARBON MEASUREMENTS VIII

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INTRODUCTION

This date list presents results of samples measured at ISOTOPES during 1968 and 1969 and several measurements made previously for which complete sample data has recently been received.

Samples were analyzed by the same methods as described in Radiocarbon 1968, v. 10, p. 246, with each sample being assayed twice in different counters and on different days. It is interesting to note the increasing application of the method to dating soil profiles. For these samples inorganic carbonate is first removed by hydrochloric acid digestion at 90°C for eight hours and, when required, possibility of contamination by migratory humic acids is eliminated by sodium hydroxide extraction as described by Perrin, Willis, and Hodge (1964). Bone samples were pretreated in a manner similar to that described by Berger, Horney, and Libby (1964) with modifications by Haynes (1967). Shell samples were abraded to remove physical signs of weathering and the residue treated with hydrochloric acid prior to evolution of the sample gas.

Errors associated with age determinations in this list are calculated by combining standard deviations calculated for total counts of standard, background, and actual sample. Counting time used for calculation of errors of 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 benefited from the technical support of Mr. J. Bonicos and Miss P. Kondratick. We would like to thank Mrs. J. Buckley for her assistance in compiling the data associated with this listing, and Mrs. M. Mandel for her careful attention to the manuscript preparation.

I. GEOLOGIC SAMPLES

Western United States

Kukak Bay, pollen profile series, Alaska

Samples from Kukak Bay (58° 19′ N Lat, 154° 10′ W Long), Alaska. Dated to provide evidence of climatic sequence in vicinity of archaeol. excavations. Coll. and subm. by D. E. Dumond, Univ. of Oregon, Eugene, Oregon. Pollen analysis by C. J. Heusser, Am. Geog. Soc., New York, N.Y.

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7670 ± 350

I-1627. Kukak Bay, 1.9 m (A) **5720 B.C.**

Peat from bog, 1.9 m deep. Coll. 1964; subm. 1965. *Comment* (D.E.D.): adjacent to distinctive volcanic ash horizon, appears too old for depth of bog, interpreted as Hypsithermal.

9100 ± 220

I-1628. Kukak Bay, 3.1 m **7150 B.C.**

Peat from bog, 3.1 m deep, 35 cm above base of column, from peat containing substantial proportion of birch pollen. Coll. 1964; subm. 1965.

4360 ± 115

I-3113. Kukak Bay, 1.9 m (B) **2410 B.C.**

Peat from same vicinity and depth as I-1627. Coll. and subm. 1967. *Comment* (D.E.D.): in accord with geol. and palynologic evidence, and consistent with I-1628.

Blue Creek series, California

Wood (*Abies concolor*) from 9.2 mi SE of Klamath (41° 27′ 00″ N Lat, 123° 53′ 40″ W Long), NE ¼ of NW ¼, Sec. 12, T. 12N, R. 2E, California. From 12 ft below terrace (Helley and La Morchi, 1968). Coll. 1966 and subm. 1969 by E. J. Helley, U. S. Geol. Survey, Menlo Park, California.

260 ± 90

I-4151. Blue Creek IA **A.D. 1690**

Sample is 113 annual rings from tree bark. *Comment*: terrace deposit is probably result of floods of 1862.

280 ± 90

I-4152. Blue Creek IB **A.D. 1670**

Sample from same position as I-4151.

Niwot Ridge series, Colorado

Soil samples from Niwot Ridge, Boulder Co., Colorado. Coll. 1968 and subm. 1969 by J. B. Benedict, Inst. of Arctic and Alpine Research, Boulder, Colorado.

1140 ± 90

I-4044. Niwot Ridge, No. 1 **A.D. 810**

Buried soil A horizon (40° 03′ 23″ N Lat, 105° 35′ 28″ W Long). From 3.4 ft behind stone banked terrace (Benedict, 1966).

2340 ± 130

I-4045. Niwot Ridge, No. 2 **390 B.C.**

Buried soil A horizon (humates extracted) (40° 03′ 35″ N Lat, 105° 36′ 35″ W Long). From 14.6 ft behind small turf banked lobe.

General Comment: dates indicate beginning of A-horizon development on slope after disappearance of perennial Temple Lake snowbank, gives minimum age for turf banked lobe. Rate of movement since late Temple

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Lake time is 1.9 mm/yr, which is slower than present measured rates. Additional data in series reported in Radiocarbon, 1968, v. 10, p. 249.

I-4191. Mechanicsville Bog, Iowa **>39,900**

Peaty silt from Mechanicsville Bog, 2.5 mi NE of Mechanicsville (41° 56′ 23″ N Lat, 91° 13′ 13″ W Long), Iowa. From bottom of 4 ft thick peat zone, below 10 ft of alluvium and colluvium. Coll. and subm. 1968 by L. D. Drake, Univ. Iowa, Iowa City, Iowa. *Comment*: augering indicates a buried bog of several sq. mi overlying Iowan outwash and till. Spruce pollen dominates spore content of dated peat.

9940 ± 160

I-3880. Agassiz Mosbeck site, Minnesota **7990 B.C.**

Driftwood from Agassiz Mosbeck site ¼ mi E of St. Hilaire (48° 01′ N Lat, 96° 19′ W Long), Pennington Co., Minnesota. Sample horizon overlies 2 ft peat and silt, overlain by 4 ft Lake Agassiz silt and sand. Coll. and subm. 1968 by L. Clayton, Univ. of North Dakota, Grand Forks, North Dakota. *Comment* (L.C.): site between Campbell and McCauleyville beaches of glacial Lake Agassiz. Driftwood deposited during rising stage of Phase III, overlying silt deposited during Phase III when Lake Agassiz rose to Campbell beach for last time.

Rice Lake series, Minnesota

Samples from sediment cores in Rice Lake (46° 55′ 16″ N Lat, 95° 34′ 30″ W Long), Becker Co., Minnesota. Coll. and subm. 1968 by J. H. McAndrews, Royal Ontario Mus., Toronto, Canada.

2450 ± 100

I-3928. Rice Lake—1 **500 B.C.**

Marly gyttja at base of *Gramineae* pollen rise.

590 ± 95

I-3927. Rice Lake—2 **A.D. 1360**

Detritus gyttja at base of *Ambrosia* pollen rise. *Comment*: *Ambrosia* pollen rise resulted from land settlement ca. 75 yr ago. Date indicates presence of older contaminant in sediment.

Trolinger Bog series, Missouri

Samples from Trolinger Bog, Avery, Benton Co. (38° 04′ N Lat, 93° 20′ W Long), Missouri. Coll. 1968 by P. J. Mehringer and C. V. Haynes; subm. by W. R. Wood, Univ. of Missouri, Columbia, Missouri. Chemical pretreatment by Dept. Geochron., Univ. of Arizona. Comments by C.V.H.

20,500 ± 450

I-3535. 4A **18,550 B.C.**

Peat residue of Unit e. *Comment*: date indicates that strata in this sec. of spring bog has been disturbed.

17,250 ± 600

I-3536. 4B **15,300 B.C.**

Humates extracted from peat of Unit e.

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25,650 ± 700

I-3537. 4A-1 **23,700 B.C.**

Vegetable debris from Unit b. *Comment*: date consistent with I-3599 and applies to extinct fauna.

+ 1900

I-3599. 1A **32,200**

− 1600

30,250 B.C.

Peat residue from lowermost Unit d_2.

16,580 ± 220

I-3922. Boney Spring, Missouri **14,630 B.C.**

Wood (*Picea sp.*) from Boney Spring (38° 06′ N Lat, 93° 22′ W Long), Benton Co., Missouri. Assoc. with *Mammut americanum* in excavated bone bed ca. 4 m deep (Mehringer *et al.*, 1968). Coll. and subm. 1968 by P. J. Mehringer, Univ. of Arizona, Tucson, Arizona. *Comment*: sample contained 10 annual rings of log with ca. 70 rings.

Dixie Valley, Nevada

Two samples of algal tufa (microcrystalline calcite) from E front of Stillwater Range, Dixie Valley (39° 54′ 20″ N Lat, 117° 59′ 45″ W Long), Nevada. Occur as botryoidal rind on Pleistocene lake shore gravel, ca. 25 ft below highest features of this type and ca. 5 ft below highest lake stand. Elev. 3520 ft. Coll. and subm. 1967 by G. A. Thompson and D. B. Burke, Stanford Univ., Stanford, California. *Comment*: dates last high rise of Dixie Lake which has well-developed shoreline features, not discernible for earlier lake stands.

11,560 ± 180

I-3269. 67-5A **9610 B.C.**

11,700 ± 180

I-3270. 67-5B **9750 B.C.**

Tularosa River series, New Mexico

Samples of Tularosa R. alluvium from Otero Co., New Mexico. Coll. and subm. 1968 by A. L. Metcalf, Univ. of Texas, El Paso, Texas.

2930 ± 105

I-3782. No. 1 **980 B.C.**

Peat-like material exposed along U. S. Hwy. 70 (33° 07′ 00″ N Lat, 106° 55′ 50″ W Long), SW ¼, NE ¼, Sec. 12, T. 14 S, R. 10 E. Similar material consistently occurs 3 to 5 ft below top of exposures.

6650 ± 130

I-3783. No. 2 **4700 B.C.**

Charcoal found 200 ft downstream from U. S. Hwy. 70 bridge (33° 08′ 42″ N Lat, 106° 53′ 50″ W Long), SE ¼, NW ¼, Sec. 32, T. 13 S, R. 11 E. From 20 ft below top of exposure.

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9360 ± 150

I-3784. Rincón Valley, New Mexico **7410 B.C.**

Charcoal from 1.5 mi WSW of general store, Garfield (32° 45′ 10″ N Lat, 107° 17′ 15″ W Long), Doña Ana Co., New Mexico. From bluff, W edge Rio Grande floodplain, elev. ca. 4100 ft. Geol. sec.: max 11 ft Fillmore fan alluvium with basal disconformity; 11 to 19 ft Leasburg alluvium of clay and sandy clay with scattered carbonate nodules. Sample from layer of scattered charcoal fragments at 16 ft; 20 ft modern Rio Grande floodplain (Hawley and Kottlowski, 1965; Hawley, 1965). Coll. and subm. 1968 by J. W. Hawley and A. L. Metcalf.

Southern Oregon Continental Slope series

Marine sediment from S Oregon continental slope taken with piston core. Coll. 1967 and subm. 1969 by J. J. Spigai, Oregon State Univ., Corvallis, Oregon.

23,900 ± 650

I-4048. Piston Core 6706-2 **21,950 B.C.**

Olive gray silt from 300 to 350 cm depth in 400 cm core, in small topographic bench (42° 09′ 36″ N Lat, 124° 56′ 12″ W Long). Water depth 1060 m. Sedimentation rate approx. 13.6 cm/1000 yr.

34,300 ± 3500

I-4049. Piston Core 6706-3 **32,350 B.C.**

Olive gray clay from 325 to 375 cm depth in 375 cm core, in topographic bench (42° 14′ 30″ N Lat, 124° 47′ 56″ W Long). Water depth 544 m. Sedimentation rate approx. 10.2 cm/1000 yr.

6340 ± 140

I-4146. Piston Core 6711-2 **4390 B.C.**

Foraminifera (rich silt) from 110 to 125 cm depth in 425 cm core, in axis of small submarine valley (42° 07′ 18″ N Lat, 124° 58′ 42″ W Long). Water depth 1363 m. Sedimentation rate approx. 18.4 cm/1000 yr. *Laboratory Comment*: all samples pretreated with HCl before combustion.

I-4068. Benton County, Oregon **>39,900**

Wood (*Quercus garryana*) Benton Co. (44° 40′ N Lat, 123° 11′ W Long), Sec. 28, T. 10S, R. 4W, Oregon. From 13.5 ft below surface in local alluvium, assoc. with Luckiamute geomorphic surface and cut into Dolph geomorphic surface. Proboscidian tusk at 11.5 ft (Balster and Parsons, 1968). Coll. and subm. 1968 by R. B. Parsons, Oregon State Univ., Corvallis, Oregon.

5960 ± 110

I-4069. Winkle, Lane County, Oregon **4010 B.C.**

Wood (*Acer macrophyllum*) from Lane Co. (44° 10′ N Lat, 123° 04′ W Long), Oregon. From 72 in. under Coburg soil profile in gleyed clay, assoc. with Winkle geomorphic surface (Balster and Parsons, 1968). Coll. 1967 by R. Herriman, K. Horn, and R. Parsons; subm. 1969 by R. Par-

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sons. *Comment* (R.P.): date substantiated by other evidence from Indian hearth beneath sediments of Winkle age; correlates with eruption of Mt. Mazama, whose pumice is commonly found in sediments assoc. with Winkle surface.

I-4148. Southern Oregon Continental Shelf 6708—42 **22,100 ± 500 / 20,150 B.C.**

Mollusk shell from S Oregon continental shelf (42° 41′ 54″ N Lat, 124° 37′ 18″ W Long). From 434 to 454 cm depth in piston core, water depth 148 m. Coll. 1967 by D. Chambers and J. J. Spigai; subm. 1969 by R. C. Roush, Oregon State Univ., Corvallis, Oregon. *Comment* (R.C.R.): date indicates shell layer formed at shallower depth during last part of Wisconsin sea-level regression.

I-4145. Rogue Submarine Canyon 6708—37, Oregon Coast **29,950 ± 2250 / 28,000 B.C.**

Silty clay from axis of Rogue Submarine Canyon (42° 30′ 24″ N Lat, 124° 50′ 18″ W Long), S Oregon continental slope. Depth 769 m, from 250 to 280 cm interval in 580 cm piston core. Coll. 1967 and subm. 1969 by J. J. Spigai. *Comment*: date indicates small sediment accumulation.

I-4147. Central Oregon Continental Shelf 6809—6 **660 ± 95 / A.D. 1290**

Shell (*Pecten,* epifauna) from outer continental shelf (45° 00′ 06″ N Lat, 124° 14′ 36″ W Long), off Central Oregon. From 12 cm depth in box core, 146 m water depth. Coll. 1968 by R. C. Roush; subm. 1969 by J. J. Spigai.

Little St. Germain Lake series, Wisconsin

Gyttja from S Bay and E Bay, Little St. Germain Lake, Vilas Co., Wisconsin. Coll. 1967 by D. S. Charlton; subm. 1968 by R. F. Black, Univ. of Wisconsin, Madison, Wisconsin.

I-3651. L 73-10, South Bay **10,880 ± 160 / 8930 B.C.**

From 33 ft 2 in. to 33 ft 7 in. depth in core (45° 54′ 12″ N Lat, 89° 27′ 6″ W Long).

I-3652. L 73-29, South Bay **4530 ± 120 / 2580 B.C.**

From 25 ft 6 in. to 25 ft 11 in. depth in core (45° 54′ 12″ N Lat, 89° 27′ 6″ W Long).

I-3780. L 72-6, East Bay **12,900 ± 300 / 10,950 B.C.**

From 38 ft 11 in. to 39 ft 4 in. depth in core (45° 55′ 26″ N Lat, 89° 27′ 31″ W Long).

Willow Spring series, Wyoming

Samples from walls of deflation hollows near Willow Spring archeol. site, S Albany Co. (41° 06′ N Lat, 103° 37′ W Long), SE Wyoming. Coll.

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1968 by B. V. Hanson; subm. 1968 by B. Mears, Univ. of Wyoming, Laramie, Wyoming.

I-4004. Willow Spring, T-2, T-3 **640 ± 95** **A.D. 1310**

Root (*Pinus Ponderosa*) from paleosol separated by 30 to 52 in. fine sand from Permo-Pennsylvanian bedrock. *Comment* (B.V.H.): present vegetation prairie with small scattered Ponderosa pines. Ancient climate cooler and more moist.

I-4005. Willow Spring, T-1 **8790 ± 140** **6840 B.C.**

Fresh-water pelecypods and gastropods (*Pisidium, Fossaria, Gryaulus, Helisoma, Promenetus, Stagnicola, Charychium, Discus,* and *Econulus*) in marl, separated by 7 ft sand from Permo-Pennsylvanian bedrock. Strata yielded no artifacts.

Eastern United States

I-4072. Deer Island, Florida (114) **2820 ± 100** **870 B.C.**

Disarticulated valves of oyster (*Crassostrea virginica*) from partially buried, raised oyster bank on Deer I., Levy Co. (29° 14′ 18″ N Lat, 83° 04′ 48″ W Long), Florida. From 31 to 34 in. depth in raised bank, parallel with and behind beach on W side of island (Vernon, 1951). Coll. 1968; subm. 1969 by R. S. Grinnell, State Univ. of New York, Binghamton, N. Y.

Glovers Pond series, NW New Jersey

Core samples from Glovers Pond, ¼ mi SW of Johnsonburg (40° 56′ 30″ N Lat, 74° 53′ 30″ W Long), Warren Co., NW New Jersey. Coll. 1966 and 1968 by J. M. Erickson, F. D. Holland, Jr., and J. A. Anderson; subm. 1968 and 1969 by J. M. Erickson and F. D. Holland, Jr., Univ. of North Dakota, Grand Forks, North Dakota.

I-3893. C—LK—le, d **4170 ± 110** **2220 B.C.**

Gyttja from center N end Glovers Pond, base of upper gyttja (Unit VIII), water depth 8.5 m.

I-3980. C—IV—3b **8690 ± 140** **6740 B.C.**

Reed and sedge peat from SW bog 450 ft from edge of Glovers Pond, base of peat (Unit F), 3.0 m from surface.

I-3979. C—I—2e, g **10,310 ± 160** **8360 B.C.**

Reed and sedge peat from NE bog 100 ft from edge of Glovers Pond, base of peat (Unit F), 4.2 m from surface.

I-3978. C—LK—il **10,430 ± 160** **8480 B.C.**

Gyttja from center N end Glovers Pond, top of lowest gyttja (Unit V) above organic-rich silt.

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14,720 ± 260

I-4162. C—LK—ln **12,770 B.C.**

Organic-rich silt from center N end Glovers Pond, base of lowest organic-rich silt (Unit IV) above oliogotrophic lake clay. *Comment* (J.M.E.): date indicates that deglaciation of this region began > 15,000 yr ago. Continuation of series reported in Radiocarbon, 1969, v. 11, p. 61-62.

10,950 ± 150

I-4016. Middletown, New York **9000 B.C.**

Rib bone of *Cervalces scotti* (moose-elk) from 7.8 mi SSW of Middletown (41° 20′ N Lat, 74° 27′ 30″ W Long), Orange Co., New York. At lower peat-marl interface, 4.5 to 5 ft deep. Coll. 1968 by D. W. Fisher and E. M. Reilly; subm. 1969 by D. W. F., New York State Mus. and Sci. Service, Albany, New York. *Comment*: 1st *Cervalces* found in New York and 2nd most complete skeleton.

Leap Peat Bog site series, Pennsylvania

Wood samples from Leap Peat Bog (41° 02′ 50″ N Lat, 75° 06′ 37″ W Long), Monroe Co., Pennsylvania. Site located 2.9 mi N of junction of Marshalls Creek with Delaware R., and 4.5 mi NE of E Stroudsburg. Assoc. with Marshalls Creek Mastodon, 5 ft 7½ in. deep. Coll. and subm. 1968 by D. Hoff, Wm. Penn Memorial Mus., Harrisburg, Pennsylvania. *Comment*: skeleton disarticulated; remains apparently rafted into position.

12,160 ± 180

I-3929. Leap Peat Bog—1 **10,210 B.C.**

12,020 ± 180

I-3930. Leap Peat Bog—2 **10,070 B.C.**

11,230 ± 170

I-3647. Charlotte 1, Vermont **9280 B.C.**

Pelecypod shells from sand/gravel beach 1.7 mi S of Charlotte (44° 17′ N Lat, 73° 15′ W Long), Vermont. From pit, 10 ft depth. Coll. and subm. 1968 by W. P. Wagner, Univ. of Vermont, Burlington, Vermont. *Comment* (W.P.W.): dates phase of Champlain Sea (Karrow, 1961).

8570 ± 160

I-4074. Williston Bog, Vermont **6620 B.C.**

Peat from 1.5 mi S of Williston, along Allen Brook (44° 25′ N Lat, 73° 30′ W Long), Vermont. From bottom 2 in. of 50 ft sec. Bog occurs in depression of hummocky dead ice terrain. Coll. 1969 by W. P. Wagner and R. Switzer; subm. 1969 by W. P. Wagner. *Comment* (W.P.W.): date gives minimum estimate of dead ice terrain.

9280 ± 150

I-4075. Gillett Pond, Vermont **7330 B.C.**

Peat from Gillett Pond, 3.8 mi SE of Richmond (44° 21′ N Lat, 72° 58′ W Long), Vermont. From bottom 2 in. of 20 ft core measured from

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water surface. Coll. 1969 by W. P. Wagner and R. Fillon; subm. 1969 by W. P. Wagner. *Comment* (W.P.W.): date is minimum for outlet channel.

Canada

Aspy Basin series, Canada

Samples from Aspy Basin coll. and subm. 1966 by W. A. Newman, Syracuse Univ., Syracuse, New York.

3090 ± 95

I-2437. Aspy Basin 1 **1140 B.C.**

Twigs and branches from peat, N Aspy R. bank (46° 52′ 04″ N Lat, 60° 34′ 48″ W Long), Cape Breton I., Canada. From lower 2 in. of 4 in. peat layer at base of terrace at 12 ft.

20,300 ± 400

I-2438. Aspy Basin 2 **18,350 B.C.**

Organic debris embedded in clay 1320 ft downstream from Upper S Aspy Bridge (46° 52′ 27″ N Lat, 60° 30′ 00″ W Long), Cape Breton I., Canada. From fluvioglacial deposit.

Home Bay series

Samples relating to glacial chronology and postglacial uplift in fiords entering Home Bay, E Baffin I., NW Territories. Coll. 1966 and 1967 by members or associates of Geog. Branch, Dept. of Energy, Mines and Resources, Ottawa, Ontario, Canada.

8300 ± 135

I-2611. Tingin Fiord **6350 B.C.**

Marine shells from + 62m (68° 57′ N Lat, 69° 07′ W Long), deposit extended from 43 to 72 m. Coll. and subm. 1966 by J. T. Andrews, Univ. of Colorado, Inst. of Arctic and Alpine Research, Boulder, Colorado. *Comment* (J.T.A.): dated to estimate rate of silt deposition and thus date onset of deposition at 43 m.

7560 ± 140

I-3063. Fox Charlie Bay **5610 B.C.**

Fragmented shells (*Mya truncata, Hiatella arctica*) from remnant of silt terrace (68° 44′ N Lat, 68° 39′ W Long), at + 48 m, proximal side of Ekalugad readvance moraine. Coll. 1967 by J. H. England; subm. 1967 by J. T. Andrews.

7460 ± 130

I-3065. Home Bay **5510 B.C.**

Shells (*Mya truncata, Hiatella arctica*) *in situ,* from clay immediately below surface of shallow delta terrace (68° 43′ N Lat, 67° 50′ W Long), at + 18 m. Coll. 1967 by J. H. England; subm. 1967 by J. T. Andrews. *Comment* (J.T.A.): minimum date for deglaciation.

6190 ± 120

I-3064. Bonny Bay **4240 B.C.**

Shells (*Mya truncata*) from distal slope of youngest readvance moraine at head of Bonny Bay (68° 53′ N Lat, 69° 02′ W Long), at

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+ 30 m. Shells overridden, and clay matrix contained considerable morainic debris. Coll. 1967 by J. H. England; subm. 1967 by J. T. Andrews.

I-2583. Tingin Fiord, E Baffin Island **6130 ± 120 4180 B.C.**

Marine shells from + 16 m (68° 57′ N Lat, 69° 03′ W Long), sparsely distributed in well-defined foreset beds traced to delta surface at 24 m (Andrews, 1967; 1968). Coll. and subm. 1966 by J. T. Andrews. *Comment* (J.T.A.): date provides reliable estimate for sea level at 24 m.

I-2412. "Venturi Bay" **5900 ± 130 3950 B.C.**

Shells (*Macoma calcarea,* Gmelin) (*Mya truncata,* Linné) from + 32.8 m (68° 42′ N Lat, 69° 21′ W Long), in oxidized sand 5 cm width (Andrews, 1967). Coll. and subm. 1966 by J. T. Buckley. *Comment* (J.T.B.): date is minimum for ice retreat to head of Ekalugad Fiord.

I-3062. "Ekalugad Fiord" **5840 ± 150 3890 B.C.**

Shells (*Mya truncata, Hiatella arctica*) *in situ,* with periostracum still attached, from foreset beds at + 33 m (68° 52′ N Lat, 69° 25′ W Long), surface of deposit at + 40 m. Coll. 1967 by M. Church; subm. 1967 by J. T. Andrews. *Comment* (J.T.A.): dates 3 moraine loops closely assoc. with initiation of terrace at 43 m.

I-2548. "Pitchforth Fiord" **5580 ± 130 3630 B.C.**

Marine shells from + 6.4 to + 18 m (68° 58′ N Lat, 68° 34′ W Long), at base of stream-cut sec. in delta with top at ca. 18 m (Andrews, 1967). Coll. and subm. 1966 by J. T. Andrews. *Comment* (J.T.A.): date compares in alt. and time with I-2549 (5100 ± 120) from Kangok Fiord (this series).

I-2411. Inner Kangok Fiord **5380 ± 185 3430 B.C.**

Shells (*Mya truncata,* Linné) from delta in bay on S side of head of N arm of Kangok Fiord (68° 36′ N Lat, 68° 50′ W Long), at + 30.6 m. In black clay 3 m below main delta surface (Andrews, 1967). Coll. and subm. 1966 by J. T. Buckley. *Comment* (J.T.B.): indicates age of ice retreat from head of Kangok Fiord; delta surface is crossed by large moraine.

I-2422. Ekalugad Fiord, E.B.I. **4990 ± 175 3040 B.C.**

Shells (*Nucula tenis,* Montagu), (*Mya truncata,* Linné), (*Mya pseudoarenaria,* Schlesch), (*Hiatella arctica,* Linné), (*Macoma calcarea,* Gmelin), (*Clinocardium ciliatum,* Fabricius) *in situ* from anaerobic silt at river surface (68° 52′ N Lat, 69° 25′ W Long), 9.17 m elev., 8 m depth, overlain by foreset terrace sediments (Andrews, 1967). Coll. and subm.

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1966 by M. Church. *Comment* (J.T.A.): date probably a reliable estimate of marine limit and contrasts with I-2412 (5900 ± 130) (this series) for a moraine farther down the fiord.

4850 ± 120

I-3066. South Arm, Ekalugad Fiord **2900 B.C.**

Shells (*Hiatella arctica, Mya truncata*), *in situ* from silt matrix (68° 48′ N Lat, 69° 24′ W Long), at + 11.5 m. Coll. 1967 by J. H. England; subm. 1967 by J. T. Andrews.

5100 ± 120

I-2549. "Corrie Bay", Kangok **3150 B.C.**

Shells (*Clinocardium ciliatum,* Fabricius), (*Mya truncata,* Linné), at + 11.5 to 15 m (68° 32′ N Lat, 68° 08′ W Long), from foreset beds of delta (Andrews, 1967; 1968). Coll. and subm. 1966 by J. T. Andrews.

4590 ± 115

I-2582. North Kangok Fiord **2640 B.C.**

Marine shells from sand in gullied river cliff (68° 36′ N Lat, 68° 55′ W Long), at + 9.85 m (Andrews, 1967). Coll. and subm. 1966 by J. T. Buckley.

4430 ± 110

I-2584. Ekalugad Fiord, Home Bay **2480 B.C.**

Marine shells paired *in situ* from sandy foreset beds (68° 52′ N Lat, 69° 27′ W Long), at + 19 m (Andrews, 1967). Coll. and subm. 1966 by M. Church.

4420 ± 110

I-2413. "Bonny Bay" **2470 B.C.**

Shells (*Mytilus edulis,* Linné) *in situ* from clay resembling deltaic material but in form resembling beaches (68° 53′ N Lat, 69° 01′ W Long), 2 m below gravel/sand surface (Andrews, 1967). Coll. and subm. 1966 by J. T. Buckley. *Comment* (J.T.B.): moraine marks stage in glacial retreat down "Bonny Bay" of main Ekalugad ice. Date is minimum for time by which "Bonny Bay" was ice-free and invaded by sea.

4050 ± 130

I-2546. "South Ekalugad River" **2100 B.C.**

Shells (*Macoma calcarea,* Gmelin), (*Mya truncata,* Linné), (*Clinocardium ciliatum,* Fabricius) from surface of terrace of black clay at base of mt. (68° 43′ N Lat, 69° 10′ W Long), 14.6 m elev. (Andrews, 1967). Coll. and subm. 1966 by J. T. Buckley. *Comment* (J.T.B.): date compares with that of shells at 40 m at mouth of river, and should indicate time of ice retreat from valley.

3890 ± 105

I-2586. "Loozie Bay" **1940 B.C.**

Marine shells (*Astarte borealis,* Schumacher), (*Astarte montagui,* Hancock), (*Mytilus edulis,* Linné) from beds of silty sand dipping seaward (68° 47′ N Lat, 68° 37′ W Long), alt 3 m (Andrews, 1967). Coll. and subm. 1966 by J. T. Andrews.

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3850 ± 105

I-2585. Kangok Fiord, Bay 2 **1900 B.C.**

Marine shells from distinct sandy stratum and bed traced to surface at 5 m (68° 32′ N Lat, 68° 01′ W Long), alt 2 m (Andrews, 1967; 1968). Coll. and subm. 1966 by J. T. Andrews. *Comment* (J.T.A.): date will be used to construct uplift curve for outer Kangok Fiord.

Baffin Island Miscellaneous series

+ 1700

I-3200. Broughton Island **32,200**

− 1400

30,250 B.C.

Marine shells (*Mya truncata, Hiatella arctica*) from excavated exposure at + 17 m (67° 34′ N Lat, 64° 00′ W Long), Baffin I. In coarse sand considered to represent littoral facies. Coll. and subm. 1967 by J. T. Andrews. *Comment* (J.T.A.): date unexpectedly old. Interpretations: (1) Shells were *in situ* and represent interstadial/interglacial deposits. (2) Sample had been dredged from former marine deposits during a readvance. Former hypothesis considered more likely.

1360 ± 105

I-2414. Dewar Lakes **A.D. 590**

Peat from 305 m elev., 1.5 m depth (68° 45′ N Lat, 71° 20′ W Long), 3.8 km N of Dewar Lakes, (Fox-3) central Baffin I. From base of peat, sand, and silt sec. in enclosed depression within morainic loop (Andrews, 1967). Coll. and subm. 1966 by D. M. Barnett. *Comment* (D.M.B.): only date from central part of island at this lat, gives minimum date for deglaciation of this locality.

6270 ± 210

I-2410. Butterfly Lake **4320 B.C.**

Marine shells (*Portlandia arctica, Hiatella arctica, Mya truncata, Clinocardium ciliatum*) from + 75.4 m (69° 21′ N Lat, 75° 49′ W Long), W coast Baffin I. In sand delta at 84.3 m. Coll. and subm. 1965 by C. A. M. King and J. T. Buckley.*Comment* (C.A.M.K.): local marine limit to N at 94 m. Highest shell sample from this area. Date related presumably to ice front close by, which supplied sediments of delta.

7940 ± 130

I-1932. Inner Clyde Inlet **5990 B.C.**

Marine shells (*Clinocardium ciliatum,* Fabricius, *Mya truncata,* Linné) id. by Dr. F. J. E. Wagner, from clay (69° 52′ N Lat, 70° 28′ W Long), 50.5 m elev., E Baffin I. Coll. and subm. 1965 by D. M. Barnett. *Comment* (D.M.B.): sample dates moraine phase and transgression to marine limit of 61 m. Date compares with I-1673 and I-1602 (Radiocarbon, 1966, v. 8, p. 184) from head of Inugsuin Fiord (Andrews, 1967).

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I-2581. Sam Ford Fiord **$36{,}250^{+3600}_{-2500}$ B.C.**

Marine shells (*Hiatella arctica,* Linné) from 72.7 m elev., 1 mi from coast near mouth of Sam Ford Fiord (70° 59′ N Lat, 70° 37′ W Long), above left bank of river draining "Remote Lake", E Baffin I. From sandy delta probably ice cored, lying between 2 large moraines. Coll. and subm. 1966 by J. T. Buckley. *Comment* (J.T.B.): date significant in dating retreat of ice in Sam Ford Fiord after Wisconsin maximum. Date is maximum for oldest moraines visible on outer coast.

Isabella Bay, Itirbilung series

I-3211. Isabella Bay, a **8760 ± 140 B.C.** (6810 B.C.)

Marine mollusks (*Mya truncata, Astarte striata, Macoma calcarea*) from silty sand in front face of delta (69° 28′ N Lat, 68° 52′ W Long), at + 11.58 m. Surface of delta at 25 m elev. Coll. and subm. 1967 by C. A. M. King. *Comment* (C.A.M.K.): shells found as whole bivalves, probably *in situ.*

I-3133. Isabella Bay, b **8530 ± 140 B.C.** (6580 B.C.)

Fragments of marine mollusks from deltaic sand (69° 28′ N Lat, 68° 52′ W Long), Henry Kater Peninsula, alt. 21.37 m. Coll. and subm. 1967 by C. A. M. King.

I-3134. Isabella Bay, c **8160 ± 135 B.C.** (6210 B.C.)

Marine mollusks (whole bivalves and *Mytilus edulis*) *in situ,* from delta surface in silty sand (69° 28′ N Lat, 68° 52′ W Long), Henry Kater Peninsula, 18.62 m elev. Coll. and subm. 1967 by C. A. M. King.

I-3136. Itirbilung Fjord, b **8670 ± 140 B.C.** (6720 B.C.)

Marine mollusks (large *Mya truncata* in whole pairs) from sand underlying crest of outermost moraine (69° 18′ N Lat, 68° 10′ W Long), Henry Kater Peninsula. Coll. and subm. 1967 by C. A. M. King.

I-3213. Itirbilung Fjord, c **7970 ± 140 B.C.** (6020 B.C.)

Marine mollusks (*Mya truncata, Macoma calcarea, Astarte striata, Hiatella arctica,* and *Serrapes groenlandicum*) from delta surface to 10 cm depth in sand (69° 18′ N Lat, 68° 10′ W Long), N side Itirbilung Fjord. From + 21.02 m, whole paired bivalves, probably *in situ.* Coll. and subm. 1967 by C. A. M. King.

I-3135. Itirbilung Fjord, d **7160 ± 140 B.C.** (5210 B.C.)

Marine mollusks (*Astarte striata, Clinocardium cliatum, Mytilus edulis*) paired valves *in situ,* from sand, covering range of 10 cm (69° 18′

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N Lat, 68° 10′ W Long), Henry Kater Peninsula. In delta. Coll. and subm. 1967 by C. A. M. King.

Hudson Bay, Hudson Strait series

6590 ± 125

I-2415. Fox Valley, Hudson Bay 1 **4640 B.C.**

Shells (*Mya truncata* Linné, *Hiatella arctica* Linné, *Macoma calcarea* Gmelin, *Mytilus edulis* Linné) from + 94 m, depth, 4 m, Gilmour I. (59° 50′ N Lat, 80° 00′ W Long) Ottawa I. From foreset beds 4 m below terrace surface. Coll. and subm. 1966 by J. T. Andrews and G. Falconer.

6580 ± 125

I-2416. Wide Strand Bay **4630 B.C.**

Shells (*Mya truncata* Linné), *in situ*, from + 39 m, Gilmour I. (59° 50′ N Lat, 80° 00′ W Long), Ottawa Is. From foreset beds which were traced to intersection with 50 m terrace. Coll. and subm. 1966 by J. T. Andrews and G. Falconer. *Comment* (J.T.A.): date suggests that (1) shells were redeposited from higher level and (2) beds were truncated by progressively falling sea level (Andrews, 1967; 1968).

4960 ± 130

I-2547. Gilmour Island **3010 B.C.**

Marine shells (and vegetation) (*Mya truncata* Linné, *Hiatella arctica* Linné, *Macoma calcarea* Gmelin, *Balanus balanus* Linné, *Macoma* sp. cf. *Macoma balthica* Linné) from + 48 to + 55 m (59° 50′ N Lat, 80° 00′ W Long), Ottawa Is. From foreset sand beds, relative sea level at 55 m. Coll. and subm. 1966 by J. T. Andrews and G. Falconer.

3530 ± 110

I-2417. Gilmour Island, Ottawa Islands **1580 B.C.**

Shells (*Mya truncata* Linné) *in situ*, paired, some with siphons attached, from 10 m elev. (59° 50′ N Lat, 80° 00′ W Long), Site 9. From foreset beds traced to surface at ca. 21 m. Coll. and subm. 1966 by J. T. Andrews and G. Falconer. *Comment* (J.T.A.): dates prominent and semi-continuous delta. Suggests average fall of relative sea level approx. 0.6 m per century. Estimate is minimum for rate of uplift (Andrews, 1967; 1968).

1150 ± 100

I-2418. Fox Valley, Hudson Bay 2 **A.D. 800**

Shells, *in situ*, from steeply dipping foreset beds of beach near present sea level (59° 50′ N Lat, 80° 00′ W Long), + 2 m, Gilmour I., Ottawa Is. Coll. and subm. 1966 by J. T. Andrews and G. Falconer. *Comment* (J.T.A.): date refers to relative sea level ca. 4 to 5 m and implies rebound of ca. 0.45 m per century (Andrews, 1967; 1968).

6950 ± 130

I-2443. The Points **5000 B.C.**

Shells (*Hiatella arctica* Linné, *Mya truncata* Linné) from + 127 m, depth 5 cm (63° 33′ N Lat, 85° 00′ W Long), Southampton I. From

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marine sands. Coll. and subm. 1966 by J. B. Bird. *Comment* (J.B.B.): minimum age for formation of The Points (a fluvioglacial ridge) and for deglaciation (Andrews, 1967).

6610 ± 125

I-2432. Duke of York Bay **4660 B.C.**

Shells (*Mya truncata* Linné, *Hiatella arctica* Linné, *Balanus balanus* Linné) from mud circles of marine silt, + 112 m (65° 13′ N Lat, 85° 32′ W Long), Southampton I. Coll. and subm. 1966 by J. B. Bird. *Comment* (J.B.B.): minimum date for disappearance of ice from Southampton I. lowlands (Andrews, 1967).

6580 ± 125

I-2444. Cape Weggs **4630 B.C.**

Shells (*Hiatella arctica* Linné, *Mya truncata* Linné) from beach ridge, sandy matrix, + 44 m (62° 50′ N Lat, 72° 54′ W Long), Labrador/Ungava. Coll. and subm. 1966 by R. J. Rogerson. *Comment* (R.J.R.): date fits uplift curve for N Ungava.

Portage Inlet series, Canada

Peat and organic matter from N shore Portage Inlet (inlet directly connected to Strait of Juan de Fuca), S of Trans-Canada Hwy. (48° 27′ 50″ N Lat, 123° 25′ 20″ W Long), SE Vancouver I., Canada. Coll. 1968 by H. D. Foster and P. W. Marshall; subm. 1968 by H. D. Foster, Univ. of Victoria, Victoria, British Columbia.

5470 ± 115

I-3673. 5.60 ft **3520 B.C.**

Peat from top of peat horizon 5.60 ft deep, 3.01 ft below mean sea level. Underlying 4 ft shelly, gray marine clay. *Comment* (H.D.F.): date is maximum for beginning of marine transgression (Porter and Denton, 1967; Godwin, Suggate, and Willis, 1958).

6670 ± 120

I-3674. 6.40 ft **4720 B.C.**

Peat from immediately above ½ to ¾ in. thick volcanic ash band preserved within peat horizon, 6.40 ft deep, 4.01 ft below mean sea level. Peat horizon overlain and underlain by marine clay. *Comment* (H.D.F.): indicates time of an eruption of Mt. Mazama (Fryxell, 1965).

9250 ± 140

I-3676. 8.75 ft **7300 B.C.**

Peat from base of peat horizon overlying weathered Victoria Clay, 8.75 ft deep, 6.36 ft below mean sea level. Horizon overlain by 4 ft shelly marine clay. *Comment* (H.D.F.): date indicates time when relative sea level fell (Hansen, 1950).

11,700 ± 170

I-3675. 12.40 ft **9750 B.C.**

Organic matter from weathered Victoria Clay, 12.4 ft deep, 10 ft below mean sea level. Victoria Clays underlying 3 ft of peat, peat over-

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lain by 4 ft shelly marine clay. *Comment* (H.D.F.): indicates that Victoria Clays, elsewhere exposed above sea level, predate this period (Armstrong *et al.,* 1965).

6890 ± 110

I-3671. Duck Pond Bog, New Brunswick **4940 B.C.**

Peat from Duck Pond Bog, Campobello I., Charlotte Co. (44° 51′ N Lat, 66° 57′ W Long), New Brunswick, Canada. From bottom of bog, overlying blue-gray clay, ca. 14 ft depth. Coll. and subm. 1968 by J. A. Teeri, Univ. of New Hampshire, Durham, New Hampshire. *Comment* (J.A.T.): date agrees with inferred fluctuations of postglacial sea level and crustal rebound.

2730 ± 100

I-3672. Hinton, Alberta **780 B.C.**

Charcoal from Bm horizon, 7 ft depth in Jasper National Park (53° 11′ N Lat, 117° 57′ W Long), Hinton, Alberta, Canada. Soil profile developed in loess from Athabasca R. floodplain. Coll. 1967 by J. Dumanski; subm. 1968 by S. Pawluk, Univ. of Alberta, Edmonton, Alberta, Canada. *Comment* (S.P.): dated to determine whether profile was a paleosol.

Europe

Blelham Bog series, England

Organic lake mud from Blelham Bog, Windermere (54° 24′ N Lat, 02° 58′ W Long) N Lancashire, England. From near base of sediments of small filled kettle hole lake. Coll. and subm. 1968 by W. Tutin, Univ. of Leicester, England.

12,500 ± 190

I-3589. No. 1 **10,550 B.C.**

From 434 to 438 cm depth. *Comment* (W.T.): dates 1st evidence of rise in temperature by expansion of juniper into late-glacial vegetation.

12,650 ± 170

I-3590. No. 2 **10,700 B.C.**

From 430 to 434 cm depth.

12,460 ± 190

I-3591. No. 3 **10,510 B.C.**

From 426 to 430 cm depth.

12,000 ± 200

I-3592. No. 4 **10,050 B.C.**

From 422 to 426 cm depth.

12,050 ± 180

I-3593. No. 5 **10,100 B.C.**

From 415 to 420 cm depth.

11,430 ± 170

I-3594. No. 6 **9480 B.C.**

From 408 to 413 cm depth.

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11,450 ± 180

I-3595. No. 7 **9500 B.C.**

From 400 to 401 cm depth.

13,450 ± 220

I-3596. No. 8 **11,500 B.C.**

From 438 to 443 cm depth. *Comment* (W.T.): immediately overlies Cambridge Q-758 dated 12,380 B.C. ± 230, date correlates well.

10,650 ± 170

I-3597. No. 9 **8700 B.C.**

From 384 to 389 cm depth.

10,490 ± 160

I-3598. No. 10 **8540 B.C.**

From 379 to 384 cm depth.

General Comment (W.T.): series covers Late-Weichselian profile at site. Plot of dates indicates profile can be divided into 3 periods of accumulation rate and is suitable for preparation of an absolute pollen diagram. Comparison with other dates in NW Europe suggest dates from Blelham Bog are consistently 300 to 500 yr too old (Godwin 1960, Van der Hammen *et al.*, 1967). Possible C^{14} deficiency in district lake sediments is being investigated.

6120 ± 250

I-3538. Pegwell Bay, Kent, England **4170 B.C.**

Organic silt from cliff exposure Pegwell Bay, near Ramsgate (51° 19′ 44″ N Lat, 01° 22′ 44″ E Long), Kent, England. Sample horizon overlies thick loess, overlain by colluvial deposit containing Neolithic or Bronze Age flint flakes. From 8 to 15 cm below top of organic horizon, 1.3 m deep (Kerney, 1965). Coll. and subm. 1968 by J. A. Catt, Rothamsted Experimental Sta., Harpenden Herts, England.

1125 ± 100

I-3744. Broadbalk, Plot 3, England **A.D. 825**

Soil from Broadbalk field, Rothamsted Experimental Farm (51° 48′ N Lat, 0° 23′ W Long), Harpenden Herts, England. From Plot 3, 0 to 9 in. depth. Coll. 1944 by R. G. Warren and subm. 1968 by D. S. Jenkinson, Rothamsted Experimental Sta. *Comment* (D.S.J.): sample from continuous wheat growing experiment to study entry of bomb-derived C^{14}.

7320 ± 120

I-3713. 8B Bridgewater Bay, Somerset **5370 B.C.**

Peat from top of gravel bed at Highbridge (51° 15′ N Lat, 2° 59′ W Long), Somerset, England. From boring 45 ft 2 in. to 45 ft 6 in. depth, ca. 37 ft below British Ordnance Datum. Sample represents early part of Pollen Zone 7a. Coll. 1968 by C. Kidson; subm. 1968 by A. Heyworth, Univ. College of Wales, Aberystwyth, Cards., U.K.

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10,200 ± 300

I-3966. 1—Koivusilta Bog, Finland **8250 B.C.**

Gyttja from Koivusilta Bog (61° 38′ N Lat, 29° 42′ E Long), Saari Co., SE Finland. From 4 cm thick layer, 4.39 m below bog surface. Coll. and subm. 1968 by Reino Repo and Risto Tynni, Geol. Survey, Univ. of Finland, Otaniemi, Finland. *Comment* (R.R.): gyttja layer represents pollen of Younger Dryas period. Silt directly above represents pollen transition to Preboreal period.

10,100 ± 400

I-3967. 2—Bog Pond, Finland **8150 B.C.**

Silt containing *Bryales* peat from Bog Pond (61° 29′ N Lat, 29° 46′ E Long), Puumala Co., SE Finland. From depth 3.96 to 4.00 m. Coll. and subm. 1968 by R. Repo and R. Tynni. *Comment* (R.R.): pollen analysis shows sample to represent transition between Younger Dryas and Preboreal periods.

Apulian-Ionian Ridge series, Mediterranean

Organic carbon from box core on top of Apulian-Ionian Ridge (39° 32′ N Lat, 18° 56′ E Long), NE Ionian Sea, Mediterranean. Water depth 860 m. Coll. 1968 and subm. 1969 by R. Hesse and U. von Rad, Inst. f. Geol., Techn. Hochschule, Munchen, W. Germany.

4530 ± 140

I-4168. Kastenlot OT 25 A **2580 B.C.**

Sample from 0 to 10 cm.

9640 ± 150

I-4169. Kastenlot OT 25 L **7690 B.C.**

Sample from base of core, 170 to 185 cm. *Comment* (U.v.R.): fine varve-like laminae, 0.2 mm thick, between 160 and 170 cm, could be annual layers deposited during warm Atlanticum period (Van Straaten, 1966; Ninkovich and Heezen, 1965; Hesse, von Rad, and Fabricius, Sediments from the Strait of Otranto between the Adriatic and Ionian Seas: Marine Geol., (ms. in preparation).

14,820 ± 210

I-3649. Western Mediterranean Sea **12,870 B.C.**

Wood, 3.59 cm below sea bottom in 12 cm diam. core (35° 43′ N Lat, 4° 20′ W Long), aboard *Maria Paolina G.* (oceanographic vessel), W Mediterranean Sea. Coll. 1968 by Saclant ASW Research Center; subm. 1968 by Carlo Bartolini, Inst. Di Geol., Firenze, Italy. *Comment* (C.B.): date being correlated with oxygen isotopes and current nannoplankton studies.

Africa and Near East

Chad Republic series, Africa

Carbonate nodules from Republic of Chad, Africa. Coll. and subm. 1968 by G. Bocquier, Services Scientifiques Centraux, Bondy, France. *Comment*: carbonate accumulation probably occurred during 3rd lacustrine transgression in Chad basin.

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8570 ± 210

I-4056. KK 4 **6620 B.C.**

Feldspar cemented with calcite from peidmont of Guera bordering Chad basin (12° 07′ N Lat, 18° 37′ E Long). Alt. 415 m. From depth 120 cm in lithomorphic vertisol containing montmorillonite (Bocquier, 1968).

8665 ± 240

I-4057. MK 62 **6715 B.C.**

Quartz cemented with calcite from edge of Logone flooded area (10° 24′ N Lat, 16° 21′ E Long). Alt: 330 m. From depth 110 cm in solodized solonetz. At depth 6.1 m, soil becomes hydromorphic vertisol.

2710 ± 160

I-4110. KF 8 **760 B.C.**

Quartz cemented with calcite from piedmont of Guera, bordering Chad basin (11° 54′ N Lat, 18° 29′ E Long). Alt: 480 m. From depth 90 cm in solonetzic soil.

27,200 ± 1000

I-2061. Wadi Or, Egyptian Nubia **25,250 B.C.**

Marl from lower part of upper member Korosko Formation, Wadi Or (22° 17′ N Lat, 31° 37′ E Long), Egypt. Coll. 1963 by C. L. Hansen and K. W. Butzer; subm. 1965 by K. W. Butzer, Univ. of Wisconsin, Madison, Wisconsin.

18,300 ± 300

I-2060. New Korosko, Upper Egypt 1 **16,350 B.C.**

Clayey marl from upper part Masmas Formation at New Korosko, Kom Ombo Plain (24° 32′ N Lat, 33° 04′ E Long), Egypt. Coll. 1962 by K. W. Butzer and C. L. Hansen; subm. 1965 by K. W. Butzer. *Comment* (K.W.B.): limestone absent in Wadi Shait and Nile Basin upstream. Dated carbonate derived from sub-Saharan Nile drainage, providing ample time for equilibrium with atmospheric CO_2 (Butzer and Hansen, 1968).

I-2063. Northwest Wadi, Egypt **>39,900**

Marl of fluvial origin from NW Wadi, Kurkur Oasis (23° 54′ N Lat, 32° 19′ E Long), Egypt. Coll. 1963 and subm. 1965 by K. W. Butzer.

I-2064. North Well, Egypt **>39,900**

Marl of subaqueous origin from North Well, Kurkur Oasis (23° 54′ N Lat, 32° 19′ E Long), Egypt. Coll. 1963 and subm. 1965 by K. W. Butzer.

17,100 ± 400

I-2178. New Shaturma, Upper Egypt **15,150 B.C.**

Marly sandy silt, subfacies of Masmas Formation, from Pit BH, New Shaturma, Kom Ombo Plain (24° 32′ N Lat, 33° 04′ E Long), Egypt. Coll. 1962 by C. L. Hansen and K. W. Butzer; subm. 1965 by K. W.

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Butzer. *Comment* (K.W.B.): marl contains *Planorbis, Bulinus,* and *Valvata* shells, contamination by younger carbonate from overlying Ineiba Formation possible.

17,400 ± 300

I-2179. New Korosko, Upper Egypt 2 **15,450 B.C.**

Silty marl from Malki Member of Ombo Plain (24° 32′ N Lat, 33° 04′ E Long), Egypt. From Pit 36, Bed E. Coll. 1962 by C. L. Hansen and K. W. Butzer; subm. 1965 by K. W. Butzer.

860 ± 115

I-2561. Wadi Qena, Upper Egypt **A.D. 1090**

Charcoal from hearth zone 4 km NE of Qena Town, Wadi Qena (26° 09′ N Lat, 32° 46′ E Long), Egypt. Coll. 1963 by V. Burton and K. W. Butzer; subm. 1966 by K. W. Butzer. *Comment* (K.W.B.): sample contemporary with post-Byzantine alluviation.

4660 ± 100

I-2567. Wadi Kharit, Egypt **2710 B.C.**

Bark *Acacia* from 11 km E New Arminna, Kom Ombo Plain (24° 28′ N Lat, 33° 10′ E Long), Egypt. Coll. 1962 by C. L. Hansen and K. W. Butzer; subm. 1966 by K. W. Butzer. *Comment* (K.W.B.): believed contemporary with sunken hearth of late prehistoric settlement in Wadi Kharit, may provide date for Member I of Shaturma Formation.

11,560 ± 180

I-3706. El Kilk el Gebel, Loc. A, Egypt **9610 B.C.**

Shell (*Unio*) from 2 km W of village of El Kilk el Gebel, near Idfu (24° 59′ N Lat, 32° 50′ E Long), W bank Nile R., Egypt. From 5 cm deep silt cap on 3 m rise fluvial sand. Coll. 1967 by J. Phillips; subm. 1968 by F. Wendorf, Southern Methodist Univ., Dallas, Texas. *Comment* (F.W.): site occurred during Birbet interval, between Sahaba and Arkin depositions. Date fits well with dates from Nubia: Site 330, top of Sahaba, 10,300 B.C. ± 200 (WSU-109) and Site DIW-1, bottom of Arkin, 7440 B.C. ± 180 (WSU-175) (de Heinzelin, 1968; Wendorf, 1965).

I-3864. Algal Stromatolite, West Africa Coast **>39,900**

Algal stromatolite, W of Guinea (09° 14′ 30″ N Lat, 15° 37′ 00″ W Long), W Africa. Well-rounded ball from dredge haul, depth 98 to 104 m. Coll. and subm. 1966 by R. L. McMaster, Narragansett Marine Lab., Univ. of Rhode Island, Kingston, Rhode Island.

Asia

2740 ± 100

I-3781. Khorramabad, Iran **790 B.C.**

Soil and charcoal from 4½ km N of Khorramabad, S bank of ravine crossed by Harsin Rd. (33° 31′ 30″ N Lat, 48° 20′ E Long), Iran. From contact between Tehran and Khorramabad formations, former yielded Baradostian implement at this exposure. Coll. 1967 and subm. 1968 by Claudio Vita-Finzi, Univ. College, London. *Comment* (C.V.F.): date sup-

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ports proposed correlation between Tehran alluvium and older alluvial fill of Mediterranean valleys.

14,980 ± 460

I-4193. Lake Biwa-ko Boring, Japan **13,030 B.C.**

Sediment from center of Lake Biwa-ko (35° 15′ N Lat, 136° 05′ E Long), Japan. From 12 m depth in 70 m water depth (I-2742, I-2844, Radiocarbon, 1969, v. 11, p. 71). Coll. 1967 and subm. 1969 by S. Horie, Kyoto Univ., Otsu Shiga-Ken, Japan.

I-3667. Sui Sim Tin Mine No. 3, W Malaysia **>39,000**

Wood from log in tin-bearing alluvium, Sui Sim Tin Mine No. 3 Grid. Ref. 942 785, Ser. L707, Sheet 2 N/5 (4° 38′ N Lat, 5° 7′ E Long), Kampong Bercham, Perak, W Malaysia. From 20 ft depth, ca. 2 ft above limestone bedrock. Coll. 1968 by S. P. Sivam; subm. 1968 by N. S. Haile, Univ. of Malaya, Kuala Lumpur, Malaysia. *Comment* (S.P.S.): date indicates alluvium is probably Pleistocene age and fluvial conditions were predominant during this time.

Kampong Pinosuk series, Malaysia

Wood from Kampong Pinosuk near Ranaw (5° 58′ 36″ N Lat, 116° 36′ 48″ E Long), Sabah, Malaysia. Coll. 1968 and 1969 by G. Jacobson, Geol. Survey of Malaysia; subm. 1968 and 1969 by Esso Exploration Malaysia, Inc.

I-4046. 100 ft **>39,900**

From 100 ft above base of 300 ft thick tilloid deposit.

I-4047. 90 ft **>39,900**

From 90 ft above base.

I-4207. 200 ft **>39,900**

From 200 ft above base.

General Comment (Esso): dates indicate that main part of tilloids formerly thought to be of solifluction origin, probably related to Pleistocene glaciation (Jacobson, G., Geol. of the Mount Kinabalu area: Geol. Survey Malaysia, Rept. 8, ms. in preparation).

Mangalum Island series, Sabah Malaysia

Wood and peat from NE tip Mangalum Is., 31 mi WNW of Kota Kinabalu (6° 12′ 30″ N Lat, 115° 36′ 13″ E Long), Sabah Malaysia. Coll. 1968 by N. S. Haile and N. Wong; subm. 1968 by P. H. Monaghan, Esso Prod. Research Co., Houston, Texas.

260 ± 95

I-3611. No. 1 **A.D. 1690**

Wood from 1 ft layer peaty gray clay, 3 to 6 ft depth.

I-3612. No. 2 **<185**

Peat from 1 ft layer peaty gray clay, 3 to 6 ft depth.

General Comment (P.H.M.): dates confirm palaeontologic determination given by British Mus., United Kingdom.

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920 ± 95

I-3668. South China Sea **A.D. 1030**

$C^{13}/C^{12} = -31.8$

Peat from E of Singapore (104° 38′ 12″ E Lat, 01° 25′ 18″ N Long), on board *USC* and *GS Oceanographer*, S China Sea. From core of Holocene gray mud, distinct layer 3 cm thick, 42 cm from top. Coll. and subm. 1968 by N. S. Haile, Univ. of Malaya, Kuala Lumpur, Malaysia.

Bahamas and South America

Cat Island series, Bahama Islands

A study of glacial-eustatic and storm sea-level changes of Holocene topography in stable Bahama Banks region where tidal range is 0.9 m. Coll. 1966 and subm. 1967 by A. O. Lind, U. S. Army Terrestrial Sci. Center, Hanover, New Hampshire.

3250 ± 90

I-2724. Greenwood Barrier-Dune Tract A-180.2 **1300 B.C.**

Carbonate sand (coral-algal fragments with foraminifera tests and other unident. fragments) from Atlantic coast of Cat I. (24° 11′ N Lat, 75° 18′ W Long), Bahamas. Dune Tract A is massive fossil coastal dune behind oldest Holocene beach-ridge terrace. From exposure of semi-lithified eolianite, 2 m below dune crest, 11 m above mean-low-tide level. *Comment* (A.O.L.): dunes are related to major fall in relative sea level at middle of 2nd millennium B.C. Combined with I-2922 (this series) rate of vertical accretion is ca. 2 m per 150 yr (Lind, 1968).

1600 ± 80

I-2725. South Bird Point—Terrace B-28 **A.D. 350**

Sample material same as I-2724 from Atlantic coast of Cat I. (24° 32′ N Lat, 75° 34′ W Long), Bahamas. Intermediate beach-ridge terrace. From 30 to 40 cm below ridge crest, ca. 4 m above mean low water. A 10 cm A-1 horizon overlies sample horizon. *Comment* (A.O.L.): Terrace B ridges were deposited after erosion truncated Terrace A topography, and during stand of relative sea level 1 m higher than present. Similar, more recent series of events is associated with Terrace C.

2450 ± 110

I-2726. South Bird Point—Terrace A-76 **500 B.C.**

Sample and location same as I-2725. From youngest beach-ridge of Terrace A at 30 to 40 cm below ridge crest, 6 m above mean low water. *Comment* (A.O.L.): Terrace A deposits formed when relative sea level was ca. 2 m higher than present.

I-2839. Alligator Point. Terrace B Fossil Beach-5 **910 ± 145** **A.D. 1040**

Pelecypod valves (*Trigonocardia medium* Linné) from Exuma Sound coast of Cat I. (24° 32′ N Lat, 75° 39′ W Long), Bahamas. From lithified surface representing foreshore deposit, presently 2.5 m above mean low water. *Comment* (A.O.L.): shelly foreshore deposit good marker for estimating former high relative sea level.

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I-2922. Greenwood Barrier Dune Tract A-180.4 **3400 ± 110**
1450 B.C.

Material and location same as I-2724, 4 m below crest of Terrace A, ca. 9 m above mean low water.

I-2923. South Bird Point—Terrace A-278 **3030 ± 110**
1080 B.C.

Material and location same as I-2725. From upper level of oldest beach ridge of Terrace A, 30 to 40 cm below ridge crest, 5 m above mean low water.

I-2924. Anguilla Barrier—Terrace B-38 **1550 ± 95**
A.D. 400

Material same as I-2724 from Atlantic coast of Cat I. (24° 39′ N Lat, 75° 38′ W Long), Bahamas. From 60 to 70 cm below surface of Terrace B, 3 m above mean low water. *Comment* (A.O.L.): date agrees with Terrace B at South Bird Point (I-2725, this series).

I-2925. Anguilla Barrier—Terrace A-125 **2530 ± 105**
580 B.C.

Material and location same as I-2924. From upper level of Terrace A, 90 to 100 cm below surface, 5.5 m above mean low water. *Comment* A.O.L.): date correlates with upper level of Terrace A at South Bird Point (I-2726, this series).

I-2926. Greenwood Barrier—Terrace B-61 **625 ± 100**
A.D. 1325

Material and location same as I-2724. Intermediate-level beach-ridge terrace. From surface of shallow dune cap 0 to 10 cm depth, 4.5 m above mean low water. A-l horizon present at sampling point. *Comment* (A.O.L.): date indicates eolian accretion ended in early part of 2nd millennium A.D.

I-2927. Greenwood Barrier—Terrace C-46 **490 ± 95**
A.D. 1460

Material and location same as I-2724, 0 to 10 cm depth from surface of dune cap, 3 m above mean low water. A-1 horizon at sampling point. *Comment* (A.O.L.): Terrace C was deposited when sea level was at ca. + 0.5 m; no significant beach-ridge accretion since.

I-2979. Alligator Point—Terrace C Fossil Beach-4 **395 ± 100**
A.D. 1555

Pelecypod valves (*Lucina jamaicensis*) location same as I-2837, from surface of fossil beach, 1.2 m above mean low water. *Comment* (A.O.L.): this fossil shingle beach is identical with modern low tide beaches in same area. Shingle is derived from adjacent beach.

I-3408. Bariloche Bog, Argentina No. 1 **1170 ± 95**
A.D. 780

Heart wood from log *Austrocedrus* (*Libocedrus*) *chilensis* (wood ca. 120 yr old before death of tree) from Bariloche Bog km Post 1738, 12 km

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W of San Carlos de Bariloche (41° 06′ 50″ S Lat, 71° 26′ 20″ W Long), Argentina. Layer of pumice lapilli ½ in. thick overlies log (Auer, 1949; 1965). Coll. 1967 and subm. 1968 by D. B. Lawrence, Univ. of Minnesota.

1020 ± 100

I-3409. Bariloche Bog No. 2 **A.D. 930**

Sample and location same as I-3408, but may have been contaminated with modern dust.

General Comment (D.B.L.): purpose of dating is to learn timing of volcanic eruptions along axis of S Andes and to test hypothesis of Auer (1949; 1965).

3110 ± 110

I-3843. Otuma Embayment, Peru **1160 B.C.**

Pecten valve (*Pecten purpuratus*) from basal layer of Midden 12, ca. 16 ft above MSL, on margin of raised Otuma embayment (14° S Lat, 76° 15′ W Long), Otuma lagoon, Ica Prov., Peru. Site presently on crest of 7 to 8 ft sea cliff bordering lagoon; entire lagoon has been raised to subaerial position ca. 2 mi from modern coast. Coll. 1968 by N. P. Psuty and A. K. Craig; subm. 1968 by N. P. Psuty, Dept. of Geog., Univ. of Wisconsin, Madison, Wisconsin. *Comment* (N.P.P.): date indicates lagoon was viable ecologic unit and uplift that stranded lagoon is more recent.

510 ± 100

I-3844. Lagunillas Embayment, Peru **A.D. 1440**

Seaweed from elevated Strandline 4, 28 ft above MSL, W margin Lagunillas embayment (13° 53′ S Lat, 76° 19′ W Long), 5 mi S of Paracas, Ica Prov., Peru. Coll. 1968 by N. P. Psuty and A. K. Craig; subm. 1968 by N. P. Psuty. *Comment* (N.P.P.): indicates time of rapid crustal shifts that elevated high-tide swash line.

II. ARCHAEOLOGIC SAMPLES

Western United States

Katmai National Monument series, Alaska

Samples coll. during excavations by Univ. of Oregon in 2 separate areas of Katmai Natl. Monument, Brooks R. in Naknek drainage system NW side Alaska Peninsula and Pacific coast SE side of Peninsula. All comments by D. E. Dumond.

Materials from Naknek drainage have been divided into 8 sequential cultural phases with modifications (Dumond and Cressman, 1962; 1963; Radiocarbon, 1964, v. 6, p. 273-278; Pacific Coast materials have been divided into 5 sequential phases. Typologic distinctions supported especially by series of volcanic ash deposits found on both sides of Peninsula (Nowak, 1968).

All samples except where noted coll. and subm. by D. E. Dumond, Univ. of Oregon, Eugene, Oregon.

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Brooks River Bluffs phase

From S bank Brooks R., Alaska (58° 35′ N Lat, 155° 44′ W Long), assoc. with rubbed slate implements and gravel-tempered pottery. Previously reported determinations were Y-932, 450 ± 60 (Radiocarbon, 1962, v. 4, p. 256), and I-209, 230 ± 80 (Radiocarbon, 1964, v. 6, p. 274). Geologic, typologic, and radiocarbon evidence assigned phase to A.D. 1500 to 1800.

I-523. B.R. Bluffs phase, BR 5-1 **480 ± 90** **A.D. 1470**

Charred wood from slab-lined hearth outside habitations, early stage of latest occupation of Locality BR5. Coll. 1961 by D. E. Dumond; subm. 1961 by L. S. Cressman.

B.R. Camp phase

From N bank Brooks R., Alaska (58° 35′ N Lat, 155° 44′ W Long), assoc. with polished slate implements and gravel-tempered pottery comparable to artifacts of Nukleet culture of Norton Bay (Giddings, 1964). Previous determinations I-524, 300 ± 75 and I-525, 680 ± 90 (Radiocarbon, 1964, v. 6, p. 274-275). Geologic, typologic, and radiocarbon evidence assigned phase to A.D. 1000 to 1500.

I-1632. B.R. Camp phase, BR 20-1, House **670 ± 105** **A.D. 1280**

Charred wood, scattered on floor of house with sunken entrance, Locality BR 20. Coll. 1964; subm. 1965.

I-1635. B.R. Camp phase, BR 20-1, Fireplace **845 ± 100** **A.D. 1105**

Charred wood from hearth outside house (I-1632), assoc. with pottery. Coll. 1964; subm. 1965.

B.R. Weir phase

From one site on N bank and another on S bank of Brooks R., Alaska (58° 35′ N Lat, 155° 44′ W Long). Assoc. with implements predominantly of flaked dense igneous rock, and fiber-tempered pottery bearing exterior impressions of small checks or diamond shapes applied with paddle. Previous determinations I-210, 1850 ± 100 and I-526, 1230 ± 150 (*op. cit.*, above, p. 275-276). Geologic, typologic, and radiocarbon evidence assigned phase to A.D. 100 to 500.

I-1158. B.R. Weir phase, BR 14-1 **2110 ± 350** **160 B.C.**

Charred wood from campfire of briefly occupied site, Locality BR 14, S bank of river. Assoc. with check-stamped pottery. Coll. and subm. 1963.

I-1631. B.R. Weir phase, BR 20-1, Hearth **1895 ± 140** **A.D. 55**

Charred wood from campfire remnant within zone of B.R. Weir phase occupation debris, Locality BR 20, N bank of river. Coll. 1964 and subm. 1965.

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1790 ± 130

I-1633. B.R. Weir phase, BR 20-1, Floor **A.D. 160**

Charred wood, scattered on occupation floor, Locality BR 20, N bank of river. Coll. 1964 and subm. 1965.

1690 ± 110

I-3116. B.R. Weir phase, BR 20-2 **A.D. 260**

Charred wood, scattered in occupation floor with diagnostic artifacts, Locality BR 20, N bank of river. Coll. and subm. 1967.

B.R. Gravels phase

From N and S banks of 1½ mi long Brooks R. (58° 35′ N Lat, 155° 44′ W Long), Alaska. Assoc. with small bipointed endblades of chipped chalcedony, burins, microblades, and small polished adze heads; phase clearly related to Arctic Small Tool tradition, of which Denbigh Flint complex of Norton Bay (Giddings, 1964) is best known example. Previous determinations Y-930, 3972 ± 440 (Radiocarbon, 1962, v. 4, p. 255); I-517, 3125 ± 200; I-518, 3250 ± 200 (Radiocarbon, 1964, v. 6, p. 277). Geologic, typologic and radiocarbon evidence assigned phase to 1900 to 1000 B.C.

3090 ± 200

I-1157. B.R. Gravels phase, BR 15-1 **1140 B.C.**

Charred wood, scattered on floor of semi-subterranean habitation, Locality 15, Unit 1, S side of river. Coll. and subm. 1963.

3050 ± 250

I-1159. B.R. Gravels phase, BR 4-1 **1100 B.C.**

Charred wood from stone fireplace, Locality BR 4, N side of river. Coll. and subm. 1963.

3900 ± 130

I-1629. B.R. Gravels phase, BR 10-3 **1950 B.C.**

Charred wood from stone fireplace, Locality BR 10, S side of river. Coll. 1964 and subm. 1965.

3450 ± 110

I-1947. B.R. Gravels phase, BR 16-2 **1490 B.C.**

Charred wood from fire area, central floor of semi-subterranean habitation, Locality BR 16, S side of river. Coll. and subm. 1965.

3390 ± 110

I-3115. B.R. Gravels phase, BR 15-2 **1440 B.C.**

Charred wood from E ¼ of floor, semi-subterranean habitation, Locality BR 15, Unit 2, S side of river. Coll. and subm. 1967. *Comment*: unusual number of polished implements (adze blades, burin-like implements) and presence of some stemmed points similar to those of Smelt Creek form, suggest this occupation may post-date others of B.R. Gravels phase; not supported by geologic or radiocarbon evidence.

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Smelt Creek phase

From N bank Brooks R., Alaska (58° 35′ N Lat, 155° 44′ W Long), assoc. with implements chipped of chalcedony and igneous rock, and urn-shaped fiber-tempered, check-stamped pottery comparable to artifacts of Norton culture of Norton Bay (Giddings, 1964). Previous determination I-508, 1900 ± 150 (Radiocarbon, 1964, v. 6, p. 276). Geologic, typologic, and radiocarbon evidence assigned phase to 200 B.C. to A.D. 100.

I-1948. Smelt Creek phase, BR 11 **2140 ± 105**
190 B.C.

Charred wood from campfire in substantial Smelt Creek occupation zone, Locality BR 11, Test 6. Coll. and subm. 1965.

B.R. Strand phase

From 2 sites, one N and one S of Brooks R. (58° 35′ N Lat, 155° 44′ W Long), each on ridge thought to have flanked mouth of Brooks R. and been under construction by waves of Naknek Lake 2000 B.C. and earlier. All occupation debris was covered by lake-deposited sand and gravel and by volcanic ash, Y-931, 3860 ± 90 (Radiocarbon, 1962, v. 4, p. 256). Assoc. with leaf-shaped and side-notched knives of chipped stone comparable to those of Palisades II complex of Onion Portage and large thrusting implements of polished slate similar to those of T. Birch phase of Pacific coast (Clark, 1968). Geologic, typologic, and radiocarbon evidence assigned phase to 2500 to 1900 B.C.

I-1630. B.R. Strand phase, BR 10-3 **3840 ± 130**
1890 B.C.

Charred wood, scattered over thin occupation layer in beach sand, Locality BR 10, S side of river, strat. below strata yielding B.R. Gravels phase implements and I-1629 (this list). Coll. 1964 and subm. 1965.

I-1946. B.R. Strand phase, BR 20-3 **4430 ± 110**
2480 B.C.

Charred wood from thick fire area of tear-drop shaped occupation floor yielding B.R. Strand phase implements. Locality BR 20, N side of river. Coll. and subm. 1965.

I-1634. B.R. Strand phase, BR 20-1 **4240 ± 250**
2290 B.C.

Charred wood, scattered over thin occupation layer with B.R. Strand phase implements, Location BR 20, N side river. Coll. 1964 and subm. 1965.

I-3114. B.R. Strand phase, BR 20-2 **3900 ± 120**
1950 B.C.

Charred wood from various places on extensive occupation floor yielding B.R. Strand phase implements, overlain by 20 to 40 cm partially cemented lake gravels deposited on ancient beach by ancestral Naknek Lake. Coll. and subm. 1967.

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7360 ± 250

I-1160. Pre-occupation, BR 5-2 **5410 B.C.**

Charred wood apparently deposited by wave action in beach sand, S bank of Brooks river (58° 35′ N Lat, 155° 44′ W Long), Alaska. Beneath lowest (at least 10) volcanic ash deposits, Locality BR 5, 10 m above present level of Naknek Lake (Muller, 1952). Coll. and subm. 1963.

Pacific Coast sub-series

Two major site areas 25 mi apart. Coll. 1964 and 1965; subm. by D. E. Dumond.

Katmai Mound phase

From 2-component site consisting of remains of 89 semi-subterranean habitations, at Kukak Bay, Shelikof Strait coast of Katmai Natl. Monument (58° 19′ N Lat, 154° 10′ W Long), Alaska. Assoc. with polished slate implements and gravel-tempered pottery identical to those of B.R. Camp phase of Naknek drainage, 60 mi away. Previous determination I-505, 775 ± 95 (Radiocarbon, 1964, v. 6, p. 277). Geologic, typologic, and radiocarbon evidence assigned phase to A.D. 1000 to 1500.

775 ± 110

I-1636. K. Mound phase, KK 1-13 **A.D. 1175**

Charred wood from hearth of K. Mound phase floor, House 13, Site KK 1. Hearth contained gravel-tempered pottery. Coll. 1964 by H. S. Rice; subm. 1965.

K. Beach phase

From Kukak Bay, Shelikof Strait coast of Katmai Natl. Monument (58° 19′ N Lat, 154° 10′ W Long), Alaska. Assoc. with chipped projectile blades of chalcedony and igneous rock, polished slate implements, and fiber-tempered pottery; collection similar to B.R. Falls phase of Naknek drainage. Geologic, typologic, and radiocarbon evidence assigned phase to A.D. 500 to 1000.

1450 ± 130

I-1637. K. Beach phase KK 1-73 **A.D. 500**

Charred wood from midden debris within House 73, Site KK 1, yielded diagnostic K implements. Coll. 1964 by H. S. Rice; subm. 1965.

1075 ± 100

I-1638. K. Beach phase, KK 1-66 **A.D. 875**

Charred wood from fireplace in major occupation floor of House 66, Site KK 1. Coll. 1964 by H. S. Rice; subm. 1965.

1460 ± 95

I-1944. K. Beach phase, KK 1-19 **A.D. 490**

Charred wood from lowest and major occupation floor of House 19, Site KK 1. Coll. 1965 by H. S. Rice; subm. 1965.

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T. Cottonwood phase

From Takli I., off Shelikof Strait coast of Katmai Natl. Monument (58° 4′ N Lat, 154° 30′ W Long), Alaska. Assoc. with chipped projectile blades primarily of igneous rock, polished slate implements, and small amount of fiber-tempered pottery. Typologic evidence assigned phase to 1st centuries A.D.

I-1942. T. Cottonwood phase, AK 3 **1680 ± 100 A.D. 270**

Charred wood from occupation floor at base of Stratum 1, Site AK 3. Coll. 1963 by M. Nowak; subm. 1965.

T. Birch phase

From Takli I., off Shelikof Strait coast of Katmai Natl. Monument (58° 4′ N Lat, 154° 30′ W Long), Alaska. Assoc. with large chipped projectile blades of igneous rock, and numerous polished slate implements comparable to Ocean Bay II phase of Kodiak I. (Clark, 1966). Geologic typologic, and radiocarbon evidence assigned phase to between 2200 and 800 B.C. (Clark, 1968).

I-1639. T. Birch phase, AK 1, Base **4110 ± 160 2160 B.C.**

Charred wood, scattered, from base of Stratum II, Site AK 1. Coll. 1964 by M. Nowak; subm. 1965.

I-1941. T. Birch phase, AK 1, Top **2910 ± 105 960 B.C.**

Charred wood, apparently remains of campfire in heaviest T. Birch phase occupation zone, top of Stratum II, Site AK 1. Coll. 1965 by M. Nowak; subm. 1965.

I-1943. T. Birch phase, AK 3 **3470 ± 110 1520 B.C.**

Charred wood, hearth in Stratum II, Site AK 3. Coll. 1965 by M. Nowak; subm. 1965.

I-3733. T. Birch phase, AK 1, Stratum I **2810 ± 100 860 B.C.**

Charred wood, scattered, substantially at top of occupation, Site AK 1. Coll. 1965 by M. Nowak; subm. 1968.

Takli Alder phase

From Shelikof Strait coast of Katmai Natl. Monument, Alaska. Major part of collection is from lowest 2 of 4 distinguishable strata of Site AK 1. Assoc. with chipped projectile blades and knives, comparable to Near group of Aleutian I. Geologic, typologic, and radiocarbon evidence assigned this phase to 4000 to 3000 B.C.

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5650 ± 115

I-1940. T. Alder phase, AK 1 **3700 B.C.**

Charred wood, scattered, from base of Stratum II, Site AK 1, Takli I. (58° 4′ N Lat, 154° 30′ W Long), Alaska. Coll. 1965 by M. Nowak; subm. 1965.

5830 ± 120

I-1945. T. Alder phase, KK la **3880 B.C.**

Charred wood, scattered, in red, oxidized stratum of apparent midden deposit in outlying area of Site KK 1, Kukak Bay (58° 19′ N Lat, 154° 10′ W Long), Alaska. Coll. 1965 by H. S. Rice; subm. 1965.

4530 ± 110

I-4161. Pedro Bay site, 2, Early Component, Alaska **2580 B.C.**

Charcoal from Pedro Bay site, NE shore of Lake Iliamna (59° 45′ N Lat, 154° 10′ W Long), SW Alaska. From base of cultural layer in charcoal band 24 to 28 in. below soil surface, Pits 18 and 21 (Clark, 1966; Townsend and Townsend, 1961). Coll. 1967 and subm. 1969 by J. B. Townsend, Univ. Manitoba, Winnipeg, Canada. *Comment*: date indicates early occurrence of ground slate tools in Alaska.

370 ± 95

I-3658. Polacca Wash, Arizona **A.D. 1580**

Human bone from Hopi Indian Reservation, Polacca Wash (35° 38′ N Lat, 110° 35′ W Long), Arizona. From mass burial 2 ft deep (Turner, 1968; Olson, 1966). Coll. 1964 by A. P. Olson; subm. 1968 by C. G. Turner, II, Arizona State Univ., Tempe. *Comment* (C.G.T.): features of this burial, except apparent cannibalism, are high correlated with 2.7 century old Hopi legend about destruction of Awatobi (extinct Hopi village).

2260 ± 210

I-4006. Point St. George I, California **310 B.C.**

Charcoal with fine sand from Point St. George (41° 45′ N Lat, 124° 15′ W Long), Del Norte Co., California. From cluster of small hearths between 42 and 45 in. depth, Sq. 52, Trench 3, near bottom of Feature 36 (Gould, 1966). Coll. 1964 and subm. 1969 by R. A. Gould, Am. Mus. Nat. Hist., New York, N.Y. *Comment*: cultural assocs. indicate sample dates early part of Point St. George I occupation. Earliest reported date for N California or S Oregon coast.

1010 ± 100

I-4107. Ismay Pueblo, Colorado **A.D. 940**

Charcoal (*Pinus edulis, Juniperus utahensis*) from floor stratum, Rm. 3, Ismay Pueblo (37° 14′ N Lat, 108° 41′ W Long), NW ¼ Sec. 2, R 17E, Township 34 N, New Mexico PM, Cortez, Colorado. Site 1 mi SSW of Yucca House. Coll. 1967 and subm. 1969 by R. A. Luebben, Grinnell College, Grinnell, Iowa. *Comment*: small pueblo with tower and ground features. Architecture and artifacts are typically Mesa Verde Pueblo III (Martin, 1929). Date suggests reuse of old timbers.

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I-3818. 5JF10 Van Bibber Creek, Colorado **2140 ± 145 / 190 B.C.**

Charcoal from Van Bibber Creek (39° 47′ 54″ N Lat, 105° 14′ 30″ W Long) SE ¼, Sec. 8, T. 3S, R. 70W, Golden Quad., Colorado. From depth 23 in. assoc. with 3 projectile points. Site contained 3 cultures: Woodland, Southwestern, and Archaic. Comparable Archaic materials were found at nearby sites (Leech, 1966). Coll. 1968 by C. E. Nelson, subm. 1968 by J. Benedict.

I-3365. Harris Chamber, Dry Cave, New Mexico **14,470 ± 250 / 12,520 B.C.**

Feces primarily *Neotoma* from Dry Cave, SE ¼, Sec. 22, T. 22 S, R. 24 E (32° 22′ 25″ N Lat, 104° 28′ 55″ W Long), Eddy Co., New Mexico. From upper 2 excavation units overlying sterile limestone. Coll. and subm. 1968 by A. H. Harris, Univ. of Texas. *Comment* (A.H.H.): over 40 species of vertebrates, most from dated horizon, including species of *Sorex, Notiosorex, Myotis, Eptesicus, Plecotis, Lepus, Marmota, Ondatra, Mustela et al.* are under study.

I-4108. Site BJ74, New Mexico **635 ± 95 / A.D. 1310**

Weaving batten (*Quercus gambelii* Nutt) from earliest occupational stratum, below Rm. 1, Site BJ74 (35° 49′ 15″ N Lat, 106° 37′ 30″ W Long), Jemez Mts., New Mexico. Site 1.1 mi E of junction of Jemez R. and its E fork. Coll. 1939 by Paul Reiter; subm. 1969 by R. A. Luebben. *Comment* (R.A.L.): assoc. with Post-Spanish intrusive red wares and glazepolychromes. Date indicates batten is heirloom. BJ74 probably satellite of nearby larger pueblo of Unshagi.

South Cannonball Village series, North Dakota

Samples from S Cannonball Village, confluence of Cannonball and Missouri R. (46° 24′ 30″ N Lat, 100° 35′ 15″ W Long), Sioux Co., North Dakota. Coll. 1966 by J. J. Hoffman; subm. 1969 by R. B. Johnston, Div. of River Basins Surveys, Lincoln, Nebraska.

I-4202. 32 S 119—(A) **840 ± 90 / A.D. 1110**

Charcoal and charred wood from collapsed structural member on SW ¼ of floor of House 1, semi-subterranean habitation.

I-4203. 32 S 119—(B) **610 ± 95 / A.D. 1340**

Decayed wood from post butt, NW wall of House 5, semi-subterranean habitation.

I-4204. 32 S 119—(C) **630 ± 95 / A.D. 1320**

Decayed wood from post butt, NW corner of House 4, semi-subterranean habitation.

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820 ± 100

I-4205. 32 S 119—(D) **A.D. 1130**

Decayed wood from post butt, NW corner of House 2, semi-subterranean habitation.

Eastern United States

Fort Center series, Florida

Charcoal from Fort Center (26° 45′ N Lat, 81° 20′ W Long), W shore Lake Okeechobee, Florida. Coll. 1967 and subm. 1968 by W. H. Sears, Florida Atlantic Univ., Boca Raton, Florida.

1645 ± 115

I-3552. Mound A **A.D. 305**

Midden lens, probably house floor, in living platform. *Comment* (W.H.S.): artifact complex includes clay platform pipes. Date applies to living area in Hopewellian ceremonial complex.

1610 ± 110

I-3553. Mound B-1 **A.D. 340**

Midden material on 1st stage structure in large mound. *Comment* (W.H.S.): Hopewellian material strat. assoc. The 1st stage structure was built with fill from charnel house pond, which contains clay platform pipes in 1st layer deposited.

1690 ± 100

I-3554. Mound B-2 **A.D. 260**

Isolated charcoal fragment in mound construction layer. *Comment* (W.H.S.): construction layer, with secondary burials, slightly later than unit with date I-3553. Earlier date suggests charcoal picked up with fill dirt.

1770 ± 110

I-3555. Midden A **A.D. 180**

Midden deposit, lower stratum 1 ft above midden base. *Comment* (W.H.S.): horizon at end of, or immediately post-dating, period with semi-fiber tempered ware. Equivalent to early St. Johns Ia.

2400 ± 105

I-3556. Great Circle fill **450 B.C.**

Midden deposited in base of 1200 ft diam. circular ditch. Strat. 1st fill in 2nd period of construction. *Comment* (W.H.S.): circle with causeways, definitely Adena type. Rebuilt, probably enlarged, number of times. Earliest structure on site, initial construction with semi-fiber tempered pottery earlier than this date.

1055 ± 100

I-3441. Kipp Island, New York **A.D. 895**

Charcoal from Burial 7, Kipp I. #4 site (Aub. 13-1) Seneca Co. (42° 59′ 32″ N Lat, 76° 43′ 39″ W Long), New York. From cremation burial containing burned human remains and charcoal of crematory fire, interred without burial offerings in shallow grave at subsoil level, 11 in. depth (Sec. E 20 S 50). Coll. 1963 and subm. 1968 by W. A. Ritchie, New

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York State Mus. and Sci. Service. *Comment* (W.A.R.): burial pertained to cemetery of Hunter's Home phase, late Middle Woodland stage. Date agrees with existing radiocarbon determinations for sites of this phase in New York State (Ritchie, 1965).

1590 ± 100

I-3442. Fredenburg site, New York **A.D. 360**

Charcoal from Feature 1, Sec. 22, Fredenburg site (42° 28′ 05″ N Lat, 75° 08′ 47″ W Long), Otsego Co., New York. From shallow basin-shaped hearth found in thin artifact-bearing layer of single-component site. Coll. 1967 by H. D. Tuggle; subm. 1968 by R. E. Funk, New York State Mus. and Sci. Service. *Comment* (R.E.F.): date consistent with estimates for age of newly defined, late Middle Woodland, Fox Creek complex.

1100 ± 95

I-3444. Black Rock site, New York **A.D. 850**

Charcoal from Feature 2, Sec. W 50 S 10, Black Rock site, Athens (42° 15′ 28″ N Lat, 73° 48′ 50″ W Long), Greene Co., New York. From shallow basin-shaped pit, pit contents clearly indicated its assoc. with primary late Middle Woodland component on site. Coll. 1963 and subm. 1968 by R. E. Funk. *Comment* (R.E.F.): date as anticipated on typologic grounds and comparisons with the Point Peninsula sequence of central New York.

1565 ± 100

I-3731. A (dequentaga I)—W90N15, New York **A.D. 385**

Charcoal from fire hearth at 21 in. depth, stratified site along Susquehanna R., 2 mi E of Oneonta (42° 26′ 45″ N Lat, 75° 01′ 15″ W Long), New York. Assoc. with Steubenville type projectile points and Vinette 1 pottery sherds. Coll. and subm. 1968 by B. E. Raemsch, Hartwick College, Oneonta, N. Y. *Comment* (B.E.R.): dates from this component are among 1st for this culture, site presently being excavated.

Susquehanna series, New York

Charcoal and soil from S shore Susquehanna R. (42° 26′ 45″ N Lat, 75° 01′ 15″ W Long), ca. 2 mi E of Oneonta, New York. Coll. and subm. 1968 by B. E. Raemsch.

4040 ± 115

I-3730. A W85-S20 **2090 B.C.**

From hearth area in 16 in. soil, overlying late Pleistocene gravel. *Comment*: date indicates Lamoka component overlying thinly distributed late Lithic stage component. Assoc. with Hell Gap type point snub-nosed scraper and side-scrapers somewhat similar to Bull Brook type (Ritchie, 1965).

1190 ± 110

I-3732. A W85-N15 **A.D. 760**

From stratified site where red-soil fire hearths were common, 14 to 20 in. depth. *Comment*: date indicates Steubenville component. Assoc. with type points, sherds of Vinette styles of pottery, and shell.

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1300 ± 100

I-3931. A W90-N20 **A.D. 650**

From same location as I-3732, same comment.

3830 ± 100

I-3917. A W110-N20—1 **1880 B.C.**

From hearth area covered by tan river sand, above glacio-fluvial gravels, 71 in. depth. *Comment*: projectile points recovered of gray chert and brown jasper indicative of Boreal Archaic component (Byers, 1959).

4080 ± 105

I-3918. A W110-N20—2 **2130 B.C.**

From ca. 18 in. from I-3917. *Comment*: same as I-3917. Assoc. with stemmed side-notched and eared points showing evidence of stone grinding (Byers, 1959).

3380 ± 100

I-3974. Adequentaga site **1430 B.C.**

From 5 ft diam. hearth at 24 in. depth (measured from grass roots). Assoc. with shell fragments, bone, and an Orient Fishtail knife type. At 27 in. horizon Susquehanna Broad points were found. These cultures are considered by Ritchie (1965) to be transitional from late Archaic to Early Woodland. *Comment*: date believed assoc. with Susquehanna Broad points and agrees with Ritchie's Snook Kill date.

Mexico

6500 ± 125

I-4098. Tlapacoya II-140, Mexico **4550 B.C.**

Soil from Site II, Sq. 140, SE ¼, Tlapacoya (19° 18′ N Lat, 98° 55′ W Long), Basin of Mexico. Lacustrine plain in former Chalco lake, depth 2.30 m. Coll. 1969 by Raul Araña; subm. 1969 by J. L. Lorenzo, Dept. de Prehist., Moneda, Mexico. *Comment* (J.L.L.): assoc. with Coxcatlan (Gary) point, date coherent with cultural material (Mirambell, 1967; Mooser, 1967).

760 ± 90

I-4106. Whetton Pueblo, Chihuahua, Mexico **A.D. 1190**

Charred roof material from floor stratum, Rm. 4, Whetton Pueblo (30° 2′ N Lat, 108° 30′ W Long), Rancho Gavilán, Chihuahua, Mexico. Site 650 m WSW of confluence of Rio Gavilán and Rio Gavilán del Norte. Coll. 1968 and subm. 1969 by R. A. Luebben. *Comment*: small stone pueblo of Medio period, Village Farming Community horizon. No comparable site excavated in N Sierra Madre occidental.

6200 ± 125

I-4192. Tlapacoya IV-A24, Mexico **4250 B.C.**

Soil from Site IV, Sq. A-24, SE ¼, Tlapacoya (19° 18′ N Lat, 98° 55′ W Long), Basin of Mexico. Riparian zone in Tlapacoya, then an island on Chalco Lake, 3.7 m depth. Coll. 1969 by Christine Niederberger; subm.

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1969 by J. L. Lorenzo. *Comment* (J.L.L.): middle preceramic horizon, probably incipient agriculture (Mirambell, 1967; Mooser, 1967).

Canada

Battle Creek series, Canada

Charcoal, charred bones and soil from Battle Creek (49° 39′ 40″ N Lat, 110° 04′ 18″ W Long), Cypress Hills, Alberta, Canada. Coll. and subm. 1966 by P. D. Jungerius, Dept. of Mines and Tech. Surveys, Ottawa, Canada (Andrews, 1967).

I-2428. No. 1 — **3880 ± 165** / **1930 B.C.**

Charcoal and charred bones from Indian composite beneath 70 cm alluvium.

I-2608. No. 2 — **880 ± 100** / **A.D. 1070**

Soil from 0 to 15 cm depth, stream bank exposure. Soil developed in alluvial material overlying buried soil containing Indian remains.

I-2609. No. 3 — **3610 ± 100** / **1660 B.C.**

Buried soil in alluvial fan, 2 A horizon, elev. 1174 m.

Pediment series, Canada

Charcoal and soil from South Pediment and Pediment, Cypress Hills, Alberta, Canada. Coll. and subm. 1966 by P. D. Jungerius (Andrews, 1967).

I-2429. South Pediment 1 — **4320 ± 110** / **2370 B.C.**

Charcoal from 19 cm depth (49° 33′ N Lat, 110° 14′ W Long), South Pediment. From Indian fireplace under 19 cm colluvium.

I-2430. South Pediment 2 — **580 ± 95** / **A.D. 1370**

Soil from stream bank exposure (49° 31′ 30″ N Lat, 110° 13′ 48″ W Long), 9 cm depth, South Pediment. Soil *in situ* in alluvial plain of recent pediment. From upper two well-developed A-horizons.

I-2610. Pediment — **520 ± 95** / **A.D. 1430**

Soil from 1250 m elev. (49° 33′ 12″ N Lat, 110° 13′ 04″ W Long), Pediment. A-1 horizon of buried soil.

I-3956. Kamut Lake (MePn-1), Canada — **210 ± 90** / **A.D. 1740**

Charred caribou bone from NE end of Kamut Lake (66° 43′ 10″ N Lat, 116° 17′ 20″ W Long), Northwest Territory, Canada. From 4 ft diam. hearth 6 in. below sandy surface. Coll. and subm. 1968 by W. C.

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Noble, McMaster Univ., Hamilton, Canada. *Comment*: site is multicomponent with date relating to late Eskimo occupation. Site contains materials of Acasta Lake complex, small tool complex and late Eskimo copper.

6970 ± 360

I-3957. Acasta Lake (LiPk-1), Canada **5020 B.C.**

Charcoal from NE corner of Acasta Lake (65° 24′ N Lat, 115° 30′ W Long), Northwest Territory, Canada. From Hearth 95, Unit D, 13 in. below soil surface of sandy esker. Assoc. with artifacts (Forbis, 1961). Coll. and subm. 1968 by W. C. Noble. *Comment*: date marks earliest Indian complex E of Great Bear Lake substantiating early Indian penetration to within few mi of central Arctic coast. Closest similar artifacts lie far to S in Alberta, Montana, and Wyoming.

Europe

1925 ± 85

I-3968. PC 68-10a, Cosa, Italy **A.D. 25**

Wood (*Quercus*) from cofferdam of Roman dock, Cosa (42° 24′ N Lat, 11° 17′ E Long), Ansedonia, Italy. Buried in mud and water 1.2 to 1.9 m below present ground level. Coll. and subm. 1968 by J. D. Lewis and A. M. McCann, Am. Acad. in Rome, Italy. *Comment* (A. McC.): sample documents existence of inner harbor at ancient port of Cosa. Cultural period late Republican or early Imperial. Date consistent with other finds from dock level.

4290 ± 110

I-3788. Port au Choix—3, Newfoundland **2340 B.C.**

Charcoal from Port au Choix (50° 42′ 27″ N Lat, 57° 20′ 30″ W Long), Newfoundland, Canada. From Burial 22 beneath human bones and grave goods. Coll. 1968 by W. A. Ritchie; subm. 1968 by J. A. Tuck, Memorial Univ. of Newfoundland, St. John's, Newfoundland. *Comment* (J.A.T.): dates large cemetery of Port au Choix phase of Maritime Archaic tradition.

Pontevedra series, Spain

Charcoal and carbonized vegetable matter from Pontevedra Province, Spain. Coll. 1964 by E. de Aguirre and subm. 1966 by K. W. Butzer, Univ. of Wisconsin, Madison, Wisconsin.

26,700 ± 3600

I-2174. Budiño site, No. 1 **24,750 B.C.**

Powdered carbonized wood and vegetable matter from Budiño site (42° 06′ 30″ N Lat, 8° 35′ 00″ W Long). Pontevedra Prov., Spain. From Paleolithic occupation floor in late Pleistocene colluvium (de Aguirre and Butzer, 1967; Butzer, 1967). *Laboratory Comment*: dated material separated from bulk soil by flotation. Sample soluble in dilute NaOH, but was pretreated with HCl.

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18,000 ± 300

I-2175. Budiño site, No. 2 **16,050 B.C.**

Powdered charcoal, carbonized vegetation and soil from same location as I-2174. From hearth 10 cm above I-2174. *Comment* (K.W.B.): Paleolithic industry at Budiño includes choppers, trihedral picks, Clactonian flakes and notches, proto-bifaces, and denticulates worked in quartz. Artifacts found in undisturbed assocs. It's unlikely that 8000 yr separate the 2 samples. I-2174 though much smaller would be less liable to contamination by humic acids. *Laboratory Comment*: finely divided nature of sample prevented separation from bulk soil. Sample pretreated with HCl.

18,700 ± 320

I-2176. LaGuardia **16,750 B.C.**

Carbonized organic debris and soil from Playa de Fedorento, La Guardia (41° 54′ 30″ N Lat, 8° 51′ 00″ W Long), Pontevedra Prov., Spain. From 4 m depth, part of Sanjían beds.

I-2177. Mougás **>39,900**

Carbonized wood and soil from Mougás (42° 03′ 12″ N Lat, 8° 51′ 00″ W Long), Pontevedra Prov., Spain. From 0.8 m above base of 3 m peaty sediment on interglacial beach.

28,400 ± 1200

I-2261. Sanjián **26,450 B.C.**

Powdered carbonized wood and organic debris in sediment from Sanjián (41° 58′ 5″ N Lat, 8° 51′ W Long), Pontevedra, Spain. From middle of 5 m organic silt underlying 15 m coarse alluvial fan sediment. *Comment* (K.W.B.): sequence represents type site of Sanjián formation, dates cold interval following mid-Würm interstadial.

3660 ± 100

I-3984. Gobaederra Cave, Spain **1710 B.C.**

Human bones from Sierra de Badaya, N of Subijana de Morillas (42° 50′ 17″ N Lat, 00° 48′ 03″ W Long), Spain. Alt: 870 m. Sample from burial level corresponding to Spanish Bronze Age I (Apellaniz, Llanos, and Fariña, 1967). Coll. 1968 and subm. 1969 by A. Llanos, J. M. Apellaniz and J. Fariña, Mus. Prov. de Arqueología, Vitoria (Alava) Spain.

3920 ± 100

I-3985. Cueva de los Husos I, Spain **1970 B.C.**

Charcoal from N of Elvillar (42° 35′ 48″ N Lat, 01° 08′ 05″ W Long), Spain. From Bronze Age I level. Coll. 1968 and subm. 1969 by J. M. Apellaniz.

Africa

Mauritania series, Africa

Charcoal from various sites in S central Mauritania, Africa. Coll. and subm. 1968 by P. J. Munson, Univ. of Illinois, Urbana, Illinois.

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3350 ± 110

I-3561. Goungou A **1400 B.C.**

From Features 2 and 5 (18° 21′ N Lat, 9° 12′ W Long), 2 refuse-filled pits, 10 to 30 cm depth. *Comment* (P.J.M.): dates Khimiya phase of Neolithic occupation of region. Date in agreement with 3205 ± 95 B.P. (GX-1323) from same site, Mauny, 1950).

3190 ± 110

I-3562. Goungou B **1240 B.C.**

From Test Sq. #1 (18° 20′ 50″ N Lat, 9° 11′ 55″ W Long), 60 to 80 cm depth. *Comment* (P.J.M.): dates early portion of Goungou phase of Neolithic occupation.

2950 ± 100

I-3563. Goungou B **1000 B.C.**

From same location as I-3562, 20 to 40 cm depth. *Comment* (P.J.M.): dates later portion of Goungou phase of Neolithic occupation.

3205 ± 105

I-3564. Naghez **1255 B.C.**

From Test Sq. #1 (18° 21′ N Lat, 9° 11′ 30″ W Long), 30 to 50 cm depth. *Comment* (P.J.M.): dates Naghez phase of Neolithic occupation. Earliest architectural sites.

3100 ± 105

I-3565. Seyyid Ouinquil **1150 B.C.**

From Test Sq. #1 (18° 22′ 10″ N Lat, 9° 9′ 20″ W Long), 5 to 18 cm depth. *Comment* (P.J.M.): dates Chebka phase of Neolithic occupation. Large fortified architectural sites. Date in essential agreement with 2780 ± 140 (GX-1325) from late Chebka phase site Le Baidla I.

2330 ± 105

I-3566. Taidart II **380 B.C.**

From deposits within small walled-in rockshelter (18° 26′ 30″ N Lat, 9° 24′ 20″ W Long), 13 to 35 cm depth. *Comment* (P.J.M.): dates Akjinjeir phase, terminal Neolithic. Date is in fair agreement with 2600 ± 110 (GX-1326) from Bledd Initi site, and in good agreement with historical records which place initial "Libyco-Berber" invasion at ca. 500 B.C.

South America

Central Coast, Peru series

Various samples of archaeologic interest from central coast of Peru. Coll. and subm. 1966 to 1968 by F. Engel, Univ. Agraria, Lima, Peru.

8030 ± 150

I-2440. V. 2448 **6080 B.C.**

Powdered charcoal and soil from just below entrance to cave in Puna (12° 14′ S Lat, 76° 21′ W Long). From 4th level of refuse.

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10,030 ± 170
I-3091. V. 2526 **8080 B.C.**

Charred wood from Chilca Canyon (12° 13′ S Lat, 76° 22′ W Long). From Cave 1, Site 12 B-VI-450, Level 800.

6290 ± 120
I-3092. V. 2518 **4340 B.C.**

Vegetal remains from same location as I-3091, younger stratigraphic layer.

Pampa of Haldas series, Peru

Various cultural samples from villages in Pampa of Haldas, N coast Peru. Coll. 1968 by B. Ojeda and F. Engel; subm. 1968 by F. Engel.

3135 ± 105
I-3275. N. 82 **1185 B.C.**

Charcoal from Level 500, Site 9A-II-10, Haldas (9° 42′ 44″ S Lat, 78° 18′ 05″ W Long), Peru. *Comment* (F.E.): dates pottery expected to be pre-Chavin.

4770 ± 120
I-3276. N. 223 **2820 B.C.**

Wood from funeral bundle in Grave 2, Site 488, Haldas (9° 40′ S Long, 78° 16′ 40″ W Long), Peru. *Comment* (F.E.): graves belong to early pre-agricultural settlers on N coast.

870 ± 100
I-3277. N. 263 **A.D. 1080**

Plant remains from Level 300, Site 9A-II-125, Haldas (9° 41′ 50″ S Lat, 78° 18′ 58″ W Long), Peru. *Comment* (F.E.): sample helps date post-Chavin re-occupation of Pampa of Haldas.

2920 ± 105
I-3466. N. 403 **970 B.C.**

Charcoal from Level 1, Site 9A-II-2088, Haldas (9° 42′ 43″ S Lat, 78° 17′ W Long), Peru. *Comment* (F.E.): sample helps date Puerto Morin period.

6650 ± 120
I-3467. N. 396 **4700 B.C.**

Vegetal remains from Level 200, Site 9A-II-2075, Haldas (9° 42′ 53″ S Lat, 78° 17′ 33″ W Long), Peru. *Comment* (F.E.): sample helps date early agricultural period in Haldas.

3870 ± 110
I-3468. N. 404 **1920 B.C.**

Vegetal remains from Level 100, inside large quadrangular pre-ceramic platform, Site 9A-II-3002, Haldas (9° 42′ 43″ S Lat, 78° 18′ 19″ W Long), Peru. *Comment* (F.E.): sample helps date early community architecture on N coast.

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205 ± 85

I-2841. Village 922, V. 2478, Peru **A.D. 1745**

Charcoal from Village 922 in Chilca canyon (12° 33′ 34″ S Lat, 76° 38′ 39″ W Long), Peru. Coll. and subm. 1967 by F. Engel.

580 ± 100

I-2843. Village 2081, V. 2485, Peru **A.D. 1370**

Charcoal from Village 2081 in Chilca canyon (12° 23′ 30″ S Lat, 76° 39′ 40″ W Long), Peru. From Level 1, Site 12B-VII-2081. Coll. 1967 by B. Ojeda; subm. 1967 by F. Engel. *Comment* (F.E.): sample helps date large villages found in dry canyons of lower Andes and provides information about possible climatic changes.

3560 ± 115

I-3274. Pampa Ancon, N. 211, Peru **1610 B.C.**

Charcoal from Pampa Ancon, I (11° 43′ S Lat, 77° 08′ W Long), central coast Peru. From Level 100, Site 11B-VIII-100. Coll. and subm. 1968 by F. Engel. *Comment* (F.E.): dates large village of stone houses belonging to early pre-maize period.

6150 ± 120

I-3560. Village 25, N. 458, Peru **4200 B.C.**

Charcoal from Village 25 at mouth of Ica R. (14° 52′ 23″ S Lat, 75° 34′ 06″ W Long), S coast Peru. From strat. Cut 1, Level 9, Site 15B-VII-25, at + 10 m. Coll. and subm. 1968 by F. Engel.

Viru Valley series, Peru

Samples from Viru Valley, N coast Peru. Coll. 1969 by F. Engel and B. Ojeda; subm. 1969 F. Engel.

3240 ± 100

I-4111. Guañape, V. 2703 **1290 B.C.**

Charcoal from Site 7A-VIII-71B #500 (8° 25′ 25″ S Lat, 78° 54′ 10″ W Long), Guañape, Level 500.

3030 ± 100

I-4112. Guañape, V. 2704 **1080 B.C.**

Textiles and vegetal remains from Site 7A-VIII-71B #200 (8° 25′ 25″ S Lat, 78° 54′ 10″ W Long), Guañape, Level 2.

1700 ± 130

I-4113. Gallinazo, V. 2701 **A.D. 250**

Ashes from Site 7A-VIII-59 #100 (8° 26′ 25″ S Lat, 78° 53′ 22″ W Long), Gallinazo, Level 100.

1850 ± 100

I-4114. Gallinazo, V. 2702 **A.D. 100**

Charcoal from Site 7A-VIII-59 SC II #1.100 (8° 26′ 25″ S Lat, 78° 53′ 22″ W Long), Gallinazo, Level 1.100.

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I-4174. V. 2730 **2150 ± 95**
200 B.C.

Charcoal from Site 7A-VIII-66 #1 (8° 24′ 39″ S Lat, 78° 53′ 39″ W Long), Level 1. *Comment* (F.E.): aid in dating Puerto Morin occupation on N coast of Peru.

I-4175. Chilca Canyon, Peru **1100 ± 100**
A.D. 850

Charcoal from hearth inside house, Village 12B-VII-947 #200 (12° 25′ 26″ S Lat, 76° 44′ 45″ W Long), Level 200, Chilca canyon, central coast Peru. Coll. and subm. 1969 by F. Engel and B. Ojeda, Natl. Agrarian Univ. of Peru, Lima, Peru. *Comment* (F.E.): aid in dating above ground architecture and orange polished pottery of unknown type found in village.

References

Date lists:

Isotopes IV	Trautman, 1964
Isotopes V	Trautman and Willis, 1966
Isotopes VI	Buckley, Trautman, and Willis, 1968
Isotopes VII	Buckley and Willis, 1969
Yale VII	Stuiver and Deevey, 1962

Andrews, J. T., 1967, Radiocarbon dates obtained through the Geog. Branch field observations: Geog. Bull. 9, p. 115-162.

———— 1968, Postglacial rebound in Arctic Canada; similarity and prediction of uplift curves: Canadian Jour. Earth Sci., v. 5, p. 39-47.

Apellaniz, J. M., Llanos, A., and Farina, J., 1967, Cuevas sepulcrales de Lechon, Arralday, Calaveras y Gobaederra: Estudios de Arqueología Alavesa, Consejo de Cultura Deputación Foral de Alava, Tomo II, Vitoria.

Armstrong, J. E., Crandell, D. R., Easterbrook, D. J., and Noble, J. B., 1965, Late Pleistocene stratigraphy and chronology in southwestern British Columbia and northwestern Washington: Geol. Soc. America Bull., v. 76, p. 321-330.

Auer, Väinö, 1949, Las capas volcánicas como nuevo método de cronología postglacial en Fuegopatagonia: Agri. Tomo III, Rev. Inv., Buenos Aires, v. 2, p. 83.

———— 1965, The Pleistocene of Fuego-Patagonia, Pt. IV, Bog profiles: Acad. Sci. Fenn. Ann., ser. A III, Geol.-Geog. 80, p. 96.

Balster, C. A. and Parsons, R. B., 1968, Geomorphology and soils, Willamette Valley, Oregon: Oregon State Univ. Spec. Rept. 265, 31 p.

Benedict, J. B., 1966, Radiocarbon dates from a stone-banked terrace in the Colorado Rocky Mountains, U.S.A.: Geog. Ann., v. 48A(1), p. 24-31.

Berger, R., Harney, A. G., and Libby, W. F., 1964, Radiocarbon dating of bone and shell from their organic components: Science, v. 144, p. 999-1001.

Bocquier, G., 1968, Biogeocenoses et morphogenese actuelle de certains pediments du Bassin Tchadien: 9th Internatl. Cong. Soil Sci. Adelaide Trans., IV, p. 605-614.

Buckley, J. D., Trautman, M. A., and Willis, E. H., 1968, Isotopes' radiocarbon measurements VI: Radiocarbon, v. 10, no. 2, p. 246-295.

Buckley, J. D. and Willis, E. H., 1969, Isotopes' radiocarbon measurements VII: Radiocarbon, v. 11, p. 53-105.

Butzer, K. W., 1967, Geomorphology and stratigraphy of the Paleolithic site of Budino: Eiszeitalter und Gegenwart, v. 18, p. 82-103.

Butzer, K. W. and Hansen, C. L., 1968, Geomorphology and prehistoric environments at the Aswan Reservoir: Univ. of Wisconsin Press, Madison, 562 p.

Byers, D. S., 1959, The archaeology of New York State: Am. Antiquity, v. 24, no. 3.

Clark, D. W., 1966, Perspectives in the prehistory of Kodiak Island, Alaska: Am. Antiquity, v. 31, no. 3, p. 358-371.

Clark, G. H., 1968, Archaeology of the Takli site, Katmai Natl. Monument, Alaska: M.A. Thesis, Univ. of Oregon, Univ. microfilm M-1439.

de Aguirre, E. and Butzer, K. W., 1967, Problematical Pleistocene artifact assemblage from northwestern Spain: Science, v. 157, p. 430-431.

https://doi.org/10.1017/S0033822200036225 Published online by Cambridge University Press

de Heinzelin, J., 1968, Geological history of the Nile valley: the prehistory of Nubia: F. Wendorf (ed.), Southern Methodist Univ. Press, Dallas.
Dumond, D. E. and Cressman, L. S., 1962, Prehistory in the Naknek drainage: Research on northwest prehistory, Univ. of Oregon, Dept. of Anthropol., p. 7-54.
———— 1963, Two early phases from the Naknek drainage: Arctic Anthropol., v. 1, no. 2, p. 92-104.
———— 1968, Eskimos and Aleuts: Proc. 8th Internatl. Cong. Anthropol. and Ethnol., Science.
Forbis, R. G., 1961, Early point types from Acasta Lake: Am. Antiquity, v. 27, no. 1, p. 112-113.
Funk, R. E., 1967, A Paleo-Indian site in the Hudson Valley: Eastern States Archeol. Fed. Bull., no. 28.
Funk, R. E. and Johnson, R. A., 1964, A probable Paleo-Indian component in Greene County, New York: Pennsylvania Archaeol., v. XXXIV, no. 1.
Fryxell, Roald, 1965, Mazama and Glacier Peak volcanic ash layers: relative Ages: Science, v. 147, p. 1288-1290.
Giddings, J. L., 1964, The archaeology of Cape Denbigh: Brown Univ., Providence, R. I.
Godwin, H., 1960, Radiocarbon dating and Quaternary history in Britain: Proc. Roy. Soc. Lond. B, v. 153, p. 287-320.
Godwin, H., Suggate, R. P., and Willis, E. H., 1958, Radiocarbon dating of the eustatic rise in ocean-level: Nature, v. 181, p. 1518-1519.
Gould, R. A., 1966, Archaeol. of the Pointe St. George site, and Tolowa prehistory: Univ. of California Pubs. in Anthropol., v. 4, 141 p.
Hansen, H. P., 1950, Pollen analysis of three bogs on Vancouver Island, Canada: Jour. Ecology, v. 38, p. 270-276.
Hawley, J. W., 1965, Geomorphic surfaces along the Rio Grande Valley from El Paso, Texas to Caballo Reservoir, New Mexico: New Mexico Geol. Soc. Guidebook of Southwestern Mexico II, p. 188-198.
Hawley, J. W. and Kottlowski, F. E., 1965, Road log from Las Cruces to Nutt: New Mexico Geol. Soc. Guidebook of Southwestern Mexico II, p. 15-27.
Haynes, C. V., 1967, Radioactive dating and methods of low-level counting: IAEA, Vienna, p. 163.
Helley, E. J. and La Morchi, T., 1968, U.S.G.S. prof. paper 600 D, p. 34-37.
Karrow, P. F., 1961, The Champlain Sea and its sediments *in*: Soils in Canada: Royal Soc. Canada, spec. pub. 3, p. 97-108.
Kerney, M. P., 1965, Weichselian deposits in the Isle of Thanet, East Kent: Geol. Assoc. London Proc., v. 76, p. 269-274.
King, C. A. M. and Andrews, J. T., 1967, Radiocarbon dates and significance from the Bride Moraine, Isle of Man: Geol. Jour., v. 5, p. 305-308.
King, C. A. M. and Buckley, J. T., 1967, The chronology and deglaciation around Eqe Lake and Lake Gillian, Baffin Island, N.W.T.: Geog. Bull., v. 9, p. 20-32.
Leech, L., 1966, Excavations at Willow Brook: Southwestern Lore, v. 32, no. 2.
Lind, A. O., 1968, Recent high sea-level stands in the Bahamas: Paper, Assoc. of Am. Geographers Ann. Mtg., Washington, D. C.
Martin, P. S., 1929, The 1928 archaeological expedition of the State Historical Society of Colorado: The Colorado Magazine, v. VI, p. 1-36.
Mauny, R., 1950, Villages Neolithiques de la Falaise (dhar) Tichitt-Oualata: Notes Africaines, no. 50, p. 35-43.
Mehringer, P. J., Schweger, C. E., Wood, W. R., and McMillan, R. B., 1968, Late Pleistocene boreal forest in the western Ozark highlands: Ecology, v. 49, no. 3, p. 567-568.
Mirambell, L., 1967, Excavaciones en un sitio pleistocenico de Tlapacoya, Mexico: Bol. I.N.A.H., no. 29, p. 37-41.
Mooser, Federico, 1967, Tefracronología de la Cuenca de Mexico para los últimos 30,000 años: Bol. I.N.A.H., no. 30, p. 12-15.
Muller, E. H., 1954, The glacial geology of the Naknek district, the Bristol Bay region, Alaska: Ph.D. thesis, Univ. of Illinois.
Ninkovich, D. and Heezen, B. C., 1965, Santorini Tephra: Submarine Geol. and Geophysics, 17th Symposium Colston Res. Soc. Proc., Bristol, Butterworths, London, p. 413-452.
Nowak, M., 1968, Archaeological dating by means of volcanic ash strata: Ph.D. thesis, Univ. of Oregon.

https://doi.org/10.1017/S0033822200036225 Published online by Cambridge University Press

Olson, A. P., 1966, A mass secondary burial from northern Arizona: Am. Antiquity, v. 31, no. 6, p. 822-826.
Perrin, R. M. S., Willis, E. H., and Hodge, C. A. H., 1964, Dating of humus Podzols by residual radiocarbon dating: Nature, v. 202, p. 165-166.
Porter, S. C. and Denton, G. H., 1967, Chronology of neoglaciation in the North American Cordillera: Am. Jour. Sci., v. 265, p. 177-210.
Reiter, Paul, 1938, The Jamez Pueblo of Unshagi, New Mexico: Univ. of New Mexico and School of Am. Research mon., Univ. of New Mexico Press.
Ritchie, W. A., 1965, The archaeology of New York State: Natural History Press, New York, a—p. 1-99, b—p. 260-265.
Stuiver, Minze and Deevey, E. S., 1962, Yale natural radiocarbon measurements VII: Radiocarbon, v. 4, p. 250-262.
Townsend, J. B. and Townsend, S. J., 1961, Archeological investigations at Pedro Bay, Alaska: Univ. of Alaska Anthropol. Papers, v. 10, no. 1, p. 25-58.
Trautman, M. A., 1964, Isotopes, Inc. radiocarbon measurements IV: Radiocarbon, v. 6, p. 269-279.
Trautman, M. A. and Willis, E. H., 1966, Isotopes, Inc. radiocarbon measurements V: Radiocarbon, v. 8, p. 161-203.
Turner, C. G. and Tucker, N., 1968, A massacre at Hopi: Paper, Soc. Amer. Archeologists Ann. Mtg., Santa Fe.
Van der Hammen, T., Maarleveld, G. C., Vogel, J. C., and Zagwijn, W. H., 1967, Stratigraphy, climatic succession and radiocarbon dating of the last glacial in the Netherlands: Geol. en Mijnbouw, v. 46, p. 79-95.
Van Straatin, L. M. J. U., 1966, Micro-malacological investigations of cores from the southeastern Adriatic Sea: Koninkl. Nederl. Akad. Van Wetenschapen Proc., ser. B., v. 69(3), p. 429-445.
Vernon, R. O., 1951, Geology of Citrus and Levy Counties, Florida: Florida Geol. Survey, bull. 33, 256 p.
Wendorf, F., 1965, Contributions to the prehistory of Nubia: Fort Burgwin Research Center and Southern Methodist Univ. Press, Santa Fe and Dallas.

CORRECTION

In Volume 11, No. 1, p. 66, Sample I-3430 should refer to Orford, Suffolk, and not Oxford, as stated.

https://doi.org/10.1017/S0033822200036225 Published online by Cambridge University Press