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U. S. GEOLOGICAL SURVEY RADIOCARBON DATES IX*

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This list contains the results of measurements made during 1965 and 1966. Samples are counted in the form of acetylene gas, as previously, and ages computed on the basis of the Libby half-life, 5568 ± 30 yr. The error listed is always larger than the one-sigma statistical counting error commonly used, takes into account known uncertainty laboratory factors, but does not include external (field or atmospheric) variations.

Unless otherwise stated, collectors of all samples are members of the U. S. Geological Survey. The authors are indebted to Mrs. Julia Hohl, who assisted in the preparation of this list and of the samples since the fall of 1966.

SAMPLE DESCRIPTIONS

A. Eastern U. S.

W-1903. Sussex County, Delaware **> 42,000**

Wood from stump of cypress between Seaford and Middleford (38° 39′ 36″ N Lat, 75° 36′ 12″ W Long), Sussex County, Delaware. In clay overlain by sand and gravel. Coll. 1966 and subm. by Henry Hutchinson, Sussex Soc. of Archeol. and History, Bethel, Delaware. *Comment:* wood probably grew during Sangamon Interglaciation.

W-1542. Lafayette Square, Washington, D. C. **> 45,000**

Fresh-water peat from Lafayette Square (38° 53′ 58″ N Lat, 77° 02′ 7″ W Long), Washington, D.C. From upper part of peat above organic silt, alt ca. 50 ft. Peat contains pollen, mostly of spruce and pine, some of fir, and a few deciduous trees; also contains fresh-water sponge spicules and diatoms. Sample is from near top of Wicomico Formation and above cypress swamp (Cooke, 1952). Coll. 1964 and subm. by A. S. Knox. *Comment* (A.S.K.): pollen indicates thick boreal coniferous forest. Peat is early Wisconsin (Knox, 1962), whereas swamp is Sangamon (W-302, >38,000, USGS IV). Date is compatible.

W-1661. Jacksonville, Florida **7170 ± 300 5220 B.C.**

Shells (*Ostrea equestris*) from Atlantic shelf in area of relict sediment, at 19 m depth, near Jacksonville (30° 00′ N Lat, 81° 15.0′ W Long), Florida. Coll. 1964 and subm. by K. O. Emery, Woods Hole Oceanographic Inst., Massachusetts. *Comment* (K.O.E.): further sub-

* Publication authorized by the Director, U.S. Geological Survey.

stantiates ages of relict sediment of shelf, but in area far S of previously dated oysters (Merrill and others, 1965).

W-1596. Sandy Point, Maine **11,790 ± 300 9840 B.C.**

Mollusc shells (clams, scallops, and snails) from Stockton Springs, at S end of Sandy Point (44° 29′ 50″ N Lat, 68° 48′ 35″ W Long), Maine. In marine clay overlain by esker sand and gravel, alt 10 ft above mean high tide. Coll. 1964 and subm. by G. C. Prescott. *Comment* (G.C.P.): date equivalent to that of shells from similar esker, with clay between layers of gravel, near Waterville (W-737, 11,800 ± 240, USGS V).

W-1636. Gay Head, Martha's Vineyard, Massachusetts **> 42,000**

Pieces of thick-shelled *Mercenaria mercenaria* from N part of Gay Head, sea cliff at W tip of Martha's Vineyard (41° 21′ N Lat, 70° 50′ W Long), Massachusetts. From sand overlying glauconitic ferruginous clay. Coll. 1964 and subm. by C. A. Kaye. *Comment* (C.A.K.): sand horizon originally thought Pliocene (Dall, 1894), but more recently considered Pleistocene (Raup and Lawrence, 1963). Kaye (1964) has placed horizon in Aftonian interglaciation and date confirms it is older than classical Wisconsin.

W-1520. Tahawus, New York **> 40,000**

Disseminated woody stem and root fragments, including material of *Pinus strobus* (id. by Bierhorst) from South Tailings Pond, Sanford Pit (43° 58′ N Lat, 74° 03′ W Long), Tahawus, New York. Stratigraphy, top to bottom: postglacial pond sediments, till, sand, clay with wood fragments (W-1520), clay and silt, till. Coll. 1963 by Malcolm Heyburn; subm. by E. H. Muller, Syracuse Univ., New York. *Comment* (E.H.M.): both tills in exposure are pre-late Cary. Wood fragments in interglacial pond sediment may be similar in age to interstadial beds at Otto, New York (GrN-3213, 63,900 ± 1700), and at St. Pierre, Quebec (GrN-1799, 65,300 ± 1400).

W-1662. Cape Romain, South Carolina **17,290 ± 500 15,340 B.C.**

Shells (*Crassostrea virginica*) from Atlantic shelf in area of relict sediment, at 33 m depth, near Cape Romain (33° 10.7′ N Lat, 78° 15.5′ W Long), South Carolina. Coll. 1964 and subm. by K. O. Emery. *Comment* (K.O.E.): date supports prior dates obtained on oysters from relict sediment of continental shelf (Merrill and others, 1965).

B. Central U. S.

W-1570. Autaugaville, Alabama **< 200**

Wood from base of terrace of Alabama River, 3 mi SW of Autaugaville, in gravel pit, SW ¼ sec. 32, T 17 N, R 14 E (32° 24′ N Lat, 86° 41.5′ W Long), Alabama. From base of terrace 140 ft above river, over-

lying Cretaceous strata. Coll. 1964 and subm. by L. C. Conant. *Comment* (L.C.C.): it had been expected sample would date terrace, but it is obviously recent.

14,650 ± 500

W-1571. Demopolis Dam, Alabama **12,700 B.C.**

Log from scour pool in Tombigbee River at downstream end of spillway, SW ¼ SW¼ NE ¼ sec. 21, T 18 N, R2 E (32° 31′ 20″ N Lat, 87° 52′ 35″ W Long), Sumter County, Alabama. From Mastodon-bearing clay below recent alluvium and overlying Cretaceous strata. Coll. 1964 by D. E. Jones; subm. by L. C. Conant. *Comment* (L.C.C.): dates flood plain of Tombigbee River.

23,400 ± 600

W-1688. College Corner, Indiana **21,450 B.C.**

Organic silt from creek bank 2 mi NNW of College Corner, SE ¼ NW ¼ sec. 24, T 11 N, R 1 W (39° 36′ 35″ N Lat, 84° 49′ 45″ W Long), Indiana. Overlies gravel pocket and underlies till. Coll. 1965 and subm. by Marvin Saines, Univ. of Massachusetts, Amherst. *Comment* (M.S.): agrees with date of 20,000 ± 500 (I-610, Isotopes III) reported by Gooding (1963) for his Connerville Interstade.

18,300 ± 500

W-1687. Salt Creek, Iowa **16,350 B.C.**

Organic carbon from buried soil (depth ca. 14.6 ft) SE ¼ SW ¼ sec. 6, T 84 N, R 14 W, Tama County (42° 7′ N Lat, 92° 30′ W Long), Iowa. At base of calcareous loess of Wisconsin age overlying pebble layer of Iowan erosion surface on Kansan till. Coll. 1965 by G. F. Hall and E. Robello; subm. by R. V. Ruhe, U. S. Dept. Agriculture, Iowa State Univ., Ames. *Comment* (R.V.R.): nearby sample (I-1269) of soil organic carbon is 11 feet higher but also on erosion surface. Dates indicate Iowan surface is 18,300 to 29,000 yr old.

17,200 ± 600

W-1617. Big Bone Lick, Kentucky **15,250 B.C.**

Plant-bearing silt from cranial cavity of type specimen of *Boötherium bombifrons* (Harlan), extinct musk-ox, 2 mi E of Ohio River, Big Bone Lick, Boone County (38° 52′ 32″ N Lat, 84° 45′ W Long), Kentucky. Matrix in cavity contains mainly spruce and a little pine pollen (id. E. Leopold). Coll. 1807 by General William Clark; subm. by F. C. Whitmore. *Comment* (F.C.W.): sample is oldest from Big Bone Lick. Others from area are W-908, <250, USGS VI and W-1357, <200, USGS VIII—both from top of gravel bearing a fauna dominated by *Bison bison;* and W-1358, 10,600 ± 250, USGS VIII—from horizon containing proboscidean tusk. Horizon comprises Faunal Zone C of Schultz and others (1963), and is regarded as post-Tazewell. Date of W-1617 indicates presence of fauna of Tazewell age.

9010 ± 300

W-1572. Maysville, Kentucky **7060 B.C.**

Charcoal from E end of Charleston Bottom of Ohio River on N side of railroad track in excavations for Maysville sewage plant (38° 41.15′ N Lat, 83° 47.2′ W Long), Kentucky. From discontinuous bed of charcoal 15 ft below surface of low terrace 15 ft above modern flood-plain and 35 ft below highest Wisconsin (Tazewell?) terrace. Coll. 1964 and subm. by K. L. Pierce. *Comment* (K.L.P.): date indicates low terraces along Ohio River, formerly thought part of modern flood-plain, are quite old.

7900 ± 200

W-1527. Stanley Light, Kentucky **5950 B.C.**

Wood in "blue clay" 300 yd upstream from Stanley Light, Owensboro West quad. (37° 50′ 30″ N Lat, 87° 13′ 30″ W Long), Kentucky. Clay extends from Ohio River at pool stage to 3 ft above water and underlies sand and silty clay. Coll. 1963 by T. N. V. Karlstrom and L. L. Ray; subm. by L. L. Ray. *Comment* (L.L.R.): sample is younger than carbonaceous material from depositional planes in overlying beds ca. 50 yd upstream (I-420, 9250 ± 300). Discrepancy between dates is unresolved.

Blackhoof series, Minnesota

Peat overlying sand in channel of St. Louis River, NW ¼ sec. 1, T 46 N, R 18 W (46° 30′ 15″ N Lat, 92° 34′ 40″ W Long), SW of Blackhoof, Carlton County, Minnesota. Coll. 1965 by H. E. Wright, Jr., and K. Wasylikowa; subm. by H. E. Wright, Jr. *Comment* (H.E.W.): river was diverted by Superior Lake at Nickerson-Thompson moraine before formation of glacial Lakes Nemadji and Duluth. Date may mark retreat of ice from moraine, suggesting correlation with Valders of Michigan lobe. However, date of 11,635 on glacial Lake Aitkin II (which postdates Alborn-Nickerson phase) suggests peat formed after ice retreat.

10,630 ± 500

W-1677. 134-137 cm and 150-153 cm depth **8680 B.C.**

10,420 ± 300

W-1714. 143-148 cm depth **8470 B.C.**

13,480 ± 350

W-1762. Kotiranta Lake, Minnesota **11,530 B.C.**

Organic detritus from basal lake sediment above outwash sand in Kotiranta Lake, 6 mi W of Cloquet, sec. 23, R 18 W, T 49 N (46° 42′ 32″ N Lat, 92° 35′ W Long), Carlton County, Minnesota. Coll. 1962 and subm. by H. E. Wright, Univ. of Minnesota, Minneapolis. *Comment* (H.E.W.): lake is on outwash plain assigned to Split Rock phase of

Superior lobe, and date is minimum for this ice advance. Seed analysis indicates tundra vegetation here until ca. 11,500 yr B.P.

14,690 ± 390

W-1763. Weber Lake, Minnesota **12,740 B.C.**

Silty lake sediment 1035 to 1055 cm deep in core of basal sediment, Weber Lake, sec. 36, T 58 N, R 11 W, (47° 25′ N Lat, 91° 40′ W Long), 2 mi S of Greenwood Lake, Lake County, Minnesota. Coll. 1963 and subm. by H. E. Wright. *Comment* (H.E.W.): sample from ca. 100 cm below W-873 (10,550; USGS V). It is located between Toimi drumlins of Rainy lobe, and is oldest date available for St. Croix phase in Minnesota.

W-1712. Cass County, North Dakota **> 38,000**

Fragmented wood from drill hole 94 to 104 ft deep, SE ¼ SE ¼ SE ¼ sec. 35, T 139 N, R 50 W, Cass County, North Dakota. Sand overlain and underlain by till. Coll. 1964 by Roger Schmid; subm. by R. L. Klausing. *Comment* (R.L.K.): nearest sample of comparable age is W-1574 from Richland County, North Dakota, >36,000 yr B.P. Sand and gravel from which samples were collected may be early Wisconsin.

W-1528. Ramsey County, North Dakota **> 28,000**

Wood in till SW ¼ SE ¼ sec. 14, T 154 N, R 61 W, Ramsey County (48° 10′ Lat, 98° 27′ W Long), North Dakota, 1 in. above contact with outwash sand and gravel at 44 ft depth. Coll. 1964 and subm. by J. P. Bluemle, North Dakota Geol. Survey, Grand Forks. *Comment* (J.P.B.): date indicates pre-Wisconsin till.

5440 ± 200

W-1537. Zap, North Dakota **3490 B.C.**

Wood in low terrace in valley of Spring Creek, near Zap, Mercer County, NW ¼ sec. 17, T 144 N, R 89 W (47° 18′ N Lat 102° 00′ W Long), North Dakota. Wood-bearing layer, also containing bones (including two skulls of *Bison (Superbison) crassicornis* and shells, occurs in alluvium 25 ft below top of terrace. Coll. 1964 and subm. by J. A. Brophy, North Dakota State Univ., Fargo. *Comment* (J.A.B.): date establishes surprising presence of *Bison* (*Superbison*) *crassicornis* on northern Great Plains in mid-hypsithermal time (Brophy, 1965).

11,770 ± 500

W-1755. Harrisburg, South Dakota **9820 B.C.**

Shells of *Lymnaea* from road cut 3 mi SE of Harrisburg, SW ¼ NW ¼ sec. 9, T 99 N, 49 W (43° 24′ 30″ N Lat, 96° 38′ 45″ W Long), Lincoln County, South Dakota. From lacustrine sediment, apparently superglacial, now in a basin in late Wisconsin till. Coll. 1964 and subm. by F. V. Steece, South Dakota Geol. Survey. *Comment* (F.V.S.): locality 5 mi inside margin of James lobe. Sample probably dates late Wiscon-

sin ice retreat. Other dates for till W and S of locality are 12,330 (Y-452, Yale III) and 12,050 (W-1189, USGS VII).

12,340 ± 300

W-1756. Mitchell, South Dakota **10,390 B.C.**

Wood imbedded in base of till of late Wisconsin age at interstate excavation 2 mi SE of Mitchell, Davison County, SW ¼ NE ¼ sec. 25, T 103 N, R 60 W (43° 41′ 45″ N Lat, 97° 58′ 30″ W Long), South Dakota. Coll. 1965 by F. V. Steece and C. M. Christensen; subm. by F. V. Steece. *Comment* (F.V.S.): date substantiates late Wisconsin age for drift at this locality; compares with other dates from surface drift of James lobe.

9300 ± 200

W-1530. Scotland, South Dakota **7350 B.C.**

Wood from rotary drill cuttings 6 mi NE of Scotland, Hutchinson County (43° 11′ 10″ N Lat, 97° 39′ 3″ W Long), South Dakota. At 55-ft depth in outwash, adjacent to James River, underlying till thought to be Cary (Flint, 1955). Coll. 1964 by C. M. Christensen; subm. by D. J. McGregor, South Dakota Geol. Survey. *Comment* (D.J.M.): date too young to be Cary.

Wessington Springs series, South Dakota

Charcoal or carbonized-wood fragments near Wessington Springs, South Dakota. Coll. 1962 and 1965 by F. V. Steece and J. A. McMeen; subm. by F. V. Steece. *Comment* (F.V.S.): as W-1623, W-1625, and W-1630 are from late Wisconsin till (Steece, 1964), charcoal must have been incorporated into till from older deposit, and dates are therefore anomalous. W-1626 is thought to be from early Wisconsin drift that underlies late Wisconsin drift to the E, but as black organic material is of same type as three other samples that gave anomalous dates, date of W-1626 is thought to be unreliable.

W-1623. Wessington Springs **> 42,000**

Charcoal or carbonized-wood fragments from stream bank 2 mi E of Wessington Springs, SW ¼ NW ¼ sec. 16, T 107 N, R 64 W (44° 05′ N Lat, 98° 32′ W Long), Jerauld County, South Dakota. From basal part of till of late Wisconsin (Cary: Steece and others, 1960; Mankato: Flint, 1955) ice advance.

W-1625. Jerauld County **> 42,000**

Charcoal or carbonized-wood fragments from gravel pit on E escarpment of Coteau du Missouri, 7 mi NW of Wessington Springs, NE ¼ NE ¼ SE ¼ sec. 8, T 108 N, R 65 W (44° 10′ N Lat, 98° 40′ W Long), Jerauld County, South Dakota. From base of late Wisconsin till overlying silt and outwash gravel.

W-1630. Hand County **> 42,000**

Black carbonized wood from surface till 20 mi NW of Wessington Springs, SW ¼ SE ¼ sec. 12, T 109 N, R 66 W (44° 15′ 20″ N Lat, 98° 42′ 35″ W Long), Hand County, South Dakota. From base of late-Wisconsin till, the surface deposit of region.

W-1626. Buffalo County **> 42,000**

Black carbonized wood from ca. 20 mi WNW of Wessington Springs, SE ¼ SE ¼ NE ¼ sec. 14, T 108 N, R 68 W (44° 09′ 35″ N Lat, 98° 56′ 55″ W Long), Buffalo County, South Dakota. From concentrated zone in silt beneath surficial late Wisconsin till.

12,680 ± 300

W-1757. Woonsocket, South Dakota **10,730 B.C.**

Log from gravel, 10 to 11 ft below surface, 3 mi NW of Woonsocket, Sanborn County, sec. 8, T 106 N, R 62 W (43° 59′ 45″ N Lat, 98° 18′ 36″ W Long), South Dakota. Coll. 1965 by Leslie Easlund; subm. by F. V. Steece. *Comment* (F.V.S.): minimum age of outwash is 10,060 ± 300 (W-1033, USGS VII). Date older than expected; wood may have been dislodged from late-Wisconsin till by melt water and trapped in outwash.

4970 ± 250

W-1653. Belton, Texas **3020 B.C.**

Shells *(Tritogonia verrucosa, Quadrula pustulosa,* and *Amblema perplicata)* 14 ft below surface of T-1 terrace of Lampasas River, in excavation for Stillhouse Hollow Dam SW of Belton (31° N Lat, 97.5° W Long), Bell County, Texas. Coll. 1965 and subm. by R. H. Slaughter, Southern Methodist Univ., Dallas, Texas. *Comment* (R.H.S.): date is early recent, indicating that a few northern molluscan species outlasted northern mammalian species in Texas.

2280 ± 200

W-1689. Dallas, Texas **330 B.C.**

Mollusc shells from Trinity River, Dallas (33° N Lat, 96° 70′ W Long), Texas. From channel fill 38 ft below stream and 50 ft below present flood-plain. Coll. 1962 and subm. by B. H. Slaughter, Shuler Mus. of Paleontology, Southern Methodist Univ., Dallas, Texas. *Comment* (B.H.S.): indicates 50 to 60 ft of cutting ca. 3000 yr ago, then refilling in last 2000 yr. Similar events are reported in North Sulphur River, which refilled 1870 yr ago.

22,130 ± 600

W-1719. Seagoville, Texas **20,180 B.C.**

Oak and cockleburr from thin lens of organic muck in crossbedded sand, 15 ft above Pleistocene sediments beneath flood-plain of Trinity River W of Seagoville (33° N Lat, 97° W Long), Dallas County, Texas. Coll. 1965 and subm. by B. H. Slaughter. *Comment* (B.H.S.): dates oc-

currence of *Bison antiquus* and is minimum terminal date for Geochelone in Texas. Indicates valley filling took place simultaneously throughout the drainage.

W-1598. McKinley, Wisconsin **> 38,000**

Spruce fragments from well at 170 to 180 ft depth, McKinley, Polk County, SW ¼ SW ¼ sec. 3, T 36 N, R 15 W (45° 38′ N Lat, 92° 13′ W Long), west-central Wisconsin. In sand overlain and underlain by sandy clay. Coll. 1964 by Beecroft Bros. Well Drillers; subm. by R. F. Black, Univ. of Wisconsin, Madison. *Comment* (R.F.B.): first sample found in state which dates more than 30,000 yr.

W-1758. Woodville, Wisconsin **> 45,000**

Peat in pond filling in uppermost part of till exposed in railroad cut, NW ¼ NW ¼ sec. 35, T 29 N, R 16 W (44° 58′ N Lat, 92° 18′ W Long), Woodville, Wisconsin. Bed is deformed and partly truncated by stony drift. Coll. 1965 and subm. by R. F. Black. *Comment* (R.F.B.): erratic wood sample from till in same cut dated 30,650 ± 1640 yr B.P. (Y-572) and another, 3 mi W, in base of till dated 29,000 ± 1000 yr B.P. (W-747). Peat therefore must not have been initially deposited above till, but represents older pond deposit transported by ice that deposited till.

C. Western U. S.

Ehrenberg series, Arizona

Carbonized wood from flood-plain alluvium of Colorado River, ca. 2 mi N of Ehrenberg (33° 38′ 18″ N Lat, 114° 31′ 10″ W Long), Yuma County, Arizona. In Parker-Blythe-Cibola area, deposits are 90 to 125 ft thick, and consist of basal cobble gravel overlain by sand with some gravel (Metzger, 1964). Coll. 1964 by McBride Pump and Supply Co.; subm. by D. G. Metzger. *Comment* (D.G.M.): dates support conclusion that deposits were laid down as Colorado River aggraded following last major glaciation (see also W-1142 and W1143, this date list).

6250 ± 300

W-1501. Carbonized wood, 67 ft **4300 B.C.**

From sand overlying basal cobble gravel at 67 ft depth.

8610 ± 300

W-1502. Carbonized wood, 110 ft **6660 B.C.**

From basal cobble gravel at 110 ft depth.

1730 ± 200

W-1741. Kinboko Canyon, Arizona **A.D. 220**

Bark from *Juniperus utahensis* used as wadding between sandstone slabs of Basketmaker II storage cyst in Kinboko Cave 3 in Kinboko Canyon (35° 37′ N Lat, 110° 30′ W Long), Arizona. Coll. in undisturbed

fill 3 to 18 in. below sterile sand surface layer. Coll. 1965 and subm. by D. O'Bryan. *Comment* (D.O.): date extends range and number of dated Basketmaker II sites in Southwest and will aid tree-ring dating of wood found with bark.

Blythe series, California

Carbonized wood and wood from flood-plain alluvium of Colorado River,Blythe (33° 36′ 48″ N Lat, 114° 35′ 39″ W Long), California. Colorado River deposits of Parker-Blythe-Cibola area have been subdivided into older alluvium (W-1142), Chemehuevi Formation, and younger alluvium (W-1143). Younger alluvium here 90 to 125 ft thick, consists of basal cobble gravel overlain by sand with some gravel (Metzger, 1964). Coll. 1961 by McBride Pump and Supply Co.; subm. by D. G. Metzger. *Comment* (D.G.M.): W-1143 supports conclusion that deposits were laid down as river aggraded following last major glaciation (see also W-1501 and W-1502, this date list).

5380 ± 300

W-1143. Wood, 57 ft **3430 B.C.**

From sand overlying basal cobble gravel, at 57 ft depth.

W-1142. Carbonized wood, 344 ft **> 38,000**

From older alluvium beneath younger flood-plain deposits at 344 ft depth.

Glass Mountain series, California

Wood and charcoal from Glass Mountain, Medicine Lake High lands, California, in or at edge of composite rhyolite-dacite flow. Coll. 1963 and subm. by Irving Friedman. *Comment* (I.F.): this was attempt to date time of eruption of composite rhyolite-dacite flow. Pumice eruption that preceded rhyolite eruption has been dated 1107 ± 380 to 1660 ± 300 (Chesterman, 1955). Date obtained for W-1544 was on heart of tree, rather than on outer charcoal.

970 ± 200

W-1544. Cedar(?) tree **A.D. 980**

Cedar(?) tree engulfed by snout of dacite flow in SE tongue of rhyolite-dacite composite flow, ca. 0.4 mi W of sec. 7, T 43 N, R 5 E (41° 35′ 15″ N Lat, 121° 27′ 30″ W Long).

90 ± 200

W-1549. Charcoal, edge of flow **A.D. 1860**

Charcoal from tree at edge of rhyolite-dacite composite flow, NE of "Hot Spot," sec. 33, T 44 N, R 4 E (41° 36′ 17″ N Lat, 121° 31′ 15″ W Long).

380 ± 200

W-1547. Charcoal, toe of flow **A.D. 1570**

Charcoal from tree near toe of rhyolite-dacite composite flow, NE of "Hot Spot," sec. 33, T 44 N, R 4 E (41° 36′ 17″ N Lat, 121° 31′ 15″ W Long).

130 ± 200

W-1545. Rotted log **A.D. 1820**

Partially rotted log at edge of flow, near pumice mine on S side of Glass Mountain (41° 35′ 20″ N Lat, 121° 31′ W Long).

190 ± 200

W-1546. Charcoal, foot of lobe **A.D. 1760**

Charcoal at foot of lobe of rhyolite flow, sec. 26, T 44 N, R 4 E (41° 37′ 15″ N Lat, 121° 28′ 50″ W Long).

390 ± 200

W-1551. Charcoal, SE lobe **A.D. 1560**

Charcoal from wood along edge of flow, SE lobe (41° 35′ N Lat, 121° 29′ 20″ W Long).

26,780 ± 600

W-1506. Lost Hills, California **24,830 B.C.**

Wood from core drilled by California Dept. of Water Resources ca. 9 mi N of Lost Hills, San Joaquin Valley, NW ¼ NW ¼ sec. 21, T 25 S, R 21 E (35° 40′ N Lat, 120° 25′ W Long), California, at ca. 40 ft depth, 3 ft beneath fine-grained lacustrine sediment. Coll 1964 by M. G. Croft and John Cipperly; subm. by J. F. Poland. *Comment* (M.G.C.): date indicates fine-grained deposits are probably 25,000 yr old, correlative with Parting Mud of Searles Lake, California (Smith, 1962). Average rate of deposition, then, is 1.5 ft per 1000 yr.

Lost Hills series, California

Wood fragments in sand from SE of Lost Hills, California. Coll. 1964 and subm. by M. G. Croft. *Comment* (M.G.C.): W-1650 dates approximate end of major pluvial-lacustrine cycle in San Joaquin Valley, and encroachment of alluvial fans into Valley. W-1652 substantiates interpretation. Beginning of pluvial-lacustrine cycle has been dated at 26,780 ± 600 yr (W-1506, this date list).

14,060 ± 450

W-1650. Wood, 35 ft **12,110 B.C.**

Wood fragments from sand ca. 9 mi SE of Lost Hills, NW ¼ NW ¼ sec. 16, T 28 S, R 22 E (35° 30′ N Lat, 119° 37′ W Long). From top of tongue of blue Sierran sand and clay, at 35 ft depth, which interfingers laterally with lacustrine clay underlying Tulare Lake Bed and is overlain by oxidized fan alluvium derived from Coast Range.

13,350 ± 500

W-1652. Wood, 20 ft **11,400 B.C.**

Wood fragments from sand ca. 5 mi SE of Lost Hills, NE ¼ SW ¼ sec. 20, T 27 S, R 22 E (35° 33′ 45″ N Lat, 119° 38′ W Long). From several ft above lacustrine clay underlying Tulare Lake Bed, at 20 ft depth.

W-1503. Mendota, California **> 40,000**

Wood from core drilled by U. S. Bureau of Reclamation ca. 1½ mi SE of Mendota, San Joaquin Valley, NE ¼ NW ¼ sec. 8, T 14 S, R 15 E (36° 43′ 45″ N Lat, 120° 21′ 50″ W Long), California. From 89 ft depth, 50 ft beneath fine-grained lacustrine or paludal beds. Coll. 1962 by H. E. Richardson and Carl Roots; subm. by J. F. Poland. *Comment* (J.F.P.): date indicates deposition of uppermost 89 ft of sediments close to axis of San Joaquin Valley trough has required more than 40,000 yr (see W-1192, USGS VII).

Millux series, California

Wood from cores drilled by California Dept. of Water Resources in San Joaquin Valley, California. From beds underlying fine-grained lacustrine sediments. Coll. 1964 by M. G. Croft and John Cipperly; subm. by J. F. Poland. *Comment* (M.G.C.): dates indicate that lacustrine deposits, possibly correlative with Late Sehoo Lake deposits (Morrison, 1964), are ca. 9000 yr old. Deposition in area has averaged ca. 4 ft per 1000 yr.

9040 ± 300

W-1505. Wood, 37.5 ft **7090 B.C.**

Sample from sand lens in fine-grained lacustrine sediment at 37.5 ft depth 2 mi S of Millux, Kern County, SW ¼ SW ¼ sec. 10, T 32 S, R 26 E (35° 9′ 4″ N Lat, 119° 10′ 46″ W Long).

17,130 ± 350

W-1504. Wood, 73.5 ft **15,180 B.C.**

From ca. 12 ft beneath fine-grained lacustrine sediment at 73.5 ft depth, 2½ mi S of Millux, Kern County, SE ¼ NW ¼ sec. 16, T 32 S, R 26 E (35° 8′ 45″ N Lat, 119° 11′ 20″ W Long).

5480 ± 300

W-1579. Palo Alto, California **3530 B.C.**

Wood fragments at 22 to 24 ft depth in borehole near W end of Stanford Linear Accelerator along San Francisquito Creek, 3 ¼ mi WSW of Stanford Univ. (37° 24′ 47″ N Lat, 122° 13′ 29″ W Long), Palo Alto, California. From organic material overlain by alluvium. Coll. 1962 by F. R. Conwell; subm. by E. H. Pampeyan. *Comment* (E.H.P.): dates derivation of alluvium from rocks on opposite side of San Andreas fault.

Searles Lake series, California

Aragonite oolites disseminated in lake silt, SW Searles Valley (35° 35′ 40″ N Lat, 117° 23′ 45″ W Long), San Bernardino County, California. Coll. 1964 and subm. by G. I. Smith. *Comment* (G.I.S.): stratigraphic relations between this sample and previous samples 5 mi NW do not agree with dates; however, essential duplication of W-1679 and W-1680 and nature of material suggest stratigraphy is in error.

W-1679. First fraction dissolved — **11,020 ± 400 / 9070 B.C.**

W-1680. Last fraction dissolved — **11,820 ± 400 / 9870 B.C.**

W-1575. Western Searles Valley, California — **29,200 ± 2000 / 27,250 B.C.**

Mollusc shells from S of highway leading to Searles Valley, ½ mi E of mouth of Salt Wells Canyon, NW ¼ sec. 24, T 26 S, R 42 E (35° 40′ 00″ N Lat, 117° 24′ 54″ W Long), California. From sand layer ca. 8 ft above valley floor level here. This and several overlying units are possibly equivalent to Lower salt unit in Searles Lake. Coll. 1963 and 1964 and subm. by G. I. Smith and P. F. Irish. *Comment* (G.I.S.): from same horizon as W-1422, 27,400 ± 800 (USGS VIII), 0.9 mi SE of W-1575.

W-1529. Bijou Creek, Colorado — **29,000 ± 700 / 27,050 B.C.**

Tree stump in alluvium in NW valley wall of Bijou Creek, NW ¼ SE ¼ SE ¼ sec. 29, T 4 N, R 59 W (39° 50′ N Lat, 104° 10′ W Long), Morgan County, Colorado. Coll. 1963 and subm. by G. R. Scott and M. E. Gardner. *Comment* (G.R.S.): as pre-Piney Creek alluvium is ca. 5500 yr old, sample must have been contaminated by Cretaceous carbonaceous material from Laramie Formation. Analysis of pollen assemblage supports interpretation (see also W-1663, this date list).

W-1663. South Platte River, Colorado — **> 32,000**

Carbonaceous material from cross-stratified alluvium in S valley wall of South Platte River, SW ¼ sec. 31, T 5 N, R 59 W (40° 25′ N Lat, 104° 02′ W Long), Morgan County, Colorado. Coll. 1965 and subm. by G. R. Scott and M. E. Gardner. *Comment* (G.R.S.): from pre-Piney Creek alluvium, known at another locality to be ca. 5500 yr old. Material presumed to be contaminated by carbonaceous material from Cretaceous Laramie Formation (see also W-1529, this date list).

Marsh Valley series, Idaho

Carbon from base of basalt flow in road cut, T 7 S, R 36 E (42° 47′ N Lat, 112° 15′ W Long), Bannock County, Idaho. Coll. 1963 and subm. by R. C. Bright. *Comment* (R.C.B.): samples presumably represent or-

ganic material at surface of or in soil when buried by hot lava. Dates thus establish age of basalt flow (compare with 35,000 ± 3000, W-1177, USGS VII, from same flow). As overflow waters of Lake Bonneville flowed on top of this flow, overflow of Lake Bonneville is younger than samples.

30,000 ± 2000

W-1329. Carbon, E of Inkom **28,050 B.C.**

From roadcut on N side of freeway ca. 1 mi E of Inkom, N of bridge across U. S. 91, W ½ sec. 22.

25,000 ± 2000

W-1334. Carbon, E of Sorelle Road **23,050 B.C.**

From roadcut on N side of freeway, first cut E of Sorelle Road, ca. 250 yd N of U. S. 91, NW ¼ sec. 21.

12,750 ± 350

W-1644. Sun River Canyon, Montana **10,800 B.C.**

Snail shells from S bank of Diversion Lake on Sun River, NE ¼ SE ¼ sec. 35, T 22 N, R 9 W (47° 37′ N Lat, 112° 43′ W Long), Lewis and Clark County, Montana. From silt, in alluvial fan, containing pods of Glacier Peak Volcanics of Culver (1936), silt is 1.3 ft above Pinedale outwash gravel. Coll. 1963 and 1964 and subm. by M. R. Mudge. *Comment* (M.R.M.): date, together with petrography and chemistry of ash, correlates ash with the type Glacier Peak of Culver, dated at 12,000 ± 310, WSU-155 (Fryxell, 1965). The occurrence will probably be a "paratype" (reference locality) for eastern area.

W-1553. Valles Caldera, New Mexico **> 42,000**

Charred tree branch from Valles Caldera, Jemez Mountains, roadcut N side of New Mexico Route 4, 200 m W of E fork of Jemez River (39° 49.6′ N Lat, 106° 35.3′ W Long), New Mexico. Occurred 1 ft from base of ash flow underlying Banco Bonito glass flow and stream-reworked pumice, and overlying stream gravel that truncates El Cajete pumice fall. Coll. 1964 and subm. by R. A. Bailey. *Comment* (R.A.B.): directly underlies youngest eruptive units in Valles Caldera. Date is compatible with preliminary obsidian-hydration dating (ca. 70,000 yr), by R. L. Smith.

Abert Lake series, Oregon

Carbonate mud from playa flat at NNE end of Abert Lake, sec. 7, T 33 S, R 22 E (42° 44′ N Lat, 120° 9′ W Long), south-central Oregon. From pits dug in recent playa sediments. Coll. 1964 by B. F. Jones, A. H. Truesdell, A. S. Van Denburgh, and G. I. Smith; subm. by B. F. Jones. *Comment* (B.F.J.): dates give maximum sedimentation rate of 500 yr/ft for Abert Lake deposits, indicating no episodes of large sediment influx.

1150 ± 250

W-1593. Silt **A.D. 800**

Dark silt from 2.0 to 2.2 ft depth.

3830 ± 250

W-1594. Clay **1880 B.C.**

Dark clay from 2.6 to 5.0 ft depth.

670 ± 200

W-1742. Hop Valley, Utah **A.D. 1280**

Wood from upper 15 ft of lake sediments back of slide dam, Hop Valley (37° 22′ 30″ N Lat, 113° 7′ 30″ W Long), Zion Natl. Park, Utah. Coll. 1965 and subm. by A. J. Eardley, Univ. of Utah, Salt Lake City. *Comment* (A.J.E.): slide probably caused by earthquake along Hurricane Fault zone.

12,290 ± 350

W-1824. Roy, Utah **10,340 B.C.**

Wood chips from top of clay bed overlain by clay with sand stringers (alt ca. 4307) sec. 14, T 5 N, R 2 W, Salt Lake City Base and Meridian (41° 10′ 12″ N Lat, 112° 2′ 18″ W Long), Roy, Utah. Coll. 1965 by Wes Stoddard; subm. by H. D. Goode, Univ. of Utah, Salt Lake City. *Comment* (H.D.G.): date suggests wood was deposited in or on Bonneville Formation, during last high rise of Lake Bonneville.

2880 ± 200

W-1746. Taylor Creek, Utah **930 B.C.**

Lignitic wood buried in lake beds of back of slide dam, S fork of Taylor Creek (37° 27′ 30″ N Lat, 113° 10′ 45″ W Long), Zion Natl. Park, Utah. Coll. 1965 and subm. by A. J. Eardley. *Comment* (A.J.E.): much younger, undissected dam and lake fill upstream probably correlate with Hop Valley slide (W-1742, this date list). Both slides probably caused by earthquakes.

Beacon Hill series, Washington

Peat from N end of Beacon Hill, Seattle (47° 36′ N Lat, 122° 19′ W Long), Washington. Peat bed crops out in landslide scarp. Coll. 1965 and subm. by D. R. Mullineax. *Comment* (D.R.M.): peat bed was deposited during Olympia Interglaciation but represents only small part of Olympia time. Wood fragments from upper part of bed dated 24,300 ± 700 (W-1388, USGS VIII).

24,200 ± 700

W-1638. Middle of peat bed **22,250 B.C.**

24,000 ± 700

W-1641. Base of peat bed **22,050 B.C.**

W-1523. Double Bluff, Washington **> 40,000**

Wood fragments from peat bed in bluff E of S point of Double Bluff, S end of Whidbey Island, Puget Sound, NW ¼ SE ¼ sec. 27, T 29 N, R 2 E (47° 58′ 10″ N Lat, 122° 32′ W Long), Washington. Alt of bed is 55 ft, 75 ft below top of nonglacial fluvial and lacustrine sediments. It is underlain by sealevel till of Hansen and Mackin (1949) and overlain by Vashon Drift. Pollen assemblage consists of 31 percent *Pseudotsuga menziesii,* 34 percent *Tsuga,* 17 percentage *Pinus,* and small amounts of *Picea* cf. *engelmanni, Abies* cf. *grandis* and *Abies* cf. *lasiocapa* (id. by Leopold). Coll. 1962 and subm. by D. R. Crandell. *Comment* (D.R.C.): pollen assemblage believed to represent climate similar to that of today.

W-1578. Eglon, Washington **> 43,000**

Wood from beach bluff 1 mi S of Eglon, Kitsap County, SW ¼ NE ¼ sec. 11, T 27 N, R 2 E (47° 50′ 50″ N Lat, 122° 30′ 20″ W Long), Washington. From upper 6 in. of sand underlying clay, which is underlain by Esperance Sand Member of Vashon Drift. Coll. 1963 by D. R. Crandell and H. H. Waldron; subm. by D. R. Crandell. *Comment:* sample thought to be from deposit of Olympia Interglaciation. Previous sample from same locality (W-1458, >34,000, USGS VIII) showed some activity, so second sample run.

W-1516. Indian Point, Washington **> 40,000**

Peat from bed in beach bluff 1 mi SE of Indian Point, on shore of Puget Sound, NW ¼ NE ¼ sec. 16, T 29 N, R 3 E (47° 55′ N Lat, 122° 25′ 45″ W Long), SW Whidbey Island, Washington. Sampled bed, alt 140 ft, is overlain by Vashon Drift, and was formed during interglaciation that immediately preceded deposition of "mid-cliff" till (Hansen and Mackin, 1949). Coll. 1963 by D. R. Crandell and H.H. Waldron; subm. by D. R. Crandell.

W-1514. Kayak Point, Washington **> 40,000**

Wood from layer of wood fragments in bluff adjacent to Puget Sound, on S side of Kayak Point, Snohomish County, SW ¼ NE ¼ sec. 36, T 31 N, R 3 E (48° 08′ N Lat, 122° 21′ 45″ W Long), Washington. Bluff 25 ft above high tide, in alluvial and lacustrine(?) sediments mapped as Admiralty Clay (Newcomb, 1952), overlain by Vashon Drift. Coll. 1963 by D. R. Crandell and H. H. Waldron; subm. by D. R. Crandell. *Comment* (D.R.C.): sediments thought to be formed during Olympia Interglaciation, but date indicates sediments represent next older interglaciation, which preceded deposition of "mid-cliff" till (Hansen and Mackin, 1949).

W-1515. Maplewood, Washington **> 38,000**

Peat from bluff on W side of Colvos Passage 0.8 mi S of Maple-

wood, Kitsap County, NE ¼ NE ¼ sec. 21, T 22 N, R 2 E (47° 23′ 15″ N Lat, 122° 33′ W Long), Washington. Bed ca. 80 ft above high tide, 0.5 mi S of locality of UW-25, 32,700 ± 1000 (Univ. of Washington I). Coll. 1963 by D. R. Crandell and H. H. Waldron; subm. by D. R. Crandell. *Comment* (D.R.C.): UW-25 from sediments deposited during Olympia Interglaciation; W-1515 from fluvial and lacustrine sediments of next older interglaciation, indicated by date and by presence, above sample horizon, of pre-Vashon till probably correlative with "mid-cliff" till of Hansen and Mackin (1949).

Mount St. Helens series, Washington

Charcoal fragments from pumice layers exposed in roadcut along logging road sec. 26, T 9 N, R 5 E (46° 14.5′ N Lat, 122° 09′ W Long), on N side of Mount St. Helens, Washington. Coll. 1965 and subm. by D. R. Mullineaux. *Comment* (D.R.M.): W-1751 dates start of series of pumice eruptions from Mount St. Helens after quiescence. W-1752 agrees with dates from same layer near Mount Rainier Natl. Park (W-1115, W-1116, USGS VII).

W-1751. **4680 ± 200**
2730 B.C.

Above soil zone in older pumice, at base of fresh pumice layers which include Y.

W-1752. **3510 ± 230**
1560 B.C.

From base of pumice layer Y.

W-1769. Seattle, Washington **≧ 41,000**

Wood from Lake City Tunnel, alt ca. 55 ft, under 32nd Avenue NE and NE 69th St., Seattle (47° 41′ N Lat, 122° 17′ W Long), Washington. In gravel just below nonglacial sediments of Olympia Interglaciation. Coll. 1965 by E. R. McMaster; subm. by D. R. Mullineaux. *Comment* (D.R.M.): possible activity and date similar to W-1429 (USGS VIII) from under youngest pre-Vashon drift. If activity in these samples is real, youngest pre-Vashon glacier probably occupied Puget Sound lowland 40,000 to 45,000 yr ago.

W-1622. Seola Beach, Washington **> 42,000**

Peat from ravine adjacent to sewage-disposal plant, NE ¼ SW ¼ SE ¼ sec. 12, T 23 N, R 3 E (47° 29′ 35″ N Lat, 122° 21′ 34″ W Long), King County, Washington. From peat bed in sequence of pre-Vashon glacial alluvial and lacustrine sediments. Coll. 1963 and subm. by H. H. Waldron. *Comment* (H.H.W.): age confirms that sediments are pre-Olympia Interglaciation and probably correlate with other nonglacial sediments of Salmon Springs age.

2350 ± 250

W-1587. South Puyallup Valley, Washington **400 B.C.**

Fragments of charred wood from N valley wall of South Puyallup Valley along West Side Highway, ¼ mi W of bridge across South Puyallup River (46° 48.5′ N Lat, 121° 53.5′ W Long), Mt. Rainier Natl. Park, Washington. From young, bomb-bearing debris flow at surface along valley wall. Coll. 1959 by D. R. Mullineaux and D. R. Crandell; subm. by D. R. Mullineax. *Comment* (D.R.M.): debris flow that charred log from which sample came probably caused by volcanic eruption which may have also produced pumice layer (Crandell and others, 1962), dated ca. 2000 to 2400 yr (W-1393 and W-1394, USGS VIII).

Elk Creek Bog series, Wyoming

Peat from bog, NE ¼ sec. 29, T 15 N, R 79 W (41° 14′ N Lat, 106° 18′ W Long), Medicine Bow Natl. Forest, Wyoming. Coll. 1965 and subm. by William Fleming, Colorado State Univ., Ft. Collins. *Comment* (W.F.): deposition of peat began near beginning of Temple Lake Stade. Assuming uniform compaction of peat, average rate of accumulation was .09 cm/yr for first 1000 yr, and 0.036 cm/yr thereafter.

2800 ± 200

W-1717. Depth 98-103 cm **850 B.C.**

3840 ± 300

W-1718. Basal peat; depth 190 cm **890 B.C.**

W-1517. Mammoth Hot Springs terrace, Yellowstone National Park, Wyoming **> 34,000**

Travertine from upper terrace along Terrace Loop Road, Mammoth Hot Springs Terrace (44° 58′ N Lat, 110° 43′ W Long), Yellowstone Natl. Park, Wyoming. Coll. 1964 and subm. by J. M. Good and Meyer Rubin. *Comment* (J.M.G.): date indicates carbonate being deposited on Mammoth Hot Springs terrace is probably from pre-existing limestones and that relative age determinations among various deposits cannot be based on C^{14} dating.

2730 ± 230

W-1744. Park County, Wyoming **780 B.C.**

Calcareous silty peat, 120 to 135 cm below surface in sequence of lake sediments deposited in Sunlight Creek Valley, Sunlight Basin, SE ¼ SE ¼ sec. 23, T 55 N, R 106 W (44° 43′ 30″ N Lat, 109° 35′ 05″ W Long), Park County, Wyoming. Coll. 1965 and subm. by Noel Potter, Jr., Univ. of Minnesota, Minneapolis. *Comment* (N.P.): valley is dammed by moraine formed when ice moved up Sunlight Creek from Clarks Fork Valley. Field evidence suggests moraine is Bull Lake in age, but date does not support interpretation.

D. Alaska

W-1524. East Mentasta Valley, Alaska — **11,300 ± 200 / 9350 B.C.**

Organic silt from gravel pit on N side of Tok Cutoff section of Glenn Highway, Mile 87.9, East Mentasta Valley (62° 56.2′ N Lat, 143° 26.4′ W Long), Alaska. From base of silt underlying peat and overlying alluvium. Sequence lies 15 ft above valley floor. Coll. 1963 and subm. by H. R. Schmoll. *Comment* (H.R.S.): date indicates underlying alluvium was deposited during last major glaciation, and suggests adjacent sequence of till and gravel, which comprises dominant glacial landform in valley and is overlain by alluvial sequence, was deposited during an older glaciation. This is consistent with dates on this sequence (W-1379, >38,000, USGS VIII) and from stratigraphically higher (W-1161, 9650 ± 370, USGS VII).

Iliamna Lake series, Alaska

Organic material from four zones in beach ridge in terrace 5.1 mi N 22° W of outlet of Iliamna Lake (59° 23′ 30″ N Lat, 155° 56′ 30″ W Long), SW Alaska. Coll. 1963 by R. L. Detterman and B. L. Reed; subm. by R. L. Detterman. *Comment* (R.L.D.): W-1479 compares with other dates for last major advance of Wisconsin Glaciation in area and marks position of lake level as ice melted and beach ridge began to form. W-1481 compares with dates from Cook Inlet area on Tustumena Stade of Alaskan Glaciation (Karlstrom, 1964), and probably marks lake level at that time. W-1483 dates volcanic eruption.

W-1479.	**Zone 1; alt ca. 61 ft**	**8520 ± 350 / 6570 B.C.**
W-1481.	**Zone 2; 4 ft 6 in. above Zone 1**	**1980 ± 250 / 30 B.C.**
W-1483.	**Zone 3; 5 in. above Zone 2**	**400 ± 200 / A.D. 1550**
W-1482.	**Zone 4; 3 ft 6 in. above Zone 3**	**200 ± 200 / A.D. 1750**

Kennecott Glacier series, Alaska

Branches of balsam poplar and of willow or alder, diam ca. 2 in., near present terminus of Kennecott Glacier, McCarthy, Alaska. Coll. 1962 and subm. by L. A. Yehle. *Comment* (L.A.Y.): W-1488 records advance of Kennecott Glacier, whose maximum position, or that of a succceeding advance, was occupied until late 1800's.

W-1488. Balsam poplar branch — **250 ± 200 / A.D. 1700**

Branch of balsam poplar, found with other organic material in pockets and in thin plaster of till against bedrock face, alt 1750 ft, 1½

mi N of terminus of Kennecott Glacier along W side of Kennecott Glacier Valley, 2 mi NW of McCarthy (61° 27′ 30″ N Lat, 142° 57′ 10″ W Long). Glacier has retreated laterally ca. ¼ mi E of locality.

490 ± 200

W-1522. Willow or alder branches **A.D. 1460**

Willow or alder branches occurring in uppermost part of 3-ft unit of dominantly volcanic, angular gravel overlain by till, alt 1550 ft, 500 ft from present terminus of Kennecott Glacier, 2 mi NE of McCarthy (61° 27′ 22″ N Lat, 142° 53′ 10″ W Long).

W-1499. Malaspina District, Alaska **< 200**

Spruce wood from stump, rooted in outwash gravel on N bank of Yahtse River, 1 mi below point at which it emerges from beneath E margin of Malaspina Glacier (59° 58′ N Lat, 141° 28.5′ W Long), Alaska. Coll. 1963 and subm. by George Plafker. *Comment* (G.P.): sample (computed as 160 yr) fixes approximate culmination date of most recent advance of Guyot Glacier. Date coincides with most recent advance of adjacent Malaspina Glacier (200 ± 50, Sharp, 1958), and is in accord with early maps of Icy Bay by Russian explorers (1788) and by Vancouver (1794), which show Guyot Glacier front near its maximum stand, as indicated by conspicuous end moraines along E shore of Icy Bay, with marginal zone of mature forest not yet overridden. Ice held maximum until 1904, when it began 25 mi retreat to present position.

W-1796. Middleton Island, Stage-III terrace, Alaska **1150 ± 500 A.D. 800**

Driftwood from peaty sand 20 in. above bedrock surface of Stage-III marine terrace (post-earthquake elev 94 ft above MLLW), Middleton Island (59° 25′ 20″ N Lat, 146° 21′ 40″ W Long), Alaska. Coll. 1965 and subm. by George Plafker. *Comment* (G.P.): date anomalously young compared with 2390 ± 200 (W-1404, USGS VIII) from next lower terrace (alt 58 ft), and 4470 ± 250 (W-1405) from next-higher terrace (alt 136 ft). Contamination or labelling error suggested.

4185 ± 250

W-1797. Middleton Island, Stage-V terrace, Alaska **2235 B.C.**

Driftwood from peaty log gravel on Stage-V marine terrace (post-earthquake elev 37.5 ft above MLLW), Middleton Island (59° 26′ N Lat, 146° 19′ 45″ W Long), Alaska. Overlain by sandy peat. Coll. 1965 and subm. by George Plafker. *Comment* (G.P.): date anomalously old compared with 2390 ± 200 (W-1404) from next-higher terrace (alt 58 ft) and 1350 ± 200 (W-1724) from sample from comparable position elsewhere on same terrace.

9970 ± 300

W-1738. Mitkof Island, Alaska **8020 B.C.**

Saxidomus giganteus from sand (alt 21 ft) on SW end of Mitkof

Island, 0.6 mi NNW of Blaquiene Point (56° 35′ N Lat, 132° 32′ 05″ W Long), Alaska. Sand overlies marine till and is covered by sand and gravel. Coll. 1965 by R. W. Lemke; subm. by R. W. Lemke and L. A. Yehle. *Comment* (R.W.L.): comparison with W-1734 (this date list) indicates most postglacial uplift of Mitkof Island occurred between 10,000 and 12,500 yr ago.

7930 ± 300
W-1484. Mt. Harper, Alaska **5980 B.C.**

Compressed and contorted organic material from exposure on NW side of SW tributary to Joseph Creek, in moraine 7 mi NE of Mt. Harper (64° 23.3′ N Lat, 143° 26.2′ W Long), Alaska. Occurs as pod beneath boulder ca. 12 ft above creek in a coarse-grained diamicton, probably colluvium derived from till in the moraine. Coll. 1963 and subm. by H. R. Schmoll. *Comment* (H.R.S.): apparently dates colluviation during which material was crushed and buried by unsorted deposit derived from till, probably when stream was cutting through moraine. Expected to date deposition of till in moraine, outermost of several well-preserved moraines in valley system, but date appears too young.

12,400 ± 800
W-1734. Petersburg, Alaska **10,450 B.C.**

Small bivalve shells from alt 205 ft in pit 2 mi SE of Petersburg (56° 47′ 48″ N Lat, 132° 54′ 50″ W Long), Alaska. From top of marine clay overlain by sand and gravel. Coll. 1965 by R. W. Lemke; subm. by R. W. Lemke and L. A. Yehle. *Comment* (R.W.L.): dates highest level of postglacial marine sediments found on Mitkof Island.

Prince William Sound series, Alaska

Wood fragments and tree stumps from peat in parts of Prince William Sound area elevated during earthquake of March 27, 1964. Coll. 1964 by L. R. Mayo and George Plafker; subm. by George Plafker. *Comment* (G.P.): these terrestial sediments were intertidal before earthquake, indicating pre-earthquake subsidence. Dates fix maximum time interval of subsidence at each locality.

930 ± 200
W-1588. Nowell Point **A.D. 1020**

Wood fragment from intertidal peat at Nowell Point, Knight Island Passage (60° 26.5′ N Lat, 147° 56.3′ W Long). One of 10 or 11 peats interbedded with beach gravel. Locality was submerged 17 ft below highest tide before earthquake, and is now ca. 13 ft below.

3680 ± 300
W-1589. Perny Island **1730 B.C.**

Wood fragment from peat interbedded with beach sand, Perny

Island (60° 40.3′ N Lat, 147° 52.25′ W Long). Peat submerged 11.2 ft below highest tides before earthquake and is now 9.5 ft below.

560 ± 200

W-1590. MacLeod Harbor **A.D. 1390**

Tree root in beach gravel from MacLeod Harbor (59° 53.3′ N Lat, 147° 46.0′ W Long). Locality was submerged 9.7 ft below highest tides before earthquake and is now ca. 23 ft above.

230 ± 200

W-1591. Latouche Island **A.D. 1720**

Tree stump, 3 in. diam, rooted in peat, Latouche Island, 2 mi NNE of Latouche Mine (60° 04.5′ N Lat, 147° 51.8′ W Long). Peat, interbedded with beach sand, was submerged 8.5 ft below highest tides before earthquake and is now at tide level.

1140 ± 250

W-1592. Columbia Bay **A.D. 810**

Tree stump from E side of Columbia Bay (60° 58.25′ N Lat, 146° 59.1′ Long). Rooted in intertidal peat layer underlain and overlain by beach gravel. Was 6 ft below highest tides before earthquake; now ca. 4 ft below.

Sitka series, Alaska

Organic material from vertical face 1 mi NW of outlet of Swan Lake, NE ¼ NW ¼ NW ¼ sec. 35, T 55 S, R 63 E (57° 3′ 50″ N Lat, 135° 21′ 02″ W Long). W-1740 underlies and W-1739 overlies Mt. Edgecombe ash. *Comment* (R.W.L.): W-1739 gives minimum for Mt. Edgecombe ash. Agrees with eruption date of 9000 yr B.P. estimated by Heusser (1960). W-1740 was intended to give minimum date for ash, but is believed erroneous, possibly because of contamination by modern rootlets.

8570 ± 300

W-1739. **6620 B.C.**

Root wood from base of muskeg.

2450 ± 250

W-1740. **500 B.C.**

Comminuted organic material (charcoal woody fragments, and rootlets) in small pocket above poorly sorted deposit of silt through cobble-size material.

10,300 ± 200

W-1526. Slana Fire Guard Hill, Alaska **8350 B.C.**

Organic silt from roadcut on N side of Tok Cutoff section of Glenn Highway, Mile 59.4, 0.1 mi NE of abandoned Fire Guard Station (62° 42.8′ N Lat, 143° 59.5′ W Long), Alaska. From organic silt 8 in. above base of stratified sand, occupying depression in thick sand-gravel se-

quence, and overlain by slumped sand and gravel. Coll. 1963 and subm. by H. R. Schmoll. *Comment* (H.R.S.): date indicates organic silt was deposited contemporaneously with nearby Ahtell Creek peat layer. Date is equivalent to average of dates from bottom (W-429, 11,440 ± 400, USGS IV) and top (W-487, 9240 ± 300, USGS IV) of Ahtell Creek peat bed, which may mean the organic silt here is equivalent to entire thickness of peat at Ahtell Creek site.

E. Miscellaneous

W-1491. Georges Bank, Atlantic Ocean **11,000 ± 350 9050 B.C.**

Peat and twigs from NW margin of Georges Bank at 59 m depth (41° 09.3′ N Lat, 68° 43.2′ W Long), Atlantic Ocean. One specimen contained many rhizomes of *Spartina,* twigs and pollen largely from *Picea,* with some from *Pinus* and *Abies,* and spores from *Sphagnum.* Another contained twigs, seeds, bud scales, and rootlets, some of which are cedar *Cupressaceae* (id. E. S. Barghoorn). Also fresh-water diatoms of *Pinnularia nobilis* Ehrenberg and *P. lata* (Brabisson) Wm. Smith (id. David Wall and R. R. Guillard). Coll. 1964 by Capt. Norman Lepire; subm. by K. O. Emery, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. *Comment:* age greater than that reported for any other salt-marsh peat from sea floor and is compatible with greater water depth. Probably Great South Channel was occupied by ice that filled Gulf of Maine during late Pleistocene. Peat probably deposited after ice retreated (Emery, Wigley, and Rubin, 1965).

W-1673. Puerto Montt, Chile **> 30,000**

Wood from central root zone of tree in tidal zone of beach ca. 3 km SE of Puerto Montt (41° 29′ S Lat, 72° 55′ W Long), Chile. Coll. 1963 by Juan Benitez and W. Danilchik; subm. by W. Danilchik. *Comment* (W.D.): occurrence was 4.5 m below W-948 (15,400 ± 400, USGS VII), with a 2-m conglomerate intervening. Both dates fundamental to chronolithology of area.

W-1548. Irazu volcano, Costa Rica **13,800 ± 300 11,850 B.C.**

Wood from left bank of Reventazon River at Cachi damsite (09° 52′ N Lat, 83° 48′ W Long), Costa Rica. From top of lacustrine sediments alt 970 m, immediately under lava flow of Irazu volcano. Coll. 1964 by Edwin Mojica; subm. by K. J. Murata. *Comment* (K.J.M.): sample thought to underlie last lava flow of Irazu volcano which since then has erupted nothing but ash. It was hoped it would date change in mode of eruption, but date casts doubt on this being last flow from volcano.

Lake Waiau series, Hawaii

Organic matter (blue-green algae planktonic spicules and frustules) from ash and clastic sediment from bottom of Lake Waiau, Mauna

Kea (19° 48.88′ N Lat, 155° 28.76′ W Long), Hawaii (see Woodcock and others, 1966.) Coll. 1965 and subm. by A. H. Woodcock, Univ. of Hawaii, Honolulu. *Comment* (A.H.W.): this is first dating of summit region of Mauna Kea. Dates bracket period during which several ash falls occurred, and will calibrate pollen analysis.

W-1833. Depth ca. 2 m — **7160 ± 500 / 5210 B.C.**

W-1834. Depth ca. 1 m — **2270 ± 500 / 320 B.C.**

W-1494. Haifa, Israel — **4360 ± 250 / 2410 B.C.**

Shells, mainly *Loripes lacteus* and *Glycimeris violacescens,* from 9 m below sealevel, Haifa (35° N Lat, 32° 47′ W Long), Israel. Coll. 1964 and subm. by A. Slatkine, Technion-Israel Inst. of Technology, Haifa. *Comment* (A.S.): represents phase of Flandrian transgression of Slatkine and Rohrlich (1963).

W-1675. Klang Strait, Malaysia — **10,000 ± 400 / 8050 B.C.**

Peat from core ca. 15 in. below sea floor and 89 ft below sealevel in Klang Strait area (03° 15.5′ N Lat, 101° 10.3′ E Long), Malaysia. Coll. 1964 and subm. by G. H. Keller, U. S. Naval Oceanographic Office, Washington, D. C. *Comment* (G.H.K.): although area is one of tectonic activity, sample indicates little vertical movement since deposition of peat.

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