U.S. Geological Survey Radiocarbon Dates IV

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The following list (Table 1) covers radiocarbon dates measured at the U.S. Geological Survey radiocarbon laboratory during the period between 1 July 1955 and 7 November 1956 (*1*). The laboratory procedure, in which acetylene gas is used, has remained essentially the same (*2*), and the ages and errors have been computed in the same manner as before (*3–5*). The additional step of boiling wood, charcoal, and peat samples in NaOH as well as in HCl has been included in the pretreatment of samples to remove lignins and humic acid fractions. This was done to eliminate the possibility of foreign carbon addition in the form of stains or accumulations by ground water solutions. This pretreatment does not reduce the danger of rootlet contamination, however. Most of the 180 samples have been measured in two counting sets for a total of 3 days each.

Some of the problems pursued in this series of dates include: (i) the age of sea water, which is of considerable geochemical importance in the formulation of atmosphere–mixed layer–deep-sea equilibrium models (*6*); (ii) the age of the Mankato substage, which proved to be a pre-Two Creeks rather than a post-Two Creeks event (*7*); (iii) the sequence and timing of the continental glaciations on the North American continent and its contemporaniety with those in South America and Australia; (iv) climatically induced sea-level changes as related to the postglacial altithermal interval; (v) the dating of mountain glaciations; (vi) the timing of pluvial stages of lakes in the Interior Basin (*8*); (vii) Alaskan glacial chronology; and (viii) the study of modern grass for evidence of nuclear bomb contamination of the atmosphere.

Units of measurements listed in the descriptions of samples are those expressed by the collectors.

Table 1. Radiocarbon dates.

Description	Sample No.	Age (yr)
I. *Samples with oceanic implications*		
Sea-water carbonate. Large samples of sea water from known depths in the Atlantic Ocean were processed on shipboard with acid to drive off the CO_2. The gas was collected as a carbonate and submitted to the U.S. Geological Survey by G. Jaffe and F. Gaetano of the U.S. Navy Hydrographic Office. Precise measurements in two counters were made to determine the C^{14} activity of the carbonates. In addition, a portion of each sample converted to acetylene was submitted to H. C. Urey's laboratory at the University of Chicago, where C^{13}/C^{12} analyses were made by T. Mayeda. A C^{13} correction was made on each carbonate sample to normalize the readings to the δC^{13} of -25.00 per mil which H. Craig finds as the average for woods (*9*). The corrected activity was then compared with that of a 19th century wood, corrected for C^{13} and age. The results are arbitrarily presented in the form of years of age, rather than activity deficiency.		
Surface; lat. 15°22′N, long. 60°23′W.	W-313	650 ± 60
Depth 640 m; lat. 16°04′N, long. 57°31′W.	W-351	635 ± 60
Depth 1620 m; lat. 16°10′N, long. 56°26′W.	W-352	630 ± 60
Depth 1750 m; lat. 16°42′N, long. 57°13′W.	W-314	840 ± 60
Bahama Banks, Bahama Islands. A series of core samples taken in traverses off the western side of Andros Island in the Bahamas from a sequence consisting of unconsolidated calcareous sediments overlying a rock platform of limestone as part of a study made by the collector, P. E. Cloud (U.S. Geological Survey), to determine time of deposition or subaerial alteration of these rocks.		
Top of core of calcareous sediment from collector's locality G3, 6 to 12 in. below the water-sediment interface.	W-448	450 ± 200
Bottom sample of sediment at locality G3, 78 to 84 in. below the interface, directly above rock platform.	W-447	2490 ± 400
Core from upper surface of rock platform beneath calcareous sediments, collector's locality D1.	W-327	16,955 ± 400
Same as above, from B1.	W-383	21,300 ± 1000
Same as above, from D5.	W-384	19,300 ± 1000
Same as above, from C2.	W-446	17,000 ± 800
Same as above, from F2.	W-449	12,400 ± 600
Same as above, from A11.	W-450	15,600 ± 800
Same as above, from E9.	W-451	15,440 ± 800
Same as above, from C6.	W-452	16,730 ± 850
Same from 1.5- to 2-ft bluff of punky compact limemud, at western apex of Andros Island, locality C7a.	W-330	1675 ± 200
Rerun of W-330, different specimen.	W-453	1025 ± 400
Wells, Me. Samples from a large tidal marsh at Wells, near the mouth of Upper Landing Creek, near Eton farm. The marsh is sheltered from the ocean by a long barrier beach, never overtopped even during the largest storms today. The collector, W. H. Bradley (U.S. Geological Survey, Washington, D.C.), believes that this barrier beach was probably formed during the climatic optimum when sea level may have been 5 or 6 feet higher than it is now.		
Mya shells buried in mud in a layer 1 ft above the mean-low-tide line, found in upright, living position 1100 ft from land.	W-395	200 ± 160
Tree stump in place, 2 ft below mean high tide and 300 ft from land. The tree grew at a stage when sea level was lower	W-396	2980 ± 180

Description	Sample No.	Age (yr)
than it is today—sometime during the post-climatic optimum, perhaps during Matthes' Little Ice Age.		
Sagadahoc Bay, Me. Mya shells from two buried, extensive, thin, but highly characteristic *Mya* shell pavements in the Sagadahoc Bay tidal flats. Collected by W. H. Bradley for an investigation of the history of the tidal flat.		
Mya shells from 2 ft below present surface.	W-328	390 ± 160
Mya and *Gemma* shells from 11 to 13 in. depth.	W-329	< 200
Neskowin, Ore. Fragments of Sitka spruce collected from several stumps, situated below mean tide in the Pacific Ocean, 50 to 200 ft south of Proposal Rock. These stumps are exposed only at very low or minus tides, the seawardmost stump being at the 0.0-ft tide mark. The stumps are part of a drowned forest, from an area believed not to be affected by local subsidence; the drowning is therefore considered to have been a result of eustatic rise in sea level. Collected by P. D. Snavely, Jr., U.S. Geological Survey, Menlo Park, Calif.	W-390	1730 ± 160
Guam, Mariana Islands. Tridacna shell from the north side of Facpi Point, Guam, found imbedded in emerged constructional reef limestone, the upper flat surface of which is 3 to 4 ft above low-tide level. The reef in which the shell was found must have grown during a sea stand higher than present sea level, possibly during the "6-foot stand." Collected and interpreted by S. O. Schlanger, U.S. Geological Survey, Washington, D.C.	W-370	3400 ± 250
Peel Island, Australia. Coral, *Mycedium tubifex,* collected 1939 by an expedition of the Great Barrier Reef Committee, from Dead Reef, Western Spit, Peel Island, Moreton Bay, Queensland. Submitted by E. D. Gill, National Museum of Victoria, Melbourne, for dating the 10-ft stand of the ocean. Gill states: "Measurements of strand lines made on the adjacent island of St. Helena indicate that the dead reefs are due to a recent lowering of sea level of between 10 and 12 ft."	W-443	3710 ± 250
II. *Glacial samples*		
Athol, Mass. Log from near the base of swamp material on top of outwash in a swamp 3800 ft west of Pleasant Street, 1350 ft south of a curve in Bachelder Road in the west-central 1/9 of Athol quadrangle, Mass. The log gives a minimum date for the last glacial substage in Massachusetts. Collected by Margaret Bryan, U.S. Geological Survey, Denver, Colo.	W-361	10,800 ± 250
Corry, Pa. Peat and marl from a bog in a kettle hole just inside the city limits of Corry, Erie County. This locality is 6 mi within the outer Wisconsin drift margin, which is near Binghamton. The section consists of (from surface down) 9.7 ft of peat, 3 ft of marl and base in clay. Sample from J. B. Droste, R. W. Doehler, and G. W. White (University of Illinois).		
Peat from basal 8 in. of peat.	W-347	9430 ± 300
Marl from top 8 in. of marl.	W-346	13,000 ± 300
Marl from basal 8 in. of marl.	W-365	14,000 ± 350
Westchester, Ohio. Wood found in area of the early Wisconsin terminal moraine exposed in one of the branches of the East Fork of Mill Creek, about 1/3 mi east of Westchester, Mason quadrangle. Collected by J. L. Rich, University of Cincinnati.	W-304	20,500 ± 800
Anderson, Ohio. Log from contact of blue-gray till overlying sand and medium coarse gravel exposed in cut along east bank of Anderson Run, at Anderson, Ross County, in Wisconsin terminal moraine. Till thickness, 0 to 15 ft; sand, 5 to 15 ft. Collected by R. P. Goldthwait, Ohio State University.	W-331	18,000 ± 400
Sidney, Ohio. Log from between two tills exposed near Sidney, Shelby County, at the Baltimore & Ohio Railroad cut 3/4 mi west of U.S. highway 25. The log came from the base of surface till and immediately above soil developed on underlying till (*10, 11*). (Same locality and position as sample W-188, which was dated 23,000 ± 800 yr.) Collected by J. L. Forsyth, R. P. Goldthwait, and M. Rubin.	W-356	22,480 ± 800
Kirkwood, Ohio. Samples taken from a cut along Upper Brush Creek, 1/2 mi east of U.S. highway 25, in NW1/4NW1/4 sec. 6, Shelby County (*10*). From base, the section consists of calcareous till, 1 ft exposed; leached gravel, 0 to 3 ft; soil, clay, and sand, 2 to 3 ft; peat band with twigs, 0 to 1/2 ft; calcareous till, with logs near base, 2 to 25 ft; gravel, alluvial, 0 to 4 1/2 ft; soil, 2 ft. Collected by J. L. Forsyth, Geological Survey, Ohio Department of Natural Resources, Columbus.		
Log taken from near base of upper till.	W-414	22,000 ± 1000
Twigs from peat band below till.	W-415	$> 37,000$
Parkerstown, Ohio. Wood from a peaty zone below Lake Whittlesey beach gravels at the intersection of the Ohio Turnpike and Ohio route 4 in Erie County. Underlying the peat is sandy alluvium and lake clay and at the base, calcareous till (*10*). Collected by J. L. Forsyth.	W-430	12,920 ± 400
Muncie, Ind. Wood from Buck Creek ditch, SE1/4SW1/4 sec. 14, T19N, R10E, 7 mi south of Muncie, Delaware County. This fossiliferous bed is exposed from near Muncie to near Newcastle in the banks of Buck Creek and Blue River and has yielded remains of deer, elk, and mastodon (*12*). Collected by J. Frye, B. Leonard, W. J. Wayne, and M. Rubin.	W-325	9755 ± 300
Granite City, Ill. Wood from a dug Ranney collector well at Granite City, 1300 ft east, 2250 ft south of the northwest corner, sec. 20, T3N, R9W, Madison County. Wood was taken from a depth of 60 to 65 ft in what was thought to be Recent alluvium. Sample and stratigraphic interpretation made by R. E. Bergstrom; submitted by M. M. Leighton, Illinois State Geological Survey, Urbana.	W-317	8340 ± 250
Princeton, Ill. Peat and wood from a section exposed in the west valley wall of East Bureau Creek, 4.5 mi east of Princeton, SE1/4NW1/4 sec. 8, T16N, R10E, Bureau County. The section includes, in ascending order, (i) Illinoian till with Sangamon profile of weathering, 11 ft exposed; (ii) Farmdale loess, 3 ft; (iii) Iowan loess, 9 ft; (iv) pro-Tazewell, coarse gravel outwash, 10 ft; (v) Taze-		

Description	Sample No.	Age (yr)
well till, 20 ft; (vi) Tazewell loess, 4 ft. Samples and stratigraphy by M. M. Leighton.		
Wood from black soil 2 ft below top of Farmdale loess.	W-333	25,700 ± 800
Peat from peat layer 15 in. below contact of peaty Iowan loess with pro-Tazewell gravel. Records continued growth and accumulation of plant remains during a brief pause in loess deposition.	W-334	22,450 ± 1000
Farm Creek, Ill. Wood from classic Farm Creek section, 6 mi east of Peoria, SW¼ SE¼ sec. 30, T26N, R3W, Tazewell County. The Iowan here is directly overlain by tight stony till of Shelbyville age. Samples and stratigraphy by M. M. Leighton.		
Wood from upper 3 in. of Iowan loess.	W-349	20,340 ± 750
Wood from upper 6 in. of Iowan loess. Glacial erosion here seems to have been negligible, but cannot be demonstrated.	W-399	20,700 ± 650
Bloomington, Ill. Samples from section exposed in the south bank of Rock Creek, 15 mi northwest of Bloomington, NE¼ NW¼ sec. 32, T25N, R1W, McLean County. This section was described by the late Leland Horberg (*13*) and consists of, in ascending order, (i) Illinoian till, (ii) Farmdale loess; (iii) Iowan loess; (iv) Tazewell till. Samples and interpretation by M. M. Leighton.		
Moss peat from contact of Iowan loess and overlying Tazewell (probably Shelbyville) till. The presence of the moss peat was discovered by J. Brophy, and the moss was later identified by W. Welch as species of *Calliergonella* and *Drepanocladus*.	W-379	24,700 ± 1000
The age of the moss seemed to be excessive, and a new sample from the identical horizon was collected and run.	W-483	20,500 ± 600
Fossil wood from 10-in. peaty layer 3 ft below the top of Farmdale loess.	W-406	26,150 ± 700
Havana, Ill. Wood from 15 ft below the top of a terrace of Bloomington outwash and backwater deposits, exposed in a ravine 5 mi west of Havana, NE¼ sec. 33, T4N, R3E, Fulton County. These sediments were deposited during aggradation of Illinois Valley (to which the ravine is tributary) by Bloomington valley-train materials. Middle Tazewell. Stratigraphy by H. R. Wanless; sample collected by Wanless and M. M. Leighton.	W-381	15,600 ± 600
Chicago, Ill. Wood from sediments of Lake Chicago taken from the North Shore Channel by F. C. Baker during 1910–1914. Submitted by M. M. Leighton from Baker's Illinois State Geological Survey Pleistocene fossil collection (*14*).		
Wood from silt, stratum VII, station 9, 1402 ft north of Foster Ave. on North Shore Channel.	W-425	5370 ± 200
Wood from sand, stratum XI, station 33, 500 ft south of Devon Ave. on North Shore Channel.	W-426	10,700 ± 300
Bonfils, Mo. Wood from gray calcareous silt in a terrace exposed in a quarry 0.5 mi south of Bonfils. Collected by M. M. Leighton and R. E. Bergstrom.		
Wood from 14 ft below top of terrace.	W-469	17,150 ± 600
Wood from 16 ft below top of terrace.	W-470	17,800 ± 600
Traverse City, Mich. Wood from near Brookside subdivision, at Stop No. 1 of the Mid-West Friends of the Pleistocene trip, 1956. Samples came from 6 ft down in the first layer of the Valders till of Thwaites. Discussion ensued as to whether the wood was from modern trees or whether it dated the Valders. Collected by M. Rubin.	W-467	< 200
Mankato, Minn. Wood from within a gray till underlying the surface buff till exposed in a cut along the relocation of highway 169, 4 mi north of Mankato on the west valley wall of the Minnesota River, Nicollet County. Lower till is unleached. Collected by J. H. Zumberge, University of Michigan.	W-300 W-301	> 37,000 > 37,000
North Branch, Minn. Wood and peat buried beneath 5 ft of sand of Anoka sand plain, from a drainage ditch 3 mi southeast of the town of North Branch, Chisago Country; formed during the wastage of the Grantsburg sublobe of the Des Moines lobe (7). Collected by H. E. Wright, Jr., University of Minnesota.		
Wood from 6-inch peat layer.	W-354	12,030 ± 200
Peat from same horizon as sample W-354.	W-389	12,700 ± 250
Moorhead, Minn. Wood from Moorhead Station 2, Clay County. Peat from a depth of 45 ft in lake clay. Rerun of Chicago's C-497 (11,283 ± 700 yr). Procured from W. F. Libby's laboratory through E. A. Martell.	W-388	9930 ± 280
Minneapolis, Minn. Wood and peat incorporated in sand of Mississippi Valley train from building excavation in Loring Park. Collected in 1923 by W. S. Cooper (*15*) from a depth of 3 to 12 ft; submitted by H. E. Wright, Jr.		
Peat from sand.	W-445	10,200 ± 300
Wood from same sand.	W-454	11,790 ± 200
Blomford, Minn. Basal organic sediment from a lake on Grantsburg till near Blomford, Isanti County, at a depth of 12 ft below the water surface. Collected by H. E. Wright, Jr.	W-465	4890 ± 200
Cedar Creek Bog Lake, Minn. Gyttja from an ice-block feature in the Anoka sand plain in south-central Isanti County, from the base of the organic sediment at a depth of 30 ft just above the sand. Collected by H. E. Wright, Jr., and F. M. Swain, University of Minnesota.	W-466	11,830 ± 200
Kittson County, Minn. Peat from rotary test hole SW¼SE¼ sec. 30, T161N, R46W, at depth of 95 ft in Lake Agassiz sediments. In a test hole 1.7 mi southeast of the sampled one, in a "shoreward" direction, Lake Agassiz deposits extend to 120 ft. Collected by J. R. Rapp and R. Schneider, U.S. Geological Survey, St. Paul, Minn.	W-468	> 36,000
Anoka, Minn. Peat from depth of 3 ft in sand in a low terrace of Rum River on the Anoka sand plain, 3 mi northeast of Anoka in center sec. 27, T31N, R24W, Anoka County. Collected by R. Farnham, H. E. Wright, Jr., and M. Rubin.	W-497	1900 ± 250
Knife River, N.D. Marl with gastropods from a local lens in late Wisconsin till (Mankato?), in NE¼SE¼ sec. 30, T146N, R89W in road cut, west side of section line road, south side of small draw. Collected by W. E. Benson, National Science Foundation, Washington, D.C.	W-402	11,220 ± 300
Jackson Hole, Wyo. Carbonized fragments in varved glacial silt which overlies 150 ft of outwash in an exposure 500	W-312	27,000 ± 800

Description	Sample No.	Age (yr)
ft above the broad valley of Pilgrim Creek, in NE¼N¼ sec. 29, T46N, R114W. The silt is believed by the collector to be somewhat younger than the Buffalo glacial stage (*16*). Collector, J. D. Love, U.S. Geological Survey, Laramie, Wyo.		
Grand Teton National Park, Wyo. Shell material from a white marl associated with and possibly slightly older than knob and kettle topography and outwash gravels of the Pinedale glacial substage, 3 mi southeast of Jackson Lake, in sec. 32, T45N, R114W, Teton County (*16*). Collected by J. D. Love and D. Taylor, U.S. Geological Survey, Laramie, Wyo.		
Shells underlying thick gravel bed.	W-392	9580 ± 250
Shells at depth of 3 ft, 3/16 mi northwest of sample W-392.	W-393	8800 ± 250
Port Angeles, Wash. Wood taken from exposure along U.S. highway 101, northeast of bridge across Morse Creek, 2 mi east of Port Angeles. Twigs, limbs, and logs occur in bedded sandy clay in glacial or glaciofluvial deposits which underlie, uncomformably, continental drift of Vashon age. Collected by R .D. Brown, Jr., U.S. Geological Survey.	W-339	> 38,000
Port Angeles, Wash. Wood from a quarry on the east side of a new road, 1050 ft S7°W from BM 6 ft on Port Angeles and Western switching yards at southwest end of Ediz Hook, Port Angeles. Sample is from continental drift of Vashon age and was collected from an outwash. Collected by P. D. Snavely, Jr.	W-391	> 38,000
Puget Sound Basin, Wash. Basal 3 in. of peat overlying Vashon drift at the bottom of peat bogs. Samples were selected to determine minimum age for the Vashon as well as the rate of retreat. Collected by D. R. Crandell, H. H. Waldron, and D. R. Mullineaux, U.S. Geological Survey, Denver, Colo.		
Belmore, at depth of 35.5 ft, SW¼ sec. 34, T18N, R2W, about 2 mi southwest of Olympia.	W-394	11,500 ± 300
Thomas Lake, 16.2 ft, SW¼ sec. 33, T28N, R5E, about 7 mi south of Everett.	W-397	9230 ± 320
Sedro Woolley, 27.2 ft. SW¼ sec. 31, T36N, R5E, about 3 mi north of Sedro Woolley.	W-398	12,900 ± 330
Fairbanks, Alaska. Wood from stump in place, from Fairbanks Creek, opposite valley from FE Mining Camp, 20 mi northeast of Fairbanks. The stump was from near the base of Engineer formation, overlying the Goldstream muck. Collected by T. L. Péwé, U.S. Geological Survey, College, Alaska.	W-434	6040 ± 240
Fairbanks, Alaska. Fragments of stems and twigs from 8 ft below the unconformity separating Goldstream muck from the overlying Engineer formation, at Eva Creek, 9 mi west of Fairbanks in sec. 5, T1S, R2W. Collected by T. L. Péwé.	W-435	23,900 ± 1000
Sheep Creek, Alaska. Log and twigs from the east wall of a placer cut on Sheep Creek, SE¼ sec. 17, T1N, R2W. Collected by T. L. Péwé.		
Log at unconformity between what is thought to be post-Wisconsin loess and Wisconsin frozen organic silt, 4 ft below surface.	W-475	> 35,000
Twigs from a woody horizon 5 ft below unconformity in Wisconsin muck associated with large foliated ice masses.	W-476	> 35,000
Galena, Alaska. Log from 10 ft below surface at base of muck formation overlying clean brown sand exposed in cut bank of Yukon River (north bank), 6 mi upstream from Galena. Collected by T. L. Péwé.	W-472	8140 ± 300
Cook Inlet region, south-central Alaska. Peat from organic lacustrine section exposed at top of 80-ft-high sea bluff immediately south of East Foreland, Kenai Peninsula. The sample was collected from the base of a 3- to 5-ft thick section of folded peat and organic silt, silt and sand unconformably overlying intensely folded sand and gravel, and overlain unconformably by 6 to 12 ft of slightly folded sand and organic silt and by 8 ft of undisturbed organic lake silt. The pattern of folding and the lithologic character of these sediments, which border end moraines of Naptowne and Knik age, are interpreted as indicating a series of ice advances near East Foreland of a piedmont glacier lobe which advanced across the inlet from the Alaska Range. (See description of sample W-294, which was collected from an older series of related deposits.) Insofar as the Naptowne end morainal deposits are involved in the folding, it is evident that the most recent of the recorded intervals of advance deformation is post-Naptowne maximum in age. The age (12,950 yr) of the sampled horizon, because it marks an interval just prior to a late episode of advance, is consistent with this interpretation and with the placement of the culmination of the Killey (Cary)-Skilak (Mankato) interstadial boundary (12,500 yr) as earlier derived (*17*). Collected in 1954 and interpreted by T. N. V. Karlstrom, U.S. Geological Survey, Washington, D.C.	W-416	12,900 ± 300
Cook Inlet region, south-central Alaska. Organic silt from a bog deposit buried beneath eolian sand exposed in sea bluff near Point Possession, Kenai Peninsula. The sample was collected from near the base of an organic silt section overlying about 20 ft of glaciolacustrine stoney silt of Naptowne (Wisconsin) age and about 30 ft of pre-Naptowne drift, deeply oxidized and contorted. This sample provides a minimum date for the drainage of the proglacial lake or at least of the lowering of the lake surface well below an elevation of about 150 ft above present sea level in the upper part of Cook Inlet. Slight oxidation at the top of the glaciolacustrine deposits suggests a brief interval of subaerial weathering between the termination of proglacial lake deposition and the beginning of organic silt accumulation in a depression of the newly exposed lake bottom. The sample is consistent in age and stratigraphic position with sample L-137C (9500 ± 650 yr), which was collected from the same section and from a stratigraphically higher woody peat horizon which records a major interval of bog drying essentially contemporaneous with that of the Skilak (Mankato)-Tanya (Cochrane) interstadial and with the Yoldia sea transgression in Eu-	W-474	10,370 ± 350

Description	Sample No.	Age (yr)
rope (*18*). Collected in 1954 and interpreted by T. N. V. Karlstrom.		
Cook Inlet, Alaska. Sample from a buried forest zone in a till section exposed in a railroad cut near Tunnel Section House on the Alaska Railroad between Seward and Portage, on the Kenai Peninsula. The cut lies within ¾ mi of Bartlett Glacier and between end moraines that mark the maximum advances of the Tunnel I and Tunnel II glacial events of the Cook Inlet glacial chronology (*18*). The stratigraphic sequence, from top to bottom, is as follows: 2 to 6 ft of surface till (Tunnel I) with an incipient soil profile; forest zone (sample W-318); and 6 to 8 ft of till oxidized at top contact to depths of 1 to 5 in. The basal till represents the Tustumena III glaciation of the Cook Inlet chronology. A previously analyzed sample (W-78) collected from an ice-scoured log incorporated in the basal till dated 2370 ± 100 yr. These two samples, plus a third dated sample collected from forest remains buried in Tunnel II till of the innermost belt of the two most recent moraines in front of Tustumena glacier (L-117K, 400 ± 150 yr), support the dating of the Tustumena III glaciation between 500 B.C. and A.D. 500; Tunnel I between A.D. 500 and A.D. 1500; and Tunnel II between A.D. 1500 and the present. Collected and interpreted by T. N. V. Karlstrom.	W-318	1385 ± 200
Central Kobuk River Valley, Alaska. Peaty material collected 95 ft down from the top of a 110-ft bluff on the south side of Kobuk River, west of mouth of Ambler River at lat. 67°05'N, long. 158°10'W. The bluff exposes from top to bottom: 10 ft of tan eolian sand; 65 ft of grayish eolian sand; 35 ft of mixed organic and sandy material. The date serves as a reference point in the chronology of the eolian deposits of the central Kobuk Valley. Collected and interpreted by A. T. Fernald and D. R. Nichols, U.S. Geological Survey, Washington, D.C.	W-420	> 38,000
Upper Kobuk River Valley, Alaska. Log collected 5 ft down from the top of a 20-ft terrace bluff along the east side of Beaver Creek, a tributary of the Kobuk River, at lat. 66°52'N, long. 155°02'W. The bluff exposes 2 ft of peat over 18 ft of rubbly gravel that contains a few logs. Collected by A. T. Fernald and D. R. Nichols.	W-473	2470 ± 250
Central Kobuk River Valley, Alaska. Tree trunk collected 35 ft down from the top of a 100-ft bluff along the north side of the Kobuk River, near the mouth of Kavet Creek at lat. 67°08'N, long. 159°03'W. The bluff exposes from top to bottom: 5 ft of loess; 75 ft of stratified sand, silt, and organic debris; 20 ft of slump material that includes gravel and large boulders. The date is the only available reference point for the chronology of the central Kobuk Valley, which is outside the morainal systems of the Kobuk region. Collected and interpreted by A. T. Fernald and D. R. Nichols.	W-368	> 33,000
Nome, Alaska. The coastal plain at Nome, Alaska, is underlain by a sequence of marine, glacial, alluvial, and colluvial sediments that record a rather complete chronology for at least the latter half of Pleistocene time (*19, 20*). The specimens described here were collected in 1955 in new exposures in the "Submarine Beach" dredging area on the ridge between the lower Snake River and the Bering Sea, 2.5 mi west of Nome. Here, an end moraine of Nome River (presumably Illinoian) age was planed by wave action during a subsequent period of high sea level (presumably Sangamon). The end moraine was truncated at an altitude of 27 ft above sea level, and a gravel barrier bar, known locally as "Second Beach," was built on its surface. Sand accumulated behind the barrier bar in an estuary on the site of the present valley of Snake River. Later, presumably during Wisconsin time, sea level fell, winters became severe though snow cover was thin, and ice wedges formed in the exposed estuarine sand and silt. Late in Wisconsin time, peat and colluvial silt were deposited in a shallow swale on the surface of the estuarine sediments. Shortly afterward, during a period when summers were longer or warmer than at present, the ice wedges began to melt. Colluvial sedimentation continued, filling the trenches resulting from the thawing of the ice wedges. A long hiatus ensued, to be followed a few thousand years ago by renewed deposition of peat and colluvial silt in the swale. Winters became severe again, and a new set of ice wedges formed. The newly dated specimens consist of peat and wood from the colluvial sediments in the swale. They establish the age of the colluvial sediments, give a minimum age for the older ice wedges, a maximum age for the younger ice wedges, and a minimum age for the estuarine sediments of "Second Beach." The period of warm summers, which was apparently initiated here at least as early as between 10,000 and 9500 yr ago, was probably equivalent to a period of warm summers recorded 9500 to 8300 yr ago in northern Seward Peninsula by several specimens analyzed by the solid-carbon method at the Lamont laboratory (*21*). Collected by D. M. Hopkins, U.S. Geological Survey, Menlo Park, Calif.		
Wood from basal colluvial sediments filling a collapse trench on the former site of an ice wedge in the estuarine sediments. Gives minimum age for Second Beach and for the ice wedges subsequently formed in estuarine sediments.	W-463	13,040 ± 300
Peat lens at base of lower colluvial sediments filling another collapse trench.	W-461	10,050 ± 270
Peat from thoroughly involuted colluvial sediments about 2 ft vertically above specimen W-461 and about 2 ft below the top of the unit. Specimens W-461 and W-485 probably bracket the initiation of rapid thawing of ice wedges.	W-485	9690 ± 400
Peat from 1 ft below surface and 0.5 ft above the base of the upper, noninvoluted unit of peat and colluvial silt. Modern ice wedges have tops at about this depth beneath the surface and must be younger than this specimen.	W-484	2770 ± 300
Southeastern Copper River Basin. Peat and wood collected from partially lignitized zone capping 1 ft soil development	W-307	> 37,000

Description	Sample No.	Age (yr)
on silty sand 100 ft down in a 150-ft bluff cut in a terrace of the Copper River, 11 mi southeast of Copper Center. A second buried soil profile lies 3 ft below the sample. The soil horizons, both with distinct podsol developments, overlie 20 ft of greenish grey till and are overlain by 30 ft of sand and fine gravel, 60 ft of coarse outwash gravel, and 10 ft of terrace gravel. The basal 15 ft of the section is concealed. The lignitized peat and wood and soil horizons represent a stabilized surface during an interglacial period which followed deposition of the till. Stratigraphic relations in adjacent bluff sections indicate that terrace cutting at the sample section has removed two tills with thick intervening outwash and lacustrine deposits, which overlie the thick outwash above the sample. The upper till immediately underlies the floor of the southeastern part of the Copper River basin. Collected and interpreted by D. R. Nichols, U.S. Geological Survey, Washington, D.C.		
Southeastern Copper River Basin, Alaska. Twig fragments in coarse pumiceous and andesitic sand in a 300-ft bluff on the north side of the Tonsina River approximately 6 mi above its mouth. The sand is associated with coarse sand and gravel that fill channels cut into an andesite-rich till. The till is presumed to represent a prolonged period of volcanism during a major glaciation. The sand and gravel are overlain by 70 ft of laminated silt and sand with local cobble-gravel zones and by 60 ft of gray surficial till. The andesite-rich till truncates outwash sand and gravel which overlays two older tills. The sample was deposited in outwash during retreat of the ice of a major glaciation and prior to a period of lake deposition and subsequent ice advance. Collected and interpreted by D. R. Nichols.	W-373	> 35,000
Southeastern Copper River Basin, Alaska. Peat and twigs from a 1-in. to 3-ft bed of massive silt and sand exposed in a gravel pit at mile 92, Richardson Highway, 8 mi south of Copper Center. The gravel pit is on the margin of a 15-ft escarpment on the northern boundary of a glacial drainage channel. The organic-bearing sand and silt is overlain by 3 to 4 ft of highly contorted and laminated silt and clay and by 4 to 7 ft of a heterogeneous deposit (till?) with numerous washed zones and lenses of contorted sand and sandy gravel. A soil profile 1 ft thick is developed on the till (?) at the surface. Two to three feet of massive, blocky gray silt with occasional pebbles underlies the sample zone to the base of the exposure. The sequence was interpreted to represent either (i) an ice margin-drainage channel contact during retreat of the last major advance of ice into the basin which dammed the basin drainage and formed an extensive interior lake (*22*), or (ii) possible slumping of the till surface along the drainage escarpment. The date suggests that deposition of the woody material and contortion of some of the bedded deposits is by relatively recent slumping along the escarpment. Collected and interpreted by D. R. Nichols.	W-433	480 ± 160
Barrow, Alaska. Peat from buried organic zone in bottom sediments of an artificially drained lake basin 4 mi south of the Arctic Research Laboratory, Barrow. The sample was collected from an 8-in. bed of silt-free peat overlain by a 2-in. bed of organic-free silt which in turn is overlain by 2-in. of dark brown organic-rich silt. Buried peat in a comparable stratigraphic position is found in several lake basins in this area. Collected by K. M. Hussey and submitted by H. W. Coulter, U.S. Geological Survey, Washington, D.C.	W-432	3540 ± 300
Arctic Coast, Northern Alaska. Log approximately 18 ft long and 6 in. in diameter incorporated in a crossbedded sandy gravel member of the marine Gubic formation of Pleistocene age exposed along the coastal bluffs southwest of Point Barrow, midway between Barrow Village and the Wiley Post Memorial. Extensive marine mega- and microfaunas occur in the Gubic formation. Collected by K. M. Hussey, Arctic Research Laboratory, and H. W. Coulter.	W-380	> 38,000
Upper Matanuska Valley, Alaska. Peat collected from near the top of a 100-ft bluff along the north bank of the upper Matanuska River in south-central Alaska. The site is about 1650 ft above sea level and is 400 ft S20°W of milepost 102 on Glenn Highway, from Anchorage. It is 6000 ft N80°W, or down-valley, from the terminus of Matanuska Glacier, one of the largest in the northern Chugach Mountains, and the chief source of the Matanuska River. Most of the river bluff is formed of coarse, crudely bedded, glacial drift. At the sample locality it is capped by bog and pond deposits consisting of (i) 4 ft of surficial peat which contains three thin beds of volcanic ash and (ii) basal silt containing numerous fresh-water gastropods and pelecypods (U.S. Geological Survey, Cenozoic locality No. 19191). The dated sample was taken from the basal inch of peat, just above its contact with the fossiliferous silt. The sample dates initiation of peat deposition within the pond depression and therefore provides a close approximation of the date of change from pond to bog environment. The undisturbed, horizontal volanic ash beds and the fresh, uncompressed character of the peat, together with the absence of a mantle of glacial drift, show that the Matanuska Glacier has not covered the site since deposition of the dated peat. The date, therefore, provides a minimum age for the last time during which the site, only 6000 ft from the present terminus, was covered by the Matanuska Glacier. Collected by J. R. Williams and O. J. Ferrians, Jr., U.S. Geological Survey, Washington, D.C.	W-431	8000 ± 300
Northeastern Copper River Basin, Alaska. Peat collected from road cut at approximately mile 61.3, Tok Highway, just east of Ahtell Creek. The section from the base (road level) upward consists of 6 ft of well-oxidized, well-sorted, coarse gravel; a 1-ft lens of unoxidized till-like		

Description	Sample No.	Age (yr)
material; 4 ft of unoxidized coarse gravel containing cobbles and a few boulders; 3 ft of peat interbedded with fine sand and silt; 4 ft of unoxidized, coarse gravel containing cobbles and a few boulders; and a thin vegetation mat at the surface. The elevation and character of the deposits, the stratigraphy, and the nearby strandlines suggest that the peat was deposited during a period of glacial retreat, with relatively low lake- and base-level, and that the gravel, which underlies and overlies the peat, was deposited as outwash during periods of glacial advance, with relatively high lake- and base-level. Collected and interpreted by O. J. Ferrians, Jr., and H. R. Schmoll, U.S. Geological Survey, Washington, D.C.		
Peat from base of peat bed.	W-429	11,440 ± 400
Peat from top of peat bed.	W-487	9240 ± 300
Northeastern Copper River Basin, Alaska. Wood collected from a bluff on the east side of the Gakona River about 20 mi from its mouth. The section, from the base upward includes: 35 ft of cover; 5 ft of oxidized fine gravel and sand; 5 ft of slightly oxidized, fine, silty sand with organic material disseminated throughout; forest horizon (sample W-377); 15 ft of unoxidized outwash gravel; and 10 ft of unoxidized stony silt mantled by a thin vegetation mat at the surface. Stratigraphic relations suggest that the 5-ft thick bed of organic silt and sand and the forest zone represent deposition during a major interglacial period which was terminated by a major glacial advance as represented by the overlying outwash deposits. Outwash deposition was followed by a period of glaciolacustrine deposition during the high-level phases of an interior lake that occupied the Copper River Basin. Collected and interpreted by O. J. Ferrians, Jr., and H. R. Schmoll.	W-377	> 35,000
Southwestern Copper River Basin, Nelchina River. Peat collected from the base of stratified peat and cliff-head dune sand deposits at the top of the north bank of the Nelchina River at lat. 62°00'N, long. 146°32.3'W. Below the dated peat lie about 150 ft of glacial drift, chiefly till, which is underlain near the base of the cliff by gravel and sand, and at the base by lake silt. The sand near the base of the cliff was dated as older than 38,000 yr (W-295). Collected and interpreted by J. R. Williams and O. J. Ferrians, Jr.	W-306	975 ± 160
Northern Chugach Mountains, Tazlina Lake Area, Alaska. Black organic silt, containing alder and willow sticks and spruce needles, was collected from a depth of 4 ft in an exposure at the edge of a pond in the upper valley of Tokaina Creek, located at lat. 61°52.5'N, long. 146°19'W. The dated organic silt, interpreted as a pond deposit, is overlain by grass and sedge peat which is interpreted as marsh or bog deposits and is underlain by blue-gray sandy clay which is tentatively interpreted as the deposit of an ice-dammed lake which filled the valley of Tokaina Creek. The dated sample furnishes a minimum age for retreat of the ice and disappearance of the lake, and dates the pond deposits. Collected and interpreted by J. R. Williams and O. J. Ferrians, Jr.	W-378	2500 ± 200
Munday Creek, Yakataga District, Alaska. Small tree rooted in place at the base of a 30-ft section of alluvial sand, gravel, and silt deposited as a fan on a marine terrace at the mouth of the bedrock canyon of Munday Creek. The tree grew at the inner margin of a prominent marine terrace now at an altitude of about 40 ft and is believed to have been buried at an early stage in the formation of the alluvial fan, probably not more than 100 yr after the sea withdrew from this stand. Collected by D. J. Miller, U.S. Geological Survey, Menlo Park, Calif.	W-369	1050 ± 160
Crillon Lake, Lituya District, Alaska. Small tree in a poorly stratified ice-contact deposit on the inner face of and about 10 ft below the crest of the end moraine at the south end of Crillon Lake. The sample gives a maximum age for the last major advance of the South Crillon Glacier to a point about 4.5 mi south of and about 500 ft higher than the present front. If the tree is of local origin, as is indicated by the bark, small limbs, and roots attached, the sample also fixes, within a few tens of years, the beginning of retreat from this stand. The last advance of the South Crillon Glacier is correlated on other evidence with the last advance of ice to the mouth of nearby Lituya Bay, and is possibly about the same age as the last advance of ice to the outer part of Glacier Bay, on the opposite side of the Fairweather Range. Collected by D. J. Miller.	W-371	390 ± 160
Icy Bay, Yakataga District, Alaska. Small pieces of wood in an end moraine exposed in sea cliff west of Icy Cape. The sample gives a maximum age for the older of two major advances of ice into the ocean at the mouth of Icy Bay, 18 mi or more beyond the present tidal front of the Guyot and Tyndall glaciers. The last advance probably culminated during the 18th century and may be the one recorded in native legend (*23*). The presence of many unbroken fragile shells of marine mollusks in till up to an altitude of at least 20 ft in the moraine from which the wood sample was obtained indicates that the older advance occurred during a higher stand of the sea, possibly the stand dated by sample W-369. Collected by D. J. Miller.	W-374	1200 ± 160
Cape Suckling, Katalla District, Alaska. Small tree, one of many rooted in place in stratified peaty mud on beach at approximately 0 tide level. The sample was interpreted as representing a eustatic low sea-level phase, but in view of the result, either local subsidence of the forest to its present position or contamination of the sample is suspected now. Collected by D. J. Miller.	W-376	390 ± 160
Marine Terrace, La Perouse Glacier, Lituya District, Alaska. Small piece of beach-worn driftwood at the base of a 10 ft section of stratified sand and gravel, and immediately above a wave-planed bedrock surface at altitude about 150 ft. The sample gives a maximum and probably nearly correct date for the formation	W-405	3250 ± 200

Description	Sample No.	Age (yr)
of one of the intermediate terraces in the Lituya district. The date is consistent with Heusser's conclusion, based on pollen studies, that a nearby marine terrace at about half this altitude has emerged within the past 2000 yr (*24*). Collected by D. J. Miller.		
Cape Suckling, Alaska. Shells of shallow-water marine mollusks from a sea cliff 12 ft above mean high tide. Collected by D. J. Miller.	W-462	5120 ± 220
Willow Creek, Alaska. Organic silt from pond sediments taken from base of a bog in a lateral moraine complex 2.5 mi west-southwest of the steel bridge at the mouth of Willow Creek Valley, Talkeetna Mountains. Collected by Bjorn G. Andersen, University of Oslo, Norway.	W-360	11,930 ± 250
Talkeetna Mountains, Alaska. Twigs and wood fragments from "beaverpond" sediments at the base of a 7- to 8-ft bog section located in the central Willow Creek Valley, 4 mi down the valley from Lucky Shot mine, in the southwestern Talkeetna Mountains. The bog is in a closed depression within the large main morainal complex in the valley. Sample and interpretation by Bjorn G. Andersen.	W-336	9870 ± 250
Eastern Talkeetna Mountains, Tyone Creek, Alaska. Compressed fibrous peat collected near the base of the 30-ft-high west bank of Tyone Creek at lat. 62°15'N, long. 147°5.9'W. The stratigraphic section exposed in the river bank, from top to bottom is: 3 ft of glacial till, about 4 ft of gravel, 15 ft of slumped material, and 8 ft of interbedded silt and peat which contains a few pods and lenses of oxidized sand and gravel. The silt-peat deposits from which the sample was taken probably represent an interglacial fluvial deposit which was buried, first by outwash and then by glacial ice. Collected and interpreted by J. R. Williams and O. J. Ferrians, Jr.	W-357	> 35,000
Hotham Inlet, Alaska. Peaty material within an organic layer collected 45 ft down from the top of a 100-ft bluff on the north shore of Hotham Inlet between the deltas of the Kobuk and Noatak rivers at lat. 67°02'N, long. 161°59'W. The bluff exposes, from top to bottom: 5 ft of organic silt; 35 ft of stratified sand and silt; 10 ft of organic material, including tree trunks and logs; and 50 ft of gray till. The date is a minimum one for an extensive glaciation in this region. Collected and interpreted by A. T. Fernald and D. R. Nichols, U.S. Geological Survey, Washington, D.C.	W-344	> 38,000
Sheguiandah, Manitoulin Island, Ontario. Peat from basal 1-in. layer of a 5 ft bog section that overlies lake clays containing Indian artifacts, at the Sheguiandah site, swamp area 3, test trench 1. The sample layer lies 135 ft above Lake Huron and above what are believed to be Lake Algonquin clays. A cold episode is recorded in the peat at about the 4-ft level and should correlate with the Cochrane readvance. Collected by T. E. Lee, National Museum of Canada, Ottawa, Ont.	W-345	9130 ± 250
Ste. Anne de Madawaska, New Brunswick. Wood from the bank of the Quisibis River, along the north shore of the St. John River. The section consists of silts, sand, and clay, resting on a bog layer (sample horizon) that overlies gravel and sand from the valley train of St. Jacques drift (*25*). Collected by H. A. Lee, Geological Survey of Canada, Ottawa, Ont.	W-353	8250 ± 200
Grenoble, France. Fragment of a tree, identified as *Pinus* species, from varved clays in a section known in French geologic literature (*26*) as the "Argiles d'Eybens," near Grenoble. The deposit is believed to represent the Third Interglacial (Riss-Würm of Europe, Sangamon of North America). Collected by L. Moret, University of Grenoble; submitted by H. L. Movius, Jr., Harvard University.	W-315	> 37,000
Queensland, Tasmania. Carbonized fragments of King William pine from Linda Moraine, Gormanston, east of Queenstown, western Tasmania. The sample comes from varved clays deposited in a glacially dammed lake at the head of Linda Valley and belonging to the Malannan phase of glaciation (*27*). Submitted by E. D. Gill.	W-323	26,480 ± 800
Henty River, Tasmania. Wood from clays deposited behind a moraine exposed in a railroad cut 0.6 mi north of the bridge over the Henty River, on the line from Zeehan to Strahan. The moraine marks the beginning of retreat of the Malanna ice sheet, the earliest phase of Pleistocene glaciation in Australia. Submitted by E. D. Gill.	W-444	> 32,000
La Paz, Bolivia. Organic matter from the upper part of a thin lake bed deposit, upstream from an end moraine across the Chocayapu River along the road to Chacaltaya in a locality called Patapatani, near city of La Paz (*28*). The lake was dammed by the end moraine, and therefore the organic matter should date sometime postmoraine formation. This moraine is similar in position to many others along the western front of the eastern Andes of Bolivia and seems to represent the last advance of the last glaciation. Collected by E. Dobrovolny, U.S. Geological Survey, Denver, Colo.	W-367	9200 ± 250
Greenland Ice Cap. Organic matter from sediments exposed as a smear in one of the shear planes near the low-cliffed terminus of the North Ice Cap. The sample was collected approximately 65 mi northeast of Thule, Greenland, by R. P. Goldthwait.	W-408	4760 ± 220
III. *Other geologic samples*		
Great Salt Lake, Utah. Samples obtained from a core taken from bottom of Great Salt Lake in 28 ft of water, lat. 40°47.9'N, long. 112°16.6'W. The samples consist of the organic carbon and the carbonate carbon fractions of the intervals 18-to-22.5 ft and 25-to-30.5 ft below the lake bottom. These represent the section of the core containing sediments of fresh-to-brackish water environment, and establish an average age through this thickness of sediments for the last (perhaps the main) Wisconsin fresh-water stage of the lake. Collected by A. J. Eardley and R. Cohenour, University of Utah.		

Description	Sample No.	Age (yr)
Carbonate carbon.	W-319	16,680 ± 300
Organic carbon.	W-321	16,850 ± 300
Searles Lake, Calif. Samples taken from drill hole GS-27 located on Searles Lake, from depth of 78.0 to 78.1 ft. This core presented an excellent opportunity to check the use of various carbonaceous materials for age determinations. Sufficient carbon was obtained from a twig, gaylussite crystals, and organic mud for three separate determinations, all from within a 0.1-ft section of core. The core bottoms at 83 ft in mud. The samples come from the overlying unit, the "lower salt" formation, which extends up to the 58.6-ft depth. Next comes the "parting mud" layer, with its top at 43.3 ft and then comes the "upper salt" with its top at 18.6 ft. Overburden mud extends to the surface. The "parting mud" layer has yielded organic material that was dated by Libby (*29*) at from 10,000 to 24,000 years in proper sequence. This mud represents the last fresh-water stage of the lake. Submitted by D. V. Haines, U.S. Geological Survey, Claremont, Calif.		
Wood from core.	W-340	26,700 ± 2000
Carbonate from gaylussite crystals.	W-341	23,000 ± 1400
Organic carbon from mud.	W-343	29,500 ± 2000
Harrisville, Utah. Carbonaceous material from well-developed soil 0.5 to 1.0 ft thick, about 11 ft below the land surface, exposed in a clay pit of the Harrisville Brick Co. SW¼SW¼NE¼ sec. 6, T6N, R1W, Weber County, north of Ogden. The soil is the uppermost of three soils displayed in the pit, at 4290-ft elevation; it is considered post-Lake Bonneville group by collector, J. H. Feth, U.S. Geological Survey, Menlo Park, Calif.		
Plant remains from soil.	W-335	8330 ± 300
Shells from same soil.	W-385	7720 ± 300
Hooper, Utah. Plant stems from the bank of the U.S. Bureau of Reclamation's Hooper Pilot Drain in center sec. 8, T5N, R2W, southwest of Ogden, Weber County. Woody matter at 4235-ft elevation was in growth position in gray sand 6 ft below the land surface. Considered post-Lake Bonneville group by collector, J. H. Feth.	W-386	9730 ± 350
Great Salt Lake, Utah. Algal tufa from beaches of former Lake Bonneville, from the north end of the Oquirrh Range, just west of Garfield. Collected by A. J. Eardley, University of Utah.		
Tufa from Lake Bonneville shoreline, elevation 5200 ft.	W-409	11,300 ± 300
Rerun of W-409, from weathered portion.	W-439	11,420 ± 300
Tufa from Provo shoreline, elevation 4800 ft.	W-410	> 32,000
Tufa from Stansbury level, elevation 4520 ft.	W-411	14,000 ± 450
Tufa from Stansbury level, elevation 4480 ft.	W-412	14,000 ± 450
Weber River, Utah. Samples from section exposed on the northwest wall of a small canyon extending northeast from the floodplain of Weber River into Uintah bench, in the SW¼ sec. 21, T5N, R1W. Weber County. Collected by J. H. Feth and M. Rubin.		
Peat from 1 in. thick bed underlying 13 ft of marl and clay, elevation 4600 ft.	W-326	9925 ± 300
Rerun of W-326.	W-440	10,260 ± 300

Description	Sample No.	Age (yr)
Marl immediately above peat.	W-382	12,960 ± 350
Pyramid Lake, Nev. Lithoid tufa from the top of Anaho Island, Pyramid Lake, at elevation 4376 ft, about 30 ft below the highest level of Lake Lahontan. Collected by J. W. Calhoun, Nevada State Museum, Carson City, and P. C. Orr, Western Speleological Institute, Santa Barbara, Calif.	W-442	12,050 ± 400
Pleasant View, Utah. Tufa from various levels on the southwestern tip of Pleasant View salient, a spur of Cambrian limestone and quartzite from the Wasatch Range, 10 mi north of Ogden. The samples were collected by J. H. Feth, to date the stages of Lake Bonneville.		
Tufa with snail shells from limestone pinnacle at elevation 4975 ft (Alpine level).	W-455	14,030 ± 500
Tufa encrusted on low knob of limestone at elevation 4800 ft (Provo level).	W-456	11,650 ± 450
Tufa with snail shells from roof of wave-cut cave at the same level as W-456.	W-458	14,380 ± 500
Stansbury Mountains, Utah. Tufa from various levels of Lake Bonneville. Collected by J. H. Feth and H. Waite, U.S. Geological Survey, Menlo Park, Calif.		
Tufa from Stansbury level on a ridge west of the main Stansbury Range, 3 mi south of Timpie.	W-490	16,530 ± 800
Tufa from Provo level, above W-490.	W-491	13,380 ± 400
Tufa from low-level Stansbury, encrusting the top of a ridge in Skull Valley, west of Stansbury Mountains, 4 mi south of the railroad.	W-494	18,000 ± 1000
Assawompsett, Mass. Log from hearth buried by 1 m of eolian sand on which a normal brown podzolic soil profile has developed, exposed at Assawompsett Pond on Vaughan St. The log would antedate the eolian activity and the soil development. Collector, J. H. Hartshorn, U.S. Geological Survey, Boston, Mass.	W-363	4320 ± 250
Washington, D.C. Wood from a peat layer encountered in excavation made in 1955 for an annex to the Mayflower Hotel. Peat was overlain by 10 ft of muck, which in turn was overlain by 10 ft of sand and clay. Collected by C. Milton and M. Rubin.	W-302	> 38,000
Spartanburg, S.C. Wood taken from peaty clay in an exposure on a small tributary to Buck Creek, of the Pacolet River drainage basin, 13 mi north of Spartanburg. Submitted by W. C. Overstreet, U.S. Geological Survey, Shelby, N.C.	W-308	> 34,000
Evansville, Ind. Wood from Megalodon beds in river alluvium near Evansville. Collected by Leo Lesquereux in 1870 from strata containing a mammalian faunal assemblage including *Megalonyx, Bison, Equus, Tapirus,* and *Odocoileus.* The section has been referred to both the Sangamon and Yarmouth intervals (*30*). Submitted by E. S. Barghoorn, Harvard University, and L. L. Ray, U.S. Geological Survey, Washington, D.C.	W-418	9400 ± 250
Yankeetown, Ind. Wood from the Indiana bank of Ohio River, approximately 1000 ft west of the Warrick-Spencer county line, sec. 26, T7S, R8W, in laminated silts 5 ft above the pool stage of the river. Collected by L. L. Ray.	W-428	4030 ± 160
Lonoke County, Ark. Charcoal and wood fragments taken from 50-ft depth in a well	W-316	5520 ± 160

Description	Sample No.	Age (yr)
located in the NW¼NE¼ sec. 22, T1N, R10W. The sample comes from a layer of sands and gravels underlying silts and clays. Well bottomed in Tertiary clay at 86 ft. Collected by P. E. Dennis, U.S. Geological Survey, Little Rock, Ark.		
Sitka, Kan. Bunch grass collected on Harper Ranch, 6 mi south of Sitka, Clark County, by Harmon and Claudia Craig on 7 Oct. 1955. Grass from this location had previously been found by Craig to be greatly enriched in C^{13} relative to the range of normal terrestrial plants (*9*, p. 70), and he interprets such enrichment as being due to assimilation of carbon from limestone-derived carbonate in a pedocalcic soil (*9, 31*). The C^{13}/C^{12} ratio in caliche from this area is the same as that of average limestone for which δC^{13} is about 0 per mil (*31*). This sample was collected to determine whether vegetation in such an area would show an apparent C^{14} age due to assimilation of "old" carbon from caliche and soil carbonate. A series of new C^{13} analyses on grass from this area, made by H. Craig, gave a δC^{13} value for this sample of -11.0 per mil, and values of -12.1 per mil and -12.9 per mil, respectively, for bunch grass and buffalo grass growing together about 100 yd from the spot at which the present sample was collected (normal terrestrial plants average -25 per mil). All samples were treated with HCl to remove any carbonate. It was believed, therefore, that the grass would show a radiocarbon age of several thousand years if the soil carbonate contained no radiocarbon.	W-350	+5.4% (see discussion)
However, the radiocarbon measurement gives a C^{14} activity 4.5 percent higher than that of our modern standards (*32*), which, when corrected for isotopic fractionation in preparation of C_2H_2 by comparison of C^{13} analyses of combusted C_2H_2 and combusted grass, becomes 5.4 percent, which is equivalent to 430 years in the future. (Combusted C_2H_2, analyzed by T. Mayeda, gave $\delta C^{13} = -15.4$ per mil. This activity is not corrected for the C^{13} difference between the grass and our wood standards because derivation of carbon from two sources is involved and because the radiocarbon content of the soil carbonate is not known. The anomalously high activity must represent a recent addition of radiocarbon to the atmosphere from nuclear weapons and reactors, which is gradually increasing the C^{14} content of atmospheric CO_2. Except for the effect of natural isotopic fractionation, the figure of 5.4 percent is a lower limit for the addition as of 1955, which has evidently been sufficient to overcompensate for any "dead" carbon assimilated; however, because the radiocarbon content of the soil carbonate has not been measured, an exact value for the atmospheric radiocarbon increase cannot be given. On the other hand, it is highly improbable that more than a few percent of artificially produced radiocarbon had been added by 1955, and thus it seems that, in the process of continual solution and reprecipitation, the soil carbonate has been brought up almost to modern radiocarbon content.		
Kassler quadrangle, Colo. Molar of *Mammuthus* (*Parelephas*) from pebbly clay at the "Spring site" in NW¼NE¼ sec. T6N, R69W, Kassler quadrangle. Collected by G. Scott, U.S. Geological Survey, Denver, Colo.	W-401	10,200 ± 350
Yellowstone, Wyo. Section of lodgepole pine taken from an erosion channel on the northeast side of the cone of Old Faithful Geyser, near the base. The sample dates a quiescent period in the formation of the mound and verifies the collector's figure of about two centuries for the beginning of the eruption of the present Old Faithful Geyser (*33*). Collected by G. D. Marler, Thornton, Idaho, and submitted by H. Craig, Scripps Institution of Oceanography, La Jolla, Calif.	W-311	730 ± 200
Beartooth Mountains, Wyo. Peat from a deposit 1 mi south of Sawtooth Mountain, T57N, R104W, on Deep Lake quadrangle at elevation 9700 ft. Collected by W. G. Pierce, U.S. Geological Survey, Menlo Park, Calif.	W-459	7570 ± 400
American Falls Reservoir, Idaho. Charcoal from American Falls lake bed area, taken from beneath the facial portion of a skull of *Bison gigantobison latifrons* in sands 2 to 3 ft below the surface at Michard Flats. The purpose of dating was to establish a range for this species. Collected by M. L. Hopkins, Idaho State College.	W-358	> 32,000
East Tintic, Utah. Charred wood from the west bank of a main stream channel cut into a Recent terrace, in the west-central part of sec. 26, T8S, R4W Salt Lake Meridian. Collector: H. D. Goode, U.S. Geological Survey, Denver, Colo.	W-421	470 ± 160
Sulphur Bank, Calif. Log from preandesite lake beds at Sulphur Bank, the locality of one of the largest producers of mercury in the United States. All the mercury of the deposits was precipitated after this log and the enclosing lake beds were deposited. Collected by D. E. White, U.S. Geological Survey, Menlo Park, Calif.	W-362	> 33,000
Sacramento, Calif. Wood from a depth of 60 ft in a Ranney well dug for city of Sacramento at the end of Sixth Avenue. The wood occurs in the coarse gravels and sands underlying the fine-grained deposits of the upper 28 ft. The coarse, gravelly deposits which continue to a depth of 104 ft are presumed to represent backfill laid down during rise of sea level concurrent with glacier recession in post-Wisconsin time. Collected by G. H. Davis, U.S. Geological Survey, Sacramento, Calif.	W-436	2240 ± 250
Hermit's Cave, N.M. Samples from cave in Guadalupe Mountains, Eddy County. Collected by C. B. Schultz, University of Nebraska, and submitted by G. E. Lewis, U.S. Geological Survey, Denver, Colo.		
Charcoal from hearth, extinct mammal horizon, 3.2 ft below bench mark A, square 13.	W-495	12,900 ± 350
Log from extinct mammal horizon near hearth of square 13, 2 ft below floor of cave, square 14.	W-498	11,850 ± 350
Log at mouth of cave, 2.7 ft below datum point A, square 26.	W-499	12,270 ± 450
Orting, Wash. Wood taken from a drainage ditch at southwest corner SE¼NW¼ sec. 4, T18N, R5E, Pierce County, 1.5 mi		

Description	Sample No.	Age (yr)
south southeast of Orting. The sample was taken to date the mud flow deposits in the Puyallup River valley floor. Collector, D. R. Crandell, U.S. Geological Survey, Denver, Colo.		
Wood from drainage ditch.	W-407	< 200
Rerun of above wood, to verify date.	W-424	< 200
La Crosse, Wash. Wood from postscabland alluvial silts, 5 ft above contact with scabland gravel and 20 ft below ash layer that is 5 ft below surface. Exposed in the NE¼ sec. 25, T15N, R38E, southwest corner of La Crosse, Wash., quadrangle. Collected by L. M. Gard, U.S. Geological Survey, Denver, Colo.	W-486	6120 ± 300
Hilo, Hawaii. Charcoal buried in volcanic cinder, 6.48 mi S41°W of Coconut Island. The samples come from a prehistoric vent of the last (Kau volcanic series) group of lavas of Mauna Loa. Collected by Stephen Ho; submitted by G. A. Macdonald, U.S. Geological Survey, Denver.		
Charcoal.	W-477	2000 ± 250
Charcoal.	W-478	2070 ± 250
Puna, Hawaii. Charcoal from nearly horizontal 4-in. layer of tree mold in pahoehoe lava, found 1.07 mi N33°W of Makaaiea point in the Puna district of the island of Hawaii. The sample represents uppermost prehistoric flow of the Puna volcanic series. Collected by G. A. Macdonald, U.S. Geological Survey, Menlo Park, Calif.	W-359	< 200
Bikini Island, Marshall Islands. Coral and reef detritus from core in drill hole 3, south end of Bikini Island. The sample came from a depth of 60 ft, just above a stratigraphic break. Submitted by J. I. Tracey, U.S. Geological Survey, Washington, D.C.	W-417	$> 38,000$
Prince Patrick Island, Northwest Territories, Canada. Driftwood from strand line at elevation 490 ft, at lat. 76°18'N. long. 119°36'W. Submitted by J. G. Dyer, U.S. Weather Bureau, Washington, D.C.	W-423	$> 38,000$
Mexico, D.F., Mexico. Carbon and carbonate from soil surrounding a giant armadillo found in the Becerra formation near the town of San Miguel Tecamachalco, west of Mexico City. Submitted by A. R. V. Arellano, Instituto Geologico, Mexico, D.F.		
Carbonate fraction of soil.	W-488	8540 ± 350
Organic carbon from soil.	W-493	7940 ± 300
Thjórsárbrú, southwestern Iceland. Peat buried by lava exposed in west bank of Thjórsá River at new bridge on the high road 76 km east of Reykjavik. The sample came from the top of a 20-cm peat bed overlying coarse unconsolidated postglacial sediments, and was overlain by a huge basaltic lava flow, oldest of the Thjórsá lavas. The lava is considered by the collector to be one of the greatest postglacial lava flows recorded, for it covers an area of 800 km^2 with a volume of 22 km^3. Collected by G. Kjartansson, Museum of Natural History, Reykjavik, and submitted by A. Löve, University of Montreal.	W-482	8065 ± 400
Kärlich, Rheinland, Germany. Wood found in a clay pit, from the *Brockentuff* horizon between the underlying Würm II loess and the overlying Würm III loess. The *Brockentuff* is the result of small gas eruptions which brought Tertiary material up through fault zones and deposited it on top of the Würm II loess. The samples therefore do not date the time between Würm II and Würm III, according to the submitter, E. A. Rosauer, Mineralogisches Institut, Bonn-am-Rhein, Germany.	W-303 W-305	$> 38,000$ $> 38,000$
IV. *Archeology*		
Newcastle, Me. Mya and other shells collected from the largest oyster shell heap on the Glidden estate on the west side of the Damariscotta River, New Castle. These shell heaps are famous among archeologists, yet their age had never been determined previously. Collector, W. H. Bradley.		
Shells from near base of heap.	W-337	1710 ± 160
Shells from near top of heap.	W-342	1610 ± 160
Yanhuitlán, Oaxaca, Mexico. Charcoal from fireplace of human origin, from 2 km north northeast of Yanhuitlán. Culture represented is believed to be preceramic. Collected by José L. Lorenzo, National Institute of Anthropology and History, Mexico, D.F.; submitted by C. Fries, U.S. Geological Survey, Washington, D.C.		
Charcoal from fireplace.	W-479	4050 ± 200
Charcoal from among rocks of the foundations of walls at the site.	W-480	3950 ± 200
Nazca, Peru. Offertory material placed under and in a stone cache at center of lines that are erected along points of astronomical observation, near Nazca. Collected by M. Reiche; submitted by C. Evans, U.S. National Museum.	W-310	< 200
Nazca, Peru. Charcoal from Paracas culture from site N-4 (cahuachi) strata cut 1, 3.75 to 4.00-m level. Submitted by W. D. Strong, Columbia University.	W-422	2080 ± 160
Uenae site, Hokkaido, Japan. Charcoal from pit 2, Uenae site, 9 mi south of Chitose, from the Later Jomon period. Collected by H. MacCord, U.S. National Museum.	W-322	3230 ± 160
Taniguchi site, Hokkaido, Japan. Charcoal from a layer which seems to represent the Middle Jomon period, based on the pottery classification, from pit 1, Taniguchi site, 12 mi north of Sapporo. Collected by H. MacCord.	W-372	3950 ± 200
Tanaka site, Hokkaido, Japan. Charcoal from roof beams of a burned house, which seemed to date (previous to analysis) from the protohistoric period in Hokkaido. The site is at Osatsu, 8 mi north of Chitose. Pottery from the site is known as "Satsumon" type. Collected by H. MacCord.	W-419	1100 ± 160
Wadi Beihan, Western Aden Protectorate, South Arabia. Charcoal from burned beam at Hajar Bin Humeid mound. The mound consists of 10 major superimposed occupational strata. Sample comes from stratum 2, phase 2 from the bottom, in a context of occupational debris and potsherds. This date confirms the pottery chronology for pre-Islamic South Arabia set up by G. W. Van Beek (*34*). Collected by D. W. Dragoo, Carnegie Museum, and G. W. Van Beek, Johns Hopkins University, and submitted through W. F. Albright, Johns Hopkins University.	W-437	2800 ± 160

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Karl Lark-Horovitz, Physicist and Teacher

The death of Karl Lark-Horovitz, on 14 April 1958, brought an end to an active and creative career devoted to the advancement of teaching and research in physics.

He was born on 20 July 1892, in Vienna, where he received his entire formal education. His studies at the University of Vienna, chiefly in the field of chemistry, were interrupted by a period of service in the Austrian army during World War I. He received his doctorate in physics in 1919, and taught at the University of Vienna until 1925. His early publications, some of which preceded his doctoral thesis, ranged over the subjects of radioactivity, relativity, the electromotive force of dielectrics, and visual space perceptions by the human eye. This wide field of scientific interest had its counterpart in a breadth of interest in other intellectual areas; for instance, his minor for the Ph.D. was on the ideas of pre-Socratic philosophers. It was further reflected in his later interests and achievements in science, which ranged from the physics of the solid state to biophysics, from x-rays to nuclear investigations, and from the physical investigation of the qualities of good violins to practical considerations on the production of glass.

In 1925 he was awarded an International Research Council fellowship, which brought him first to the University of Toronto, then successively to the University of Chicago, the Rockefeller Institute for Medical Research, and Stanford University. He delivered several lectures at Purdue University in the spring of 1928, and was invited to join the staff as professor of physics. He was appointed director of the Physical Laboratory in 1929, and head of the department in 1932; he held these positions until his death.

From the time of his arrival at Purdue, Dr. Lark-Horovitz played an active role in the reorganization and the teaching of undergraduate courses. He integrated ideas from chemistry, biology, and philosophy into the program of the general physics courses. He organized his material to emphasize the growth of the science of physics as one aspect of the history of civilization and to show the effect of scientific discovery on the social and economic development of society. The courses he taught to the science and nonscience majors in the early 1930's had many of the qualities of modern general education courses. The revisions and innovations he made in the physics courses for engineers also served to attract some of the ablest students to the field of physics.

At the beginning, he also carried a major fraction of the teaching load of the graduate program, as well as the entire burden of the direction of research. He began to develop a program of research in x-rays and the physics of surfaces with a tiny budget and improvised equipment. The success of this work soon led to increased financial support of research in physics. By 1936, elaborate equipment, such as the cyclotron, began to be acquired by a combination of purchase and of construction by the talented and enthusiastic group of graduate students that Dr. Lark-Horovitz had trained. His many graduate students would agree that he was an exacting taskmaster, but one who was extremely fertile in ideas, who had an exceptional familiarity with the pertinent literature, and who succeeded in communicating some of his own vigor and enthusiasm to them.

From 1936 to 1942 the research interests of Dr. Lark-Horovitz were concentrated in the field of nuclear physics. He made attempts to observe neutron diffraction with sources which, it is known now, had inadequate intensity. He began programs of work on nuclear reactions and investigated the fission of the uranium nucleus. He undertook investigations of cosmic rays with photographic plates sent up by balloon, and investigated biophysical problems by using radioactive tracers. His research interests were always up-to-date.

In 1942 he brought to Purdue a defense contract that turned his interest finally in the direction of solid-state physics. The contract was concerned with the development of crystal rectifiers, and his experience as a chemist led him to the wise choice of germanium as a material for investigation. He, and the group that he gathered around him, made rapid progress in the purification of this material, and applied new methods to the analysis of its behavior. Some