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US GEOLOGICAL SURVEY RADIOCARBON DATES XIII

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This list contains the results of some measurements made between 1965 and 1973. Samples are counted in the form of acetylene gas, as previously, and ages computed on the basis of the Libby half-life, 5568 ± 30 years. The dates have not been corrected for fractionation by a $\delta^{13}C$ measurement. The error listed, always larger than the one-sigma statistical counting error commonly used, takes into account possible fractionation in the laboratory and in nature and the variability experienced with replicate samples. We wish to thank Charles Oman for his technical assistance.

Unless otherwise stated, collectors of all samples are members of the US Geological Survey.

A. Eastern United States

W-2304. East Canaan, Connecticut **>38,000**

Organic nodules composed of partially decomposed wood, alt 252m, exposed in forest beds at East Canaan Delta, 0.3km NNW of intersection of Rte 44 and Canaan Valley Rd, East Canaan (42° 01.0′ N, 73° 16.6′ W), Connecticut. Coll 1968 by J T Leftwich, L B Smith, W S Newman, J H Hartshorn; subm by G W Holmes. *Comment* (GW): age is anomalously old for these glacial-deltaic sediments which should date ca 13,000 BP. The organic material is allochthonous, possibly brought in from older deposits, as was noted for similar dates from this area: 28,000 ± 1000 and >33,000, W-2043, -2174 (R, 1970, v 12, p 319).

Wononpakook Lake series, Connecticut

Samples from swamp, E of Wononpakook Lake (41° 56.3′ N, 73° 27.9′ W), Connecticut. Coll 1968 by Cornelia Cameron; subm by G W Holmes.

W-2401. **3980 ± 250**

Fresh peat, depth 368cm, underlain by clayey peat.

W-2398. **8480 ± 300**

Peaty clay, depth 762cm, underlain by "glacial" clay. *Comment* (GWH): represents earliest organic deposition after "glacial" lake clay.

Burlington series, Vermont

Wood and shells from blue-gray silt and clay unit, depth 4m, drainage trench, Lund Home, Burlington (44° 27′ 30″ N, 73° 12′ 30″ W), Vermont. Coll 1968 and subm by A S Hunt and W P Wagner, Univ Vermont, Burlington, Vermont.

W-2309. **10,950 ± 300**

Wood.

W-2311. **11,420 ± 350**

Pelecypods.

General Comment (ASH & WPW): ages are comparable to other Champlain Sea dates.

W-2128. Hemenway Landing, Massachusetts **> 40,000**

Carbonized wood chips, depth 24.6m, at contact of gray clayey silt overlying light gray sand, Hemenway Landing (41° 49′ 19″ N, 69° 57′ 55″ W), Massachusetts. Coll 1967 and subm by J E Cotton. *Comment* (JEC): minimum date for end of fluvial sequence and beginning of lacustrine sequence.

Kittatinny Mountain series, New Jersey

Carbonaceous samples coll from a peat bog, depression in main ridge, Kittatinny Mt, Sussex Co (41° 14′ 08″ N, 74° 42′ 10″ W), New Jersey were dated to allow regional correlation of its pollen stratigraphy (Sirkin & Minard, 1972).

W-2236. **7800 ± 650**

Brown reed and sedge peat intermixed with organic muck, depth 5.1 to 5.4m in bog. Coll and subm 1968 by J P Minard.

W-2562. **12,300 ± 300**

Gyttja, depth 5.5 to 5.75m, at contact with clay. Coll 1970 by L A Sirkin and subm by J P Minard.

General Comment (LAS & JPM): dates are consistent with sample from 3m depth, 6260 ± 300, W-2200 (R, 1970, v 12, p 320). Sedimentation in bog probably begun sometime between 15,000 and 18,300 yr ago as deglaciation of area began.

W-2307. Shackleford Banks, North Carolina **< 200**

Peat overlying stained sand zones, Shackleford Banks beach at high-tide mark, ocean side (34° 39′ 30″ N, 76° 34′ 25″ W), North Carolina. Coll 1968 and subm by P J Godfrey, Natl Park Service, Beaufort, North Carolina. *Comment* (PJG): site represents ancient position of a fresh-water, wooded swamp when Outer Banks were farther from the mainland than they are today.

W-2344. Augusta, Kentucky **> 40,000**

Wood in till exposed on Rte 8 near Augusta (38° 46′ 18.2″ N, 83° 59′ 14.4″ W), Kentucky. Coll and subm 1969 by W F Outerbridge. *Comment* (WFO): till has long been considered Illinoian (McFarlan, 1943, p 127), but rock in this cut and wood were so fresh, to the extent that termites were invading, that I thought it might be younger.

W-2320. Tailbace Canal, Alabama **> 37,000**

Lignitized wood in gravelly sand at base of Quaternary alluvium, depth 12m, near head of Tailbace Canal, Ellmore Co (32° 35′ N, 86° 31′

30″ W), Alabama. Coll 1968 by John Winefordner and Clayton Gore, both of Alabama Power Co, Alabama; subm by L C Conant. *Comment* (LCC): minimum date for extensive flood plain of Alabama R. Flood plain from which this sample came is lowest of a succession of some half dozen or more terraces that reach at least 120m higher. Date suggests that some low terraces of river system may be Tertiary.

Atlantic continental shelf series

Dolomite samples from Atlantic Ocean. Subm 1969 by J C Hathaway.

W-2323. **>40,000**

Depth 400m, Lydonia Canyon (40° 24.5′ N, 67° 39.1′ W). Coll 1968 by J C Hathaway, using DSRV Alvin.

W-2322. **>40,000**

Depth 180m, dredged from wall of Hudson Canyon (39° 30.0′ N, 72° 15.0′ W). Coll 1968 by Capt Henry W Climm, of fishing vessel, *Capn Bill IV*.

W-2416. **>33,000**

Complete re-run of W-2322.

General Comment (JCH): these dolomites are not genetically related to aragonite of 20,400 ± 800, W-2170 (R, 1970, v 12, p 319) as previously thought. Microfauna in sample indicate cold water environment. Stratigraphic position suggests post Tertiary age.

B. Central United States

W-2305. Long Lake, South Dakota **9220 ± 300**

Pelecypods from collapsed outwash deposited over stagnation moraine (Clayton, 1962), E side of State Hwy 101, 8.6km N of Long Lake (45° 51′ 09″ N, 99° 12′ 15″ W), South Dakota. Coll 1968 by C M Christensen, J K Hawley, and K C Christensen; subm by C M Christensen, South Dakota Geol Survey, Vermillion, South Dakota. *Comment* (CMC): date compares favorably with several dates from stagnation drift on Coteau du Missouri in North Dakota, 9000 ± 300 and 9870 ± 290, W-1019, -954 (R, 1964, v 6, p 46) and further substantiates theory that stagnant ice was still melting as late 9000 BP.

W-2388. East Stump Lake, North Dakota **920 ± 200**

Wood fragments, depth 9 to 11m near contact between lacustrine sediments and glacial till, N end East Stump Lake, Nelson Co (47° 54′ 47″ N, 98° 23′ 25″ W), North Dakota. Coll 1969 by J S Downey; subm by Q F Paulson. *Comment* (QFP): date probably indicates beginning of latest period of deposition in lake basin. Possibly date represents end of extremely arid period when lake received little, if any, overland flow or ground-water discharge.

W-2450. Ward, North Dakota **28,340 ± 1000**

Wood fragments recovered from drill cuttings, depth 93m, base of glaciofluvial deposits in buried bedrock channel, Ward Co, North Dakota. Coll 1969 by M O Lindvig; subm by Q F Paulson. *Comment* (QFP): glacial drift in channel was probably part of interglacial drainage system.

W-2386. Nederlo Creek, Wisconsin **1130 ± 200**

Birch log protruding from stream bank at water level, underlying 2.4m topsoil, Nederlo Creek, Crawford Co (43° 21′ 33″ N, 90° 54′ 36″ W), Wisconsin. Coll and subm 1969 by S M Hindall. *Comment* (SMH): log was found under 0.6m light (modern) silt of loessial origin and 1.8m darker, clayey silt of Holocene age. Lighter material essentially represents upland sheet erosion, probably within last 100+ yr or during time of extensive soil cropping without conservation practices. Darker material represents post-Pleistocene deposits from combined prairie-woodland environment that was indigenous to area prior to cultivation.

W-2357. Slab City, Wisconsin **12,200 ± 350**

Spruce log overlain by 3.6m till in borrow pit, 0.8km SW of Slab City, Shawano Co (44° 43′ N, 88° 27′ W), Wisconsin. Coll 1964 and subm by R F Black, Univ Wisconsin, Madison, Wisconsin. *Comment* (RFB): this Two Creeks material near outer margin of Valderian ice compares with others from area (Black & Rubin, 1967-68) and 11,560 ± 350, W-2015 (R, 1970, v 12, p 323) and 12,410 ± 100, WIS-347 (R, 1970, v 12, p 342).

W-2370. Ruble, Iowa **> 30,000**

Wood, flattened in cross sec, in till exposed in a well, Ruble, Plymouth Co (42° 48′ 30″ N, 96° 24′ 30″ W), Iowa. Coll 1967 by Dennis Carlson, South Dakota Geol Survey, Vermillion, South Dakota; subm by F V Steece, SDGS. *Comment* (FVS): age indicates that enclosing till is pre-Farmdalian. Regional studies in SE South Dakota and adjacent parts of Iowa and Minnesota indicates that till is Illinoian (Steece, 1965). This date correlates well with date of > 35,000, W-1969 (R, 1969, v 11, p 212) which is from same surface till of Illinoian age. Area is adjacent to and continuous with a region mapped as Illinoian in South Dakota but separated by Big Sioux R.

C. Western United States

W-2289. Yellowstone Lake, Wyoming **10,360 ± 350**

Peaty clay, depth 85 to 104cm, NE side of pond, 0.8km of Trail Creek patrol cabin, SE arm of Yellowstone Lake, Yellowstone Natl Park (44° 18′ N, 110° 14′ W), Wyoming. Coll 1966 and subm by R G Baker. *Comment* (RGB): minimum date for period when Yellowstone Lake was 27m higher than present level (Baker, 1976; Spiker *et al*, 1977).

Hanford region series, Washington

Geol investigations were conducted in S-central Washington to resolve differing interpretations concerning faulting and tectonic movements (Bingham *et al*, 1970). Samples were coll and subm 1969 by J W Bingham.

W-2363. 11,950 ± 300

Carbonaceous silt deposited as lens, 369m above MSL, backhoe trench, Smyrna Bench, N side of Saddle Mts, Grant Co (46° 49′ 40″ N, 119° 33′ 40″ W). *Comment* (JWB): provides limit for 2 events. Dated material occurs near bottom of loess filling large trough. Trough was probably caused by pulling apart of bounding caliche and fanglomerate during large block slide. Sliding probably occurred at end of or during last glaciofluvial flooding down Crab Creek. This indicates that trough, as well as many small cracks, was opened up a relatively short time before 12,000 BP and that glaciofluvial flooding ceased before that date. Second event is volcanic ash deposition, which occurred shortly after 12,000 BP. If ash is from Glacier Peak, date becomes critical because Glacier Peak ash has previously been considered to be 12,000 to 13,000 BP and to be within latest glaciofluvial flood episode.

W-2310. >40,000

Wood embedded in medium to coarse sand within a sequence of well-bedded sand and gravels, alt 192m, bulldozer trench, S side of Gable Mt, Hanford Works Reservation, Benton Co (46° 35′ 40″ N, 119° 29′ 25″ W). Coll by R E Brown of Battelle Northwest, Washington, and J W Bingham. *Comment* (JWB): unit dated is 2nd oldest of 4 exposed glaciofluvial units deposited by floodwater of Glacial Lake Missoula (Richmond *et al*, 1965), Upper 2 deposits were dated elsewhere at ca 20,000, and 13,500 to 12,000 BP.

W-2168. Newberry volcano, Oregon 1720 ± 250

Wood underlying main pumice fall from Central Pumice Cone in Newberry Caldera, 40km S of Bend (43° 44′ N, 121° 14′ W), Oregon. Coll 1968 by Mike Higgins; subm by Arthur Grantz. *Comment* (AG): compares favorably with age, 2054 ± 230 (Peterson & Groh, 1965, p 11) from charcoal in ash inside caldera.

Corral Canyon series, California

Samples dated in attempt to arrive at a recurrence interval for land movement in Corral Canyon area (34° 00′ N, 118° 45′ W). Exact relations of each sample to possible movement is very complex and is detailed in Yerkes and Wentworth (1965), and Birkeland (1974, p 148). Samples coll 1965 and 1968 by P W Birkeland, Univ Colorado, Boulder, Colorado and C M Wentworth.

W-1634. 2950 ± 300

Shells (*Mytilus californianus, septifer bifurcatus*) from silty sand, Trench 3.

W-1635. **2440 ± 500**

Carbonaceous clay along slip surface, 24m, NW wall of Trench 3.

W-1678. **3080 ± 250**

Soil from S end of Trench B, bottom of soil horizon in alluvial fan.

W-1637. **4050 ± 300**

Organic clay from top of same soil horizon, Trench B.

W-1645. **9330 ± 400**

Organic clay from base of same soil horizon, Trench B.

W-2328. **16,280 ± 400**

Small charcoal pieces in clay, 810m E of mouth of Corral Canyon, E-facing valley wall of Gully A.

General Comment: these dated fan deposits overlie marine terrace deposits (115,000 ± 15,000 to 154,000 ± 30,000 yr, Szabo & Rosholt, 1969). Dates fall into consistent pattern, although contamination by both modern and fossil carbon is suspected. Fan deposition probably began ca 10,000 to 20,000 BP.

Laguna Alta series, California

Peat samples 3.4m below surface of peat deposit that formed in pond on San Andreas fault, NW part of Laguna Alta, San Mateo Co, California.

W-2561. **2340 ± 250**

Peat (37° 39′ 38″ N, 122° 28′ 48″ W). Coll 1962 by M G Bonilla and G O Gates; subm by M G Bonilla.

W-2659. **2690 ± 250**

Peat (37° 39′ 33″ N, 122° 28′ 42″ W). Coll 1962 by M G Bonilla, D M Hopkins, Clyde Wahrhaftig and D S McCulloch; subm by M G Bonilla.

General Comment (MGB): Laguna Alta was, before urbanization, a pond along San Andreas fault, and was almost certainly formed by movement along the fault. Radiocarbon date is minimum for period during which this trace of the fault has been active.

Los Angeles damsite series, California

Three samples from N wall of damsite, Van Norman Reservoirs area, N San Fernando Valley (34° 17.75′ N, 118° 28.75′ W), California. Coll 1972 by M G Bonilla, R F Yerkes, and R H Campbell; subm by M G Bonilla.

W-2747. **9580 ± 300**

Organic matter, depth 3.6m, alt 333m, Unit 4.

W-2746. **10,000 ± 300**

Organic matter, 1.6m SSW of W2747, Unit 4.

General Comment (MGB): dates indicate that wet plant-promoting environment persisted at least 8000 yr.

W-2745. **>40,000**

Wood, depth 9.3m, alt 327m, Unit 9.

General Comment (MGB): dates are consistent with ages inferred from fossil molar of *Paramylodon* sp and with other radiocarbon dates from (Yerkes *et al,* 1974). These dates were used to estimate the age of faulting at damsite. Surficial deposits locally cut by faults are correlated with units stratigraphically underlying Unit 4 and overlying Unit 9. Displacement probably occurred > 10,000 yr ago.

W-2336. Buena Vista Slough, California **31,000 ± 1000**

Fibrous wood from sequence of alluvial sand, silt, and clay, depth 18.6m, .48km NE of Sta 3168 + 00 of California Aqueduct, 4.8km S of Button Willow, 43km W of Bakersfield (35° 21′ 55″ N, 119° 28′ 12″ W), California. Coll 1969 by Neal Crawford, California Dept Water Resources; subm by B E Lofgren. *Comment* (BEL): good correlation with other radiocarbon dates in Tulare and Buena Vista lakebeds (Croft, 1968, p B155). Suggests depositional continuity between the 2 lake basins, certainly by stream gravels, and probably by pluvial lake clays.

Lake Bonneville series, Utah

Shells and lake sediment exposed in dragline excavation, 960m NE of Danger Cave, NE of Wendover (41° 00′ N, 114° 00″ W), W Utah (Jennings, 1957). Coll and subm 1969 by H J Bissell, Brigham Young Univ, Provo, Utah.

W-2332. **24,000 ± 600**

Gastropods from 0.3m mollusk bed, depth 2.1m, overlying silty clay unit of Provo Formation, Lake Bonneville Group (Bissell, 1963).

W-2335. **8850 ± 300**

Organic muck, depth 1.8m, underlain by W-2332, overlain by 1.2m lacustrine silt, and this by .45m alluvium and soil.

General Comment (HJB): gastropod bed is likely Provo Substage No. 1. A hiatus of some 15,000 yr is represented after accumulation of shell bed and organic muck.

W-2353. Big Cottonwood Canyon, Utah **770 ± 200**

Wood (*Pinus flexilis*), Lake Catherine Cirque of Big Cottonwood Canyon, Brighton quad (40° 35′ N, 111° 36′ W), Utah. Coll 1967 by Ted Arnow and Richard Van Horn; subm by Richard Van Horn. *Comment* (RV): date suggests limber pines grew in cirque during interstade between Temple Lake and historic glaciations (Richmond, 1962), the latter destroying pines on cirque floor but not those on rock ridges above ice. Date agrees with others from Rocky Mts which indicate interstade occurred ca AD 0 — 1400.

D. Alaska

W-2240. Emmikroak Creek, Alaska **> 35,000**

Wood in beach deposits 9m above present level of Chukchi Sea, 1km E of Emmikroak Creek (68° 00′ N, 166° 00′ W), Alaska. Coll 1958 and subm by Reuben Kachadoorian. *Comment* (RK): minimum age for solifluction material that overlies beach deposits. Minimum age for last sea-level rise.

W-2288. Iliamna, Alaska **Modern**

Organic material in sand, depth 76cm, Augustine I. emerged beach deposit, 2.1km SSE of entrance to S lagoon, and 1.9 km N of S Augustine VABM sta, Cook Inlet (59° 21′ N, 153° 31′ 30″ W), Alaska. Coll and subm 1967 by R L Detterman. *Comment* (RLD): together with date, 2650 ± 250, W-2123 (R, 1970, v 12, p 330) gives maximum rate of uplift, 30 to 60cm/century, along W side of Cook Inlet. Modern age tends to confirm this rapid rate of uplift (Detterman & Reed, 1973).

Mt Michelson series, Alaska

Wood and peat samples from Mt Michelson quad, NE Alaska. Subm by R L Detterman.

W-2397. **6400 ± 250**

Peat and plant remains in highly organic layer overlying ice wedge from raised terace, 2.6km inland from Arctic coast, Marsh Creek (69° 57′ 30″ N, 144° 48′ 10″ W). Coll 1969 by R L Detterman. *Comment* (RLD): age represents beginning of Hypsithermal in N Alaska. The ice wedge is assumed a relic of Wisconsin glaciation, and not a result of more recent, minor advances in Brooks Range.

W-2508. **> 28,000**

Wood from *Picea* log (id by R A Scott), Atlantic Richfield Prudhoe Bay State #1 well, depth 175 to 180m, 3km NW of mouth of Putuligayuk R (70° 19′ 30″ N, 148° 32′ W). Coll 1970 by Atlantic Richfield Company. *Comment* (RLD): this minimum age is 1st indication of possible Sangamon age spruce forest on North Slope of Alaska. Sample came from unconsolidated sand and gravel unit, believed to be an old fluvial deposit during a low sea-level stand.

W-2586. **> 38,000**

Complete re-run of W-2508.

W-2590. **> 39,000**

Wood from small log, depth 10.5m, tributary of Niguanak R, 27.5km SSW of Humphrey Point, Beaufort Sea, (70° 00′ N, 143° 00′ W). Coll 1970 by R L Detterman. *Comment* (RLD): confirms presence of spruce forest in N Alaska during Sangamon Interglaciation. Gravel at top of outcrop where sample was found is now considered Wisconsin outwash, and sands, silts, and gravel below are believed to be upper member of Gubik Formation. Date will help better define Gubik Formation and will make it a little older than originally defined (Black, 1964).

W-2917. Harlequin Lake, Alaska **9320 ± 350**

Marine pelecypods and barnacle shells atop ice-shove moraine, alt 54m, near SE shore of Harlequin Lake, 48km SE of Yakutat (59° 24′ N, 138° 57.5′ W), Alaska. Coll 1967 by S R Welty, US Bur Public Rds, Juneau, Alaska; subm by L A Yehle. *Comment* (LAY): dates part of interval of marine submergence during early Holocene time when land apparently was still glacio-isostatically depressed because of residual effect of ice load during last major Pleistocene glaciation. Later, sample and enclosing material were transported by ancestral Yakutat Glacier and deposited as a moraine.

W-2292. Skagway, Alaska **2880 ± 250**

Pelecypods from small pocket of shell accumulation on steep bedrock surface 9.6m above MSL, 0.5km NE of Yakutania Point, NW side of Skagway Harbor, Skagway (59° 27′ 15″ N, 135° 19′ 35″ W), Alaska. Coll 1968 by L A Yehle; subm by R W Lemke and L A Yehle. *Comment* (LAY): dates former sea level, controlled most likely by glacio-isostatic depression and rebound from Neoglacial ice load (Yehle & Lemke, 1972, p 17).

Haines series, Alaska

Pelecypod shells from Haines, Alaska. Subm by R W Lemke and L A Yehle.

General Comment (LAY): dates late Pleistocene and Holocene glacio-isostatic period of adjustment. Alt of deposit may be tectonically as well as glacio-isostatically controlled.

W-2291. **9940 ± 350**

Shells from floor of borrow pit, 10.5m above MSL, 0.5km S of junction of Sawmill Rd and Haines Hwy (59° 13′ 56″ N, 135° 28′ W). Coll 1968 by L A Yehle.

W-2293. **10,250 ± 350**

Shells, 12m below MSL, test hole 0.3km SW of junction of Sawmill Rd and Haines Hwy (59° 14′ 30″ N, 135° 28′ 30″ W). Coll 1967 by J A McConaghy.

W-2294. **11,020 ± 400**

Shells from construction site, 15m above MSL, along SW side Lutak Inlet, 5.6km NW of Haines (59° 17′ 10″ N, 135° 28′ 40″ W). Coll 1968 by L A Yehle (Lemke & Yehle, 1972, p 13).

Stikine delta region series, Alaska

Shells from Wrangell area, Alaska. Coll 1968 by L A Yehle; subm by R W Lemke and L A Yehle.

W-2326. **9700 ± 350**

Pelecypod shells, 19.5m above MSL, 0.8km SE of Point Highfield, S embankment, overlooking Wrangell Airport runway, 1.6km NNE of Wrangell (56° 29′ 05″ N, 132° 22′ 30″ W) (Lemke, 1974, p 23).

W-2327. **12,170 ± 400**

Barnacle fragments, 37.5m above MSL, N facing roadcut, Mitkof Hwy, S Mitkof I., 16.8km NW of Wrangell (56° 33′ 30″ N, 132° 37′ 30″ W).

General Comment (LAY): these 2 samples provide further evidence of shoreline displacement in SE Alaska during late Quaternary. Emergence of land was caused by glacio-isostatic rebound but total emergence was reduced by eustatic sea-level rise and tectonic sinking of Stikine delta. Other tectonic effects probably had an important influence. Comparison between W-2327 and -1738, 9970 ± 300 (R, 1967, v 9, p 523) from 8.4m above MSL, 3.2km to NE, gives a crude rate for net emergence of 1.34cm/yr. This rate appears reasonable. Present-day net emergence based on tidal gauge records is about the same at Juneau 200km to NW (Hicks & Shofnos, 1965).

Yakutat series, Alaska

Samples from 0.3m diamicton unit in intertidal zone of Lost R estuary at community of Lost R, 6.9km SE of Yakutat Airport (59° 27′ N, 139° 37′ W), Alaska. Coll 1966 and subm by L A Yehle.

W-2167. **500 ± 250**

Detrital Wood.

W-2598. **2180 ± 250**

Pelecypod shells.

General Comment (LAY): detrital wood (W-2167) is close in age, 560 ± 75, I-439 (R, 1966, v 8, p 163-164) to sheared off wood beneath major moraine 11.2km NW, near mouth of Yakutat Bay (Yehle, 1975, p 39). To account for mixing of materials of 2 different ages within same deposit, following sequence is suggested. Wood was plowed up by the glacier and, because land was glacio-isostatically depressed below present sea level, subsequent deglaciation and melting of glacier was accompanied by calving, floating, and occasional grounding of icebergs. During in-place melting, waves and tidal currents would have jostled and washed the bergs, resulting in spreading-out and mixing of englacial debris with soft underlying deposits, one part of which contained marine shells (W-2598).

Seward Peninsula series, Alaska

This study was made to establish time when certain forest and transition plants and animals reached their early Holocene limits in NW Alaska. Woods and sediments were coll from Seward Peninsula (SP) 1966-1970 by D M Hopkins; subm by D M Hopkins and C H Nelson. (McCulloch & Hopkins, 1966).

W-2810. **4290 ± 250**

Lacustrine sediments exposed in bank of intramorainal pond, near SE of Lopp Lagoon, W SP (65° 43′ 20″ N, 167° 27′ 30″ W). Exposure is within an end moraine of late Wisconsin glaciation, York Glaciation of Sainsbury, (Sainsbury, 1967a, b). *Comment* (DMH): sample unexpectedly young. Exposure was interpreted in field as consisting of pre-glacial lakebeds overlain by drift of York Glaciation, which Sainsbury shows took place before 10,900 yr ago. Locality is too far in front of mountains to suggest that it was overridden by drift of Neoglacial age. Probably exposure is cut through sediments in a kettle lake that was later covered by colluvium from a nearby morainal knob.

W-2808. **8080 ± 300**

Beaver-chewed log, NW side of mining cut at Mud Creek, near Candle, NE SP (65° 56′ 40″ N, 161° 59′ 00″ W).

W-2809. **8310 ± 300**

Stump rooted in buried turf, 3m above W-2808, same location.

General Comment (DMH): site lies W of present-day forest boundary and W of present limit of beaver. Both samples indicate evidence of warm climate from Mud Creek 10,000 to 8000 yr ago; date of 3600 ± 500, L-117F (Broecker *et al*, 1956, p 157) from same location is discredited.

W-2592. **8360 ± 300**

Stem of large willow shrubs, id by Virginia Page, in sedge peat filling ice-wedge pseudomorphs in bluffs on S shore of Lopp Lagoon, W SP (65° 40′ 20″ N, 167° 54′ 02″ W). *Comment* (DMH): records growth of large willow shrubs near Bering Strait, in region that now lacks shrubs of any kind.

W-2596. **8480 ± 300**

Birch log in fossil beaver dam from wave-cut bluff, mouth of Old Wound, N SP (66° 29′ 55″ N, 164° 46′ 30″ W). *Comment* (DMH): represents W-most fossil occurrence of birch during early Holocene warm period.

W-2619. **9190 ± 350**

Large log from bank of thaw lake, 8km SE of Northwest Corner, N SP (66° 31′ 31″ N, 164° 15′ 50″ W). *Comment* (DMH): sample coll at W-most occurrence of large freshwater mollusk, *Anodonta beringiana*, during early Holocene warm period.

W-2620. **9625 ± 350**

Large pieces of wood from thaw lake deposit on coast of N SP, between Cape Deceit and Rex Point (66° 04′ 00″ N, 163° 03′ 18″ W). *Comment* (DMH): probably represents W-most early Holocene fossil occurrence of *Populus*.

W-2804. **28,700 ± 1000**

Organic residue from loess exposed in wave-cut bluff at Northwest Corner Light, N SP (66° 34′ 54″ N, 164° 27′ 17″ W). *Comment* (DMH): older than expected and surprising in that it falls onto a period for which I had expected evidence of interstadial with sea level only slightly lower than at present, glaciers retracted, and aeolian activity reduced. Instead, this date indicates that intense aeolian activity on N SP-Kotzebue Sound area was not confined to late Wisconsin time but evidently persisted throughout Wisconsin cold cycle.

Devil Mt series, SP, Alaska

This study was made to establish tephrochronology of areas affected by ashfalls from Devil Mt (DMt). These upper Pleistocene ashfalls can be recognized widely in Kotzebue Sound. Col 1966 and 1970 and subm by D M Hopkins.

W-2800. **9350 ± 350**

Peaty material overlain by ashfall from S crater, from bluffs at SW shore of N DMt Lake (66° 23′ 36″ N, 164° 31′ 45″ W).

W-2802. **9410 ± 350**

Wood pieces, 0.6m below W-2800.

W-2803. **10,370 ± 500**

Peaty material, 0.9m below W-2802.

W-2801. **11,610 ± 500**

Peaty material, 0.6m below W-2803, underlain by ashfall from N crater, DMt.

General Comment (DMH): DMt Lake consists of 2 intersecting maars. S maar erupted after 9350 BP and N one erupted prior to 11,600 BP, but after 14,500, W-2806. Loess fall ended between time of deposition of W-2803 and -2802, ca 10,000 BP, but another sample, W-2805, indicated that 11,000 BP would be better estimate of end of loess fall.

W-2806. **14,490 ± 400**

Screen residue from lakebeds exposed in cut bank of Espenberg R (ER) (66° 31′ 50″ N, 164° 00′ 12″ W). *Comment* (DMH): age as expected. Sample was coll just below 1st appearance of DMt ash and thus provides close approx of date of ashfall.

W-2807. **25,390 ± 800**

Well-macerated peat, thought to be buried turf, involved in ice-wedge collapse in exposure on ER (66° 31′ 20″ N, 164° 00′ 20″ W).

Comment (DMH): sample unexpectedly old. In field ash layer was thought to be identical to ash layer of W-2806 and ice-wedge collapse was thought to have formed during early Holocene warm period. Redeposition of older peat seems improbable. Apparently, ash in this sect is probably identical with ash near Kougachuk Creek dated 42,000 yr.

W-2670. **>42,000**

Stems and roots of birch shrubs buried beneath fresh ashfall, exposed sea bluffs, 0.5km N of mouth of Kougachuk Creek, N SP (66° 15′ 54″ N, 163° 49′ 52″ W). *Comment* (DMH): sample is much older than anticipated. I had thought this ash layer was same as that of W-2806. Evidently, ash layer at Kougachuk Creek was erupted earlier and from another of numerous maars and cinder cones of area, most probably from South Killeak Lake. But an unresolved problem remains: why is there little or no loess above this ancient ash layer?

General Comment (DMH): there are 3 ash horizons representing 3 maar eruptions in Espenberg region during Wisconsin and Holocene time. Dates, taken together with studies of the freshwater mollusks, also show that post-glacial warming was felt earlier than previously thought. Mollusks reponded as early as 11,400 yr ago, although forest plants didn't begin to appear until ca 9800 yr ago.

Espenberg River series, SP, Alaska

This series was submitted to clarify age relationships among Quaternary deposits exposed along Espenberg R (ER), a sluggish stream that heads a short distance inland from a subdued slope evidently marking Pelukian (Sangamon) shoreline on N SP. The river crosses a plain underlain by Pelukian beach and lagoonal deposits, exposed at river level, mantled by medium sand, 2 or 3m thick, that was evidently deposited as coastal dunes, overlain in turn by ca 10m periglacial loess and fine sand that was deposited or redeposited in thaw lakes. Woods and sediments were coll and subm 1970 by D M Hopkins.

W-2805. **11,550 ± 350**

Small wood fragments, base of thaw lake deposit exposed in cut bank of ER (66° 30′ 42″ N, 164° 01′ 38″ W). *Comment* (DMH): was thought to be Holocene, but this age is plausible. Sample coll from base of thaw lake deposits that contain rich "post-glacial" biota and that accumulated after end of loess fall. Sediment underlain by ca 1m loess and then by ash dated elsewhere on Espenberg R as ca 14,500 yr (W-2806).

W-2883. **21,600 ± 600**

Organic material, screen-washed from thaw-lake sediments, cut bank ER (66° 31′ 21″ N, 164° 00′ 37″ W).

W-2879. **>27,000**

Organic material at base of thaw-lake sequence, artificial excavation in cut bank of ER (66° 30′ 01″ N, 164° 05′ 53″ W).

W-2880. 16,950 ± 500

Organic debris, 0.5m below W-2879, top of silt unit, probably aeolian, containing lenses of sand and lenses and fragments of peat, representing fragments of buried turf.

General Comment (DMH): these 2 samples, W-2879 and -2880, appear to be transported, either in the field or during examination for micro-fossils.

W-2881. > 36,000

Fossil wood, thaw-lake sediments, cut bank ER (66° 30′ 38″ N, 164° 02′ 20″ W). *Comment* (DMH): high sand-silt content and lack of pumice suggest lake existed prior to last eruption at DMt Lake and during period of Pleistocene aeolian activity. But rich biota and presence of shrub-size twigs indicate lake is not contemporary with maximum cold period.

W-2882. > 32,000

Peat lumps, possibly buried turf, interbedded with silt and lenses of very fine sand, 1.8m below W-2881. *Comment* (DMH): depauperate flora suggest full-glacial conditions.

W-2878. > 34,000

Twigs in thin-bedded lacustrine silt interbedded with sand, containing distinctive Pelukian (Sangamon) fauna, cut bank of ER (66° 31′ 36″ N, 164° 00′ 12″ W).

W-2884. > 31,000

Screen residue, 2.4m below W-2806, at base of lake beds.

General Comment (DMH): series shows that some thaw lakes existed during early Wisconsin time, beyond range of radiocarbon dating and that others existed as recently as 11,500 BP (active thaw lakes still exist, away from river). Periglacial loess and fine sand has been deposited more or less continuously throughout Wisconsin Glaciation. Older 2 of 3 dated ash beds occur in some lake deposits. Medium sand of assumed coastal dunes is of early Wisconsin age, and beyond range of radiocarbon activity.

North Bering Sea series, Alaska

This study was made to establish transgressive history of region (Nelson, 1976; Nelson *et al,* 1973; 1974; Nelson & Creager, 1977). Shell samples, mainly shallow, burrowing and epifaunal species, from base of N Bering Sea were coll 1968-69 with box cores and subm by C H Nelson.

W-2682. 700 ± 250

Shells (*Neptunea*) in coarse transgressive sand, overlain by clayey silt, water depth 42m, seaward side of isolated basin, 16km NNE of Singikpo Cape, central St Lawrence I. (63° 43.7′ N, 169° 54.2′ W).

W-2467. 700 ± 200

Shell fragments (*Macoma calcerea*) in sand, overlain by 10cm fine sand, water depth 37.5m (63° 35.4′ N, 169° 58.4′ W).

W-2683. **740 ± 250**

Infaunal shells (*Hyatella Arctica, Mya Truncata*) isolated in basal sands, overlain by 11cm undisturbed laminated sand, water depth 31m, 48km S of Cape Prince of Wales, 43km of Port Clarence (65° 11.2′ N, 167° 53.2′ W).

W-2462. **750 ± 200**

Shells in silty sand, water depth 24.6m (64° 13.9′ N, 166° 14.9′ W).

W-2681. **770 ± 250**

Shells at contact between "transgressive" and fine sand, water depth 50m, 78km SW of Cape Prince of Wales (65° 04.5′ N, 169° 17.7′ W).

W-2466. **980 ± 200**

Shell fragments in muddy sandy silt, water depth 30.6m (64° 24.0′ N, 165° 35.0′ W).

W-2464. **1040 ± 200**

Shell fragments in shell bed buried by fine sand, depth 42.6m (63° 41.0′ N, 170° 11.0′ W).

W-2684. **1400 ± 250**

Rounded and abraded shells in basal pebbly clay layer, water depth 47m, 43km S of Cape Prince of Wales, 54km W of Port Clarence (65° 13.6′ N, 168° 06.6′ W).

General Comment (CHN): young dates suggest very limited or non-deposition of Holocene sediments in offshore regions.

W-2685. **1690 ± 250**

Broken and rounded shells in beach gravel, water depth 30m, 27km N of Northwest Cape off W end of St Lawrence I (63° 58.5′ N, 171° 28.2′ W).

Norton Sound series, Alaska

Shell, wood, and peat samples from below sea floor, Norton Sound, Bering Sea were coll 1967-70 and subm by C H Nelson and D M Hopkins.

W-2301. **340 ± 200**

Shells at water depth 25 to 32m, core depth 0 to 5cm, offshore at Nome (65° 00.5′ N, 168° 01.5′ W).

W-2325. **10,250 ± 350**

Wood picked from drill cuttings, 0 to 420cm in core, water depth 20.4 to 18.6m, old outwash fan of Nome R, just E of Nome (64° 27.4′ N, 165° 25′ W).

W-2686. **10,120 ± 350**

Reworked, subaerial fine peat, in Marine Yukon silts, core depth 19 to 23cm, water depth 18.7m, center of Norton Sound (63° 42.7′ N, 163° 03.2′ W).

W-2555. **10,500 ± 300**

Peat, core depth 33 to 40cm, water depth 20m, same core as W-2686. *General Comment* (DMH): indicates minimum rate of Holocene sedimentation 2cm/100 yr (Nelson *et al*, 1974, Nelson & Creager, 1977, Hopkins, 1973). Low rate of Holocene sedimentation in Norton Sound, but relatively high rate in Chukchi Sea suggests displacement and bypassing of Yukon sediment over Bering shelf.

W-2680. **1350 ± 500**

Mollusks, depth 40cm in sequence of Yukon silt, water depth 14m (63° 41.4′ N, 161° 11.6′ W).

W-2534. **> 30,000**

Peat under Yukon silt, core depth 24cm, water depth 36.5m, 36.8km W of Point Spencer (65° 05.1′ N, 167° 43.4′ W).

W-2115. **> 30,000**

Wood in alluvium, core depth 3.6 to 5.4m below sea floor, overlain by Holocene sand, water depth 13m (64° 31.3′ N, 165° 40.3′ W). *Comment* (CHN): upper Pleistocene stratigraphy related auriferous deposits.

W-2116. **> 34,000**

Shells in marine nearshore sand, core depth 6.6 to 8.4m below sea floor, water depth 12.9m (64° 26.5′ N, 165° 06.6′ W).

E. Miscellaneous Samples

W-2287. Jarvis Island, Pacific **2530 ± 250**

Dolomitized lagoonal mud underlying gypsum-algal mat surficial layers on Jarvis I (01° 00′ N, 160° 00′ W), Pacific Ocean. Subm by S O Schlanger, Univ California, Riverside. *Comment* (SOS): 1st recent dolomite from Pacific.

W-2238. Monrovia, Liberia **6160 ± 600**

Clay with very abundant plant remains, within New Georgia Clay, depth 4.2 to 4.5m, near Monrovia (06° 22′ N, 10° 47′ W), Liberia. Coll 1967 and subm by L V Blade. *Comment* (LVB): deposit is probably estuarine lagoonal. Entire sequence of sediments is Quaternary (Blade, 1970, p 8).

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