

COPENHAGEN RADIOCARBON DATES IX

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The following list comprises a selected number of measurements made up to October, 1967. Age calculations are based on 95% of the activity of the NBS oxalic-acid standard, and on a half-life for C^{14} of 5570 yr. Results are reported in yr before 1950, and in the A.D./B.C. scale.

Errors quoted include standard deviations of the count rates for the unknown sample, contemporary value, and background. Because possible errors arising from isotopic fractionation in the plants, or from the de Vries effect, have not been included, calculated errors smaller than 100 yr have been increased by rounding to that figure as a minimum.

Sample descriptions have been prepared in collaboration with collectors and submitters.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC AND POLLEN-DATED SAMPLES

A. Denmark

Limfjordstunnel, Allerød section

Samples from 2 thin organic layers found in profile through calcareous sediments at Rørdal (57° 4' N Lat, 9° 59' E Long), Jutland, during construction of tunnel underneath Limfjord. Organic stripes found ca. 7 m below present surface assumed representative of warm intervals during Late Glacial time, either Allerød or Bølling. Coll. 1966 and subm. by Th. Sorgenfrei, Inst. Tech. Geol., Tech. Univ., Copenhagen. *Comment:* dates suggest Allerød age for both samples. Sediments were calcareous; dates may be older than true ages.

K-1212. Limfjordstunnel, II **11,800 ± 140**
9850 B.C.

Peat from upper layer, 1 m NE of P 6. Date is average of 2 measurements: 11,720 ± 180 and 11,880 ± 180.

K-1211. Limfjordstunnel, I **11,650 ± 160**
9700 B.C.

Humic material from lowest of 2 organic layers. Date is average of 2 measurements: 11,510 ± 180 and 11,860 ± 220.

K-1145. Draved Mose, H 1312, D.G.U. 304 **7880 ± 120**
5930 B.C.

Peat from Profile H 1312 in drainage ditch in bog Draved Mose (55° 1' N Lat, 8° 57' E Long), S Jutland; near shore of prehistoric "Draved Lake." Peat 63 to 64 cm above sand. Dates immigration of alder. Coll. 1963 and subm. by A. Andersen and Johs. Iverson, Geol. Survey of Denmark. *Comment:* many overlying and underlying samples from peat monolith cut out of this profile were previously dated (Copenhagen VII); dates agree. Date is average of 2 measurements: 7750 ± 150 and 8000 ± 150.

Draved Mose, charred pine stumps

Samples from charred pine stumps and charred plant material from Profile H 1312 in bog Draved Mose (55° 1' N Lat, 8° 57' E Long), S Jutland. Found at transition from forest peat to sphagnum peat, close to pollen zone border VI/VII (ex Knud Jessen) where several charred stumps were discovered, suggesting destruction of large parts of forest by fire. Coll. 1965 and subm. by A. Andersen, Geol. Survey of Denmark. *Comment:* series of charred pine stumps from same level and profile were previously dated (Copenhagen VII); dates agree. Compare also Elsborg series (this date list).

K-1144. Draved Mose, D.G.U. 300 **7890 ± 150**
5940 B.C.

Wood (*Pinus* sp.) from outer year-rings of root belonging to charred stump sticking out of Profile H 1312.

K-1143. Draved Mose, D.G.U. 299 **7920 ± 150**
5970 B.C.

Charcoal (*Pinus* sp. and *Betula* sp.) from thin layer of charcoal, 73 to 75 cm above sand, found with sample K-1144.

K-1142. Draved Mose, D.G.U. 297 **7870 ± 150**
5920 B.C.

Charred plant material from charred stripe, 82 to 83 cm above sand, few cm above charcoal of K-1143. Probably originates from fire in heather vegetation that succeeded pine forest.

K-1141. Draved Mose, P 1959, D.G.U. 276 **6610 ± 140**
4660 B.C.

Alder fen peat from open profile, P 1959, 30 m long, in central part of bog Draved Mose (55° 1' N Lat, 8° 57' E Long), S Jutland. Profile exposes peat from early Atlantic time to present and overlies sand. Sample taken from 0 to 1 cm above sand. Dates beginning of peat formation at site. Coll. 1960 and subm. by A. Andersen and Johs. Iverson. *Comment:* many overlying samples from peat monolith cut out of this profile were previously dated (Copenhagen VI and VII).

Elsborg Mose, charred pine stumps

Charred stumps and layers of charcoal from bog Elsborg Mose in forest Løvenholm Skov (56° 26' N Lat, 10° 27' E Long), Jutland. Many charred pine stumps with layers of charcoal found in all parts of bog suggesting one or more extensive forest fires. Samples were measured to date this fire and compare age with that of charred stumps in Draved Mose. Coll. 1965 by H. Bahnson and A. Andersen; subm. by A. Andersen. *Comment*: stumps are younger than those of Draved Mose (Copenhagen VII, and this date list).

K-1021. Elsborg Mose, D.G.U. 283a **7190 ± 150**
5240 B.C.

Wood (*Pinus* sp.) from charred stump from profile in W part of bog. Tree had been standing at shore of small lake. Stump was in tilted position toward shore; a charred layer sloped down to lake.

K-1022. Elsborg Mose, D.G.U. 284c **7140 ± 150**
5190 B.C.

Charcoal (*Pinus* sp.) from sloping charred layer found with sample K-1021.

K-1023. Elsborg Mose, D.G.U. 285a **7320 ± 120**
5370 B.C.

Wood (*Pinus* sp.) from charred stump from N part of bog. Date is average of 2 measurements: 7400 ± 150 and 7240 ± 150.

K-1024. Elsborg Mose, D.G.U. 286a **6850 ± 120**
4900 B.C.

Charcoal (*Pinus* sp.) from layer of charcoal beside sample K-1023. Layer turned in over and covered stump. Date is average of 2 measurements: 6760 ± 140 and 6940 ± 140.

K-1222. Stensballe Sund, oyster bank **6340 ± 130**
4390 B.C.

Shells (*Ostrea edulis*) from large natural shell bank in Stensballe Sund, loc. I A (55° 52' N Lat, 9° 54' E Long), Jutland. Shells from lowest layer of bank, where shells were *in situ* in bottom sediments. Date 1st immigration of oyster into narrow sound, where even slight tide could produce strong circulation. Presumably contemporary with one of the Littorina transgressions. Coll. 1966 and subm. by U. Møhl, Zool. Mus., Univ. of Copenhagen. *Comment*: 10 to 20% of surface material was dissolved before dating. Age calculated on basis of contemporary value for terrestrial material.

K-1190. Roskilde Fjord, oyster bank **5660 ± 130**
3710 B.C.

Shell (*Ostrea edulis*) from large natural shell bank in Roskilde Fjord, Loc. II (55° 44' N Lat, 12° 3' E Long), Zealand. Shell from lowest layer of bank, where shells *in situ* were sitting in or lying on bottom sedi-

ments. Dates first immigration of oyster into Roskilde Fjord, which today is too fresh for oyster. Presumably contemporary with one of Littorina transgressions. Coll. 1966 and subm. by U. Møhl.

B. Greenland

K-1250. Patorfik, Cleft II, G.G.U. 20 **>35,000**

Shells (*Astarte et al.*) from Quaternary layer of consolidated marine clay in Cleft II at Patorfik (70° 24' N Lat, 52° 32' W Long), Umanak District, W Greenland. Shells were sticking in consolidated layer of coastal cliff, 3.3 m above sea level. Locality described by Laursen (1944). Coll. 1964 and subm. by A. Rosenkrantz, Mineralog. Mus., Univ. of Copenhagen. *Comment:* date indicates interglacial age of shells.

K-1249. Qaersuarssuk Kitdleg, G.G.U. 19 **8610 ± 160**
6660 B.C.

Shells (*Saxicava arctica* and *Mya truncata*) from layer of marine sand at Qaersuarssuk Kitdleg (70° 44' N Lat, 52° 40' W Long), Umanak District, W Greenland. Shells from layer of post-glacial, raised, deltaic sediments in coastal cliff, Locality 4a, 5 m above sea level. Fauna indicates arctic, but not high-arctic climate. Locality described by Laursen (1944). Coll. 1964 and subm. by A. Rosenkrantz.

K-988. Nerutussoq nigerdleg, G.G.U. 2b **9580 ± 210**
7630 B.C.

Laminated, clayey gyttja from lake 90 m above sea level at Nerutussoq nigerdleg (62° 4' N Lat, 49° 20' W Long), Frederikshåb, W Greenland. Sample from unit of lake deposits (6.5 cm thick) overlying basal unit (4.5 cm thick) which contained too little organic material for C¹⁴ measurement. Lake deposits lay on fluvio-glacial sands from moraine system tentatively dated to ca. 9000 B.P. Coll. 1964 and subm. by M. Kelly, Geol. Survey of Greenland, Copenhagen.

Qaqarssuaq series

Gyttja from borings through deposits in 3 lakes on different levels at Qaqarssuaq (62° 7' N Lat, 49° 37' W Long), Frederikshåb, W Greenland. Date post-glacial marine transgression and regressions at locality. Coll. 1965 and subm. by M. Kelly.

K-1149. Qaqarssuaq, G.G.U. 13 **9840 ± 170**
7890 B.C.

Detritus gyttja, rich in mosses and cladocera, from basal unit (1.7 cm thick) of fresh water organic sediments resting on inorganic laminated clays, silts, and sands of glacial and glaciomarine provenance. Core taken in existing lake at 42 m above sea level. Dates approx. maximum of post-glacial marine transgression in area. Sample aggregated from 3 adjacent boreholes.

K-1150. Qaqarssuaq, G.G.U. 14b **8510 ± 160**
6560 B.C.

Non-calcareous gyttja from 2 to 4.5 cm above bottom in basal fresh water deposits overlying marine gyttja. From existing lake at 33 m above sea level. Dates regression from sea-level at height of lake. Zone (a) of local pollen succession. Supposed age: Boreal. Sample aggregated from 3 adjacent boreholes.

K-1151. Qaqarssuaq, G.G.U. 15a, b. **8680 ± 160**
6730 B.C.

Non-calcareous gyttja from lowest 4.5 cm of basal fresh-water deposits overlying marine silts and sands in existing lake at 21 m above sea level. Dates regression from sea level at height of lake. Zone (a) of local pollen succession. Supposed age: Late Boreal or Early Atlantic. *Comment:* date considered too old.

K-1154. Mellelbygd, G.G.U. 18 **8210 ± 160**
6260 B.C.

Marine shells (*Mytilus edulis*) from layer, 50 cm thick, of sands rich in comminuted shell fragments ca. 9 m above sea level at Mellelbygd (62° 4' N Lat, 49° 20' W Long), Frederikshåb, W Greenland. Shell sand interpreted as littoral deposit, overlain by 2 m of unfossiliferous sand and underlain by glaciomarine silt with boulder. Dates maximum age for sea level within a few m of present height of site. Supposed age: Late Atlantic. Coll. 1965 and subm. by M. Kelly. *Comment:* date considered too old for height. Shells probably sedimented at some depth (ca. 15 m) below contemporaneous sea level.

K-1153. Qivdlagissat, G.G.U. 17b **7750 ± 150**
5800 B.C.

Non-calcareous clayey gyttja from 2 to 7 cm above bottom of layer of freshwater gyttja in existing lake 22 m above sea level at Qivdlagissat (62° 7' N Lat, 49° 31' W Long), Frederikshåb, W Greenland. Gyttja overlies marine silts and sands. Zone (a) of local pollen succession. Supposed age: Early Atlantic. Sample aggregated from 3 adjacent boreholes. Coll. 1965 and subm. by M. Kelly.

K-1152. Sarfa, G.G.U. 16b **4780 ± 120**
2830 B.C.

Non-calcareous detritus gyttja from 2 to 5 cm above bottom of layer of freshwater organic sediments in existing lake 4 m above sea level at Sarfa (62° 1' N Lat, 49° 35' W Long), Frederikshåb, W Greenland. Organic sediments overlie marine sands. Zone (c) of local pollen succession. Supposed age: Sub-boreal. Sample aggregated from 2 adjacent boreholes. Coll. 1965 and subm. by M. Kelly.

K-956. Godthåb, G.G.U. 1**7920 ± 140
5970 B.C.**

Marine algae in sands from core (no. 138) through post-glacial marine and freshwater deposits at Godthåb (64° 11' N Lat, 51° 45' W Long), W Greenland. Sample represents lower 7.3 cm of core from ca. 20.15 m above sea-level in marine layer extending from 19.8 m to 20.2 m above sea level underlain by marine silts and overlain by freshwater sands. Sample from sediment supposedly deposited shortly before regression of sea level from ca. 21 m above present. Supposed age: Early Atlantic. Coll. 1964 and subm. by M Kelly.

K-987. Tasiussaq, G.G.U. 3**7850 ± 190
5900 B.C.**

Laminated, non-calcareous, clayey gyttja from lake ca. 48 m above sea level at Tasiussaq (69° 2' N Lat, 51° 3' W Long), Claushavn, W Greenland. Sample is basal unit (1.5 cm thick) of lake deposits resting on fluvio-glacial sands. Dates minimum age for major moraine system on outwash of which lake is situated, and minimum age for time when sea level was ca. 40 m above present. Moraine system tentatively dated by sea level changes to ca. 8000 B.P. Sample aggregated from 4 adjacent boreholes. Coll. 1963 and subm. by M. Kelly.

*C. England***K-1057. Barfield Tarn, elm fall****5340 ± 120
3390 B.C.**

Gyttja from boring in post-glacial lake sediments in Barfield Tarn (54° 16' N Lat, 3° 22' W Long), Cumberland, England. Sample from 311 to 316 cm below surface in core. Pollen analytically dated to elm fall at Atlantic/Sub-boreal transition. Horizon coincides with change in sediment from gyttja to clay mud, and with occurrence of pollen grains of weeds and cereals. Coll. 1965 and subm. by W. Pennington (Mrs. T. G. Tutin), Univ. of Leicester, England. *Comment:* date slightly older than most dates for elm fall (Godwin, 1960; Nilsson, 1964; Copenhagen VI). This may have been caused by compactness of sediment; 5 cm in core may represent some hundred yr.

K-1058. Angle Tarn, elm fall**5210 ± 120
3260 B.C.**

Gyttja from boring in post-glacial like sediments in Angle Tarn (54° 27' N Lat, 3° 10' W Long), Cumberland, England. Sample from 192 to 200 cm below surface in core, at horizon of elm fall, marked by soil erosion which may indicate disturbance of forest. Sample overlies 50 cm of gyttja which represents time from Pre-boreal to Sub-boreal. Coll. 1965 and subm. by W. Pennington (Mrs. T. G. Tutin).

D. Iceland

K-1166. Grimsnes, volcanic layer **6220 ± 140**
4270 B.C.

Charred plant material (probably mosses and heather) below lava layer at Grimsnes (64° 27' N Lat, 20° 49' W Long), SW-Iceland. Plant material was charred when lava from Seydisholar volcano flowed over locality. Sample from 0 to 0.5 cm below lava. Stratigraphy indicates lava layer is considerably older than H 3 and younger than Layer H 5 from Hekla volcano (Jakobsson, 1966). Coll. 1965 and subm. by S. Jakobsson, Mineralogical Mus., Univ. of Copenhagen.

E. Poland

K-798. Vistula, oak trunk **1820 ± 100**
A.D. 130

Wood (*Quercus* sp.), outer year rings of big tree trunk on terrace of Vistula R. at Przegorzaly (50° 3' N Lat, 19° 53' E Long), Krakow, Poland. Trunk was lying at depth 5 to 6 m below recent surface, in sandy and gravelly sediments. Now on exhibition in Bot. Inst., Krakow. Subm. by W. Szafer, Bot. Inst., Krakow.

F. Colombia

K-577 bis. Paramo de Palacio **7920 ± 140**
5970 B.C.

Detritus gyttja, sec. "Laguna de la America," Paramo de Palacio (ca. 4° 46' N Lat, 73° 51' W Long), E Cordillera, Colombia. Section taken with Dachnowsky borer; represents Holocene and Late Glacial. Sample from layer 360 to 380 cm below surface, underlying thin layer of volcanic ash. From pollen analysis Allerød age suggested by van der Hammen and Gonzalez (1960). Coll. 1956 and subm. by T. van der Hammen, Geol. Mus., Leiden, Netherlands. *Comment:* date agrees well with previous date: K-577, 8130 ± 120 (Copenhagen IV). Van der Hammen and Gonzalez (1960) suggested discrepancy between C¹⁴ age and pollen analytical interpretation might be due to possible infiltration of younger material from above. Infiltration of magnitude necessary to change date from Allerød age to 8000 B.P., however, would also make pollen analysis unreliable.

*G. Subantarctic Islands***Marion Island series**

Samples from 2 borings in swamps on Marion Is. (46° 50' S Lat, 37° 40' E Long). Swamps overlie lava. Samples date stages in Late and Post-glacial vegetational development studied by pollen analysis (Schalke and van Zinderen Bakker, 1967). Coll. 1965 and subm. by E. M. van Zinderen Bakker, Sr., Dept. of Bot., Univ. of O.F.S., Bloemfontein, South Africa.

K-1064. Macaroni Bay, no. 2696 **9500 ± 140**
7550 B.C.

Non-calcareous peat from swamp near Macaroni Bay. Sample 175 to 185 cm below surface in core from middle of swamp, 300 cm deep. Date is average of 3 measurements: 9940 ± 210, 9170 ± 210, and 9400 ± 210. *Comment:* (E.M.v.Z.B.) date suggests some oases with a few flowering plants existed on more sheltered E side of island during Pleniglacial II when island was mainly covered by ice.

K-1063. Junior's Kop, no. 2576 **3180 ± 120**
1230 B.C.

Non-calcareous gyttja from swamp near Junior's Kop. Sample from lowest part of core, 340 to 350 cm below surface, in central part of swamp, overlying black lava. Dates minimum age for lava of Late or Post-glacial age.

II. ARCHAEOLOGIC SAMPLES

A. Denmark

Draved Mose, Mesolithic dwelling places

Samples from 2 Mesolithic dwelling places found at shore of the prehistoric "Draved Lake" in Draved Mose (55° 1' N Lat, 8° 57' E Long), S Jutland. Dwelling places found on former sand dunes, now covered by peat. Flint implements from early Mesolithic culture (Kapel, 1964). Coll. 1961 and subm. by H. Kapel and A. Andersen, Geol. Survey of Denmark. *Comment:* samples from Mesolithic dwelling places in Draved Mose were previously dated (Copenhagen V, VII). Dates agree well with oldest group of dates.

K-1139. Draved Mose, D.G.U. 147 **9250 ± 180**
7300 B.C.

Charcoal (*Pinus* sp. and *Calluna*) from cultural layer, Square G 6, on dwelling place No. 611. Core axes, trimmed blades, and microliths from early Mesolithic culture were in cultural layer.

K-1140. Draved Mose, D.G.U. 254 **9210 ± 180**
7260 B.C.

Charcoal (*Pinus* sp.) from cultural layer, Square H 1 and C 7 on dwelling place No. 332. Found together with flint implements, e.g., core axes, scrapers, and microliths, and with large worked stones. Implements seem to represent 2 phases within early Mesolithic culture.

K-1098. Højelse, Mesolithic antler axe **6080 ± 130**
4130 B.C.

Wood (*Quercus* sp.) from 11-yr-old cut branch at Kemisk Værk Køge, Højelse (55° 28' N Lat, 12° 12' E Long), Zealand. From cultural layer of gyttja, resting on swamp peat. Layer also contained ornamented antler axe and horizon with scattered flint waste (Liversage, 1967). Coll. 1965 and subm. by D. Liversage, Natl. Mus., Copenhagen.

Norslund, Coastal culture

Charcoal and shells from dwelling place at Norslund (56° 1' N Lat, 10° 14' E Long), Jutland. Assemblage of implements in dated cultural layers constitutes separate group. Norslund group, within early Coastal cultures (Andersen and Malmros, 1966). Cultural layers probably older than or contemporaneous with beginning of High Atlantic transgression. Coll. 1964 and subm. by Søren H. Andersen and C. Malmros, Prehist. Mus., Aarhus, Denmark.

K-990. Norslund, Layer 3 (A) **5730 ± 120**
3780 B.C.

Charcoal (*Corylus avellana*) from layer of gyttja (No. 3) with implements from Norslund Group.

K-991. Norslund, Layer 3 (B) **5680 ± 120**
3730 B.C.

Charcoal (*Corylus avellana*) from same layer as K-990.

K-973. Norslund, Layer 4 **6420 ± 130**
4470 B.C.

Shells (*Ostrea edulis*) from shell layer (No. 4) below layer dated in K-990 and K-991. *Comment*: date is older than expected. Shells may be natural deposit with no connection to cultural layers.

Salpetermosen, Ertebølle culture

Charcoal from Ertebølle dwelling place found in Salpetermose bog, Amtmandsvang (55° 55' N Lat, 12° 18' E Long), Zealand. On uppermost part of dwelling place 2 cultural layers were found, a lower from Mesolithic Old Coastal culture, and an upper from Ertebølle culture, separated by thin calcareous layer. Samples from stone-lined fire places in Ertebølle layer, which contained flake axes, transverse arrow heads, a few thick-walled potsherds, and large accumulations of bones, mainly of red deer. No bones of domesticated animals (except dog) were found. Coll. 1959 and subm. by U. Møhl, Zool. Mus., Univ. of Copenhagen. *Comment*: dates are older than expected. Contamination with material from older cultural layer cannot be excluded.

K-1232. Salpetermose, Hg 2466 **5550 ± 120**
3600 B.C.

Charcoal (*Alnus* sp.) from fire place in Square II 7.

K-1235. Salpetermosen, Pd 187 **5410 ± 120**
3460 B.C.

Charcoal (*Ulmus* sp.) from fire place in Square III 7.

K-1234. Salpetermosen, Hg 2469 **5780 ± 120**
3830 B.C.

Charcoal (*Corylus avellana*) from fire place in Square III 7.

K-1233. Salpetermose, Hg 2468 **6020 ± 100**
4070 B.C.

Charcoal (*Alnus* sp.) from fire place in Square III 7. Date is average of 2 measurements 6070 ± 120 and 5980 ± 120.

Ølby Lyng, Ertebølle culture

Wood from outcast layer in marine sediments at dwelling place at Ølby Lyng (55° 30' N Lat, 12° 13' E Long), Zealand. Layer contained implements of late Ertebølle culture, e.g., flat-trimmed flake axes and thick-walled potsherds (Liversage, 1967). Wickerwork screen in marine sand layers was found 10 m from previous shore line. Sample from post supporting screen dated to determine if it was contemporaneous with Ertebølle dwelling place. Coll. 1963 and subm. by D. Liversage. *Comment:* screen was younger than Ertebølle dwelling place.

K-1231. Ølby Lyng, 371 **5320 ± 130**
3370 B.C.

Wood (*Tilia* sp.) lying horizontally in outcast layer.

K-1230. Ølby Lyng, 295 **5210 ± 130**
3260 B.C.

Wood (*Tilia* sp.) lying horizontally in same layer as K-1231.

K-1010. Ølby Lyng, 362 **4030 ± 120**
2080 B.C.

Wood (*Fraxinus exel.*) from post supporting wickerwork screen found 10 m from previous shore line.

Konens Høj, Early Neolithic

Charcoal from habitation layer and grave in natural sand bank, Konens Høj, at Nybro (55° 59' N Lat, 10° 40' E Long), Jutland. Habitation layer contained potsherds and flint implements of early Neolithic type. Stone-lined grave was inserted into habitation layer and contained bones, a type-C funnel beaker, an amber ornament, and 2 copper ornaments (Stürup, 1966). Coll. 1963 and subm. by B. G. Stürup, Prehist. Museum, Randers, Denmark.

K-923. Konens Høj, cx **5260 ± 100**
3310 B.C.

Charcoal (*Quercus* sp.) from accumulation of charcoal in habitation layer. Probably originates from minor branches because of irregularly formed year-rings. Date is average of 2 measurements: 5210 ± 120 and 5320 ± 120.

K-919. Konens Høj, av **4850 ± 100**
2900 B.C.

Charcoal (*Quercus* sp.) from S end of grave in sand overlying bottom. Stratigraphy indicates charcoal is contemporaneous with antiquities in grave. Date is average of 2 measurements: 4820 ± 120 and 4880 ± 120.

K-955. Aptrup, Neolithic ard furrows **4690 ± 100**
2740 B.C.

Sample of charcoal powder from pit found below tumulus from Single Grave culture at Aptrup (56° 17' N Lat, 9° 49' E Long), Jutland. Network of ard furrows was under tumulus. Furrows crossed top of pit containing charcoal. Sample is therefore older than ard furrows and tumulus (Seeberg and Kristensen, 1965). Coll. 1964 and subm. by P. Seeberg, Viborg Stiftsmus., Viborg.

Aamosen, Neolithic paddles and dug-out boat

Wood from Neolithic dug-out and 2 paddles from Aamosen bog, Øgaard-K and Husede I (55° 36' N Lat, 11° 34' E Long), Zealand. Dug-out, 7 m long, was square-stern type with grooves for insertion of transom. Remains of fire were lying on bottom of dugout, found in 1943 (Troels-Smith, 1946). Paddles found 21 yr later only few tenths m. from dugout. Coll. 1943 and 1964 and subm. by J. Troels-Smith and Sv. Jørgensen, Natl. Mus., Copenhagen. *Comment:* dates suggest that dug-out and paddles belong together. Dugout had been treated with preservatives prior to dating. Preservatives extracted as described in K-599 (Copenhagen V). Only lignin fraction was large enough for dating.

K-1165. Øgaard-K, dug-out **4590 ± 120**
2640 B.C.

Wood (*Alnus* sp.) from dug-out (Boat No. 3) from Øgaard-K. Sample from outer year-rings only. Pollen analytically dated to Sub-boreal, after land occupation phase (Iversen, 1941).

K-985. Paddle, Husede I, 3412 D **4560 ± 110**
2610 B.C.

Wood (*Quercus* sp.) from paddle at position Hu. I, 3412 D and C.

K-986. Paddle, Husede I, 3404 E **4500 ± 110**
2550 B.C.

Wood (*Quercus* sp.) from paddle at position Hu. I, 3404 E, F, and H.

K-1214. Bølling Sø, Neolithic dug-out **4510 ± 120**
2560 B.C.

Wood (*Alnus* sp.) from outer year-rings in dug-out boat in former lake Bølling Sø (56° 11' N Lat, 9° 22' E Long), Jutland. Boat was embedded in undisturbed gyttja layers in S part of lake. Pollen analytically dated to early Sub-boreal; younger than elm fall and presumably older than land occupation phase (*Plantago lanceolata* 0.2 to 0.3% of AP). Coll. 1959 and subm. by J. Troels-Smith.

K-1189. Momhøj Mose, disc wheel **4210 ± 120**
2260 B.C.

Wood (*Quercus* sp.) from disc wheel found in Momhøj Mose bog, Bjerregaard (ca. 56° 10' N Lat, ca. 8° 55' E Long), Jutland. From small

peat deposit above pieces of wood which may originate from primitive trackway. Depth in bog unknown. Disc wheel is early one-piece type with fixed nave. Subm. from mus. collection by C. L. Christensen, Herning Mus., Herning, and H. Norling-Christensen, Natl. Mus., Copenhagen. *Comment:* similar type disc wheels from Netherlands dated to ca. 2100 B.C. (van del Waals, 1964). One-piece disc wheels from Denmark previously dated to ca. 1500 B.C. (Copenhagen VII), (cf. also K-1112, this date list). Sample superficially treated with preservatives. Prior to dating, preservatives were extracted and cellulose from sample separated and dated (cf. K-599, Copenhagen V.).

K-1188. Kideris Mose, disc wheel **4180 ± 100**
2230 B.C.

Wood (*Quercus* sp.) from disc wheel from Kideris Mose bog (56° 5' N Lat, 8° 58' E Long), Jutland. Two disc wheels found together, both with fixed naves. Disc of dated wheel consisted of 2 pieces joined together similarly to Iron Age tripartite disc wheels; considered transitional type. Subm. from mus. collection by C. L. Christensen and H. Norling-Christensen. *Comment:* K-1189 and K-1188 are oldest dated wheels from Denmark. Sample was treated with preservatives. They were extracted, and sample material was separated in cellulose and lignin fractions (Copenhagen V), which were dated separately: K-1188 A (cellulose), 4190 ± 120; and K-1188 B (lignin), 4170 ± 120. Date is average of these 2 measurements.

K-1116. Søndersø, domesticated ox **4070 ± 120**
2120 B.C.

Hip bone (*Bos taurus domesticus*) from skeleton of ox found in Søndersø peat bog (55° 47' N Lat, 12° 20' E Long), Zealand. Presumably from Sub-boreal or Sub-atlantic time. Only organic fraction was used in dating. Coll. 1941 and subm. by M. Degerbøl, Zool. Mus., Univ. of Copenhagen. *Comment:* date confirms Sub-boreal age.

K-1284. Kobberup, Single Grave culture **3900 ± 120**
1950 B.C.

Charred wood (*Corylus avellanta*) from 1-to-2-yr-old twigs in Neolithic stone cist at Kobberup (56° 31' N Lat, 9° 10' E Long), Jutland. Sample was lying in layer of flint underlying wooden coffin in stone cist. Grave contained Glob's type I battle axe (Glob, 1945), which belongs to Younger Ground Grave period (Y. Bundgravstid) within Single Grave culture. Grave also contained very well-preserved wooden objects. Coll. 1966 and subm. by P. Kjærøum, Prehist., Mus., Aarhus, Denmark.

K-1138. Gasse Høje, Single Grave culture **3890 ± 100**
1940 B.C.

Charcoal (*Quercus* sp.) from Neolithic stone chamber at Gasse Høje (55° 10' N Lat, 8° 50' E Long), S Jutland. Charcoal mixed with crushed, white burned flint which covered floor of rectangular chamber covered

with single cap-stone. It contained parts of skeletons of 4 persons, 5 transverse arrow heads, and late-type battle axe. Coll. 1965 and subm. by O. Voss, Univ. Aarhus, Jutland. *Comment*: date is average of 2 measurements: 3860 ± 120 and 3920 ± 120 .

Gaevhul Bakke, Late Neolithic

Charcoal from 2 cultural layers in deposits of blown sand at Gaevhul Bakke ($56^{\circ} 50' N$ Lat, $8^{\circ} 15' E$ Long), Jutland. Layers separated by sand. Both cultural layers contained flint implements and potsherds of late Neolithic type. Coll. 1966 and subm. by D. Liversage.

K-1204. Gaevhul Bakke, 35 **3560 ± 120**
1610 B.C.

Charcoal (*Alnus* sp.) from lower layer.

K-1203. Gaevhul Bakke, 16 **3440 ± 120**
1490 B.C.

Charcoal (*Alnus* sp.) from upper layer.

K-1020. Ulstrupgaard, Late Neolithic grave **3430 ± 110**
1480 B.C.

Charcoal (*Tilia* sp.) from primary grave under tumulus at Ulstrupgaard ($56^{\circ} 2' N$ Lat, $9^{\circ} 36' E$ Long), Jutland. Sample originates from charcoal fragments lying at bottom of grave with grain parallel to grave's long axis, presumably remains of log coffin. Grave contained reflaked flint dagger. Coll. 1966 and subm. by D. Liversage.

K-1009. Klosterlund Mose, pole **3510 ± 110**
1560 B.C.

Wood (*Quercus* sp.) from 3.3-m-long worked pole, probably from wagon, found during peat cutting in Klosterlund Mose bog ($56^{\circ} 11' N$ Lat, $9^{\circ} 21' E$ Long), Jutland. Coll. 1961 by H. Hansen; subm. by H. Norling-Christensen.

K-1112. Nonnebo Mose, disc wheel **3350 ± 120**
1400 B.C.

Wood (*Alnus* sp.) from disc wheel from Nonnebo Mose bog ($55^{\circ} 22' N$ Lat, $10^{\circ} 34' S$ Long), Funen. Wheel was early one-piece type with fixed nave. Subm. from mus. collection by E. Albrechtsen and H. Norling-Christensen. *Comment*: date agrees with age of similar disc wheel from Fårup (Copenhagen VII), but is much younger than those of Momhøj Mose and Kideris Mose (this date list). Sample treated with preservatives, which were extracted (see Copenhagen V) and the lignin fraction was separated and dated.

K-1115. Måløv, Early Bronze age **2860 ± 120**
910 B.C.

Charcoal (*Corylus avellana*) from layer, presumably old mould surface, under Bronze age tumulus at Måløv ($55^{\circ} 45' N$ Lat, $12^{\circ} 8' E$ Long),

Zealand. Probably remains of vegetation before tumulus was erected. Tumulus contained woman's grave from Bronze age, Period III. Coll. 1965 and subm. by H. Thrane, Natl. Mus., Copenhagen.

Kirkebakkegaard, Bronze age and Iron age

Charcoal from pits under plowing depth in field at Kirkebakkegaard (55° 50' N Lat, 12° 15' E Long), Zealand. Pits contained potsherds from Late Bronze age and Early Iron Age. Coll. 1966 and subm. by H. Thrane.

K-1218. Kirkebakkegaard, Pit No. 2 **2780 ± 100**
830 B.C.

Charcoal (*Fagus sylv.*) from lower layer in Pit No. 2. Layer contained indistinct potsherds from Late Bronze age, separated from upper layer by yellow, sterile clay layer. Sample dates earliest use of pit. Date is average of 2 measurements: 2790 ± 120 and 2770 ± 120.

K-1217. Kirkebakkegaard, Pit No. 4 **2170 ± 110**
220 B.C.

Charcoal (*Fagus sylv.*) from accumulation of charcoal in lower part of Pit No. 4, with indistinct-type potsherds presumably from Early Iron age.

Foerlev Nymølle, Iron-age offerings

Charcoal and wood from cult place in bog at Foerlev Nymølle (56° 3' N Lat, 9° 54' E Long), Jutland. Place contained separate offerings from Pre-Roman Iron age, some covered by stone packings. Offerings were of different types; a few were small heaps of charcoal with fragments of burned bones. Finds consist of potsherds, bones of animals, a single bone of man, and worked wooden objects. Potsherds suggest cult place had been in use for considerable duration. Coll. 1963 and 1966 and subm. by Harald Andersen, Prehist. Mus., Aarhus, Denmark.

K-1224. Foerlev Nymølle 1078 ZU **2350 ± 110**
400 B.C.

Twig (*Alnus* sp.) found under stone in stone packing and thus contemporary with cult place. Twig was cut at one end.

K-880. Goerlev Nymølle 1078 QL **2040 ± 100**
90 B.C.

Charcoal (*Quercus* sp.) from heap of charcoal on cult place. Pieces of burned bones were found in heap.

K-1252. Rybjerg Mose, "double paddle" **2280 ± 110**
330 B.C.

Wood (*Quercus* sp.) from wooden object, resembling small double paddle, ca. 90 cm long from Rybjerg Mose bog (56° 3' N Lat, 8° 20' E Long), Jutland. Function of object unknown. It appears that wood had been allowed to dry and shrink freely without application of pre-

servatives. Subm. from collection in Ringkøbing Mus. by O. Crumlin-Pedersen, Natl. Mus., Copenhagen.

**K-1251. Holmegård Mose, "double paddle" 2170 ± 110
220 B.C.**

Wood (*Quercus* sp.) from wooden object resembling double paddle, similar to K-1252, ca. 90 cm long, from Holmegårds Mose bog (56° 2' N Lat, 8° 20' E Long), Jutland. Coll. 1953 for Ringkøbing Mus.; subm. by O. Crumlin-Pedersen. *Comment*: sample treated with preservatives, which were extracted before dating.

**K-1113. Rappendam, disc wheel 2020 ± 110
70 B.C.**

Wood (*Alnus* sp.) from disc wheel from Rappendam (55° 50' N Lat, 12° 9' E Long), Zealand. Wheel is tripartite type with separate inserted nave found with many remains from naves and wagons. Coll. 1941 and 1942 by G. Kunwald; subm. by H. Norling-Christensen. *Comment*: tripartite disc wheels previously dated to Pre-Roman Iron age (van der Waals, 1964; Copenhagen VII). Sample treated with preservatives which were extracted (Copenhagen V) and cellulose fraction was separated and dated.

Olmersdiget, Iron-age linear earthwork

Wood from palisades and construction parts from linear earthwork (defensive dike), Olmersdiget, S Jutland. Dike is several km long, interrupted by lakes and meadows. Samples taken at different parts of dike. *Comment*: dates suggest reconstruction or repair of defensive dike during several hundred yr.

**K-1183. Olmersdiget, Tinglev No. 29 1830 ± 100
A.D. 120**

Outer year-rings from post No. 29 (*Quercus* sp.) in palisade at S end of Olmersdiget, S of Tinglev (54° 54' N Lat, 9° 17' E Long). Coll. 1965 and subm. by H. Neumann, Haderslev Mus., Haderslev, Denmark.

**K-1182. Olmersdiget, Tinglev No. 36 1760 ± 100
A.D. 190**

Outer year-rings from post No. 36 (*Quercus* sp.) in palisade at S end of Olmersdiget, same location as K-1183. Coll. 1965 and subm. by H. Neumann.

**K-847. Olmersdiget, Almstrup Mose 1850 ± 100
A.D. 100**

Wood (*Quercus* sp.) from post in palisade ring in bog at Almstrup (54° 57' N Lat, 9° 18' E Long), middle part of Olmersdiget. Date is average of 2 measurements: 1800 ± 110 and 1890 ± 100. Coll. 1962 and 1963 and subm. by V. LaCour, Natl. Mus., Copenhagen.

K-984. Olmersdiget, Almstrup **1540 ± 100**
A.D. 410

Wood (*Betula* sp.) from branch at bottom of ditch in front of dike at Almstrup, middle part of Olmersdiget. Coll. 1962 and 1963 and subm. by V. LaCour.

K-799. Olmersdiget, Ligaard **1350 ± 100**
A.D. 600

Wood (*Quercus* sp.) from pointed post in palisade ring at Uge Bæk brook, SE of Ligaard (54° 59' N Lat, 9° 20' E Long), N end of Olmersdiget. Coll. 1962 and 1963 and subm. by V. LaCour.

K-1242. Mammen, Iron-age ard **1830 ± 100**
A.D. 120

Wood (*Quercus* sp.) from beam of ard found during peat cutting in bog at Mammen (56° 24' N Lat, 9° 65' E Long), Jutland. Coll. 1953 by P. V. Glob and H. Andersen; subm. by A. Steensberg, Univ. of Copenhagen. *Comment:* cf. date of ard from Hendriks Mose (Copenhagen V). Sample treated with preservatives which were extracted (Copenhagen V) and lignin fraction was separated and dated.

K-1219. Haarlevvej, Iron-age road **1830 ± 100**
A.D. 120

Wood (*Fagus sylv.*) from axle on stone layer in prehistoric road Haarlevvejen in Haarlev Enge (55° 21' N Lat, 12° 14' E Long), Zealand. Sample from Ditch I over lower of 2 road constructions. Coll. 1966 and subm. by Torben Witt, Køge Mus., Denmark. *Comment:* cf. date for Broskov road (Copenhagen VI).

K-1285. Skovmarken, prehistoric iron furnace **1910 ± 100**
A.D. 40

Charcoal (*Quercus* sp.) from clay-lined pit with slag originating from some form of iron smelting or iron preparation at Skovmarken (57° 10' N Lat, 9° 54' E Long), Jutland. Charcoal mixed with slag; must belong to construction. Coll. 1966 and subm. by O. Voss, Univ. of Aarhus, Denmark.

Drengsted, prehistoric iron furnaces

Charred straw from prehistoric iron furnaces in field at Drengsted (55° 5' N Lat, 8° 40' E Long), S Jutland. Ca. 100 slag pits found in field with dwelling place from Roman Iron age. Only slag pits left of furnaces. Plug of straw was placed in each pit. During iron smelting slag fused into single large lump which reproduced shape of portion of pit and preserved part of straw (Voss, 1963). Coll. 1964 and 1965 and subm. by O. Voss. *Comment:* samples from prehistoric iron furnaces at Drengsted previously dated (Copenhagen VI). New dates agree and suggest short settlement. See also dates for prehistoric iron furnaces of same type at Torsted and Snorup (this date list).

K-1134. Drengsted, OV	1610 ± 100
	A.D. 340
Charred straw from Pit OV.	
K-1135. Drengsted, PF	1560 ± 100
	A.D. 390
Charred straw from Pit PF.	
K-1136. Drengsted, MF	1630 ± 100
	A.D. 320
Charred straw from Pit MF.	
K-1137. Drengsted, MN	1540 ± 100
	A.D. 410
Charred straw from Pit MN.	
K-1158. Drengsted, MØ	1590 ± 100
	A.D. 360
Charred straw from Pit MØ.	
K-1159. Drengsted, MI	1530 ± 100
	A.D. 420
Charred straw from Pit MI.	
K-1160. Drengsted, MO	1630 ± 100
	A.D. 320
Charred straw from Pit MO.	
K-1254. Drengsted, VE	1510 ± 100
	A.D. 440
Charred straw from Pit VE.	
K-1255. Drengsted, VF	1470 ± 100
	A.D. 480
Charred straw from Pit VF.	
K-1253. Torsted, prehistoric iron furnace	1480 ± 100
	A.D. 470
Charred straw from slag pit at Torsted (56° 12' N Lat, 8° 26' E Long), Jutland. Slag pit belongs to prehistoric iron furnace similar to those of Drengsted series, above. Coll. 1965 and subm. by O. Voss.	

Snorup, prehistoric iron furnaces

Samples of charred straw from slag pits at Snorup (55° 43' N Lat, 8° 43' E Long), S Jutland. Slag pits belong to prehistoric iron furnaces similar to those of Drengsted series, above. Coll. 1966 and subm. by O. Voss. *Comment:* dates of samples from slag pits at Drengsted, Torsted, and Snorup show remarkable consistency in age suggesting that technique was in use for short period only.

K-1256. Snorup, No. 6 **1450 ± 100**
A.D. 500

Charred straw from Pit No. 6.

K-1257. Snorup, No. 7 **1560 ± 100**
A.D. 390

Charred straw from Pit No. 7.

Eskholm, charcoal patches

Samples of charcoal from circular patches of charcoal, ca. 1 m in diameter, found by deep plowing in field on Eskholm (55° 53' N Lat, 10° 39' E Long), Stavns Fjord, Samsø. Two patches contained charcoal of yew. Coll. 1963 and subm. by J. Troels-Smith.

K-881. Eskholm, L **1640 ± 120**
A.D. 310

Charcoal (*Taxus baccata*) from Patch L found with larged burned stones.

K-1014. Eskholm, M **1620 ± 100**
A.D. 330

Charcoal (*Taxus baccata*) from Patch M.

K-1013. Eskholm, A **840 ± 100**
A.D. 1110

Charcoal (*Quercus* sp.) from Patch A.

Gerlev, channel blocking

Wood from supposedly artificial blocking in natural channel in Roskilde Fjord at Gerlev (55° 51' N Lat, 12° 2' E Long), Zealand. Blocking at ca. 1 m depth, consisting of branches, minor trunks, and stones packed together (Crumlin-Pedersen, 1966). Coll. 1965 and subm. by O. Crumlin-Pedersen.

K-1093. Gerlev, No. 6 **1610 ± 100**
A.D. 340

Branch (*Betula* sp.) from packing of branches in blocking.

K-1110. Gerlev, No. 4 **1810 ± 100**
A.D. 140

Outer year-rings from 20-yr-old branch (*Betula* sp.) from same packing as K-1093.

K-1111. Gerlev, No. 5 **1560 ± 100**
A.D. 390

Wood (*Salix* sp.) from blocking.

K-1094. Gredstedbro, shipwreck **1400 ± 100**
A.D. 550

Wood (*Quercus* sp.) from treenail in ship's frame from stream Kongeåen at Gredstedbro (55° 24' N Lat, 8° 44' E Long), Jutland. Found

ca. 20 yr ago with other remains of wreck. Typologically parallel to Anglo-Saxon funeral ship from ca. A.D. 600, excavated at Sutton Hoo, England (Crumlin-Pedersen, 1967). Kept in Antiquarian Collections, Ribe; subm. by O. Crumlin-Pedersen.

K-1096. Øer Hage, wreck Hasnaes I **1360 ± 100**
A.D. 590

Wood (*Quercus* sp.) from plank in ship (Hasnæs I) with lashed frames at Øer Hage (56° 9' N Lat, 10° 42' E Long), Jutland, 160 to 170 m inland from present shore line. Coll. 1961 and subm. by O. Crumlin-Pedersen. *Comment:* sample treated with polyethylene glycol, which was extracted before dating.

K-848. Nørre Kongerslev, dug-out boat **1170 ± 100**
A.D. 780

Wood (*Quercus* sp.) from double-pointed dugout with rounded bottom-section at Nørre Kongerslav (56° 54' N Lat, 10° 8' E Long), Jutland. Dugout from bog ca. 50 m from medieval earthwork. In boat was coarse, worked flint implement. Coll. 1960 and subm. by O. Crumlin-Pedersen.

K-1156. V. Skarholmsrende, blocking **1020 ± 100**
A.D. 930

Wood (*Quercus* sp.) from pointed pile in blocking in natural channel at Vester Skarholmsrende (54° 42' N Lat, 11° 47' E Long), Lolland (Schultz, 1936). Coll. 1966 and subm. by O. Crumlin-Pedersen.

K-1097. Øer Hage, wreck Hasnaes II **960 ± 100**
A.D. 990

Two wooden treenails (*Salix* sp.) from oak plank in shipwreck Hasnæs II at Øer Hage (56° 9' N Lat, 10° 42' E Long), Jutland, ca. 50 m inland from present shore line. Ship is typologically parallel to Viking ships from Skuldelev, Nos. 3 and 5 (Crumlin-Pedersen, 1968; Copenhagen VII). Coll. 1961 and subm. by O. Crumlin-Pedersen.

K-1095. Helnaes, blocking **890 ± 100**
A.D. 1060

Wood (*Fagus sylv.*) from blocking in natural channel at Helnæs (55° 8' N Lat, 10° 3' E Long), Funen. Blocking may be part of SE Danish system of defensive blockings against Wends. Coll. 1965 and subm. by O. Crumlin-Pedersen.

K-846. Kalvebod, bast rope **880 ± 100**
A.D. 1070

Sample of bast (*Tilia* sp.) from rope at Kalvebod Strand (55° 38' N Lat, 12° 32' E Long), Zealand. Found at water depth 4 to 6 m, covered by 0.5 m of sand, with large anchor stones, possibly connected with fishing. Coll. 1963 and subm. by O. Crumlin-Pedersen.

K-1213. Aarslev Enge, dugout boat **820 ± 100**
A.D. 1130

Wood (*Quercus* sp.) from well-preserved dugout in bog at Aarslev Enge (56° 9' N Lat, 10° 4' E Long), Jutland. Dugout was lying on gyttja, covered by gyttja and peat. Coll. 1966 and subm. by H. J. Madsen, Prehist. Mus., Aarhus, Denmark. *Comment*: sample was treated with polyethyleneglycol, which was extracted before dating.

K-977. Øresund, shipwreck **700 ± 100**
A.D. 1250

Wooden treenail (*Juniperus communis*) from frame fished up in Sound, Øresund, at Kastrup (55° 38' N Lat, 12° 40' E Long). Frame presumably from small vessel constructed in reverse clinker method (Crumlin-Pedersen, 1965). Coll. 1965 and subm. by O. Crumlin-Pedersen.

Egholm, medieval castle

Wood from piles in bank around medieval castle Egholm (55° 44' N Lat, 11° 54' E Long), Zealand. Piles were driven into base of original bank to protect it against water in surrounding moat, which was later destroyed during construction of big building ca. A.D. 1350. Coll. 1961 and subm. by J. Hertz, Natl. Mus., Copenhagen.

K-792. Egholm, N 2A **750 ± 100**
A.D. 1200

Wood (*Fagus sylv.*) from pile in bank.

K-793. Egholm, N 2 **580 ± 100**
A.D. 1370

Wood (*Fagus sylv.*) from pile in bank.

K-854. Sjørring, earthwork **720 ± 100**
A.D. 1230

Wood (*Quercus* sp.) from construction timber in earthwork at Sjørring (56° 57' N Lat, 8° 46' E Long), Jutland. Probably originates from bridge connected with earthwork. Coll. 1963 and subm. by V. La Cour. *Comment*: sample treated with preservatives which were extracted. Sample material was separated in lignin and cellulose fraction (Copenhagen V) and dated separately: K-854 A (lignin) 700 ± 100, and K-854 B (cellulose) 740 ± 100. Date is average of these 2 measurements.

K-777. Allerup Bakker, earthwork **650 ± 100**
A.D. 1300

Charred wood and bark (*Fagus sylv.*) from moat around earthwork "Voldene" at Allerup Bakker (57° 14' N Lat, 10° 13' E Long), Jutland. Sample found in humic layer, No. 9, 25 cm below present surface and 70 cm above bottom. Earthwork probably was abandoned when layer No. 9 was deposited (La Cour and Stiesdal, 1963). Coll. 1960 by B. Fredskild; subm. by V. La Cour and H. Stiesdal, Natl. Mus., Copenhagen.

K-869. V. Bjerregrav, wheel-plow **730 ± 100**
A.D. 1220

Wood (*Quercus* sp.) from beam of wheel-plow found at Navndrup, V. Bjerregrav (56° 35' N Lat, 9° 31' E Long), Jutland. Plow discovered ca. 50 cm below surface during drainage in meadow along stream Mølleåen. Coll. 1963 and subm. by A. Steensberg.

K-728. Karstofteå, lever **640 ± 100**
A.D. 1310

Wood (*Quercus* sp.) from curved piece of wood, probably lever from water mill (horizontal mill), in stream Karstofteå (55° 55' N Lat, 9° 3' E Long), Jutland. Coll. 1960 and subm. by A. Steensberg.

K-886. Linå, plow **440 ± 100**
A.D. 1510

Wood (*Quercus* sp.) from plow-sheath in mold-board plow, presumably wheel-plow, found during drainage in meadow at Linå (56° 9' N Lat, 9° 50' E Long), Jutland. Plow is same type as Tømmerby and Andbjerg plows (Steensberg, 1962; Copenhagen V). Coll. 1962 and subm. by A. Steensberg. *Comment*: sample treated with linseed oil. It was extracted, and the lignin fraction was separated (Copenhagen V) and dated.

K-976. Voldstedlund, skeleton of cow **210 ± 100**
A.D. 1740

Bones from skeleton of cow found in W chamber in passage grave at Voldstedlund (56° 39' N Lat, 9° 53' E Long), Jutland. Skeleton (without head and hoofs) lay in seemingly untouched chamber in a passage grave where passage was filled with untouched layers of earth. Skeleton lay on heap of stones covered by earth, probably from damaged corner in chamber. *Comment*: date shows no connection between skeleton and time when passage grave was in use.

B. Faroe Islands

Kirkjubø, medieval church

Charcoal and wood from oldest foundations and grave in medieval church at Kirkjubø (61° 57' N Lat, 6° 47' W Long), Strømø, Faroe Islands. Coll. 1964 and subm. by Sverri Dahl and Leon Andreasen, Antiquarian Collections, Thorshavn, Faroe Islands. *Comment*: samples probably originate from imported timber.

K-1286. Kirkjubø, No. 1752 **740 ± 100**
A.D. 1210

Charcoal (*Pinus* sp.) from oldest foundations in church.

K-1287. Kirkjubø, No. 1753 **690 ± 100**
A.D. 1260

Charcoal (*Pinus* sp.) from oldest foundations in church.

K-1288. Kirkjubø, No. 1576 **1150 ± 100**
A.D. 800

Charred wood (*Thuja* sp.) from trunk or branch, which contained at least 50 year-rings. Found in oldest foundations in church. *Comment:* unexpectedly high age.

K-916. Kirkjubø, No. 1000 **690 ± 100**
A.D. 1260

Wood (*Pinus* sp.) from bottom of coffin under floor of choir.

C. Greenland

Jørgen Brønlund Fjord, Vendenæs

Charcoal from Paleo-Eskimo ruins on terrace at tent place Vendenæs (82° 9' N Lat, 30° 5' W Long), Jørgen Brønlund Fjord, Peary Land. Implements from Independence I culture found in ruins (Knuth, 1965, 1967). Coll. 1964 and subm. by E. Knuth, Natl. Mus., Copenhagen. *Comment:* dates agree with previous dates from Independence I culture from same area (Copenhagen VII). Cf. also Ellesmere Island series, Canada (this date list).

K-1061. Vendenæs, No. 31 **3760 ± 120**
1810 B.C.

Charcoal (*Salix* sp.) from hearth in Ruin No. 3 on terrace, 12.3 m above sea level.

K-1062. Vendenæs, No. 32 **3800 ± 120**
1850 B.C.

Charcoal (*Salix* sp.) from hearth in Ruin No. 4 on terrace, 11.8 m above sea level.

K-1196. J. Brønlund Fjord, Gammel Strand Vest **3620 ± 110**
1670 B.C.

Charcoal (*Salix* sp.) from Paleo-Eskimo ruin at site Gammel Strand Vest (82° 11' N Lat, 29° 22' W Long), Jørgen Brønlund Fjord, Peary Land. Sample found in mid-passage hearth of well-preserved ellipsoid ruin (No. 3), lying on terrace, 14.3 m above sea level and 1 km from present shore line. Implements of Independence I culture found in ruin (Knuth, 1965, 1967). Coll. 1964 and subm. by E. Knuth.

K-1059. Jørgen Brønlund Fjord, Hellebæk **2510 ± 110**
560 B.C.

Charcoal (*Salix* sp.) from Paleo-Eskimo ruin at Hellebæk (82° 11' N Lat, 31° 21' W Long), Jørgen Brønlund Fjord, Peary Land. Sample was found partly in hearth of house ruin, partly on fireplace 4 m in front of ruin. Implements of Independence II culture were in ruin (Knuth, 1965, 1967). Coll. 1963 and subm. by E. Knuth. *Comment:* first date of Independence II culture made on local plant material (arctic willow). Date is a few hundred yr younger than previous dates of Independence II culture made on drift wood (Copenhagen III, IV, and VII).

Itivnera series, Sarqaq culture

Peat and charcoal from Paleo-Eskimo dwelling place at Itivnera (64° 23' N Lat, 50° 15' W Long), Kapisigdlit, Godthåb Fjord, W Greenland. Samples date layer from Sarqaq culture and periods of peat formation before and after cultural layer. Peat overlies sand. Pollen analytically investigated by B. Fredskild. Coll. 1960 and subm. by B. Fredskild, Natl. Mus., Copenhagen. *Comment*: Sample from layer previously dated (K-588, Copenhagen V).

K-1192. Itivnera, 0 to 4 cm **3200 ± 120**
1250 B.C.

Peat with detritus from layer, 1 to 4 cm thick, underlying cultural layer from Sarqaq dwelling place. Peat overlies old inorganic beach sediments. Peat formation suggests change of climate.

K-1193. Itivnera, 4 to 14 cm **3140 ± 120**
1190 B.C.

Charcoal (*Salix* sp.) from cultural layer from Sarqaq dwelling place, immediately above K-1192. Sample from lowest part of layer, 4 to 14 cm above sand. Layer extends from 4 to 21 cm above sand.

K-1194. Itivnera, 24 to 26 cm **2290 ± 100**
340 B.C.

Humified peat from lower part of sterile peat layer overlying cultural layer, 24 to 26 cm above sand.

K-1195. Itivnera, 34 to 36 cm **630 ± 100**
A.D. 1320

Swamp peat from lowest part of layer of swamp peat overlying humified peat, 34 to 36 cm above sand. Formation of swamp peat suggests change of climate.

*D. Alaska***Trail Creek, Cave 2**

Bone and antler of caribou from various layers in Cave 2 at Trail Creek (65° 48' N Lat, 163° 13' W Long), Alaska, U.S.A. Limestone caves found 30 mi. inland from Deering which served as shelter for caribou hunters; implements of several Eskimo cultures found in caves (Larsen, 1955, 1962, and 1968). Samples date layers in Cave 2. Coll. 1949 and 1950, and subm. by Helge Larsen, Natl. Mus., Copenhagen. *Comment*: all dates made on organic fraction only, which is more reliable. Dates are close to expected values, except for K-1289.

K-982. Trail Creek, Cave 2, No. 1 **1100 ± 100**
A.D. 850

Marrow-cracked bones of caribou from 1st m from entrance in 25-to-40-cm-thick Layer I which consisted of black, loose earth with small stones.

K-979. Trail Creek, Cave 2, No. 2 **2810 ± 110**
860 B.C.

Marrow-cracked bones of caribou from 2nd m from entrance in 40-to-60-cm-thick Layer II, composed of brownish earth with rock fragments and big stones. Layer contained implements of Choris or closely related culture.

K-983. Trail Creek, Cave 2, No. 4 **2700 ± 110**
750 B.C.

Well-preserved antler of caribou from same sec. and layer as K-979.

K-980. Trail Creek, Cave 2, No. 3 **9070 ± 150**
7120 B.C.

Marrow-cracked bones of caribou from 20-to-50-cm-thick Layer III, which consisted of dark, loose materials with mica and many scattered rock fragments. Layer contained implements older than Denbigh Flint Complex.

K-1289. Trail Creek, Cave 2, No. 5 **2160 ± 110**
210 B.C.

Bones of caribou 10 to 11 m from entrance, in lowest layer, which contained implements presumably belonging to Denbigh Flint Complex. *Comment:* date considered too young. Solifluction and frost action may have caused mixing of layers.

Trail Creek, Cave 9

Bones of caribou found in Cave 9, Trail Creek (65° 48' N Lat, 163° 13' W Long), Alaska, U.S.A. Cave had 2 narrow passages, N-S and W-E. Samples from 2nd m in W room, where layer was thick and contained both dark and light bones of caribou. Dark and light bones dated separately, only organic fraction was used. Layer contained implements from several stages of Paleo-Eskimo cultures (Larsen, 1955, 1962, and 1968). Coll. 1950 and subm. by Helge Larsen. *Comment:* dates show considerable mixing of bones in layer in this part of cave; dark bones are older than light ones. Samples from cave previously dated (Copenhagen III).

K-1290. Trail Creek, Cave 9, No. 2a **2770 ± 110**
820 B.C.

Dark bones of caribou from layer in W room.

K-1291. Trail Creek, Cave 9, No. 2b **510 ± 100**
A.D. 1440

Light bones of caribou from same layer as K-1290.

K-1210. Trail Creek, Cave 9, horse **15,750 ± 350**
13,800 B.C.

Organic fraction of scapula of horse outside S entrance to Cave 9, Trail Creek (65° 48' N Lat, 163° 13' W Long), Alaska, U.S.A. Found with heel bone of *Bison* sp., which apparently had been worked by man.

Coll. 1950 and subm. by Helge Larsen. *Comment*: if brought by man, which seems possible, it is earliest evidence of man in Alaska.

Cape Krusenstern, Eskimo cultures

Charcoal from house ruins on series of beach ridges at Cape Krusenstern (67° 5' N Lat, 163° 50' W Long), Kotzebue Sound, Alaska. More than 100 beach ridges were deposited consecutively at about same height above sea-level. Dwelling places and houses from time of Denbigh Flint complex and to present were found on ridges. Eskimos seem, in all periods to have settled on youngest beach ridge, closest to sea (Giddings, 1961 and 1966). Coll. 1959 and subm. by J. L. Giddings, Brown University. *Comment*: samples from house ruins at Cape Krusenstern previously dated (Pennsylvania IV and IX; Bern II).

K-837. Cape Krusenstern, house No. 50 **1180 ± 110**
A.D. 770

Charcoal (*Picea* sp.) from driftwood in tent ring 50 cm below floor in house No. 50 on partly covered beach ridge.

K-851. Cape Krusenstern, house No. 32 **1180 ± 110**
A.D. 770

Charcoal, probably of driftwood, from house No. 32. Probably represents Birnirk culture.

K-816. Cape Krusenstern, house No. 33 **1100 ± 100**
A.D. 850

Charcoal (*Picea* sp.) from driftwood from hearth in kitchen of house No. 33, lying 1 m below present surface of beach ridge. House represents either Birnirk or W Thule culture. Date is average of 2 measurements: 1080 ± 110 and 1120 ± 110.

K-817. Cape Krusenstern, house No. 6 **1070 ± 100**
A.D. 880

Charcoal (*Picea* sp.) from driftwood from hearth in house No. 6, excavated 0.5 to 1 m below surface of beach ridge. House represents W Thule culture. Date is average of 2 measurements: 1080 ± 110 and 1070 ± 110.

K-850. Cape Krusenstern, house No. 4 **1000 ± 110**
A.D. 950

Charcoal, probably from driftwood, from floor in kitchen of house No. 4, which belongs to W Thule culture.

Onion Portage site, Paleo-Eskimo cultures

Charcoal from cultural layers at Onion Portage (67° 10' N Lat, 158° 52' W Long). Kobuk R., Alaska. Site, a stratigraphic series of cultural layers, separated by sterile sand, lies 200 km inland from Chukchi Sea. Layers correspond partly to layers at Cape Krusenstern and seem to cover approx. same period of time (Giddings, 1962 and 1966). Coll. 1959 and subm. by J. L. Giddings.

**K-835. Onion Portage, below "Old Hearth" 3170 ± 120
1220 B.C.**

Charcoal, probably from driftwood and local brush, in thin layer, ca. 30 cm below cultural layer "Old Hearth" (layer No. 3).

**K-832. Onion Portage, above "Old Hearth" 2750 ± 140
800 B.C.**

Charcoal from local brush and driftwood in layer from natural fire above "Old Hearth." Sample older than Norton culture.

**K-836. Onion Portage, "Middle Layer" 1570 ± 140
A.D. 380**

Charcoal from driftwood and local brush from "Middle Layer" (layer No. 2), lying 70 cm below surface. Layer is younger than K-832 and older than Thule culture. Artefacts from layer related to Norton and Ipiutak cultures.

E. Arctic Canada

Ellesmere Island, Kettle Lake

Charcoal from Paleo-Eskimo ruins on dwelling places at Kettle Lake (81° 24' N Lat, 76° 47' W Long), Tanquary Fiord, Ellesmere Island. Ruins N and S of Kettle Lake on terraces and moraine ridges 90 to 97 m above sea level contained implements of Independence I culture. Site supposedly represents station on migration route to Peary Land, 700 km E, used by Independence I people (Knuth, 1967). Coll. 1966 and subm. by E. Knuth. *Comment*: samples are same age as Independence I samples from Peary Land (Copenhagen VII; this date list).

**K-1260. Kettle Lake South, E 6a 3930 ± 130
1980 B.C.**

Charcoal (*Salix* sp.) from fire place in ruin M. 3, 97 m above sea level on moraine ridge, a few m higher than Independence I ruins at South-group terrace.

**K-1261. Kettle Lake South, E 9 3810 ± 130
1860 B.C.**

Charcoal (*Salix* sp.) from hearth in mid-passage of South-group ruin No. 3, on terrace 95 m above sea level.

**K-1262. Kettle Lake North, E 10 3760 ± 130
1810 B.C.**

Charcoal (*Salix* sp.) from hearth in mid-passage of North-group ruin No. 4, on terrace 90 m above sea-level, *vis-à-vis* Kettle Lake South-group.

**K-1259. Ellesmere Island, "Ella Lake" 570 ± 100
A.D. 1380**

Charcoal (*Salix* sp.) from fire place found in front of Neo-Eskimo tent at "Ella Lake," W of Ella Bay (81° 3' N Lat, 70° 5' W Long), Archer

Fiord, Ellesmere Island. Tent ring had platform of big plane stones raised 20 cm above floor. Coll. 1966 and subm. by E. Knuth.

F. Egypt

K-1003. Kalabcha, door-lock **1980 ± 100**
30 B.C.

Wood (*Sapotaceae* sp.) from door-lock in temple at Kalabcha (23° 7' N Lat, 32° 10' E Long), Egyptian Nubia. Temple was under construction during reign of emperor Augustus, but construction may have begun earlier. It is not known if lock originates from 1st temple from XVIII dynasty (1570 to 1314 B.C.), or if it is connected with construction of 2 other great temples in Nubia (Philae and Dakka), i.e., ca. 350 to 250 B.C. Coll. 1961 and subm. by Vetle Jørgensen, Natl. Mus., Copenhagen. *Comment:* dates lock to time of Augustus.

K-1282. Gebel el Tuna, water wheel **1900 ± 100**
A.D. 50

Wood or bark from palm stump in Roman garden at Gebel el Tuna (27° 30' N Lat, 31° 0' E Long), Egypt. Garden irrigated by ox-powered pot-garland machine of saquiya type. Desert location and water table being ca. 34 m below surface, plant life depended on water-raising machine. During excavation in 1935 garden and well, and some palm stumps, were discovered (Schiøler, 1962 and 1963). Sample originates from 1 of stumps; probably dates later part of period when irrigation system was in use. Coll. 1964 and subm. by Th. Schiøler.

G. Iceland

Hvitarholt, Viking farm

Charcoal from buildings of Viking farm at Hvitarholt (64° 9' N Lat, 20° 20' W Long), Iceland. Expected archaeological age: 9th century or early 10th century A.D. Coll. 1963 to 1966 and subm. by K. Eldjarn, Natl. Mus., Reykjavik.

K-1243. Hvitarholt I **970 ± 100**
A.D. 980

Charcoal (*Betula* sp.) from layer of charcoal below floor and walls in farm building ("skåle").

K-1244. Hvitarholt II **890 ± 100**
A.D. 1060

Charcoal (*Betula* sp.) from stove in semi-subterranean building, perhaps bathhouse, beside building of K-1243.

K-1245. Hvitarholt III **910 ± 100**
A.D. 1040

Charcoal (*Sorbus* sp.) from floor in great hall, beside open hearth in middle of hall.

*H. Iran***Tepe Guran, Neolithic village**

Charred plant material from early Neolithic layers in mound Tepe Guran (33° 43' N Lat, 47° 6' E Long), Luristan, Iran. Mound contained 21 habitation layers from Islamic time, Bronze age, and early Neolithic. Three soundings, G I, G II, and G III, were made through layers in different parts of mound (Meldgaard *et al.*, 1964; Mortensen, 1965). Coll. 1963 and subm. by J. Meldgaard and P. Mortensen, Natl. Mus., Copenhagen.

K-1006. Tepe Guran, G III, No. 1 **8410 ± 200**
6460 B.C.

Charcoal (*Pistacia* sp. and undetermined pieces) from aceramic Neolithic habitation layer in sounding G III, 12 to 15 cm above virgin soil. Layer seems to correspond to Level U in sounding G I. Dates approx. time of 1st habitation at Tepe Guran.

K-879. Tepe Guran, G I, No. 28 **7760 ± 150**
5810 B.C.

Charcoal from herbaceous stalks, perhaps remains of fallen roofing, from sounding G I, in front of oven on floor in level H, which represents early Neolithic phase; pottery is contemporary with ceramics from Serab.

K-856. Tepe Guran, Luristan bronze **3170 ± 120**
1220 B.C.

Charcoal (*Quercus* sp.) from grave in mound Tepe Guran (33° 43' N Lat, 47° 6' E Long), Luristan, Iran. Found in pot (No. 1) from grave No. 11 in Layer C, which represents Luristan Bronze period (Meldgaard *et al.*, 1964). Coll. 1963 and subm. by H. Thrane, Natl. Mus., Copenhagen.

*I. Iraq***Tell Shimshara, Neolithic village, potsherds**

Organic-tempered potsherds from Neolithic layers in mound Tell Shimshara (36° 15' N Lat, 45° 0' E Long), Kurdistan, Iraq. Mound contained 16 Islamic, Hussian, and Neolithic habitation layers. Earliest layers (16 to 14) were aceramic; following layers (13 to 9) contained Hassuna/Samarra pottery contemporary with Hassuna IV to VI (Mortensen, 1968). Coll. 1957 by H. Ingholt, Yale University; subm. by P. Mortensen. *Comment:* measurements made on charred remains of organic tempering in potsherds. Tempering material was only partly oxidized at low temperature used during manufacture of vessels, and flakes of black carbon were present inside sherds. C¹⁴ measurements on organic-tempered potsherds were previously made by Kohl and Quitta (1963 and 1964), and by Stuckenrath (1963). Large errors may occur occasionally in dating such material, especially if carbon content of sherds is low (less

than 1%). This may be attributed either to infiltration of younger material in porous sherds, or to small amount of old organic matter in clays used in manufacture. Before dating, sherds were treated with dilute acid to remove carbonates.

K-951. Tell Shimshara, Level 13 **7940 ± 150**
5990 B.C.

Coarse, organic-tempered potsherds (undecorated Coarse Ware) from Level 13, immediately above 3 aceramic layers. Carbon content: 0.16%. *Comment:* date close to expected value.

K-972. Tell Shimshara, Level 11 **7820 ± 150**
5870 B.C.

Coarse, organic-tempered potsherds (undecorated Coarse Ware) from Level 11, above K-951. Carbon content: 0.20%. *Comment:* date close to expected value.

K-981. Tell Shimshara, Level 10 **10,030 ± 160**
8080 B.C.

Coarse, organic-tempered potsherds (undecorated Coarse Ware) from Level 10, immediately above K-972. Carbon content: 0.32%. *Comment:* old date probably due to small amount of old organic matter in clay.

K-960. Tell Shimshara, Level 9 **7300 ± 150**
5350 B.C.

Coarse, organic-tempered potsherds (undecorated Coarse Ware) from Level 9, immediately above K-981, which represents latest Neolithic habitation at Tell Shimshara. Carbon content: 0.21%. *Comment:* date close to expected value.

J. Jordan

Beidha, preceramic Neolithic village

Charcoal and charred plant material from preceramic Neolithic village at Beidha (30° 22' N Lat, 35° 26' E Long), Petra Area, Jordan. Six main building levels were differentiated, comprising 4 types of architecture in stone; each main level had its own individual phases. Implements, bones, and plant remains were discovered in layers (Kirkbride, 1966a and 1966b). Coll. 1964 and subm. by D. Kirkbride, Univ. of Oxford. *Comment:* sample from burnt roof beam in same house in layer IV as K-1084 was previously dated to BM-111, 8780 ± 200 (Kirkbride, 1966a). Samples contained considerable amount of radon, part of which entered gas samples despite radiochemical purification. After 2 to 3 weeks radon decayed. Dates are from measurements made after decay period.

K-1086. Beidha, Level VI, L. 413 **8940 ± 160**
6990 B.C.

Charcoal (*Quercus* sp.), pieces of debris, probably roofing material, from fill of burnt, segmented, round house of Level VI, oldest level.

K-1082. Beidha, Level VI, E. 130 **8710 ± 130**
6760 B.C.

Carbonized nuts (*Pistacia atlantica*) from floor of segmented, round house of Level VI, destroyed by fire. Date is average of 2 measurements: 8770 ± 160 and 8650 ± 160.

K-1083. Beidha, Level V, L. 411 **8640 ± 160**
6690 B.C.

Carbonized tree trunk (*Pistacia* sp.) found *in situ* in large posthole set in floor of burnt house in Level V.

K-1084. Beidha, Level IV, E. 2P **8730 ± 160**
6780 B.C.

Charcoal (*Juniperus* sp.), roof debris from house in Level IV, destroyed by fire.

K-1085. Beidha, Level II, F. 4 **8550 ± 160**
6600 B.C.

Charcoal (*Juniperus* sp.) near top of stone-lined pit, inside main house of late Level II.

K. Switzerland

Sumpf, Late Bronze age

Wood and charcoal from large pile dwelling at Sumpf (47° 11' N Lat, 8° 27' E Long), Canton Zug, Switzerland. Two cultural layers separated at pile dwelling, both Late Bronze age (HA/HB-Reinecke). Remains of many houses, trackways, etc., and rich collection of implements and sherds was uncovered (Speck, 1953, 1955). Coll. 1954 by J. Troels-Smith and Sv. Jørgensen, subm. by J. Troels-Smith.

K-1122. Sumpf, Hg 8769 **2600 ± 110**
650 B.C.

Charcoal (*Alnus* sp.) from upper layer.

K-996. Sumpf, SHg 490 **2690 ± 100**
740 B.C.

Wood (*Alnus* sp.) upper layer in E wall at Square 60.

K-997. Sumpf, SHg 501 **2830 ± 100**
880 B.C.

Upper end of wooden post (*Quercus* sp.), ca. 1.5 to 2 m long, standing vertically through layers.

K-998. Sumpf, SHg **2880 ± 100**
930 B.C.

Lower end of same post as in K-997.

K-1121. Sumpf, Hg 8768 **2940 ± 110**
990 B.C.

Charcoal (*Albies alba*) from lower layer.

L. Syria

Hama series

Charcoal from layer in citadel mound of Hama (35° 5' N Lat, 36° 35' E Long), Syria. Mound (the old Hamath) was excavated by Hama Expedition of Carlsberg Foundation during 1931 to 1938. Samples are from Period E, Square P 17, Building I, Room F. They originate from building timber (wainscots), torn down from walls and placed in gateway (Room F) in citadel which was burnt by Assyrians in 720 B.C. (Fugmann, 1958). Samples must be older than 720 B.C. Coll. 1935; subm. by P. J. Riis, Univ. of Copenhagen.

**K-968. Hama, Period E, P 17 (A) 2800 ± 110
850 B.C.**

Charcoal (*Juniperus* sp.) from building timber in Square P 17, Building I, Room F.

**K-969. Hama, Period E, P 17 (B) 2870 ± 110
920 B.C.**

Charcoal (*Abies* sp.) from building timber in square P 17, Building I, Room F. *Comment*: treated with paraffin, which was removed before dating.

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