

HANNOVER RADIOCARBON MEASUREMENTS I

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The following list covers the measurements in our institute until the end of 1960.

After pretreatment with HCl and NaOH the samples are converted into acetylene using the $\text{CO}_2 \rightarrow \text{Li}_2\text{C}_2$ reaction. The efficiency of the conversion $\text{CO}_2 \rightarrow \text{C}_2\text{H}_2$ always varies between 95% and 98%. The acetylene is measured at a temperature-corrected pressure of 750 mm in a 3-L copper counting tube. The background counting rate amounts to 19,9 counts/min and the net counting rate for recent wood to 33.0 counts/min. Each sample is measured 30 days after preparation for the first time and after another 20 to 30 days for the second time. For each sample the plateau of the counting gas is checked by means of an external Co^{60} source. It ranges from 4900 v to 5400 v and the slope is ca. 1%/100 v. The 50%-v (i.e. the voltage producing a counting rate that makes up exactly 50% of the plateau counting rate), the absolute counting rate at the plateau with external Co^{60} source and the coincidence counting rate all serve as controlling factors. With every measurement the sample is counted at a voltage of 5200 v for 12 to 14 hr and for control purposes, at a voltage of 5000 v for ca. five hr. For each sample the average of several individual measurements is taken by multiplying each single result by a weight-factor derived from the statistical errors of sample count, background count, and standard count. The standard applied has been adapted to the recent standard of Heidelberg by means of the enriched reference standard prepared by H. Münnich. The quoted limits of error have been calculated from the statistical errors of the measurements of sample, background, and standard.

Some of the results have been corrected according to the $\text{C}^{12}/\text{C}^{13}$ -ratio. As far as such determinations have been carried out, the σ -values indicated refer to Solnhofen limestone. The $\text{C}^{12}/\text{C}^{13}$ -measurements have been carried out in our laboratory by Paul Nitsch with a CH_4 mass spectrometer of Atlas.

Abbreviations in the following text:

NLFB = Niedersächsisches Landesamt für Bodenforschung, Hannover (Germany)

BfB = Bundesanstalt für Bodenforschung, Hannover (Germany)

SAMPLE DESCRIPTIONS**I. GEOLOGIC SAMPLES***A. Germany*

Hv-15. Rieda, Niedersachsen **1550 ± 80**

Oak wood from gravel pit Rieda (52° 53' 25" N Lat, 9° 10' 57" E Long), 6 m depth, from an ancient embankment of the Weser River, overlain by Holocene floodplain sediments. Coll. 1960 and subm. by Konrad Richter NLFB. *Comment:* dates floodplain sediments of the Weser River.

Hv-22. Landesbergen, Niedersachsen 8300 ± 120

Wood from weir dam excavation Landesbergen (52° 34' 32" N Lat, 9° 06' 45" E Long), 4.5 m depth, overlain by fluvial silt and loamy sand. Coll. 1959 and subm. by Gerd Lüttig, NLF. *Comment*: see Hv-15 and cf. Lüttig, 1960).

Hahnenmoor series, Niedersachsen

Pinus wood from a surface digging from the raised bog Hahnenmoor (52° 39' 32" N Lat, 7° 39' 37" E Long). The profile shows 3 m Sphagnum peat overlying mineral soil with a recurrence horizon at 80 to 100 cm below surface (a recurrence horizon = contact plane between underlying dark, much decomposed and overlying light, slightly decomposed Sphagnum peat). Coll. 1956 and subm. by H. D. Lang, NLF.

Hv-8. Hahnenmoor I 4650 ± 350

Wood from bog base, 3 m depth. *Comment*: bog base was dated by pollen by H. D. Lang (private communication) at ca. 3000 B.C. (Zone Boundary VIII/IX of Overbeck)

Hv-9. Hahnenmoor II 3680 ± 100

Wood from 120 cm depth. *Comment*: pollen study by H. D. Lang suggests an age of 1500-2000 B.C.

Hv-10. Hahnenmoor III 3300 ± 250

Wood from 130 cm depth. *Comment*: date was expected to be older than Hv-9. The inversion may be due to error in sample collection.

Hv-11. Oberlangen, Niedersachsen 6820 ± 600

Charcoal below a podsolic soil from a digging near Oberlangen at Ems River (52° 50' 00" N Lat, 7° 13' 22" E Long), from 50 to 65 cm below surface. Coll. 1958 and subm. by Rudolf Lüders, NLF. *Comment*: dates maximum age of podsolization.

Hohes Moor series, Niedersachsen

Peat samples from borings and surface diggings from the raised bog Hohes Moor near Rotenburg. Measurements date characteristic features of the pollen diagram, bog growth, and younger eolian sand sedimentation. Coll. 1959 and subm. by Heinrich Schneekloth. An extensive botanical, palynologic, and chemical study of Hohes Moor will be published by Schneekloth (1962).

Hv-74. Hohes Moor A, 48 to 52 cm 1740 ± 100

Peat from Section A (53° 11' 31" N Lat, 9° 26' 17" E Long), 48 to 52 cm depth. *Comment*: dates the first important rise of Carpinus pollen. Difference of some 100 yr is evident in comparison to the study by Aletsee (1958).

Hv-42. Hohes Moor A, 90 to 95 cm 1900 ± 100

Peat from Section A, 90 to 95 cm depth, immediately above the recurrence horizon. *Comment*: date does not conflict with the concept of Overbeck et al.

(1957) as to the ages of the recurrence horizons in Gifhorn Moor and Hellwege Moor.

Hv-124. Hohes Moor A, 250 cm **4640 ± 100**

Peat from Section A, 250 cm depth. *Comment*: dates the beginning fall of *Ulmus* pollen. Peat was correlated by pollen with boundary of Zones VIII/IX of Overbeck. See Hv-8 (4650 ± 350, this date list).

Hv-43. Hohes Moor A, 450 cm **8630 ± 150**

Peat from Section A, 450 cm depth. *Comment*: dates the change from soligenous to ombrogenous bog growth, which was determined by chemical means at ca. 430 cm depth.

Hv-44. Hohes Moor 83 **9750 ± 160**

Peat from Section 83 (53° 11' 41" N Lat, 9° 26' 46" E Long), at the base of the bog. *Comment*: dates beginning of bog growth in the peripheral part of Hohes Moor. In its center Late-glacial pollen spectra were found at the base.

Hv-45. Hohes Moor C **1250 ± 80**

Peat from Section C (53° 11' 50" N Lat, 9° 26' 12" E Long), immediately below an eolian sand layer. *Comment*: eolian sand sedimentation was expected to correlate with increasing farming in the early Middle Ages.

Hv-46. Hohes Moor D **5310 ± 110**

Peat from Section D (53° 11' 42" N Lat, 9° 25' 47" E Long), immediately below an eolian sand layer. *Comment*: age was expected to be similar to Hv-45.

Stade series, Niedersachsen

Peat from borings from the Stade marshy area at the mouth of Elbe River. Coll. 1959 and subm. by J. H. Benzler, NLFb. Samples date various phases of flooding by the North Sea. See Schneekloth and Wendt (1962).

Hv-26. Stade I, 50 to 56 cm **2680 ± 90**

Phragmites peat from Section I (53° 36' 51" N Lat, 9° 28' 08" E Long), from 50 to 56 cm depth, overlain and underlain by marine silty clay.

Hv-27. Stade I, 330 cm **4200 ± 90**

Alder forest peat from Section I (same locality as Hv-26) from 330 cm depth, overlain and underlain by marine silty clay. *Comment*: dates do not conflict with pollen dating by Heinrich Schneekloth. (Zones IX and X of Overbeck)

Hv-28. Stade II **3036 ± 90**

Peat from Section II (53° 36' 51" N Lat, 9° 29' 13" E Long), from 130 to 150 cm depth, overlain and underlain by marine silty clay. *Comment*: date seems to be reasonable.

Hv-30. Stade III **4840 ± 100**

Peat from Section III (53° 36' 40" N Lat, 9° 29' 03" E Long), from 475 to 505 cm depth, overlain and underlain by marine silty clay. *Comment*: date seems to be reasonable.

Twixlum series, Niedersachsen

Peat from boring from the Twixlum marshy area at the mouth of the Ems River (53° 23' 12" N Lat, 7° 07' 45" E Long). The profile shows 50 cm of fen peat, overlain by 50 cm of marine silty clay and underlain by marine silty clay. Coll. 1959 and subm. by Heinz Voigt, NLFb. Samples date flooding by the North Sea.

Hv-37. Twixlum I **1650 ± 100**

Peat from 50 to 60 cm depth, at top of layer.

Hv-38. Twixlum II **1700 ± 100**

Peat from 85 to 95 cm depth. *Comment*: difference in age between Hv-37 and Hv-38 was expected to be greater.

Neermoor series, Niedersachsen

Peat from Onken gravel pit near Neermoor (53° 18' 27" N Lat, 7° 25' 03" E Long). Profile shows 180 cm of peat overlain by 40 cm of Holocene marine silty clay and underlain by Pleistocene sand. Coll. 1959 and subm. by Heinz Voigt. Samples date bog growth and its flooding by the North Sea. See Schneekloth and Wendt (1962).

Hv-39. Neermoor I **2930 ± 70**

Sphagnum peat from 41 to 55 cm depth.

Hv-40. Neermoor II **3075 ± 100**

Sphagnum peat from 60 cm depth.

Hv-41. Neermoor III **5280 ± 100**

Carex-Phragmites peat from 210 to 220 cm depth. *Comment*: profile was correlated by pollen with the Zones VIII to X of Overbeck. C¹⁴ dates are reasonable.

Loxstedt series, Niedersachsen

Peat from borings from the marshy area from the mouth of Weser River. Coll. 1959 and subm. by H. D. Lang. Samples date sediments of the North Sea.

Hv-52. Loxstedt 58 **1800 ± 80**

Peat from Section 58 (53° 25' 51" N Lat, 8° 33' 21" E Long), from 82 to 87 cm depth. Profile shows a 7-cm peat layer overlain and underlain by marine silty clay.

Hv-53. Loxstedt 108 **2750 ± 80**

Peat from Section 108 (53° 28' 31" N Lat, 8° 34' 15" E Long), from 113 to 118 cm depth. Profile shows a 60-cm peat layer overlain and underlain by marine silty clay.

Hv-53a. Loxstedt 108 **2430 ± 100**

Same samples as Hv-53; humic-acid fraction.

Hv-54. Hagen, Niedersachsen **3500 ± 110**Peat from a boring in the marshy area at the mouth of Weser River (53° 22' 10" N Lat, 8° 30' 58" E Long), from 350 to 370 cm depth, overlain by marine silty clay. Coll. 1959 and subm. by H. D. Lang. *Comment*: dates the flooding of the North Sea in this area. Date is reasonable.**Hv-61. Navigation channel Wilhelmshaven** **> 30,000**Wood from boring in the Jade River navigation channel near Wilhelmshaven (53° 33' 35" N Lat, 8° 10' 15" E Long), from 20 to 40 m below the bottom of the sea. Coll. 1957 by Ferdinand Bohlmann, Oldenburg; subm. by Konrad Richter. *Comment*: dates North Sea sediments in the mouth of Jade River.**Nordenham T 9a series, Niedersachsen**

Peat from boring in the marshy area of the mouth of Weser River (53° 26' 30" N Lat, 8° 22' 00" E Long). Profile shows several peat layers overlain and underlain by marine silty clay. Coll. 1959 and subm. by Werner Müller, NLF. Samples date different phases of flooding by the North Sea. See Schneekloth and Wendt (1962).

Hv-97. Nordenham T 9a, 110 to 115 cm **2730 ± 100**

Raised bog peat from Section T 9a.

Hv-98. Nordenham T 9a, 135 to 140 cm **2870 ± 100**

Phragmites-Carex peat from Section T 9a.

Hv-99. Nordenham T 9a, 330 to 340 cm **3900 ± 120**

Peat; like Hv-98.

Hv-100. Nordenham T 9a, 370 to 380 cm **4380 ± 120**Peat; like Hv-98. *Comment*: pollen study suggested a greater age.**Nordenham T 9c series, Niedersachsen**

Peat from boring ca. 100 m away from the Nordenham T 9a boring. Coll. 1959 and subm. by Werner Müller. Samples date different phases of flooding by the North Sea. See Schneekloth and Wendt (1962).

Hv-101. Nordenham T 9c, 630 to 640 cm **5150 ± 120**

Phragmites peat from Section T 9c.

Hv-102. Nordenham T 9c, 665 to 670 cm **5350 ± 130**

Phragmites-Carex peat from Section T 9c.

Hv-103. Nordenham T 9c, 958 to 987 cm **6200 ± 175**

Clayey fen peat from Section T 9c.

Hv-104. Nordenham T 9c, 1062 to 1070 cm 6660 ± 120

Alnus forest peat from Section T 9c, underlain by Pleistocene sand. *Comment*: dates are reasonable.

Elsfleth series, Niedersachsen

Peat from a boring in the marshy area at mouth of Weser River near Elsfleth (53° 13' 57" N Lat, 8° 27' 20" E Long). Profile shows several peat layers overlain and underlain by marine silty clay. Coll. 1959 and subm. by Werner Müller. Samples date different phases of flooding by the North Sea. See Schneekloth and Wendt (1962).

Hv-105. Elsfleth T 19 2890 ± 110

Wood from Section T 19, 215 to 250 cm depth.

Hv-106. Elsfleth T 18, 290 to 300 cm 3200 ± 140

Clayey fen peat from Section T 18.

Hv-107. Elsfleth T 18, 370 to 380 cm 3710 ± 140

Clayey fen peat from Section T 18.

Hv-108. Elsfleth T 18, 470 to 480 cm 3940 ± 110

Fen peat from Section T 18.

Hv-109. Elsfleth T 18, 550 to 560 cm 4680 ± 150

Clayey fen peat from Section T 18.

Hv-110. Elsfleth T 18, 690 to 700 cm 4870 ± 130

Fen peat from Section T 18.

Hv-111. Elsfleth T 18, 850 to 900 cm 6050 ± 140

Alnus forest peat from Section T 18, underlain by Pleistocene sand.

General comment: dates are reasonable.

*B. Iceland***Hv-12. Husarik 1500 ± 450**

Charcoal from a digging near Husarik port (66° 2' 50" N Lat, 17° 21' 00" W Long), from the Kjökkemödding layer overlain by 2 m of eolian sand. Coll. 1958 and subm. by Konrad Richter. *Comment*: dates a landslide.

Hv-13. Stakkahlíhd I 1850 ± 100

Wood from a peat digging near Stakkahlíhd village at Lodmundarfjord (65° 22' 15" N Lat, 13° 52' 20" W Long), from the base of a bog underlain by the debris of a landslide. Coll. 1958 and subm. by Konrad Richter. *Comment*: dates a landslide. Date does not conflict with pollen dating by Heinrich Schneekloth (unpub.).

Hv-14. Stakkahlíhd II 2100 ± 100

Peat from the same locality and depth as Hv-13. *Comment*: was expected to be synchronous with Hv-13.

II. ARCHEOLOGIC SAMPLES

A. Germany

Hv-24. Hemmingen, Niedersachsen 1470 ± 70

Wood from Rehren gravel pit near Hannover (52° 19' 10" N Lat, 9° 45' 32" E Long), from (possibly) 6 m depth. Coll. 1954 and subm. by Landesmus, Hannover. *Comment*: dates a fragment of a wooden paddle or spade.

Hv-55. Dümmersee Canoe, Niedersachsen 4040 ± 100

Wood from a digging near Dümmersee (52° 28' 50" N Lat, 8° 17' 10" E Long), from ca. 1 m depth. Coll. 1959 and subm. by Konrad Richter. *Comment*: dates a canoe (?) above a Mesolithic layer.

Hv-56. Verden, Niedersachsen 1000 ± 80

Wood from the sandy filling of a circular rampart in Verden (52° 54' 50" N Lat, 9° 14' 10" E Long). Coll. and subm. by Detlev Schünemann, Verden. *Comment*: dates the rampart which was expected to belong to the period of Heinrich I, German king (A.D. 919-936). See Schünemann (1960).

Hv-58. Xanten I, Nordrhein-Westfalen 1975 ± 100

Oak wood from a levelled building of Roman Age (51° 39' 46" N Lat, 6° 26' 43" E Long), from ca. 2.1 m depth below floodplain sediment. Coll. 1959 and subm. by Wilhelm Wolff, Geol. Landesamt Krefeld. *Comment*: age of the settlement as expected.

Hv-59. Xanten II, Nordrhein-Westfalen 1740 ± 80

Pine wood from the bottom casing of a small lime pit (51° 40' 02" N Lat, 6° 26' 28" E Long), from ca. 1.7 m depth below excavation of Roman-Age buildings. Coll. 1959 and subm. by Wilhelm Wolff. *Comment*: dates the lime pit.

Hv-83. Kelheim, Bayern 1000 ± 90

Charcoal from a presumed pile from the wall of a gravel pit (48° 58' 10" N Lat, 11° 53' 50" E Long), from 90 to 120 cm depth. Coll. 1959 and subm. by Friedrich Kohl, Geol. Landesamt München. *Comment*: dates the charcoal pile.

B. Bolivia

Kalasya series, Tiahuanacu

Charcoal from the temple field Kalasya (16° 33' S Lat, 68° 41' W Long). Coll. 1959 and subm. by Hannfrit Putzer, BfB.

Hv-17. Kalasya, 50 cm 240 ± 80

Charcoal from 50 cm depth. *Comment*: sample was later proved not to belong to the culture layer.

Hv-18. Kalasya, 175 cm 1630 ± 130

Charcoal from 175 cm depth.

Hv-19. Kalasya, 180 cm **1645 ± 80**

Charcoal from 180 cm depth. *Comment*: dates of Hv-18 and Hv-19 are reasonable.

Hv-87. Buena Vista Mine **>25,000**

Wood from the Cangalli conglomerate from the Buena Vista mine near Rio Tipuani (15° 35' S Lat, 68° 10' W Long). Coll. 1959 and subm. by Hans Freydanck, BfB.

Hv-114. Icla-Chullpamoko, 140 cm **850 ± 90**

Charcoal and bone from 140 cm depth from a post-Tiahuanacu pottery layer (19° 20' S Lat, 64° 48' W Long). Coll. 1953 and subm. by H. D. Disselhoff and H. Walter, Ethnol. Mus., Berlin.

Hv-115. Icla-Chullpamoko, 270 cm **1000 ± 170**

Charcoal from 270 cm depth from same locality as Hv-114. Coll. 1958 and subm. by H. D. Disselhoff and H. Walter Ethnol.

Hv-116. Cliza-Chullpapata **1850 ± 90**

Carbonized seed (*Schinus molle*) from Prace-Tiahuanacu settlement (17° 35' S Lat, 65° 55' W Long), from 40 cm depth. Coll. 1958 and subm. by H. D. Disselhoff and H. Walter. *Comment*: seed found together with pottery corresponding to Rydens pottery from Chullpa Pampa (Grasso, 1952; 1955). Prace-Tiahuanacu age; see Crane and Griffin (1959, p. 192), sample M-510, 1680 ± 300.

Hv-121. Huancarani **2750 ± 100**

Charcoal from excavation Huancarani (17° 12' S Lat, 67° 55' W Long), from 150 to 170 cm depth. Coll. 1958 and subm. by H. D. Disselhoff and H. Walter. *Comment*: the excavated mound contained bone tools, simple pottery (ollas), some stone tools, and many guanaco and deer bones. Findings are very similar to those of younger Ongamira layers (Cordoba, Argentine). See Disselhoff 1960; Menghin and Gonzales, 1954.

III. CROSS-CHECK SAMPLE

Hv-63. St. Walburgkerk **1075 ± 95**

Oak wood from a church at Groningen (53° 12' N Lat, 6° 36' E Long), Netherlands. Subm. by Hl. de Vries, University of Groningen. *Comment*: $\delta = -23\%$. Wood of the same origin has been dated by several others (see list in U-69, Olsson, 1959, p. 100).

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