[RADIOCARBON, VOL. 9, 1967, P. 218-236]

HANNOVER RADIOCARBON MEASUREMENTS V

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INTRODUCTION

This date list contains a selection of C^{14} dates of geological samples obtained from March 1963 until July 1966. The preceding date lists (Hannover I, III, IV) give a description of preparation and measuring methods.

The C^{14} ages were calculated with Libby's half-life of 5568 yr. The year of reference is 1950. The modern standard has been taken as 95% of NBS oxalic-acid for organic samples. Variations of isotope fractionation were not considered in the calculation of C^{14} dates because the age shifts caused by them lie within the statistical limits of error. Infinite ages were stated on criterion of $+2\sigma$ above background, according to 97.5% probability for the confidence interval.

Abbreviations in the following text are N.L.f.B. for Niedersächsisches Landesamt für Bodenforschung, Hannover (Germany); B.f.B. for Bundesanstalt für Bodenforschung, Hannover (Germany); and G. L. for Geologisches Landesamt.

The author thanks Erika Guhlich, Renate Eichhorn and Norgart Lutz for their excellent work in chemical preparation and measurement of samples, Heinrich Schneekloth for helpful discussion, and all submitters of samples for their comments.

SAMPLE DESCRIPTIONS

A. Germany

Kehdingen series, Niedersachsen

Sphagnum peat from Kehdinger Moor, near Hammelwörden. Coll. 1964 and subm. by Heinrich Schneekloth, N.L.f.B. Age determinations of recurrence horizon (SWK) from 8 different profiles within region of same bog were made both by C^{14} and by pollen-analysis (H. Schneekloth). Stratigraphically, profiles were typical of raised bogs, with dark and light peat above valley bog peat and thick marine clay (Schneekloth, 1967a).

Hv-664. Kehdingen, Profile 1, 80 to 90 cm **2100 ± 70 / 150 B.C.**

Sphagnum acutifolia peat, directly above SWK (53° 45′ 24″ N Lat, 9° 16′ 51″ E Long).

Hv-665. Kehdingen, Profile 1, 125 to 135 cm **2765 ± 80 / 815 B.C.**

Sphagnum acutifolia peat, from same boring as Hv-664.

1620 ± 75

Hv-666. Kehdingen, Profile 2, 80 to 90 cm A.D. 330

Sphagnum cymbifolia peat, directly above SWK (53° 45′ 55″ N Lat, 9° 14′ 34″ E Long).

1850 ± 70

Hv-667. Kehdingen, Profile 3, 60 to 70 cm A.D. 100

Sphagnum acutifolia peat, directly above SWK (53° 43′ 40″ N Lat, 9° 17′ 59″ E Long).

2130 ± 85

Hv-668. Kehdingen, Profile 4, 95 to 105 cm 180 B.C.

Sphagnum acutifolia peat, directly above SWK (53° 43′ 51″ N Lat, 9° 16′ 20″ E Long).

2030 ± 80

Hv-669. Kehdingen, Profile 5a, 100 to 108 cm 80 B.C.

Sphagnum cymbifolia peat, directly above SWK (53° 44′ 30″ N Lat, 9° 17′ 50″ E Long).

1895 ± 75

Hv-670. Kehdingen, Profile 5b, 10 to 110 cm A.D. 55

Sphagnum cymbifolia peat, directly above SWK (53° 44′ 27″ N Lat, 9° 17′ 56″ E Long).

2035 ± 80

Hv-671. Kehdingen, Profile 6, 95 to 105 cm 85 B.C.

Sphagnum cymbifolia-cuspidata peat, directly above SWK (53° 45′ 57″ N Lat, 9° 16′ 1″ E Long).

1845 ± 70

Hv-672. Kehdingen, Profile 7, 65 to 73 cm A.D. 105

Sphagnum acutifolia-cuspidata peat, directly above SWK (53° 44′ 37″ N Lat, 9° 16′ 12″ E Long).

General Comment (H.S.): pollen-analytical dating yielded age differences for a single recurrence horizon in different profiles of same bog which are satisfactorily confirmed by C^{14} dating (Schneekloth, 1967a). The fact that SWK of same bog is not necessarily of same age was already verified in Gifhorn bog (Hannover III; Schneekloth, 1965).

Sievershausen series, Niedersachsen

Peat samples from five bogs of different developmental type in Southern Niedersachsen mountain region (Solling mountains). Coll. 1963, 1964 and subm. by H. Schneekloth. In connection with geological mapping, they were subjected to pollen-analytical (by H. Schneekloth) and C^{14} dating in order to get deeper knowledge on development of bogs and forest history in this area.

1060 ± 50

Hv-604. Torfmoor, 50 to 60 cm A.D. 890

Sphagnum acutifolia peat, slightly decomposed, from a boring (51° 45′ 33″ N Lat, 9° 33′ 44″ E Long).

1625 ± 60

Hv-605. Torfmoor, 110 to 120 cm **A.D. 325**

Sphagnum-Eriophorum peat, from same boring as Hv-604.

3515 ± 80

Hv-606. Torfmoor, 190 to 200 cm **1565 B.C.**

Sphagnum acutifolia peat, from same boring as Hv-604.

4100 ± 75

Hv-607. Torfmoor, 280 to 290 cm **2150 B.C.**

Sphagnum acutifolia peat, from same boring as Hv-604.

5000 ± 75

Hv-608. Torfmoor, 330 to 380 cm **3050 B.C.**

Sphagnum acutifolia peat, from same boring as Hv-604.

4875 ± 75

Hv-609. Torfmoor, 390 to 400 cm **2925 B.C.**

Birch-wood peat, from same boring as Hv-604.

Comment: some important pollen-floristical characteristics (Steckhan, 1961) were to be checked by C^{14}. Good conformity was established.

1720 ± 70

Hv-601. Mecklenbruch, 100 to 110 cm **A.D. 230**

Sphagnum acutifolia peat, slightly decomposed, from a boring (51° 46′ 55″ N Lat, 9° 33′ 30″ E Long).

2630 ± 80

Hv-600. Mecklenbruch, 200 to 210 cm **680 B.C.**

Sphagnum acutifolia peat, slightly decomposed, from same boring as Hv-601.

3180 ± 80

Hv-908. Mecklenbruch, 270 to 280 cm **1230 B.C.**

Sphagnum acutifolia peat, slightly decomposed, from same boring as Hv-601.

3485 ± 80

Hv-907. Mecklenbruch, 350 to 360 cm **1535 B.C.**

Strongly decomposed *Sphagnum-Carex* peat with birch-wood, from same boring as Hv-601. *Comment* (H.S.): some important pollen-floristical characteristics (Knörzer, 1949) were to be checked by C^{14}. As far as the relatively atypical pollen diagram will permit evaluation, final results are in accordance with presumptions.

3935 ± 80

Hv-906. Ahlequellemoor, 50 to 60 cm **1985 B.C.**

Forest-bog peat from a boring (51° 43′ 55″ N Lat, 9° 30′ 38″ E Long).

5690 ± 80

Hv-599. Ahlequellemoor, 120 to 130 cm **3740 B.C.**

Carex peat with wood remains, from same boring as Hv-906. *Com-*

ment (H.S.): investigations clarify process of Holocene peat transformation of the graben, of Tertiary origin, near Neuhaus. The considerable age of uppermost peat layers was surprising, but it does not contradict pollen-analytical results.

2555 ± 75

Hv-903. Friedrichshausen, 105 to 112 cm **605 B.C.**

Forest-bog peat from a boring (51° 46′ 9″ N Lat, 9° 35′ 21″ E Long). *Comment:* dating served to correlate pollen diagram, covering a short period of time, with C^{14} time scale.

3190 ± 75

Hv-905. W-Hülsebruch, 50 to 60 cm **1240 B.C.**

Carex peat from a boring (51° 43′ 22″ N Lat, 9° 36′ 6″ E Long).

4385 ± 85

Hv-904. W-Hülsebruch, 110 to 120 cm **2435 B.C.**

Forest-bog peat, from same boring as Hv-905. *Comment* (H.S.): dating served to correlate pollen diagram, covering a short period of time, with C^{14} time scale.

General Comment (H.S.): dates prove the time of approx. 3500 B.C. for beginning of continuous Fagus curve, approx. 900 B.C. for rapid increase of Fagus curve, approx. 1200 B.C. for Corylus peak C IV, and approx. A.D. 750 for beginning of continuous cereal curve; less than 100 km away from Solling mountains, increase of the Fagus curve in Harz mountains was dated approx. 1600 B.C. (Willutzki, 1962). Pollen-analytical and C^{14} dates within and between profiles could be correlated (Schneekloth, 1967b).

Zwillbrocks series, Westfalen

Samples originate from exposure in Zwillbrock Venn (52° 52′ 55″ N Lat, 6° 41′ 27″ E Long). Coll. 1964 and subm. by Ernst Burrichter, Bot. Inst. of Univ., Münster. C^{14} and pollen-analytical datings were carried out to investigate vegetational development of Zwillbrock Venn and forest history of surroundings. Pollen-analysis by E. Burrichter.

1400 ± 100

Hv-806. Zwillbrock, 53 cm **A.D. 550**

Sphagnum peat was correlated, by presence of cereal pollen, to end of period of interrupted settlement, i.e. the time of mass migration.

1655 ± 100

Hv-806. Zwillbrock, 53 cm **A.D. 295**

Sphagnum peat was correlated, by absence of cereal pollen, to beginning of period of interrupted settlement at time of mass migration.

3620 ± 110

Hv-808. Zwillbrock, 78 cm **1670 B.C.**

Cyperaceae peat, pollen-analytically dated, because of start of rational beech curve, at 1500 B.C.

5315 ± 120
Hv-807. Zwillbrock, 95 cm **3365 B.C.**

Cyperaceae peat, not datable by pollen-analysis, because of contorted profile.

6045 ± 75
Hv-610. Zwillbrock, 120 cm **4095 B.C.**

Charcoal from charred layer in forest peat, correlated by pollen-analysis to a time after elm decline.

General Comment (E.B.): C^{14} and pollen-analytical dates are correlated and show that age for time of elm decline and of beech dispersal of Westfälische Bucht is older than that for Emsland and Dutch bogs, because immigration of trees took place from S.

Dätgen series, Holstein

Peat samples directly below and above SWK, from an exposure of Grosse Moor near Dätgen (54° 9′ 42″ N Lat, 9° 55′ 12″ E Long), from three profiles in the immediate neighbourhood. Coll. 1963 and subm. by Ludwig Aletsee, Bot. Inst. der Univ., Kiel. Dating should clear problem of whether SWK in hummocks and hollows a short distance apart would be of equal age, and of whether the hiatus determined by pollen-analysis (Aletsee, 1959) really reflects a break in bog growth. Pollen-analysis by L. Aletsee.

2755 ± 65
Hv-673. Dätgen, Profile A-I **805 B.C.**

Slightly decomposed light peat, 0 to 2 cm above SWK.

2995 ± 65
Hv-674. Dätgen, Profile A-I **1045 B.C.**

Slightly decomposed dark peat, 0 to 2 cm below SWK.

2820 ± 80
Hv-675. Dätgen, Profile A-II **870 B.C.**

Slightly decomposed light peat, 0 to 2 cm above SWK.

2820 ± 80
Hv-676. Dätgen, Profile A-II **870 B.C.**

Slightly decomposed dark peat, 0 to 2 cm below SWK.

2810 ± 75
Hv-677. Dätgen, Profile A-III **860 B.C.**

Slightly decomposed light peat, 0 to 2 cm above SWK; sample from same layer dated by Heidelberg (subm. 1961 by L. Aletsee, 2860 ± 70, H-1590a/1139, unpub.) and by Kiel (subm. 1964 by L. Aletsee, 2470 ± 90, KI-65, unpub.).

2935 ± 80
Hv-678. Dätgen, Profile A-III **985 B.C.**

Slightly decomposed dark peat, 0 to 2 cm below SWK; sample from same layer dated by Heidelberg (subm. 1961 by L. Aletsee, 2965 ± 60;

H-1590b/1257, unpub.) and by Kiel (subm. 1964 by L. Aletsee, 2500 ± 80; KI-64, unpub., and 2700 ± 200, KI-11; Kiel 1966).

General Comment (L.A.): by pollen-analysis, no age differences can be established for SWK horizons of Profiles A-I, A-II and A-III. All belong to Zone IX/X (of Firbas, 1949). In Profile A-I, SWK has hummock position. Stronger humification underneath SWK indicates a temporary stagnation of peat growth. Humification above and below the recurrence horizon of Profile A-II, taken in a hollow, is little different. Profile A-III shows a sharply defined SKW which suggests a shorter phase of stagnation in peat growth towards end of dark peat period. However, SWK is of same C^{14} age in all Profiles.

Schöhsee series, Holstein

Sedimentary samples from boring in the Schöhsee (54° 9′ 58″ N Lat, 10° 26′ 4″ E Long). Coll. 1964 by Massoud Saad; subm. by Waldemar Ohle, Hydrolog. Anstalt (Max-Planck-Gesell.), Plön. Pollen-analytical and C^{14} investigations were carried out to explore history of development of the Schöhsee. Pollen-analysis by W. Ohle.

Hv-1058. Schöhsee, 200 to 235 cm **3125 ± 100**
1175 B.C.

Sample was pollen-analytically correlated to Zone X/XI.

Hv-1059. Schöhsee, 235 to 265 cm **3240 ± 115**
1290 B.C.

Sample is pollen-analytically of same age as Hv-1058.

Hv-1060. Schöhsee, 500 to 530 cm **7515 ± 195**
5565 B.C.

Sample was pollen-analytically correlated to middle of Zone VIII.

General Comment: dates give information on speed of sedimentation in the Schöhsee.

Marsh series, Schleswig-Holstein

Peat samples from various borings in Schleswig-Holstein Marsh region of North Sea coast. Stratigraphic sequence shows alternatively silty clay and little-decayed peat, sporadically occurring down to −20 m. Clay layers can be assigned to the well-known five pre-Christian transgressions. Coll. 1961 by Georg Brand, Burchard Mencke and Siegfried Bressau; subm. by Adolf Dücker, G. L. Schleswig-Holstein, Kiel. C^{14} and pollen-analytical dates serve to distinguish different flooding sequences of North Sea and to adapt Schleswig-Holstein chronology of the marine Holocene to the Dutch one (Brand and others, 1965). Pollen-analysis by R. Averdiek and B. Mencke.

Hv-176. Meldorf, 127 to 140 cm **2690 ± 105**
740 B.C.

Weakly clayey *Phragmites* peat from a boring (54° 7′ 15″ N Lat, 9° 8′ 26″ E Long), overlain by silty clay of the Schwabstedt bed. Pollen-analytically dated as late sub-Boreal.

Hv-179. Meldorf, 315 to 335 cm **4160 ± 125 / 2210 B.C.**

Carex peat from same boring as Hv-176, underlain by Husum bed; pollen-analytically classified as early sub-Boreal.

Hv-181. Meldorf, 459 to 475 cm **5480 ± 135 / 3530 B.C.**

Phragmites peat from same boring as Hv-176, underlain by silty clay of Eesch bed; pollen-analytically dated as late Atlantic.

Hv-183. Meldorf, 581 to 591 cm **7825 ± 100 / 5875 B.C.**

Forest-bog peat from same boring as Hv-176, overlain by silty clay from Eesch bed.

Hv-184. Meldorf, 660 to 670 cm **9230 ± 100 / 7280 B.C.**

Forest-bog peat from same boring as Hv-176, overlain by silty clay of Barlt bed.

Hv-185. Meldorf, 707 to 727 cm **11,950 ± 130 / 10,000 B.C.**

Carex peat from same boring as Hv-176, overlain by gyttja and underlain by Pleistocene sands. *Comment:* C^{14} dates are in conformity with pollen-analysis and show that ages of both older marine transgressions (Barlt and Eesch) are higher than expected geologically.

Hv-629. Delve, 545 to 560 cm **6130 ± 85 / 4180 B.C.**

Phragmites peat of a boring (54° 18′ 17″ N Lat, 9° 15′ 40″ E Long); marks termination of first transgression traceable in this region (Eesch bed).

Hv-622. Delve, 1280 to 1290 cm **9750 ± 115 / 7800 B.C.**

Peat from same boring as Hv-629. *Comment:* pollen-analytically dated to early Boreal (Zone VI of Overbeck). Dating clears the problem of whether the older dating (7600 B.C.) or the new one (approx. 6900 B.C.) (Straka, 1961) is valid.

Hv-631. Delve, 305 to 320 cm **4395 ± 100 / 2445 B.C.**

Peat from boring (54° 18′ 37″ N Lat, 9° 15′ 42″ E Long); marks termination of second transgression in this region. *Comment:* end of the flooding is given in the Netherlands as 2300 B.C. (De Jong, 1960).

Hv-627. Delve, 490 to 500 cm **4860 ± 275 / 2910 B.C.**

Phragmites peat from a boring (54° 18′ 3″ N Lat, 9° 15′ 40″ E Long); marks start of elm decline. *Comment:* pollen-analytically dated approx. 3000 B.C. (Willutzki, 1962).

6945 ± 90

Hv-628. Wallen, 1180 to 1200 cm **4995 B.C.**

Forest-bog peat from a boring (54° 17′ 27″ N Lat, 9° 15′ 51″ E Long); marks start of transgression in this region (Eesch bed). Age conformable with Hv-217, Hv-218, Hv-222.

1715 ± 65

Hv-767. Bergewöhrden, 80 to 90 cm **A.D. 235**

Peat from a boring in raised bog of Bergewöhrden (54° 18′ 38″ N Lat, 9° 13′ 58″ E Long), immediately above recurrence horizon; pollen-analytically, break in *Carpinus*-curve and beginning of Secale pollen point to short stratigraphic hiatus in post-Christian time (Nietsch, 1958).

2010 ± 65

Hv-768. Bergewöhrden, 95 to 100 cm **60 B.C.**

Peat from same boring as Hv-767, immediately below SWK; pollen-analysis shows beginning of *Carpinus* spread approx. 1950 B.C. (Kubitzki, 1961).

2405 ± 80

Hv-766. Bergewöhrden, 140 to 150 cm **455 B.C.**

Peat from same boring as Hv-767; marks beginning of last pre-Christian transgression (Schwabstedt bed); pollen-analytically classified to main phase of Fagus dominanee in Zone VIII/IX (Firbas, 1949).

3010 ± 70

Hv-765. Bergewöhrden, 180 to 190 cm **1060 B.C.**

Sample from same boring as Hv-767; marks pollen-analytically beginning of *Corylus* decline (approx. 1100 B.C.).

3640 ± 85

Hv-764. Bergewöhrden, 235 to 245 cm **1690 B.C.**

Peat from same boring as Hv-767; marks Meldorf bed (Lüttig, 1965). *Comment:* C^{14} and pollen-analytical dates of Bergewöhrden peat samples confirm previous ideas about sequence of transgressions in this region.

1090 ± 90

Hv-231. Husum, 40 to 50 cm **A.D. 860**

Peat from a boring (54° 26′ 29″ N Lat, 9° 6′ 7″ E Long); marks beginning of first post-Christian flooding.

1825 ± 50

Hv-243. Husum, 137 to 148 cm **A.D. 125**

Peat from a boring (54° 26′ 5″ N Lat, 9° 4′ 43″ E Long): corresponds to top of Schwabstedt bed.

2520 ± 90

Hv-237. Husum, 110 to 120 cm **570 B.C.**

Peat from a boring (54° 27′ 42″ N Lat, 9° 3′ 27″ E Long); corresponds to beginning of Schwabstedt bed in conformity with pollen-analytical results (Hv-766).

3110 ± 80

Hv-242. Husum, 210 to 220 cm **1160 B.C.**

Peat from same boring as Hv-243; corresponds to top of Meldorf bed.

3500 ± 80

Hv-220. Husum, 195 to 205 cm **1550 B.C.**

Peat from a boring (54° 25′ 20″ N Lat, 9° 1′ 19″ E Long); stratigraphically close to top of Meldorf bed.

4000 ± 80

Hv-229. Husum, 200 to 215 cm **2050 B.C.**

Peat from same boring as Hv-231; marks beginning of flood sequence IV in Schleswig-Holstein.

3620 ± 115

Hv-241. Husum, 257 to 267 cm **1670 B.C.**

Peat from same boring as Hv-243; stratigraphically corresponds to beginning of Meldorf bed (Hv-229, Hv-215).

3670 ± 100

Hv-215. Husum, 335 to 345 cm **1720 B.C.**

Peat from a boring (54° 25′ 19″ N Lat, 9° 4′ 26″ E Long); marks beginning of flood sequence IV (Meldorf bed).

4450 ± 80

Hv-219. Husum, 240 to 250 cm **2500 B.C.**

Peat from same boring as Hv-220; stratigraphically corresponds to upper Fiel bed (Hv-228).

4730 ± 100

Hv-228. Husum, 300 to 315 cm **2780 B.C.**

Peat from same boring as Hv-231; stratigraphically classified into upper Fiel-bed (Hv-219).

5740 ± 80

Hv-213. Husum, 710 to 750 cm **3790 B.C.**

Shell sample from a boring (54° 24′ 6″ N Lat, 9° 3′ 12″ E Long), from lower Fiel bed.

6050 ± 170

Hv-232. Husum, 530 to 440 cm **4100 B.C.**

Basal peat from a boring (54° 27′ 8″ N Lat, 9° 5′ 32″ E Long), lying underneath Fiel bed.

5740 ± 110

Hv-238. Husum, 647 to 662 cm **3790 B.C.**

Peat from same boring as Hv-231, fixes beginning of II-B flooding in Schleswig-Holstein (Hv-226).

5930 ± 90

Hv-226. Husum, 730 to 745 cm **3980 B.C.**

Peat from same boring as Hv-231; stratigraphically classified to II-B flooding (Hv-238).

6350 ± 80

Hv-224. Husum, 800 to 815 cm **4400 B.C.**

Basal peat from a boring (54° 26′ 45″ N Lat, 9° 6′ 0″ E Long), directly below Eesch bed.

6500 ± 140

Hv-222. Husum, 950 to 960 cm **4550 B.C.**

Basal peat from same boring as Hv-231, 10 cm below Eesch bed. Pollen-analytically of same age as Hv-628.

7100 ± 125

Hv-217. Husum, 1310 to 1320 cm **5150 B.C.**

Basal peat from a boring (54° 24′ 14″ N Lat, 9° 1′ 45″ E Long), 20 cm below Eesch bed (Hv-628).

7500 ± 170

Hv-218. Husum, 1140 to 1150 cm **5550 B.C.**

Basal peat from same Boring as Hv-220, 30 cm below Eesch bed (Hv-628).

8400 ± 100

Hv-225. Husum, 795 to 810 cm **6450 B.C.**

Basal peat from same Boring as Hv-231, 25 cm below Eesch bed.

General Comment: pollen-analytical and C^{14} results are in excellent agreement. Dates permit classification of the marine Holocene on North Sea coast of Schleswig-Holstein, which has many parallels to Dutch and Niedersachsen classifications. Common to all the three regions is occurrence of four different transgressions prior to Christian era. Thus, beginning of Eesch bed must have been approx. 5000 B.C.; that of Fiel bed approx. 3500 B.C.; that of Meldorf bed approx. 1900 B.C., that of Schwabstedt bed approx. 600 B.C. (Brand and others, 1965).

Bordelum series, Nordfriesland

Peat samples from three profiles from raised bog in Bordelum (54° 37′ 57″ N Lat, 8° 55′ 13″ E Long). Coll. 1964 and subm. by Rolf Wiermann, Bot. Inst. der Univ., Kiel. C^{14} dates clarify the bog and marsh history in S-Nordfriesland. Pollen-analytical results (Wiermann, 1962) are to be tested against C^{14} time scale. Pollen-analysis by R. Wiermann.

1370 ± 60

Hv-644. Bordelum, Profile A, 63 to 66 cm **A.D. 580**

Fen peat of 0 to 3 cm below peat/clay contact.

1570 ± 65

Hv-650. Bordelum, Profile B, 109 to 112 cm **A.D. 380**

Fen peat of 0 to 3 cm below peat/clay contact.

1600 ± 60

Hv-653. Bordelum, Profile C, 63 to 66 cm **A.D. 350**

Fen peat of 0 to 3 cm below peat/clay contact. *Comment:* the calculated average value of A.D. 440 ± 40 for beginning of flooding that

caused formation of peat/clay contact agrees well with pollen-analytical results.

Hv-645. Bordelum, Profile A, 66 to 69 cm **1750 ± 60 A.D. 200**
Fen peat of 3 to 6 cm below peat/clay contact.

Hv-652. Bordelum, Profile B, 66 to 69 cm **1740 ± 135 A.D. 210**
Fen peat of 3 to 6 cm below peat/clay contact.

Hv-654. Bordelum, Profile C, 66 to 69 cm **1650 ± 60 A.D. 300**
Fen peat of 3 to 6 cm below peat/clay contact.

Hv-643. Nordstrandischmoor, 50 to 55 cm **1670 ± 240 A.D. 280**
Slightly decomposed Sphagnum peat from a boring (54° 33′ 3″ N Lat, 8° 48′ 14″ E Long).
General Comment: dates fix age of a pollen-analytically equivalent level (rapidly increasing Fagus curve) over large area of marshes on coast of North Sea (Wiermann, 1966).

Dornum series, Niedersachsen

Peat from two borings in marsh sediment near Dornum. Sample layer is overlain by calcareous silty clay and underlain by sand. Coll. 1963 and subm. by H. D. Lang, N.L.f.B. Samples date marsh sediments.

Hv-543. Dorum, 2.0 to 2.2 m **2710 ± 50 760 B.C.**
Samples from a boring (57° 39′ 3″ N Lat, 7° 24′ 41″ E Long).

Hv-545. Dorum, 2.6 to 2.8 m **4070 ± 120 2120 B.C.**
Sample from same profile as Hv-543.

Hv-542. Dorum, 2.0 to 2.2 m **3160 ± 70 1210 B.C.**
Sample from a boring (53° 39′ 11″ N Lat, 7° 24′ 32″ E Long).

Hv-544. Dorum, 2.6 to 2.8 m **4010 ± 90 2060 B.C.**
Sample from same boring as Hv-542.
General Comment (H.D.L.): in view of geological situation and altitude of peat layers, ages varying from 3000 to 4000 B.P. were expected (Müller, 1962). Peat growth in this region was estimated at approx. 80 cm/1000 yr.

Leppersum series, Niedersachsen

Peat samples from an exposure in marsh near Leppersum (53° 26′ N Lat, 7° 12′ E Long). Coll. 1965 and subm. by Manfred Renger, N.L.f.B. Samples correlate Holocene transgressions of North Sea.

1680 ± 70

Hv-891. Leppersum, Profile 11 **A.D. 270**

Sample, depth 74 to 76 cm, stratigraphically placed in jo_1 (Müller, 1962).

2015 ± 75

Hv-889. Leppersum, Profile 150 **65 B.C.**

Sample, depth 47 to 49 cm, from same layer as Hv-891.

3805 ± 80

Hv-890. Leppersum, Profile 150 **1855 B.C.**

Sample, depth 110 to 115 cm, from stratigraphical layer ju_2.

General Comment (M.R.): good agreement with pollen-analysis and other C^{14} dates from same region (Müller, 1962) was achieved.

1805 ± 70

Hv-1158. Dalheim, Nordrhein-Westfalen **A.D. 145**

Charcoal from a charred layer, depth 55 to 60 cm, near Dalheim (51° 34′ 25″ N Lat, 8° 48′ 40″ E Long), embedded in loess loam. Coll. 1965 and subm. by E. von Zezschwitz, G. L. Nordrhein-Westfalen, Krefeld. *Comment:* according to former geologic concepts, covering of charred layer by loess loam should have taken place after clearing period in Middle ages, approx. 13th century A.D. C^{14} age is in conformity with stratigraphy.

Geislingen series, Baden-Württemberg

Samples from various core drillings near Geislingen (48° 36′ 30″ N Lat, 9° 50′ 34″ E Long). Stratigraphic sequence shows alternating beds of humus mud and calcareous tuffs. Coll. 1965 and subm. by Paul Groschopf, G. L. Baden-Württemberg, Stuttgart. Samples date postglacial valley sediments, in particular the calcareous tuffs and mud from Rohrach valley in Schwäbische Alb.

8305 ± 100

Hv-971. Geislingen, Profile 7, 6.5 m **6355 B.C.**

Birchwood from peat layer, overlain by mud and underlain by calcareous tuffs, from higher stratigraphic position than Hv-1147 and Hv-975.

7880 ± 105

Hv-972. Geislingen, Profile 7, 7.3 m **5930 B.C.**

Calcareous mud, underlain by pure mud, overlain by peat.

9420 ± 115

Hv-973. Geislingen, Profile 7, 10.0 m **7470 B.C.**

Calcareous mud underlain by calcareous tuff.

9840 ± 110

Hv-974. Geislingen, Profile 7, 12.5 m **7890 B.C.**

Wood from basal mud; a sample from same layer was dated by Heidelberg (9290 ± 190, H-126/143, unpub.); stratigraphically the same layer as Hv-1148.

7620 ± 95

Hv-975. Geislingen, Profile 140, 7.0 m **5670 B.C.**

Peat overlain by mud and underlain by calcareous tuff; same layer as Hv-1147.

6870 ± 90

Hv-1147. Geislingen, Profile 8, 9.5 m **4920 B.C.**

Peat overlain by calcareous tuff and underlain by mud, from same layer as Hv-975, but lying deeper.

9445 ± 100

Hv-1148. Geislingen, Profile 8, 15.0 m **7495 B.C.**

Peat mud underlain by calcareous mud and gravels. Stratigraphically the same layer as Hv-974.

General Comment (P.G.): datings of basal mud from neighbourhood confirm age of samples Hv-1148 and Hv-974 (Groschopf, 1961). Investigations proved that 15-m-thick calcareous tuff layers may form in less than 5000 yr; thus they provide some insight into climatic cycle of Southern Germany. Age of Hv-971 is not explainable. Calculation of C^{14} ages of calcareous mud was done under assumption of a C^{14} recent activity of 85% modern.

10,730 ± 105

Hv-546. Nienhagen, Nordrhein-Westfalen **8780 B.C.**

Peat sample and wood from an exposure, depth 3 m, at cuesta of Werra valley near Nienhagen (51° 57′ 14″ N Lat, 8° 49′ 23″ E Long), overlain by driftsand, underlain by low-terrace sand. Coll. 1963 and subm. by Heinrich Wortmann, G. L. Nordrhein-Westfalen, Krefeld. *Comment* (H.W.): according to Stoller's stratigraphy (Stroller, 1916), the driftsands originated from Eem interglacial period. Pollen-analysis by H. Rehhagen, G. L. Krefeld, suggested correlation with Zone IIb of Firbas (approx. 11,850 to 10,850 B.P.). Thus driftsands must be regarded as low-terrace sediments of the Alleröd.

21,500 ± 800

Hv-656. Adelsheim, Baden-Württemberg **19,550 B.C.**

Calcareous tuff from a recent exposure, depth 0.9 m, near Adelsheim (49° 24′ 13″ N Lat, 9° 23′ 43″ E Long). Sample stems from a Muschelkalk outcrop 15 m above valley floor; it was found in a tuffaceous layer of several meters' thickness. Coll. 1964 and subm. by Helmut Prier, G. L. Baden-Württemberg, Freiberg. *Comment:* examination of the gastropod fauna revealed frequent occurrence of *Belgrandia germanica,* which is said to have died out at end of Riss-Würm interglacial (approx. 120,000 yr) (Maeck, 1963). C^{14} result indicates contamination, perhaps by infiltrated water.

Hv-732. Neukirchen, Nordrhein-Westfalen **> 44,800**

Wood from freezing shaft, dept 14 m, in valley of Rhein river near Neukirchen (51° 26′ 38″ N Lat, 6° 33′ 12″ E Long), imbedded in gravels of the river Rhein. Coll. 1964 and subm. by Karl Thomé, G. L.

Nordrhein-Westfalen, Krefeld. *Comment:* sample intended to date middle terrace sediments which, according to geological findings, may originate from Postglacial or Holstein Interglacial (Moeser-Schichten) (Steeger, 1952). It is not Postglacial.

Celle series, Niedersachsen

Charcoal from an exposure near Celle (52° 37′ 34″ N Lat, 10° 5′ 00″ E Long), stratigraphic sequence shows 1 m rubble, 3 m fluviatile sand, underlain by thin peat layer, underlain in turn by pebbles. Coll. 1964 and subm. by H. D. Lang. Dates served the investigation of a geological profile in Aller glacial channel, composed of Holocene and Pleistocene layers (Lang, 1965).

Hv-615. Celle, 2.5 m **11,150 ± 150**
9200 B.C.

Hv-616. Celle, 3 to 6 m **30,150 ± 800**
28,200 B.C.

Comment: from provisional geological findings, a Weichsel glacial age for sample was originally assumed without the possibility of a more exact assignment.

Voltlage series, Niedersachsen

Humic acid from podsol samples from a test trench in B-horizon near Voltlage (56° 26′ 22″ N Lat, 7° 46′ 25″ E Long), overlain by fine sands. Surface is overgrown by oak birch woods. Coll. 1962 and subm. by Rudolf Lüders, N.L.f.B. Samples date minimum age of podsolic material, taken from B-horizon.

Hv-379. Voltlage, 50 to 55 cm **2710 ± 100**
760 B.C.

Hv-380. Voltlage, 115 to 130 cm **2020 ± 300**
70 B.C.

Comment: samples stem from a strongly developed podsolic horizon giving the impression of a relatively old soil. Its formation was interrupted by fluviatile erosion (Lüders, 1964).

Hv-593. Wimbachgries, Bayern **330 ± 50**
A.D. 1620

Wood from exposure in talus, depth 60 cm, near Wimbachgries (47° 33′ 14″ N Lat, 12° 52′ 13″ E Long), over- and underlain by dolomitic gravels. Coll. 1963 and subm. by Ortwin Ganss, G. L. Bayern, München. *Comment:* sample dates a landslide caused by torrential rainfall. According to palynological investigations of a peat horizon, approx. A.D. 1100 was a probable date.

Hv-594. Berchtesgaden, Bayern **> 39,800**

Wood from exposure from bottom of Laros river (47° 38′ 8″ N Lat, 13° 3′ 35″ E Long). Coll. 1953 and subm. by O. Ganss. *Comment:* dating

of sample as Interglacial follows from stratigraphic position (Ganss, 1953).

45,900 ± 800

Hv-527. Kuhgrund I, Niedersachsen **43,950 B.C.**

Coniferous trunk from exposure at Elbe river bluff, depth 11.5 m, from layer "Kuhgrund I" near Lauenburg (53° 22′ 28″ N Lat, 10° 32′ 31″ E Long), overlain by gravels. Coll. 1963 and subm. by Klaus Meyer, N.L.f.B. *Comment:* according to pollen-analysis (Schüttrumpf, 1937), bed belongs to Eem Interglacial. Two samples of same trunk, carefully pretreated with NaOH, furnished identical results.

Lüneburger Elbmarsch series, Niedersachsen

Samples from various depth in test trenches and borings in the Elbmarsch near Lüneburg, embedded in clays and sands. Coll. 1964 and subm. by Heinrich Benzler, N.L.f.B. Datings served age classification of the Elbmarsch. In glaciofluvial sands of Elbe river valley there existed, at beginning of Holocene, glacial channels that later were overblown by dunes. On them formed podsols. Elbe river deposited sands and clays that inter-finger with peat.

4060 ± 100

Hv-662. Lauenberg, 1.7 to 1.9 m **2110 B.C.**

Clayey peat from uppermost part of peat deposit of deepest channel, 4 m below sealevel, from a boring (53° 20′ 10″ N Lat, 10° 30′ 27″ E Long), overlain by clayey sands.

8420 ± 80

Hv-561a. Lauenburg, 4.6 to 4.7 m **6470 B.C.**

Peat from lowermost part of peat deposit from same profile as Hv-662.

2130 ± 70

Hv-308. Tespe, 1.3 to 1.5 m **180 B.C.**

Clayey fen peat from uppermost part of peat deposit, in channel, 2 m above sealevel, from a boring (53° 23′ 35″ N Lat, 10° 24′ 35″ E Long); layer was stratigraphically classified in $-u_2$ (Müller, 1962).

4990 ± 70

Hv-309. Tespe, 3.1 to 3.2 m **3040 B.C.**

Clayey fen peat from lowermost part of deposit from same profile as Hv-308; layer was stratigraphically classified in $-m_3$.

1310 ± 60

Hv-558. Bütlingen, 0.7 to 0.8 m **A.D. 640**

Peat from a "Humusdwog," 4 to 4.5 m above sealevel, from a test trench (53° 22′ 53″ N Lat, 10° 25′ 9″ E Long); layer was stratigraphically classified in $-O_1$.

1480 ± 50

Hv-559. Artlenburg, 0.9 to 1.0 m **A.D. 470**

Peat from humic channel fill, 4 to 4.5 m above sealevel, from a test

trench (53° 22′ 54″ N Lat, 10° 25′ 9″ E Long); sample was stratigraphically classified in -O_1.

1020 ± 50

Hv-560. Lauenburg, 1.1 to 1.2 m **A.D. 930**

Uppermost peat layer from bog near a dune, from an exposure (53° 20′ 52″ N Lat, 10° 34′ 37″ E Long).

2480 ± 60

Hv-561. Lauenburg, 1.9 to 2.0 m **530 B.C.**

Lowermost peat layer from same profile as Hv-560.

3770 ± 75

Hv-713. Artlenburg, 1.0 to 1.5 m **1820 B.C.**

Charcoal from bleached zone of a podsol grown on a dune (53° 21′ 51″ N Lat, 10° 26′ 26″ E Long). *Comment:* dates show that sedimentation and peat formation in Lüneburg Elbmarsch took place during the Holocene and that sequence of sedimentation can be classified into the scheme (Müller, 1962) established for coastal marsh regions (Benzler, 1965).

B. Foreign Countries

Triponzo series, Italy

Wood from exposure of a river terrace, 60 m thick, in travertine region of Triponzo (42° 48′ 31″, N Lat, 12° 56′ 30″ E Long), imbedded in humic clay, travertine and travertine sands. Coll. 1965 and subm. by Rainer Vinken, N.L.f.B. Samples date river terrace.

3085 ± 75

Hv-1134. Triponzo, 2.0 m **1135 B.C.**

4120 ± 85

Hv-1133. Triponzo, 12.0 m **2170 B.C.**

6275 ± 90

Hv-1436. Triponzo, 34.0 m **4325 B.C.**

8240 ± 175

Hv-1434. Triponzo, 48.0 m **6290 B.C.**

Comment: because of its altitude, river terrace was assigned to late Pleistocene. Ages of the interbedded wood samples point to formation during young Holocene. Therefore, it was concluded that in travertine regions the altitude and thickness of alluvial terraces may be misleading.

3440 ± 100

Hv-518. Strymon river, Greece **1490 B.C.**

Wood from natural exposure, depth 4 m, in alluvial terrace, height 20 m, on Strymon river (44° 55′ N Lat, 23° 30′ E Long), overlain by loamy sands and gravels. Coll. 1963 and subm. by Hubert Körber, N.L.f.B. *Comment:* sample dates the surprisingly young terrace accumulation. Black-band-ceramics indicate approx. 5000 B.C.

4080 ± 70

Hv-1145. Fisching-Asten, Austria **2130 B.C.**

Wood from gravel pit, depth 10 to 12 m, in Fisching-Asten (48° 14′ 10″ N Lat, 14° 25′ 10″ E Long), imbedded in postglacial sands and gravels. Coll. 1965 and subm. by Hermann Kohl, Naturkundliche Station, Linz. *Comment:* dating was performed to fix age of gravel layers in Donau valley. Because of position below low terrace, post-glacial age was assumed. Sample from stratigraphical layer was dated by Wien (subm. by H. Watzl, Linzer Stadtmuseum; VRI-18; 4390 ± 90; unpub.). Dates indicate agglomeration of catastrophic character, up to 12 m thick, approx. 2000 B.C.

12,020 ± 260

Hv-1265. New Abu Simbel, Egypt **10,070 B.C.**

Probably weathered *Corbicula* shells from surface of Masmas formation near New Abu Simbel (24° 25′ 0″ N Lat, 33° 2′ 30″ E Long). Coll. 1964 by Karl Butzer, Univ. of Wisconsin, Madison; subm. by Gerd Lüttig, N.L.f.B. *Comment:* sample stems from layer belonging to Middle Sebilian culture (13,000 B.C. ± 1000).

Hv-1139. Salina, Sicily **> 36,250**

Charcoal below tuffs from cover of a glacio-eustatic Mediterranean terrace, depth 3 to 4 m, on Isle of Salina (38° 33′ 42″ N Lat, 14° 51′ 47″ E Long). Coll. 1965 and subm. by Jörg Keller, Geol. Inst. der Univ., Freiburg, Germany. *Comment:* according to earlier geological concepts (Wolstedt, 1958), terrace corresponds to postglacial climatic optimum. New results show (Zeuner, 1959) that sealevel may have had same high position also in second Interstadial.

Hv-809. Larissa, Greece **> 44,100**

Lignite from exposure in steep bank of Pinios river, depth 7.5 m, near Larissa (39° 40′ N Lat, 22° 16′ E Long), overlain by clay and sands. Coll. 1960 and subm. by Horst Schneider, Geol. Inst. der Univ., Saarbrücken, Germany. *Comment:* position of sample just underneath Würm gravels, as well as neighbouring finds of *Elephas antiquus* and Levallois-Mousterian tools, point to a Riss-Würm Interstadial age.

Lipari series, Italy

Charred wood from varying exposures in volcanic mud and ashes. Coll. 1965 and subm. by Hans Pichler, Mineral. Inst. der Univ.,Tübingen, Germany. Samples date individual eruptions of younger volcanos.

3270 ± 100

Hv-1021. Lipari, 1.5 m **1320 B.C.**

Sample from weathered layer imbedded in pumice (38° 30′ 25″ N Lat, 14° 56′ 22″ E Long); dated as Neolithic from the discovery of obsidian blades.

17,300 ± 400

Hv-564. Lipari, 2.0 m **15,350 B.C.**

Sample from weathered layer imbedded in pumice (38° 31′ 11″ N Lat, 14° 55′ 42″ E Long); dated as Neolithic because of obsidian finds.

1765 ± 95

Hv-1020. Lipari, 2.5 m **A.D. 185**

Sample from weathered layer imbedded in pumice (38° 30′ 10″ N Lat, 14° 47′ 10″ E Long), from same stratigraphical layer as Hv-1021.

2875 ± 110

Hv-1019. Lipari, 4.0 m **925 B.C.**

Sample from weathered horizon imbedded in pumice (38° 30′ 18″ N Lat, 14° 57′ 38″ E Long), from same stratigraphical position as Hv-1021.

Hv-1022. Lipari, 4.5 m **> 37,600**

Sample from older pumice sequence (Cycle III) (38° 30′ 18″ N Lat, 14° 56′ 43″ E Long); according to stratigraphical position, a Pleistocene age was assumed.

Hv-1024. Roccamonfina, 5.0 m **> 37,100**

Sample imbedded in volcanic ejecta (41° 20′ 40″ N Lat, 14° 00′ 58″ E Long).

General Comment: according to artifact finds in the weathered layer, a new classification places Hv-564 in the young Paleolithic. Hv-1019, Hv-1020 and Hv-1021 were assigned to the Neolithic, and their C^{14} dates are not explained. Dates of Hv-1022 and Hv-1024 correspond to geological results.

660 ± 75

Hv-809. Penbé, France **A.D. 1290**

Oyster shells, depth 50 to 60 m, from an exposure in Atlantic Ocean seacliff on Penbé Bay (47° 30′ N Lat, 20° 38′ W Long), overlain by 10 m of humice sand and 50 m of periglacial debris. Sample lay within spray range of the surf. Coll. 1964 and subm. by Horst Schülke, Geol. Inst. der Univ., Saarlouis. *Comment:* stratigraphic situation indicated a Würm-Interstadial age. Anomalous C^{14} age may be caused by exchange with bicarbonate of modern seawater, age of which is approx. 450 yr (Eriksen and Olsson, 1963).

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