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UNIVERSITY OF KIEL RADIOCARBON MEASUREMENTS VI

H. ERLENKEUSER and H. WILLKOMM

C^{14} Laboratory of the Institut für Kernphysik, University of Kiel

This list contains data obtained during 1970. Age calculations are based on 95% of NBS oxalic acid standard activity with modern value A.D. 1950. Results are calculated using the Libby half-life and are given in the B.P. scale. They are not corrected for δC^{13} variations. Errors correspond to 1σ variation of sample net counting rate including statistics of modern standard and background.

ACKNOWLEDGMENTS

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I. GEOLOGIC SAMPLES

Plöner See series

Lake sediments of the Grosser Plöner See (54° 9.5′ N Lat, 10° 25.1′ E Long), NW Germany. Coll. and subm. 1966 by F. R. Averdieck, Inst. f. Ur- und Frühgeschichte, Univ. Kiel, who also did pollen analysis, and Waldemar Ohle, Max-Planck-Inst. f. Limnol., Plön. Basin of lake was formed during last glaciation. Two cores of sediment (KI-85 and KI-246) were taken with a 4 cm Livingstone corer at the deepest position (water depth 41 m). The longest boring reached glacial sands at 15.03 m under bottom. Depth values of the 2 cores did not correspond exactly. Therefore, depth values of KI-85 are connected pollen-analytically to KI-246.

Samples were treated first with cold 10% HCl to obtain the carbonate fraction. Residues were washed to neutrality, dried again, and burnt to get the organic fraction. For both parts we determined δC^{13} values. Results are given in Table 1 and Fig. 1.

General Comment: linear extrapolation of upper 5 organic values gives 1030 ± 100 B.P. for recent sediment surface corresponding to 88 ± 1% of recent standard activity. Most of lake sediments show such a hard water effect in the range from 600 to 1100 yr (cf. Håkansson, 1968, 1969, 1970; Ogden and Hay, 1964, 1965, 1969; Stuiver, 1969; Willkomm and Erlenkeuser, 1970).

If former sediments also had such a low recent activity, their measured C^{14} ages would be older than that of land plants of the same time. Therefore, we compared the position of boundaries of pollen zones (according to Overbeck, 1950) in the sediment with their Libby ages measured on peat of raised bogs (Overbeck *et al.*, 1957; Kubitzki and Münnich, 1960; Straka, 1961). In Fig. 1 the y values of the dotted rectangles represent the pollen boundaries in the sediment (according to high sedimentation rate, the boundaries X/XI and XI/XII are rather extended) and the

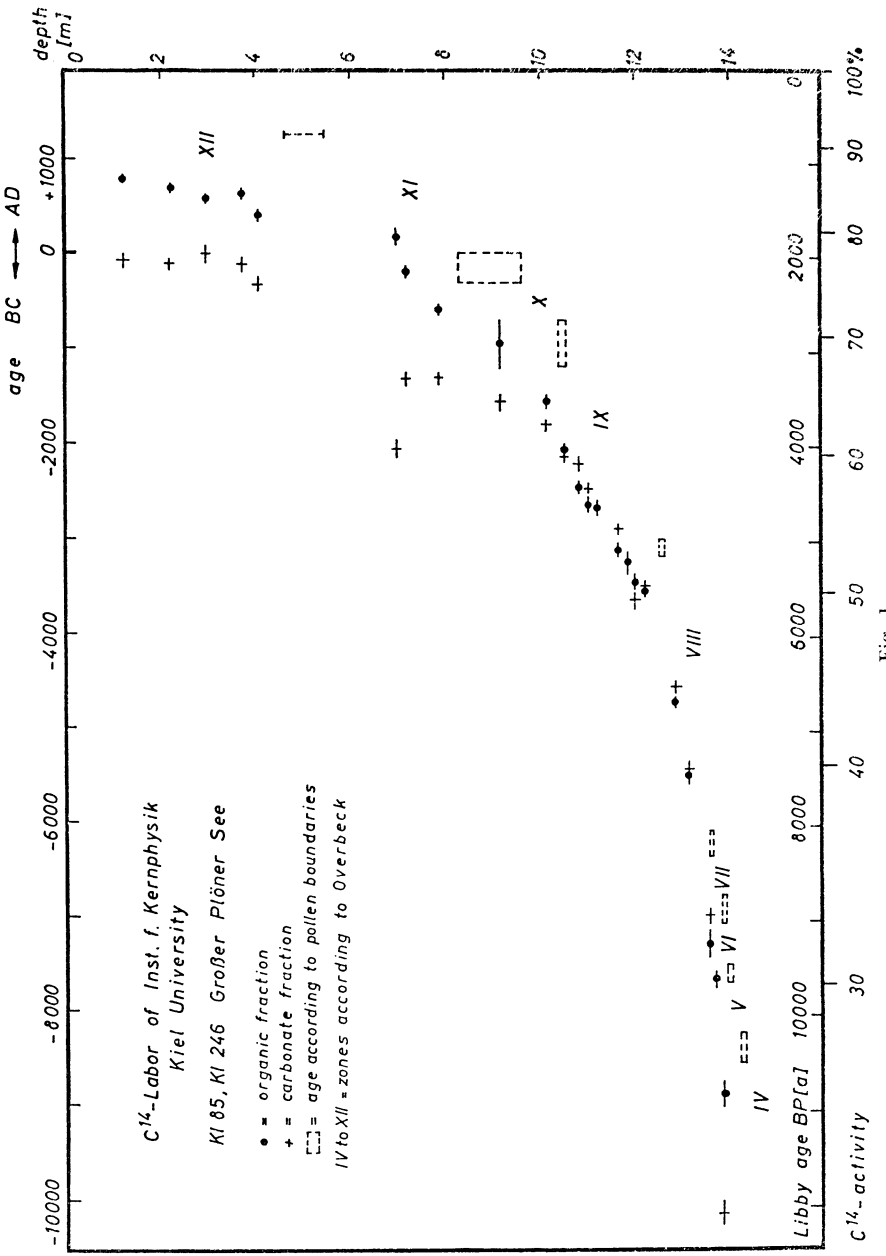

Fig. 1

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x values give the Libby ages from peat measurements*). In all sediment levels, rectangles lie ca. 1000 yr of measured Libby ages. Recent activity of sediments must have been ca. 88% during greatest part of Holocene.

Differences between organic age and carbonate age result from dead carbonates, which came into sediment as allochthonous impurities. According to isotopic effects (cf. δC^{13} values), autochthonous carbonates must have 3 to 5% more C^{14} than the organic fraction. Considering this effect, allochthonous components reach 15% (in KI-246.33 even 28%) of total carbonate fraction.

TABLE 1

C^{14} dates of Plöner See sediments

Age calculations were made without δC^{13} corrections

C^{14} Lab. Kiel		Grosser Plöner See		KI-85 and KI-246		
		Organic fraction		Inorganic fraction		
Lab. no.	Depth within sediment (cm)	Libby age $\pm 1\sigma$ B.P.	δC^{13} ‰	Libby age $\pm 1\sigma$ B.P.	δC^{13} ‰	Difference of Libby ages (yr)
246.26	91 to 157	1140± 45		2030±110		890
246.28	186 to 260	1250± 55		2030± 65		780
246.29	276 to 350	1340± 50		1940±100		600
85.14	360 to 390	1300± 65	−30.2	2080± 75	−0.9	780
85.15	390 to 420	1520± 80		2280± 90		760
246.33	682 to 719	1760± 90		4010± 75	−2.5	2250
85.25	710 to 735	2110± 75		3270± 75		1160
246.34	777 to 808	2530± 40	−30.7	3260± 75	−3.4	730
246.05	910 to 935	2900±275		3520±110	−2.0	620
246.36	1000 to 1035	3490± 90	−26.6	3750± 75	−3.4	260
246.49	1040 to 1069	4010± 80	−26.4	4110± 70	−2.9	100
246.50	1069 to 1097	4390± 75	−24.2	4160± 75	−3.7	−230
246.51	1096 to 1116	4590± 90	−30.2	4430± 65	−3.5	−160
246.04	1114 to 1135	4630±110	−19.9			
246.45	1155 to 1185	5070±100	−23.0	4840± 60	−3.2	−230
246.03	1180 to 1197	5200±130	−21.2			
246.46	1195 to 1215	5410± 80	−24.9	5600±100	−3.7	190
246.47	1215 to 1235	5480± 90	−30.0	5460± 80	−2.8	− 20
246.43	1273 to 1305	6680± 70	−22.4	6520± 90	−3.5	−160
246.44	1305 to 1335	7450±120	−23.2	7380±110	−3.3	− 70
246.40	1354 to 1374	9240±140	−23.3	8920±120	−0.4	−320
246.01	1374 to 1384	9630± 90	−21.8			
246.41	1384 to 1404	10,810±170	−28.5	12,080±170	−0.6	1270

* Boundary XI/XII indicates medieval clearing of woods, done in this region in 13th century (Ohle, 1970, ms. in preparation).

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Plöner See, surface of sediment

The preceding series does not include upper layers of sediment. To continue this series, we coll. upper 50 cm of sediment with a sampler (diam. 8 cm), which could be closed at its base. For comparison, we measured aquatic plants, coll. and subm. by F. R. Averdieck, lake water, and atmospheric CO_2. KI-318 to KI-321 coll. at Plöner See, Nordtiefe (54° 9.5′ N Lat, 10° 25.1′ E Long). KI-322 and -323 coll. at Plöner See, near Prinzen I., ca. 1 km S of foregoing location. KI-325 coll. at Süseler See (54° 4.7′ N Lat, 10° 40.6′ E Long), NW Germany. KI-326 coll. at Kiel (54° 20.5′ N Lat, 10° 7.3′ E Long), NW Germany. All samples were coll. in Sept. 1969, except KI-320 and KI-321.02, which were coll. in Oct. 1969. Measured values are given in Table 2.

General Comment: C^{14} content and C^{13} value of *Nuphar luteum* confirm assumption that these plants assimilate only atmospheric CO_2. For *Chara*, the C^{14} difference of 3.1% between organic and inorganic fractions is nearly twice the difference of δC^{13} values (19‰) according to pure isotopic fractionation. We expected the effect of atomic weapons within the upper 11 cm of sediments, but only KI-318.01 has an activity greater than 100%. Moreover, following sediments seem older than the following 6 m. There must be a disturbing influence at least on samples 318.02 and 318.06, though no irregularity could be seen in the layers. For more detailed discussion and estimation of exchange times see Kock (1970). Bomb effect in lake sediments was measured by Ogden and Hay (1969, p. 143), who found in Seth's Pond δC^{14} values up to 39%. See also Olsson (1969, p. 541), who found in submerged aquatic plants Δ values up to 550‰.

Eifel series

Samples resume problem of age of volcanic eruptions in SW Eifel area (Straka 1952, 1954, 1958, 1960, 1961a, 1961b) as marked by characteristic horizons of tuff sand embedded in detritus gyttja or peaty deposits of crater lakes (Maare) now overgrown by Flachmoor. Coll. and subm. 1969 by H. Straka, Bot. Inst., Univ. Kiel, who did pollen analysis. Samples taken with Dachnowski corer. Cores were pared by ca. 1 to 2 mm before chemical standard treatment. Dates given are not corrected for δC^{13}.

Schalkenmehrener Maar, Sch A

Gyttja, from E part of Schalkenmehrener Double Maar (50° 10.25′ N Lat, 6° 51.93′ E Long), Germany. Low mineral and carbonate content slightly increasing with depth. There are 2 tuff layers, at 575 to 585 cm depth and below 630 cm depth.

KI-304.01. 565 to 575 cm depth — **11,060 ± 140**
9110 B.C.
$\delta C^{13} = -28.3‰$

From above upper tuff layer. Equivalent samples were determined earlier: GRO-458: 10,770 ± 250 B.P. (Straka and de Vries, 1956) and GRO-961: 10,550 ± 100 B.P. (Straka, 1957).

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TABLE 2

Surface sediments of Plöner See
C^{14} values are not corrected for δC^{13} variations

Lab. no.	Material	Organic fraction C^{14} content $\pm 1\sigma$ %	Organic fraction δC^{13} ‰	Inorganic fraction C^{14} content $\pm 1\sigma$ %	Inorganic fraction δC^{13} ‰
326	Atmosph. CO_2 absorbed with 4n NaOH, 15 m above ground	155.8±0.7	−21.5		
325	Nuphar luteum (aquatic plants living from atmosph. CO_2 at surface of lake)	152.9±0.8	−25.4		
321.01	Surface water			124.1±0.7	− 8.3
321.02	Surface water			122.0±0.7	− 7.3
320	Depth water (30 m under surface)			124.7±0.7	−10.3
323	*Potamogeton pectinatus,* 1 m under surface	123.4±0.8	−18.7		
322	Chara, 1.5 m under surface	122.8±0.8	−21.0	125.9±0.5	− 2.2
318.01	Sediments, 0 to 2.5 cm under bottom (depth of water 35 m)	107.0±0.7	−28.3	93.4±1.2	− 0.6
		Libby age B.P.		Libby age B.P.	
318.02	2.5 to 8 cm	1940±70	−28.4	1680±55	− 2.0
318.06	21 to 25 cm	2340±55	−26.5	2500±90	− 1.3
318.08	30 to 33 cm	1290±80	−27.9		
319.01	36 to 46 cm	1160±65	−29.3	2210±65	− 1.1
318.11	42 to 52 cm			2080±60	− 1.2

KI-304.02. 585 to 595 cm depth — **11,700 ± 150**, **9750 B.C.**, $\delta C^{13} = -26.9‰$

Sample from below tuff sand layer.

KI-304.04. 610 to 620 cm depth — **12,650 ± 170**, **10,700 B.C.**, $\delta C^{13} = -26.0‰$

KI-304.03. 620 to 630 cm depth — **13,420 ± 240**, **11,470 B.C.**, $\delta C^{13} = -23.4‰$

Sample from above older tuff layer. *Comment*: Libby age of lower edge of upper tuff layer is estimated by interpolation to 11,500 B.P. Pollen analysis gives 10,500 B.P. C^{14} age of upper border of older layer is 13,800 B.C., to be compared with pollen-analytical age, 10,950 B.P. Large difference of latter is probably due to influence of magmatic CO_2, as may be indicated by strikingly high δC^{13} value in view of gross δC^{13} values of Eifel series.

Strohner Maarchen, St

Gyttja from Trockenmaar (50° 7.40′ N Lat, 6° 51.94′ E Long) near Strohn, Germany. Mineral content increasing with depth. Two tuff sand layers at depth 845 to 860 cm and below 902 cm.

KI-305.01. 835 to 845 cm depth — **10,940 ± 120**, **8990 B.C.**, $\delta C^{13} = -27.9‰$

Fine detritus gyttja, above upper tuff sand layer.

KI-305.02. 860 to 870 cm depth — **11,670 ± 140**, **9720 B.C.**, $\delta C^{13} = -27.8‰$

Coarse detritus gyttja, below tuff layer.

KI-305.03. 842 to 902 cm depth — **12,240 ± 270**, **10,290 B.C.**, $\delta C^{13} = -23.5‰$

Coarse detritus gyttja, overlying 2nd tuff layer. *Comment*: C^{14} age of upper tuff sand layer (lower border) estimated at 11,500 B.P., pollen analysis yields 10,300 B.P.; Libby age of older tuff layer (extrapolated to upper border) is 12,400 B.P., whereas pollen analysis gives 10,600 B.P. Noting δC^{13} value of KI-305.03 this large difference may be caused by magmatic CO_2 influence.

Hinkelsmaar, H I

Gyttja from Hinkelsmaar crater (50° 5.42′ N Lat, 6° 51.95′ E Long) near Manderscheid, Germany. Mineral content increasing with depth. Tuff layers at 415 to 425 cm depth and below 478 cm depth.

KI-306.01. 405 to 415 cm depth — **10,580 ± 170**, **8630 B.C.**, $\delta C^{13} = -31.7‰$

Fine detritus gyttja, above upper tuff sand layer.

KI-306.02. 425 to 435 cm depth — **11,290 ± 140**, **9340 B.C.**, $\delta C^{13} = -28.0‰$

Gyttja (fine detritus), below tuff sand layer.

KI-306.04. 435 to 445 cm depth — **11,440 ± 120**, **9490 B.C.**, $\delta C^{13} = -29.3‰$

Fine detritus gyttja.

KI-306.05. 458 to 468 cm depth — **12,240 ± 140**, **10,290 B.C.**, $\delta C^{13} = -26.6‰$

Fine detritus gyttja.

KI-306.03. 468 to 478 cm depth — **12,190 ± 120**, **10,240 B.C.**, $\delta C^{13} = -26.4‰$

Fine detritus gyttja, above 2nd tuff layer. *Comment*: interpolated C^{14} age for lower edge of upper tuff layer: 11,000 B.P.; pollen analysis: 11,500 B.P. Extrapolated C^{14} age of 2nd tuff layer (upper border): 12,400 B.P., pollen analysis: 12,500 B.P.

Hitsche II, Hi II

Gyttja and peat from Hitsche Trockenmaar (50° 7.50′ N Lat, 6° 52.13′ E Long) W of Gillenfeld, Germany. Mineral content increasing with depth. Traces of carbonate.

KI-307.01. 190 to 200 cm depth — **10,630 ± 160**, **8680 B.C.**, $\delta C^{13} = -29.4‰$

Coarse detritus gyttja, above tuff sand layer at 200 to 210 cm depth.

KI-307.04. 220 to 230 cm depth — **10,970 ± 90**, **9020 B.C.**, $\delta C^{13} = -27.5‰$

Peat, 10 to 20 cm below tuff layer.

KI-307.03. 280 to 290 cm depth — **12,230 ± 150**, **10,280 B.C.**, $\delta C^{13} = -28.0‰$

Fine detritus gyttja, above 2nd tuff layer below 290 cm depth. *Comment*: interpolated C^{14} age of upper tuff layer (lower border) is 10,700 B.P., agreeing with pollen analysis. Upper border of 2nd tuff layer is dated ca. 12,300 B.P. in agreement with pollen date of 12,500 B.P. Possibly, good agreement because atmospheric CO_2 assimilating plants were dated.

Mosbrucher Weiher, M A

Fine detritus gyttja from Mosbrucher Weiher (50° 15.75′ N Lat, 6° 57.23′ E Long), Trockenmaar near Kelberg, Germany. Mineral content increasing with depth, interspersed with numerous mollusk shells.

KI-308.01. 612 to 622 cm depth — **14,480 ± 160** / **12,530 B.C.** / $\delta C^{13} = -23.2‰$

KI-308.02. 622 to 632 cm depth — **14,380 ± 120** / **12,430 B.C.**

Comment: samples date upper border of tuff sand layer below 632 cm depth. According to pollen analysis, this layer is dated ca. 11,000 B.P. Here, as in dates of Strohner Maarchen and Schalkenmehrener Maar, C^{14} ages may be influenced by magmatic CO_2.

Booser Weiher, B A

KI-309. 190 to 200 cm depth — **10,830 ± 130** / **8880 B.C.** / $\delta C^{13} = -30.2‰$

Coarse detritus gyttja, with minerals and possibly some carbonate, from Booser Weiher (50° 18.80′ N Lat, 6° 59.86′ E Long) Trockenmaar near Adenau, Germany. Sample dates tuff layer below 200 cm depth. Expected age from pollen analysis: ca. 10,200 B.P.

Dürres Maar, D A

Fine detritus gyttja with some mineral content and possibly some carbonate, from Dürres Maar (50° 7.43′ N Lat, 6° 52.38 E Long), near Gillenfeld, Germany.

KI-310.01. 1160 to 1170 cm depth — **10,200 ± 140** / **8250 B.C.** / $\delta C^{13} = -27.3‰$

KI-310.02. 1170 to 1180 cm depth — **10,290 ± 210** / **8340 B.C.**

Comment: samples date tuff layer below 1180 cm depth. C^{14} age is markedly lower than pollen analytical expectation yielding 12,300 B.P. New cores will be taken for pollen analysis.

Mürmes, Mü I

Coarse detritus gyttja, mineral content increasing with depth, from Mürmes Trockenmaar (50° 9.32′ N Lat, 6° 53.59′ E Long) near Gillenfeld, Germany.

KI-311.01. 375 to 385 cm depth — **10,900 ± 120** / **8950 B.C.** / $\delta C^{13} = -31.0‰$

Sample from above tuff layer at 385 to 400 cm depth.

KI-311.02. 400 to 410 cm depth — **11,500 ± 170**, **9550 B.C.**, $\delta C^{13} = -28.8‰$

Sample from below tuff layer. *Comment*: tuff layer C^{14} age (interpolated to lower edge) is 11,200 B.P., exactly expected from pollen analysis.

Trautzberger Maar T

Mud, mineral content increasing with depth, from Trautzberg Trockenmaar (50° 6.63′ N Lat, 6° 56.78′ E Long) near Manderscheid, Germany.

KI-312.04. 632 to 642 cm — **11,170 ± 120**, **9220 B.C.**, $\delta C^{13} = -29.5‰$

KI-312.01. 642 to 652 cm — **11,440 ± 150**, **9490 B.C.**, $\delta C^{13} = -31.4‰$

Sample from above tuff sand layer at 652 to 670 cm depth.

KI-312.02. 670 to 680 cm depth — **12,080 ± 180**, **10,130 B.C.**, $\delta C^{13} = -32.6‰$

Comment: interpolated tuff layer C^{14} age (lower border) gives ca. 11,900 B.P. Pollen analysis yields 11,100 B.P. Second tuff layer below 690 cm depth. Extrapolation upon upper border gives 12,400 B.P., expected by pollen analysis.

General Comment: (Erlenkeuser *et al.*, 1971) after correction for half-life, C^{14} ages are generally greater, by varying amounts, than expected by pollen analysis, with maximum ca. 1400 yr, if samples KI-310, -304.3, -304.04, -305.03, and -308 are excepted. Differences show effect of lower C^{14} content of ground water supplying Maar lakes, partly cancelled by subsequent CO_2 exchange with atmosphere and/or by atmospheric CO_2-assimilating plants forming part of deposits. Widely deviating samples KI-304, -305, and -308 may be influenced by magmatic CO_2, the amount of which, as calculated from δC^{13} deviation from mean of gross samples, would explain, qualitatively, age differences observed.

Othmarschen series

During excavations for the new Elbtunnel, 2 peaty levels were found at Hamburg-Othmarschen (53° 33.3′ N Lat, 9° 53.8′ E Long), ca. 800 m N of Elbe R. as relics of old landslides. Coll. 1970 by F. Grube, Geol. Staatsinst., Univ. Hamburg; subm. by F. R. Averdieck, who made pollen analysis.

General Comment (F.R.A.): upper Holocene peat layer (Samples 383-385) reaches from 220 cm to 545 cm underground (ground level 25.90 m above sea level). Separated from this level by sands, a layer of interstadial clayish mud (KI-386) follows at 18.75 to 18.40 m above sea level.

KI-385. 303 to 307 cm depth — **4870 ± 80**, **2920 B.C.**, $\delta C^{13} = -27.6‰$

Wood, embedded in peat from older Zone IX.

KI-384. 445 to 450 cm depth — **6970 ± 120**, **5120 B.C.**, $\delta C^{13} = -27.1‰$

Wood, in older part of Pollen Zone VIII b. *Comment* (F.R.A.): C^{14} age seems a little too old compared to measurements on raised bogs.

KI-383. 535 to 545 cm depth — **8370 ± 80**, **6420 B.C.**, $\delta C^{13} = -31.5‰$

Peat gyttja from base of peat layer at Pollen Boundary VII/VIII.

KI-386. 18.40 to 18.75 above sea level — **>35,000**, $\delta C^{13} = -27.9‰$

Interstadial clayish mud.

Kieler Bucht series

Peat from bottom of Baltic Sea measured for dating postglacial transgression. Coll. 1969 and subm. 1970 by F. Werner, Geol. Inst., Univ. Kiel. *Comment*: dates confirm former values (cf. R., 1969, v. 11, p. 427). In the following, 1st value is depth of sample below sea bottom, 2nd value is depth of water, important for determination of transgression rate.

KI-375. 10030/A, 108 to 113 cm, 20 m — **8070 ± 80**, **6120 B.C.**, $\delta C^{13} = -28.0‰$

(54° 26.22′ N Lat, 10° 39.91′ E Long)

KI-370. 10030/B, 115 to 125 cm depth — **8340 ± 140**, **6390 B.C.**, $\delta C^{13} = -27.6‰$

Position same as KI-375.

KI-369. 10047/A, 128 to 134 cm, 24 m — **8350 ± 120**, **6400 B.C.**, $\delta C^{13} = -28.3‰$

(54° 30.88′ N Lat, 10° 41.11′ E Long)

KI-374. 10047/B, 134 to 144 cm depth — **8100 ± 100**, **6150 B.C.**, $\delta C^{13} = -27.1‰$

Position same as KI-369. Seems younger than overlying sample, within statistical uncertainty.

KI-380. 10051, 125 to 130 cm, 26 m — **8000 ± 160**, **6050 B.C.**, $\delta C^{13} = -26.4‰$

(54° 31.70′ N Lat, 10° 40.68 E Long)

Sedimentation rate Kieler Bucht

Shells and plant remains from sediment cores for dating sedimentation rate of Baltic sea. Coll. 1969 and subm. 1970 by F. Werner.

KI-368. 10005, 12 cm, 23 m — **200 ± 45**, **A.D. 1750**, $\delta C^{13} = +1.7‰$

Shells (*Cyprina Islandica*), (54° 34.10′ N Lat, 10° 39.86′ E Long).

KI-372. 10058/A + B, Plants 0 to 58 cm, 27 m — **2120 ± 75**, **170 B.C.**

(54° 31.01′ N Lat, 10° 2.29′ E Long)

KI-378. 10058/D, Plants 132 to 152 cm — **2220 ± 110**, **270 B.C.**

Depth and position like KI-372.

KI-371. 10058/F, Plants 232 to 250 cm — **3340 ± 80**, **1390 B.C.**, $\delta C^{13} = -18.4‰$

Depth and position like KI-378.

KI-266. Valsequillo fossils — **26,000 ± 530**, **24,050 B.C.**, $\delta C^{13} = -3.1‰$

Bones, 400 cm below surface, from Valsequillo valley (18° 55′ N Lat, 98° 20′ W Long), Mexico. Coll. 1967 and subm. 1968 by E. W. Guenther, Geol. Inst., Univ. Kiel. *Comment* (E.W.G.): sample was taken for dating fossil horizons of Valsequillo for profile of Pleistocene sediments in this region.

II. BOTANIC SAMPLES

Esterweger Dose, peat development

Peat samples from Esterweger Dose (53° 3.1′ N Lat, 7° 37.1′ E Long), raised bog near Papenburg, NW Germany. Coll. 1969 and subm. by K. Müller, Bot. Inst., Univ. Kiel.

General Comment (K.M.): for age determination and development of water holes in raised bogs, later filled with muddy peat, age of overlying light and muddy peat were determined at several locations.

KI-334. Muddy peat, 124 to 126 cm depth — **100.6 ± 0.4%**, $\delta C^{13} = -25.8‰$

KI-335. Light peat, 126 to 128 cm — **2030 ± 90**, **80 B.C.**, $\delta C^{13} = -27.2‰$

Underlying KI-334.

KI-336. Muddy peat, 63 to 65 cm — **1300 ± 60**, **A.D. 650**, $\delta C^{13} = -26.8‰$

KI-338. Muddy peat, 140 to 142 cm — **1730 ± 50** / **A.D. 220** / $\delta C^{13} = -24.9‰$

KI-339. Light peat, 142 to 144 cm — **1850 ± 45** / **A.D. 100** / $\delta C^{13} = -24.2‰$

KI-340. Light peat, 112 to 114 cm — **1050 ± 55** / **A.D. 900** / $\delta C^{13} = -27.3‰$

KI-341. Muddy peat, 114 to 116 cm — **1360 ± 70** / **A.D. 590** / $\delta C^{13} = -25.4‰$

KI-342. Muddy peat, 140 to 142 cm — **1590 ± 35** / **A.D. 360** / $\delta C^{13} = -25.2‰$

KI-343. Light peat, 142 to 144 cm — **1680 ± 50** / **A.D. 270** / $\delta C^{13} = -24.8‰$

General Comment (K.M.): KI-340 to -343 were superimposed. Water hole (KI-341 and -342 was later overgrown by light peat [KI-340]).

III. ARCHAEOLOGIC SAMPLES

Hollenstedt

Squared timber and peat from moat of Saxon castle at Hollenstedt (53° 19.4′ N Lat, 9° 40.1′ E Long) near Hamburg, Germany, probably destroyed by Charlemagne. Coll. 1969 by F. R. Averdieck, Inst. f. Ur- und Frühgeschichte, Univ. Kiel; subm. 1969 by F. R. Averdieck and C. Ahrens, Helms Mus. Hamburg-Harburg.

KI-299. Hollenstedt A — **1250 ± 60** / **A.D. 700** / $\delta C^{13} = -30.1‰$

Squared timber, 0.80 m below excavation zero level, 1.50 m below floor.

KI-300. Hollenstedt B — **1400 ± 50** / **A.D. 550** / $\delta C^{13} = -29.5‰$

Basal peat from moat, Sec. A, 1.09 m below zero level, 1.79 m below floor.

Rickling

Different oak and charcoal samples from Saxon settlement Rickling (55° 0.8′ N Lat, 10° 10.0′ E Long) near Segeberg, Schleswig-Holstein, Germany. Coll. by G. Schäfer, Landesmus. f. Ur- u. Frühgeschichte Schleswig, Germany, subm. 1968 by H. Hingst, Landesmus. Schleswig

and F. R. Averdieck. Samples from House 1; pottery dated to 6th to 8th century A.D.

KI-255. Rickling 1 — **1125 ± 45**, **A.D. 825**, $\delta C^{13} = -27.1‰$

Oak, 1.90 to 2.00 m below floor.

KI-256. Rickling 2 — **1100 ± 45**, **A.D. 850**, $\delta C^{13} = -27.0‰$

Oak, 1.00 to 2.00 m below floor.

KI-257. Rickling 3 — **1075 ± 55**, **A.D. 885**, $\delta C^{13} = -28.0‰$

Oak, 2.00 to 2.30 below floor.

KI-258. Rickling 4 — **1180 ± 45**, **A.D. 770**, $\delta C^{13} = -26.9‰$

Oak, 1.80 to 2.00 m below floor.

KI-260. Rickling 6 — **1245 ± 70**, **A.D. 705**, $\delta C^{13} = -27.0‰$

Charcoal, 120 cm below floor.

KI-83. Oberaden — **2540 ± 50**, **590 B.C.**, $\delta C^{13} = -25.7‰$

Wood (fir) from rim (enclosure) of well in Roman Camp Oberaden (Excavation Ditch 26/1963) (51° 35.6′ N Lat, 6° 36.1′ E Long) near Unna, Germany. Coll. 1963 by H. Jokisch, subm. 1966 by Landesmus. f. Vor- u. Frühgeschichte Münster, Germany. Depth 1.00 to 2.30 m below floor. According to coins found, camp existed from 11 to 8 B.C. only. Wood is from stave of Roman vine cask used later in well construction. Wood might be contaminated by preservatives (polyglycole) (Beck, pers. commun.)

Haithabu

Wood (*Quercus*) from Haithabu (54° 30.0′ N Lat, 9° 34.6′ E Long) Schleswig-Holstein, Germany. Coll. and subm. 1967 by D. Eckstein, and J. Bauch, Lehrstuhl f. Holzwirtschaft, Univ. Hamburg, Reinbek.

KI-241. Haithabu, Pr. 4 — **1250 ± 40**, **A.D. 700**, $\delta C^{13} = -25.7‰$

Sample is dated historically to beginning of 9th century A.D.

KI-242. Haithabu, Pr. 5 — **1630 ± 40**, **A.D. 320**, $\delta C^{13} = -25.9‰$

Wood (*Quercus*) from same piece as KI-241. *Comment*: as dendrochronologically dated by D. Eckstein and J. Bauch, age difference between samples is 280 yr.

Niani series

Charcoal found in different depths of old well, now filled in, in Niani (11° 22′ N Lat, 8° 23′ W Long), W Guinea, Africa. Coll. 1968 by W. Filipowiak, Mus. Pomorza Zachodniego, Stettin, Poland; subm. by K. W. Struve, Landesmus. f. Vor- u. Frühgeschichte, Schleswig, Germany. *General Comment* (W.F.): dates help set up chronology of capital of medieval kingdom Mali (Filipowiak, 1966, p. 116-127).

380 ± 55

KI-292. Sample 4 **A.D. 1570**

First cultural layer, 150 to 160 cm depth. *Comment* (W.F.): layer with waste (debris) of combustion, which may be caused by destruction after invasion of Songhai in A.D. 1545.

1035 ± 35

KI-294. Sample 12 **A.D. 915**

Sixth cultural layer, 277 cm depth.

1090 ± 65

KI-293. Sample 9 **A.D. 860**

Sixth cultural layer, 285 cm depth. *Comment* (W.F.): material of same level dated by Mme. Delibrias (Gif-sur-Yvette, France) at 1200 ± 100 B.P.

2130 ± 60

KI-346. Hoehbeck **180 B.C.**

$\delta C^{13} = -25.9‰$

Carbonized twigs from ca. 250 cm under present surface in former moat surrounding castle at S steep bank of Elbe R. 10 km NW of Schnackenburg (53° 4′ N Lat, 11° 26′ E Long), Niedersachsen, Germany. Coll. by P. Glüsing, Kiel; subm. 1969 by F. R. Averdieck. *Comment* (P.G.): no artifacts or other archaeologic indications to determine if castle was built by Charlemagne or Romans (Sprockhoff, 1958).

2030 ± 65

KI-347. Dangstetten 449 **80 B.C.**

$\delta C^{13} = -28.1‰$

Charcoal of waste pit found 80 to 120 cm below surface of Roman camp 8 km SE of Waldhut (47° 32′ N Lat, 8° 0′ E Long), S Baden, Germany. Coll. by P. Glüsing; subm. 1969 by F. R. Averdieck. *Comment*: camp established 16 or 15 B.C. (during campaign of Drusus and Tiberius across Alps). Coins indicate abandonment as early as 10 B.C. Measured age corresponds to recent variation of $\Delta = -(15 \pm 8)‰$.

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