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UNIVERSITY OF LUND RADIOCARBON DATES I

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INTRODUCTION

Plans for a radiocarbon dating laboratory at the University of Lund were initiated by Tage Nilsson* and Holger Arbman** in 1962. Work was begun in 1964 and at the end of 1965 most of the dating equipment was installed. Dating began in 1966 after careful testing of counting electronics and counters.

The dating system has two 1-L copper-walled proportional counters of Östlund-Engstrand construction (for details see Stockholm V, p. 204, Fig. 1) surrounded by 2.5 cm of selected lead, followed by a ring of 23 cosmic-ray Geiger counters (model HZ-100, Zentralwerkstatt Göttingen). On all sides are at least 20 cm of iron. Above and on both long sides of the counters are 10 cm of paraffin wax with about 12% boric acid between the iron layers.

The counter gas is CO_2 filled to 2280 mm Hg at a detector temperature of 20°C. The net contemporary value (95.0% of NBS oxalic acid) is about 18.4 cpm. The background is 1.96 cpm for one counter and 2.24 cpm for the other at a barometric pressure of 760 mm Hg. The barometric effect is −0.045 cpm per cm Hg.

Working voltage is 6.6 kv, with a plateau length of more than 700 v and a plateau slope of ca. 1% per 100 v for C^{14}. The reproducibility of the gas amplification (the purity of the gas) is checked before and after each counting period by counting with an outer radiation source of Co^{60} on two certain points of the γ-characteristics. For small impurities in the counting gas, standard working conditions are obtained by correction of the working voltage.

Most of the samples are pretreated with hot dilute (ca. 2%) hydrochloric acid to remove carbonates. In some cases a humic-acid extraction is performed with hot dilute (ca. 2%) sodium hydroxide. The pretreatment is adjusted according to kind and amount of material and estimated age.

Combustion of the sample and purification of the carbon dioxide are performed essentially by the method used at the Stockholm laboratory for many years (Östlund, 1957b). After combustion and purification in a tube filled with lead chromate (450°C), the carbon dioxide is absorbed in aqueous ammonia. Then it is precipitated as calcium carbonate after calcium chloride solution is added. Following intensive

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washing, the carbon dioxide is liberated with phosphoric acid, frozen out by liquid oxygen, pumped in a solid state with a Hg-diffusion pump, and finally evaporated and passed through a tube containing silver wool and copper net (450°C). There is no special radon-removing step in the system, so the purified gas is kept in a storage vessel for about two weeks before the first counting. Remaining radon can easily be detected in our α-channel.

Every sample is counted at least twice for 20 hours with about a 2-week interval. For very old or very small diluted samples there may be athirl counting The NBS oxalic-acid standard is counted once a week in each counter, and the background is measured from Saturday to Monday. The error in the background is calculated for a counting time of 20 hours. Every hundred counts in the net β-channel is registered by a printer as a control of the statistical regularity of the C^{14} and background counts.

Age calculations are based on a contemporary value equal to 0.950 of the activity of the NBS oxalic-acid standard, and on a half-life for C^{14} of 5568 yr. Results are reported in years before 1950 (years B.P.), and in the A.D./B.C. scale. Errors quoted ($\pm$ 1σ) include the standard deviations of the count rates for the unknown sample, the contemporary standard, and the background. Calculated errors smaller than 100 yr have been increased by rounding to that figure to take some account of the de Vries effect and the possible error in δC^{13}. Corrections for deviations from the normal C^{13}/C^{12} ratio ($\delta C^{13} = -25.0‰$ in the P.D.B. scale) are applied for most of the samples. δC^{13} values quoted are relative to the P.D.B. standard.

The description of each sample is based on information provided by the person submitting the sample to the laboratory.

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SAMPLE DESCRIPTIONS

I. CROSS-CHECK SAMPLES

Lu-1. Båktjenjaure — **6310 ± 75 / 4360 B.C.** — $\delta C^{13} = -25.1‰$

Wood from stump of *Pinus* or *Picea* at Lake Båktjenjaure, Jämtland, Sweden (63° 58′ N Lat, 13° 40′ E Long), alt. 700 m. Coll. by Jan Lundqvist, Geol. Survey of Sweden, Stockholm; supplied by L. Engstrand, Radioactive Dating Lab., Stockholm. *Comment:* another part of this sample was dated by the Stockholm lab.: St-1929, 6310 ± 90 B.P. (L. Engstrand, pers. commun.) No pretreatment.

Lu-2. Angelsta, Småland — **2510 ± 60 / 560 B.C.** — $\delta C^{13} = -22.3‰$

Wood from stump of fir, at depth 3.5 m in Rya Moor, Angelsta, Småland, Sweden (59° 49′ N Lat, 13° 43′ E Long). Tree rings Nos. 101 to 150 from the center. Supplied by L. Engstrand. *Comment:* the same tree rings were dated by others: Östlund (1957a), St-156, 2415 ± 65; Broecker and Kulp (1957), L-296, 2600 ± 80; Nydal (1959), T-55, 2560 ± 70; average 2510 ± 40. (St-156 corrected for Suess-effect). No pretreatment.

Lu-3. Ruds Vedby — **10,840 ± 120 / 8890 B.C.** — $\delta C^{13} = -26.2‰$

Wood from a thin, dark layer representing pollen-zone border Alleröd/Younger Dryas. Isolated from peaty lake mud in a profile at Ruds Vedby, Zealand, Denmark (55° 32′ N Lat, 11° 22′ E Long). *Comment:* distributed by H. Tauber, Copenhagen Radiocarbon Lab., Copenhagen, as cross-check sample and dated by many laboratories: Suess (1954), W-82, 10,190 ± 200; W-84, 10,440 ± 180; Östlund (1957a), St-18, 10,150 ± 370; Münnich (1957), H-105-87, 11,500 ± 300; de Vries, Barendsen and Waterbolk (1958), Gro-454, 10,995 ± 250; Olsson (1959), U-20, 10,965 ± 135; U-75, 10,815 ± 135; Barker and Mackey (1959), BM-19, 11,333 ± 200; Tauber (1960), K-101 bis, 11,090 ± 240; Tauber (1964), K-101 (remeasured), 10,970 ± 120; Alessio, Bella, and Cortesi (1964), R-64, 11,900 ± 170; Alessio, Bella, Bechechi, and Cortesi (1965), R-64 (remeasured), 11,200 ± 145; weighted average 10,995 ± 55. (St-18, U-20, U-75, W-82, and W-84 corrected for Suess-effect). No pretreatment.

Lu-4. Walburg Kerk — **1190 ± 40 / A.D. 760** — $\delta C^{13} = -25.0‰$

Wood from under former Walburg church at Groningen, Netherlands (53° 12′ N Lat, 6° 36′ E Long). Supplied by J. C. Vogel, Univ. of Groningen. *Comment:* wood of same origin was dated by others: de Vries and Barendsen (1954), 980 ± 50 (average of 10 determinations ranging from 820 to 1200 yr); Nydal and Sigmond (1957), T-29, 1050 ± 100;

Münnich (1957), H-8-7, 1245 ± 130; Olsson (1959), U-69, 1230 ± 80; Olson and Broecker (1959), L-292, 1250 ± 150; Tauber (1960), K-143, 1380 ± 120; Damon and Long (1962), A-81 bis, 1080 ± 140; Vogel (pers. comm.), new determination on same wood material, 1300 ± 40; weighted average 1185 ± 26. (U-69 corrected for Suess-effect).

II. GEOLOGIC SAMPLES

A. Sweden

Lu-8. Mammarp, Halland — **3880 ± 210** / **1930 B.C.**

$\delta C^{13} = -22.8‰$

Small charcoal particles from fossil ice wedge at Mammarp, Halland (56° 32′ N Lat, 13° 00′ E Long). Ref. H. Svensson (1964a). Coll. 1965 and subm. by Harald Svensson, Dept. Physical Geography, Univ. of Lund. *Comment:* HCl pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-16. Southern Baltic — **9420 ± 100** / **7470 B.C.**

$\delta C^{13} = -25.0‰$

Wood from stump of *Pinus* found by fishermen at water depth 80 m NE of Bornholm, southern Baltic (ca. 55° 25′ N Lat, ca. 15° 10′ E Long). Ref. K. A. Grönwall (1928), T. Nilsson (1935, p. 540); subm. by Tage Nilsson, Dept. Quaternary Geol., Univ. of Lund. *Comment* (T.N.): other submerged pine stumps from bottom of Baltic have given similar ages: St-120, 9100 ± 120 B.P.; St-179, 9330 ± 120 B.P. (Stockholm I). However, depth of find is not certainly original, *in-situ* depth, as stumps could have been dragged to present find spots by fishermen, in order to clean the fishing grounds.

HCl and NaOH pretreatment.

Lu-19. Landskrona Harbour — **8100 ± 100** / **6150 B.C.**

$\delta C^{13} = -24.0‰$

Wood from stem of *Pinus* found below marine sediments ca. 5 m below sea level in Landskrona Harbour (55° 52′ N Lat, 12° 49′ E Long). Coll. 1939 by E. Mohrén; subm. by Tage Nilsson. *Comment* (T.N.): C^{14} datings of submerged peat and wood from other parts of western Scania have given similar ages: Sjölunda, St-1196, 8075 ± 100 B.P. (Stockholm VI); Limhamn, St-720, 7895 ± 115 B.P.; St-732, 7900 ± 160 B.P. (Stockholm IV); Falsterbo, St-1215, 7645 ± 110 B.P.; St-1216, 7545 ± 100 B.P. St-1233, 7730 ± 100 B.P. (Stockholm VI).

Sample taken from outer part of stem. HCl pretreatment.

Bräckemotet series, Gothenburg

Peat, wood, and marine gyttja from Bräckemotet, Hisingen, Gothenburg (57° 42′ N Lat, 11° 54′ E Long). Stratigraphic sequence from bottom to top: Sand and gravel, 3 cm clay gyttja, 15 cm peat with pieces of

wood, 27 cm marine gyttja, 100 cm sand and gravel. Coll. 1965 by Gert Knutsson; subm. by Gösta Persson, Dept. Quaternary Geol., Univ. of Lund.

8860 ± 100

Lu-22. Bräckemotet 6538 B **6910 B.C.**

$\delta C^{13} = -27.8‰$

Peat from 14 cm above sand and gravel. *Comment:* HCl pretreatment.

9060 ± 105

Lu-21. Bräckemotet 6538 CD **7110 B.C.**

$\delta C^{13} = -28.1‰$

Wood from peat layer, ca. 17 cm above sand and gravel. *Comment:* HCl pretreatment.

8530 ± 100

Lu-20. Bräckemotet 6538 A **6580 B.C.**

$\delta C^{13} = -19.3‰$

Marine gyttja from 30 cm above sand and gravel. *Comment:* HCl pretreatment.

General Comment (G.P.): in the interval between deposition of Lu-22 and Lu-20 a Post-Glacial marine transgression reached 19 m above recent sea level in this region. In corresponding pollen diagram the rational *Alnus* limit lies about 25 cm above sand and gravel.

Djuringsholm series

Peat from layers below and above sand-filled watercourse at Djuringsholm, Vittskövle parish, Scania (55° 50′ N Lat, 14° 10′ E Long). Sand filling about 35 cm thick, overlying peat and overlain by 35 cm of peat. Coll. 1966 and subm. by Harald Svensson, Scientific Research Council, Stockholm.

2790 ± 100

Lu-39. Djuringsholm I **840 B.C.**

$\delta C^{13} = -28.2‰$

Highly humified peat from immediately below sand filling. Sample thickness ca 2 cm. *Comment:* HCl pretreatment.

1250 ± 100

Lu-40. Djuringsholm II **A.D. 700**

$\delta C^{13} = -28.2‰$

Highly humified peat from immediately above sand filling. *Comment:* HCl pretreatment.

General Comment (H.S.): investigation was made to date a fossil stream pattern (H. Svensson, 1967).

Trummen series

Sediment samples from Lake Trummen, near the city of Växjö, centrals S Sweden (56° 52′ N Lat, 14° 50′ E Long). Alt. 161 m; area 1.2 sq km; max. depth 1.5 to 2.0 m. Coll. 1966 and subm. by G. Digerfeldt, Dept. Quaternary Geol., Univ. of Lund. Datings from Lake Trummen were

carried out with an investigation of Post-Glacial and Late-Glacial development of the lake and the vegetational history of the surrounding region (Björk and Digerfeldt, 1965). Samples come from profile taken in the central and deepest part of the lake (Livingstone sampler, diam. 60 mm). Dated samples represent pollen-zone boundaries and characteristic horizons in the pollen sequence. Water depth 150 cm at the sampling point. Depths given are below sea level.

Lu-87. Trummen 1966, 679-684 cm **9690 ± 105**
7740 B.C.
$\delta C^{13} = -25.7‰$

Detritus gyttja. Just above Late-Glacial/Post-Glacial boundary. First sampling.

Lu-88. Trummen 1966, 679-684 cm **9690 ± 110**
7740 B.C.
$\delta C^{13} = -29.9‰$

Detritus gyttja. Same stratigraphic position as Lu-87. Second sampling.

Lu-45. Trummen 1966, 645-650 cm **9650 ± 105**
7700 B.C.
$\delta C^{13} = -27.0‰$

Detritus gyttja. Distinct increase of *Pinus,* distinct decrease of *Betula.*

Lu-46. Trummen 1966, 607.5-612.5 cm **9310 ± 110**
7360 B.C.
$\delta C^{13} = -30.1‰$

Detritus gyttja. At empirical *Corylus* limit.

Lu-47. Trummen 1966, 602.5-607.5 cm **9320 ± 130**
7370 B.C.
$\delta C^{13} = -28.0‰$

Detritus gyttja. Just above empirical *Corylus* limit. *Comment:* sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-48. Trummen 1966, 580-585 cm **9360 ± 100**
7410 B.C.
$\delta C^{13} = -28.5‰$

Detritus gyttja. Just below rational *Corylus* limit.

Lu-49. Trummen 1966, 570-575 cm **9360 ± 100**
7410 B.C.
$\delta C^{13} = -27.9‰$

Detritus gyttja. At rational *Corylus* limit.

Lu-50. Trummen 1966, 497.5-502.5 cm **8490 ± 100**
6540 B.C.
$\delta C^{13} = -30.2‰$

Detritus gyttja. Just below rational *Alnus* limit.

Lu-51. Trummen 1966, 492.5-497.5 cm **8530 ± 100**
6580 B.C.
$\delta C^{13} = -30.2‰$

Detritus gyttja. Just above rational *Alnus* limit.

Lu-52. Trummen 1966, 430-435 cm — **7480 ± 100** / **5530 B.C.** / $\delta C^{13} = -31.6‰$

Detritus gyttja. Just below empirical *Tilia* limit.

Lu-53. Trummen 1966, 420-425 cm — **7190 ± 100** / **5240 B.C.** / $\delta C^{13} = -30.1‰$

Detritus gyttja. Just above empirical *Tilia* limit.

Lu-57. Trummen 1966, 367.5-372.5 cm — **5450 ± 100** / **3500 B.C.** / $\delta C^{13} = -28.7‰$

Detritus gyttja. Distinct increase of *Quercus*.

Lu-89. Trummen 1966, 355-360 cm — **5320 ± 100** / **3370 B.C.** / $\delta C^{13} = -30.5‰$

Detritus gyttja. Rather distinct decrease of *Ulmus*.

Lu-58. Trummen 1966, 327.5-332.5 cm — **4530 ± 100** / **2580 B.C.** / $\delta C^{13} = -27.8‰$

Detritus gyttja. At a maximum of *Quercus* and slight decrease of *Ulmus*.

Lu-59. Trummen 1966, 312.5-317.5 cm — **4210 ± 100** / **2260 B.C.** / $\delta C^{13} = -27.4‰$

Detritus gyttja. At a maximum of *Quercus* and slight decrease of *Ulmus*.

Lu-83. Trummen 1966, 302.5-307.5 cm — **4100 ± 100** / **2150 B.C.** / $\delta C^{13} = -30.3‰$

Detritus gyttja. Distinct decrease of *Quercus* and slight decrease of *Ulmus* and *Tilia*.

Lu-101. Trummen 1966, 287.5-292.5 cm — **3800 ± 100** / **1850 B.C.** / $\delta C^{13} = -29.4‰$

Detritus gyttja. At empirical *Fagus* limit.

Lu-84. Trummen 1966, 227.5-232.5 cm — **2600 ± 100** / **650 B.C.** / $\delta C^{13} = -27.0‰$

Detritus gyttja. Slight increase of *Fagus*.

Lu-54. Trummen 1966, 207.5-212.5 cm — **2080 ± 100** / **130 B.C.** / $\delta C^{13} = -29.2‰$

Detritus gyttja. At rational *Fagus* limit.

Lu-55. Trummen 1966, 192.5-197.5 cm — **1130 ± 100** / **A.D. 820** / $\delta C^{13} = -28.2‰$

Detritus gyttja. At rational *Picea* limit.

Lu-56. Trummen 1966, 187.5-192.5 cm **1150 ± 100**
A.D. 800
$\delta C^{13} = -28.2‰$

Detritus gyttja. Just above rational *Picea* limit.

Lu-29. Trummen 1964 **8030 ± 100**
6080 B.C.
$\delta C^{13} = -24.1‰$

Charcoal found in sandy detritus gyttja ca. 5 cm above Late-Glacial clay gyttja. Sample is from another point closer to the shore. *Comment* (G.D.): the charcoal was washed out from a dwelling near the shore. *General Comment:* HCl pretreatment for all samples.

Store Mosse series

Peat samples from raised bog Store Mosse, 15 km NW of Värnamo, southern Sweden (57° 15′ N Lat, 13° 56′ E Long). Dated as part of investigation of bog development, recurrence surfaces, and vegetational history (G. Svensson, 1965). Samples were taken with a Hiller sampler at 2 different points (St I and B.P. A4) ca. 20 m apart. Depths given are below surface of the bog. Coll. 1966 and subm. by Göran Svensson, Dept. Ecological Botany, Univ. of Lund.

Lu-62. Store Mosse, Sample I, St I **1090 ± 100**
A.D. 860
$\delta C^{13} = -27.3‰$

Slightly humified (H3) *Sphagnum* peat, ca. 5 cm above highly humified layer. Depth 190 cm.

Lu-63. Store Mosse, Sample II, St I **1510 ± 100**
A.D. 440
$\delta C^{13} = -27.6‰$

Highly humified (H8) *Sphagnum* peat, ca. 15 cm below upper limit of highly humified layer. Depth 210 cm.

Lu-64. Store Mosse, Sample III, St I **2410 ± 100**
460 B.C.
$\delta C^{13} = -28.5‰$

Moderately humified (H5) *Sphagnum* peat, ca. 1 cm above highly humified layer. Depth 280 cm.

Lu-65. Store Mosse, Sample IV, St I **3100 ± 100**
1150 B.C.
$\delta C^{13} = -28.8‰$

Highly humified (H8) *Sphagnum* peat, ca. 20 cm below upper limit of highly humified layer. Depth 300 cm.

Lu-65B. Store Mosse, Sample IV, St I, pretreated **3000 ± 100**
1050 B.C.
$\delta C^{13} = -27.3‰$

Part of sample IV was pretreated with HCl and NaOH to determine whether younger or older humic acid was present in quantities sufficient to change the age.

4690 ± 100
Lu-66. Store Mosse, Sample V, St I **2740 B.C.**
$\delta C^{13} = -26.6‰$

Moderately humified (H5) *Sphagnum* peat, ca. 6 cm above boundary between ombrogenous *Sphagnum* peat and underlying fen peat. Depth 450 cm.

970 ± 100
Lu-79. Store Mosse, Sample VI, B.P. A4 **A.D. 980**
$\delta C^{13} = -26.0‰$

Slightly humified (H3) *Sphagnum* peat, ca. 2 cm above highly humified layer. Depth 195 cm.

1500 ± 100
Lu-80. Store Mosse, Sample VII, B.P. A4 **A.D. 450**
$\delta C^{13} = -27.3‰$

Highly humified (H8) *Sphagnum* peat, ca. 15 cm below upper limit of highly humified layer. Depth 210 cm.

2310 ± 100
Lu-81. Store Mosse, Sample VIII, B.P. A4 **360 B.C.**
$\delta C^{13} = -26.0‰$

Moderately humified (H5) *Sphagnum* peat, ca. 3 cm above highly humified layer. Depth 290 cm.

2780 ± 100
Lu-82. Store Mosse, Sample IX, B. P. A4 **830 B.C.**
$\delta C^{13} = -26.3‰$

Highly humified (H8) *Sphagnum* peat, ca. 15 cm below upper limit of highly humified layer. Depth 305 cm.
General Comment: all samples except Lu-65 B were charred in nitrogen atmosphere prior to burning. No other pretreatment.

B. Norway

Finnmark series, permafrost forms

Peat samples from bottom of polygon furrows and frost mound (Lu-26) from sites in Finnmark, northern Norway. Ref. H. Svensson (1963). Coll. 1965 (Lu-5 through Lu-7) and 1966 (Lu-23 through Lu-26) and subm. by Harald Svensson, Dept. Physical Geography, Univ. of Lund, and Scientific Research Council, Stockholm,

4350 ± 100
Lu-5. Bussesund, Finnmark **2400 B.C.**
$\delta C^{13} = -26.8‰$

Peat from bottom of polygon furrow at Bussesund, Finnmark (70° 20′ N Lat, 31° 00′ E Long). *Comment:* HCl pretreatment.

2180 ± 100
Lu-6. Veines I, Finnmark **230 B.C.**
$\delta C^{13} = -27.3‰$

Peat from bottom of polygon furrow at Veines, Finnmark (70° 05′ N Lat, 28° 45′ E Long). *Comment:* HCl pretreatment.

Lu-7. Kongsöfjorden, Finnmark **2320 ± 100**
370 B.C.
$\delta C^{13} = -26.1‰$

Peat from bottom of polygon furrow at Kongsöfjorden, Finnmark (70° 40′ N Lat, 29° 10′ E Long). *Comment:* HCl pretreatment.

Lu-23. Barvikvand, Finnmark **< 320**

Peat from bottom of polygon furrow W of Lake Barvikvand, Finnmark (70° 25′ N Lat, 30° 50′ E Long). *Comment:* HCl pretreatment.

Lu-24. Veines II, Finnmark **3150 ± 100**
1200 B.C.
$\delta C^{13} = -25.4‰$

Peat from bottom of polygon furrow at Veines, Finnmark (70° 05′ N Lat, 28° 45′ E Long). *Comment:* HCl pretreatment.

Lu-25. Veines III, Finnmark **1270 ± 100**
A.D. 680
$\delta C^{13} = -25.4‰$

Peat from bottom of polygon furrow at Veines, Finnmark (70° 05′ N Lat, 28° 45′ E Long). *Comment:* HCl pretreatment.

Lu-26. Karlebotn, Finnmark **1320 ± 100**
A.D. 630
$\delta C^{13} = -25.7‰$

Peat from collapsed frost mound at Karlebotn, Finnmark (70° 07′ N Lat, 28° 35′ E Long). Ref. H. Svensson (1964b). *Comment:* HCl pretreatment.

Karlebotn series

Peat samples from pals* situated 600 m ENE of Karlebotn school, Karlebotn, Finnmark (70° 08′ N Lat, 28° 35′ E Long). Investigated for beginning date of peat formation, growth rate, and age of pals. Coll. 1966 and subm. by R. Åhman, Dept. Physical Geography, Univ. of Lund.

Lu-30. Karlebotn 1, 0 cm **7520 ± 100**
5570 B.C.
$\delta C^{13} = -21.7‰$

Peat from bottom of pals. *Comment:* no pretreatment.

Lu-31. Karlebotn 2, 30 cm **6110 ± 100**
4160 B.C.
$\delta C^{13} = -25.9‰$

Peat from 30 cm above bottom of pals. *Comment:* no pretreatment.

Lu-32. Karlebotn 3, 60 cm **5140 ± 100**
3190 B.C.
$\delta C^{13} = -26.5‰$

Peat from 60 cm above bottom of pals. *Comment:* no pretreatment.

*pals = permafrost mound

Lu-33. Karlebotn 4, 90 cm — **3520 ± 100**, **1570 B.C.**, $\delta C^{13} = -25.5‰$

Peat from 90 cm above bottom and about 20 cm from top of pals. *Comment:* no pretreatment.

III. ARCHAEOLOGIC SAMPLES

Sweden

Stadshallen Lund series

Samples collected in the city of Lund (55° 42′ N Lat, 13° 11′ E Long) during extensive excavation for new town hall. Coll. 1965 and subm. by A. W. Mårtensson, Medieval Dept., Culture-Historical Museum, Lund. Preliminary report is given by submitter (Mårtensson, 1966).

Lu-9. Stadshallen Lund I — **990 ± 100**, **A.D. 960**

Charcoal from black-ware cooking pot found in a hearth. KM 57382, Sample 1. *Comment:* HCl pretreatment.

Lu-18. Stadshallen Lund II — **1180 ± 100**, **A.D. 770**, $\delta C^{13} = -24.8‰$

Charcoal from Square 1552, +36.82 – +36.72, KM 57382, Sample 2. *Comment:* HCl pretreatment.

Lu-10. Värby 65 — **4820 ± 100**, **2870 B.C.**, $\delta C^{13} = -25.2‰$

Charcoal from refuse pit at Värby No. 44, Bara parish, Scania (55° 35′ N Lat, 13° 11′ E Long). Worked flints, animal bones, and Early Neolithic C pottery of megalithic group found in pit. Coll. 1965 and subm. by B. Salomonsson, Historical Museum, Univ. of Lund. *Comment* (B.S.): date seems too old but acceptable, supported by Svenstorp Ö 51 (Lu-12). HCl and NaOH pretreatment.

Månasken series

Samples from settlement (Funnel-Beaker culture and Early Iron age) at Månasken, V. Kärrstorp No. 7, Kärrstorp parish, Scania (55° 29′ N Lat, 13° 09′ E Long). Coll. 1965 and subm. by B. Salomonsson.

Lu-11. Månasken, Structure No. 80 — **8850 ± 100**, **6900 B.C.**, $\delta C^{13} = -22.6‰$

Charcoal from pit with Early Neolithic Funnel-Beaker pottery. *Comment* (B.S.): unexpectedly early date. One reason may be that a Mesolithic hearth was destroyed during Early Neolithic times, another that old bog trees may have been used as fire material during Early Neolithic times. HCl pretreatment.

Lu-78. Månasken, Structure No. 88 **1890 ± 100**
A.D. 60
$\delta C^{13} = -24.5‰$

Charcoal from pit with pottery of Early Neolithic Funnel-Beaker type. Pottery has more cereal grain impressions than usual. *Comment* (B.S.): date too young. Pottery was evidently in secondary position in an Early Iron Age pit. HCl pretreatment.

Svenstorp series

Samples from settlement at Svenstorp, Skabersjö parish, Scania (55° 31′ N Lat, 13° 09′ E Long). Another part of site was investigated in 1962 (Salomonsson, 1963). Coll. 1963 and subm. by B. Salomonsson.

Lu-12. Svenstorp, Ö 51 **4780 ± 100**
2830 B.C.
$\delta C^{13} = -26.4‰$

Charcoal from pit with Early Neolithic C-pottery belonging to non-Megalithic Funnel-Beaker group. *Comment* (B.S.): cf. comment on Lu-10. HCl pretreatment.

Lu-17. Svenstorp, Ö 71 **1700 ± 100**
A.D. 250
$\delta C^{13} = -26.7‰$

Charcoal from fragmentary clay oven. *Comment* (B.S.): sample was dated to test if structure was contemporaneous with settlement. Date indicates it was used by later inhabitants. HCl and NaOH pretreatment.

Lu-35. Linnebjär **4690 ± 100**
2740 B.C.

Charcoal from hearth, position x = −1, y = −8, in Mesolithic site at Linnebjär, S. Sandby parish, Scania (55° 14′ N Lat, 13° 18′ E Long). Coll. 1964 and subm. by B. Salomonsson. Site is described by submitter (Salomonsson, 1965). *Comment* (B.S.): hearth is evidently not from Mesolithic times, but may be contemporaneous with the Neolithic artifacts found within settlement area (cf. Salomonsson, 1965, pp. 8-10). No pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-43. Öbacken, Structure x-40 **6960 ± 205**
5010 B.C.

Charcoal from pit within settlement area at Öbacken, Torreberga farm, Hyby parish, Scania (55° 36′ N Lat, 13° 11′ E Long). In the pit were microliths, burins, and core axes of Maglemosian types. Coll. 1962 and subm. by B. Salomonsson. *Comment* (B.S.): date seems unexpectedly young. HCl pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

St. Köpinge series

Samples found by excavation of deposits close to dolmen "Trollasten" at St. Köpinge No. 36^{17}, St. Köpinge parish, Scania (55° 28′ N

Lat, 13° 50′ E Long). Coll. 1965 and subm. by M. Strömberg, Historical Museum, Univ. of Lund. Site is described by submitter (Strömberg, 1966).

Lu-13. St. Köpinge No. 36[17], Deposit No. 10 **3460 ± 100**
1510 B.C.
$\delta C^{13} = -24.1‰$

Charcoal found with Deposit No. 10, below and beside an approx. 2 m-long slab of stone. *Comment:* no pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-14. St. Köpinge No. 36[17], Deposit No. 3 **2950 ± 100**
1000 B.C.
$\delta C^{13} = -22.9‰$

Charcoal found with Deposit No. 3 in cairn outside dolmen. *Comment:* no pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

General Comment (M.S.): dates have no bearing on finds in deposits. The charcoal was probably brought there for ritual ceremonies on later occasions.

Hagestad series

Samples from excavations at Hagestad, Löderup parish, Scania. Coll. 1961 to 1966 and subm. by M. Strömberg. Since 1960 extensive investigations are being made in this area to clarify cultural development and different milieu-influencing factors from Early Stone age to Early Middle ages. Area is ca. 30 sq km. During excavations many dwelling sites, graves, and other structures were found and investigated (Strömberg, 1961a, 1961b, 1963, 1965).

Lu-15. Hagestad No. 7[3]B **4010 ± 100**
2060 B.C.
$\delta C^{13} = -31.2‰$

Charcoal from hearth, Trench 2, x = +3, y = +4, at Hagestad No. 7[3]B (55° 24′ N Lat, 14° 11′ E Long). Coll. 1963. *Comment:* HCl and NaOH pretreatment.

Lu-67. Hagestad No. 40[1], Grave 5 **2430 ± 100**
480 B.C.
$\delta C^{13} = -26.6‰$

Charcoal from Grave 5 (cremation pit) on grave field at Hagestad No. 40[1] (55° 24′ N Lat, 14° 09′ E Long). Coll. 1966. *Comment:* HCl and NaOH pretreatment.

Lu-68. Hagestad No. 40[1], Grave 6 **2480 ± 100**
530 B.C.
$\delta C^{13} = -23.4‰$

Charcoal from Grave 6 (cremation pit) on same grave field as Lu-67. Coll. 1966. *Comment:* HCl pretreatment.

Lu-69. Hagestad No. 40[1], Grave 16 **2480 ± 100**
530 B.C.
$\delta C^{13} = -27.0‰$

Charcoal from Grave 16 (cremation pit) on same grave field as Lu-67. Coll. 1966. *Comment:* no pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-70. Hagestad No. 40[1], Grave 18 **2460 ± 100**
510 B.C.
$\delta C^{13} = -24.6‰$

Charcoal from Grave 18 (cremation pit) on same grave field as Lu-67. Coll. 1966. *Comment:* HCl pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-71. Hagestad No. 40[1], Grave 24 **2400 ± 100**
450 B.C.
$\delta C^{13} = -23.2‰$

Charcoal from Grave 24 (cremation pit) on same grave field as Lu-67. Coll. 1966. *Comment:* HCl pretreatment.

Lu-72. Hagestad No. 38[6] **2910 ± 100**
960 B.C.
$\delta C^{13} = -26.2‰$

Charcoal from hearth at Hagestad No. 38[6] (55° 24′ N Lat, 14° 11′ E Long). Sample taken ca. 40 cm below present surface. Coll. 1966. *Comment:* HCl pretreatment.

Lu-73. Hagestad No. 44[16] **2420 ± 100**
470 B.C.
$\delta C^{13} = -28.3‰$

Charcoal from hearth, ca. 30 cm below present surface, in Bronze Age settlement area at Hagestad No. 44[16] (55° 23′ N Lat, 14° 08′ E Long). Coll. 1966. *Comment:* HCl pretreatment.

Lu-74. Hagestad No. 6[4] **2600 ± 100**
650 B.C.
$\delta C^{13} = -25.8‰$

Charcoal from hearth at Hagestad No. 6[4], N of "Rytterskulle" (55° 23′ N Lat, 14° 09′ E Long). Sample taken ca. 35 cm below present surface. Coll. 1962. *Comment* (M.S.): site was complex with material from Stone, Bronze, and Iron ages. HCl pretreatment.

Lu-75. Hagestad No. 26[10] **2990 ± 100**
1040 B.C.
$\delta C^{13} = -25.4‰$

Charcoal from Hearth No. 1, found below dwelling place from 1st C. A.D. at Hagestad No. 26[10], N of the coast road (55° 23′ N Lat, 14° 09′ E Long). Coll. 1961. *Comment* (M.S.): date younger than expected. Charcoal from Hearth No. 1 probably contaminated by material from dwelling place above it. HCl pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.

Lu-76. Hagestad No. 50² **3300 ± 100**
1350 B.C.
$\delta C^{13} = -24.1‰$

Charcoal from burial mound at Hagestad No. 50² (55° 25′ N Lat, 14° 09′ E Long). Sample taken from partly charred wooden object. In the same mound were also double stone circles. *Comment:* HCl pretreatment.

Lu-77. Hagestad No. 2²B **2850 ± 100**
900 B.C.
$\delta C^{13} = -23.5‰$

Charcoal from Hearth No. 1, close to the megalithic grave at Hagestad No. 2²B (55° 25′ N Lat, 14° 08′ E Long). Coll. 1964. *Comment* (M.S.): date later than expected. HCl pretreatment.
General Comment (M.S.): all dates, except those already mentioned, correspond well with archaeologic results.

Bussevik-Senoren series, submarine blockings

Wood samples from artificial blockings found in a natural channel between the Torhamn Peninsula and the island of Senoren, eastern Blekinge (56° 07′ N Lat, 15° 47′ E Long). Blockings were built of piles driven into the bottom. Water depth is presently ca. 4 m. Coll. 1966 and subm. by B. E. Berglund, Dept. Quaternary Geol., Univ. of Lund.

Lu-27. Busseviw-Senoren 1 **870 ± 100**
A.D. 1080
$\delta C^{13} = -27.0‰$

Wood from birch pile. *Comment:* no pretreatment.

Lu-41. Bussevik-Senoren 2 **840 ± 100**
A.D. 1110
$\delta C^{13} = -27.2‰$

Wood from oak pile. Sample taken from outer annual rings of 50-year old trunk. *Comment:* HCl pretreatment.

Lu-42. Bussevik-Senoren 3 **940 ± 100**
A.D. 1010
$\delta C^{13} = -25.6‰$

Wood from oak bar in pile blocking. *Comment:* HCl pretreatment.
General Comment (B.E.B.): impossible to date these finds archaeologically, but radiocarbon dates indicate that blockings are about the same age as corresponding blockings in the Roskilde Fjord of Denmark (Copenhagen VII).

Björkärr series, Pitted Ware culture

Charcoal samples from a dwelling place at Björkärr, Torhamn parish, Blekinge (56° 06′ N Lat, 15° 49′ E Long). On a Littorina beach ridge covered with aeolic sand are 2 culture layers of Pitted Ware culture. Coll. 1964 and subm. by B. Salomonsson and B. E. Berglund.

Lu-28. Björkärr 1 **4160 ± 100**
2210 B.C.
$\delta C^{13} = -25.0‰$

Charcoal from upper culture layer. Squares S16, 17. *Comment:* HCl and NaOH pretreatment.

Lu-36. Björkärr 2 **4250 ± 100**
2300 B.C.
$\delta C^{13} = -25.5‰$

Charcoal from upper culture layer. Square S14. *Comment:* HCl and NaOH pretreatment.

Lu-38. Björkärr 4 **4440 ± 100**
2490 B.C.
$\delta C^{13} = -24.6‰$

Charcoal from lower culture layer. *Comment:* HCl pretreatment. Sample undersized, diluted with "dead" CO_2 from anthracite coal.
General Comment (B.E.B.): dates indicate age difference between lower and upper culture layers; samples also date regression between 2 Sub-Boreal transgressions of the Baltic (Berglund, 1964).

Lu-34. Drottninghall, V. Karup **1380 ± 100**
A.D. 570
$\delta C^{13} = -25.8‰$

Charcoal from hearth, position x = +14, y = +8, at Drottninghall, V. Karup parish, Scania (56° 25′ N Lat, 12° 46′ E Long). Hearth situated ca. 10 m NE of Drottninghall, a rock with rock-carvings, e.g., cup-marks and furrows. Finds associated with hearth are from Bronze and Iron ages. Coll. 1966 and subm. by H. Arbman, Historical Museum, Univ. of Lund. *Comment* (H.A.): date does not agree with expected age of rock-carvings but corresponds to age of some potsherds found near hearth. HCl and NaOH pretreatment.

Lu-44. Skanör, Kv. Lagmanshejdan **750 ± 100**
A.D. 1200
$\delta C^{13} = -20.4‰$

Human brain substance from skull found in Grave No. 173 during excavation of medieval cemetery on outskirts of the town Skanör (55° 25′ N Lat, 12° 51′ E Long). Whole skeleton was found in undisturbed position in sand, ca. 1.5 m below ground surface, just below present sea level and covered by ground water. Sample examined by A. Brun, Dept. of Pathology, Univ. of Lund. Coll. 1966 by I. Lindskog and subm. by M. Weidhagen, Skånes Hembygdsförbund, Lund. *Comment:* sample was freeze-dried and thoroughly de-gassed (it had been in contact with formaldehyde gas for a short time). To extract humic acid, sample was treated twice with 1% NaOH solution at 80°C for 3 hours.
General Comment (M.W.): Grave No. 173 had deepest position within cemetery, in which the oldest grave-layer is considered archaeologically not younger than ca. A.D. 1200. Investigation is not yet completed.

Bare Mosse series

Peat, wood, and bark from Stone age settlement at Bare Mosse, Svalöv parish, Scania (55° 57′ N Lat, 13° 05′ E Long). Lowest part of culture layer ca. 95 cm and highest part ca. 80 cm below present surface. Site is described by Forslid (1953) and Althin (1954). Coll. 1966 and subm. by Stig Welinder, Dept. Quaternary Geol., Univ. of Lund.

Lu-60A. Bare Mosse I:1, Peat — **8800 ± 100**, **6850 B.C.**, $\delta C^{13} = -27.3‰$

Cladium peat from 92.5 to 97.5 cm below surface. *Comment:* HCl and NaOH pretreatment.

Lu-60B. Bare Mosse I:1, Humic acid — **8410 ± 100**, **6460 B.C.**, $\delta C^{13} = -27.6‰$

Humic-acid fraction from Lu-60A.

Lu-61A. Bare Mosse I:2, Peat — **8570 ± 100**, **6620 B.C.**, $\delta C^{13} = -27.3‰$

Magnocaricetum peat from 77.5 to 82.5 cm below surface. *Comment:* HCl and NaOH pretreatment.

Lu-61B. Bare Mosse I:2, Wood and Bark — **8660 ± 100**, **6710 B.C.**, $\delta C^{13} = -24.5‰$

Wood and bark of *Pinus* from same stratigraphic position as Lu-61A. *Comment:* Sample was charred in nitrogen atmosphere prior to normal burning.

General Comment (S.W.): pollen-analytical age of the settlement Bare Mosse I is BO 1c-BO 2d (cf. Nilsson, 1964). Dates for the 2 samples limiting the settlement-stratum agree quite well with that result.

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Copenhagen VII	Tauber, 1966
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Heidelberg I	Münnich, 1957
Lamont IV	Broecker and Kulp, 1957
Lamont V	Olsen and Broecker, 1959
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