

## UPPSALA NATURAL RADIOCARBON MEASUREMENTS III

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The following list covers samples measured at the Uppsala radiocarbon laboratory during 1960. The technique used has been described by the senior author (Olsson, 1958). Pretreatment has not been changed since the last dating list was published (Uppsala II).

Reference sample is now 95% of the activity of the oxalic-acid standard from the National Bureau of Standards. Because this sample is used as if it were a wood standard, we have related our  $C^{13}$  values to the PDB Chicago  $C^{13}$  standard. The  $C^{13}/C^{12}$  ratios for samples were compared to that of our oxalic-acid I sample, which in turn was measured by Craig (1961) and related to the PDB Chicago  $C^{13}$  standard. The old Uppsala standard, which was 18th-century wood (Uppsala I and II), differs in  $C^{13}$  by  $-24.2 \pm 1 \%$  from PDB Chicago, and this amount should be added algebraically to  $\delta C^{13}$  values given in previous papers. To convert the old Uppsala time-scale to the new one,  $135 \pm 35$  yr should be added to previously published dates, because 95% of the NBS oxalic acid has a  $C^{14}$  activity of  $15 \pm 4 \%$  more than the old Uppsala reference sample, which in turn differs in  $C^{13}$  content from other wood samples by only 0.8 %.

The value 5570 yr has been used for the half-life of  $C^{14}$ . Results are expressed in yr before 1950. Errors include the standard deviations ( $\sigma$ ) of the counted particles for the unknown sample, reference sample, and background sample as well as the error in the  $\delta C^{13}$  values. When the activity is very low, so that  $2\sigma$  corresponds to a possibility of infinite age,  $2\sigma$  has been used instead of  $\sigma$ .

A few samples had to be diluted with  $CO_2$  from an old source to bring them to the normal working pressure of 3 atmospheres.

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## SAMPLE DESCRIPTIONS

## I. GEOLOGIC SAMPLES

*A. Mediterranean Area***U-177. Core 20902, 105.5 to 111 cm depth 15,900 ± 300**

Shells of foraminifera from core 20902 (38° 31' N Lat, 3° 50' E Long), depth 105.5 to 111 cm; depth in sea 2596 m. This level corresponds to lower parts of a layer rich in iron. The content of *Globorotalia scitula* was low. Coll. 1948 by Swedish *Albatross* Expedition (Pettersson); subm. by K. Gösta Eriksson, Uppsala Universitets Kvartärgeologiska Institution, Uppsala, Sweden. *Comment*: a fraction  $>4\mu$  was used.  $\delta C^{13} = -3.5\text{‰}$ .

*B. Spitsbergen***Vestspitsbergen series**

Peat, wood, and shells measured as a continuation of the Vestspitsbergen series (Uppsala II; Feyling-Hanssen and Olsson, 1959-1960). All altitudes are above mean sealevel.

**U-185. Skansbukta 15 M p 4800 ± 120**

Peat, 1.5 m below surface of a marine terrace, NE side of Skansbukta (78° 31.5' N Lat, 16° 3' E Long), Billefjorden, Spitsbergen; peat at 16.2 m alt. Sample gathered in a peat lamina, 3 cm thick, in sandy soil with marine shells of *Astarte borealis*, *Astarte montagui*, *Mytilus edulis*, *Saxicava arctica*, and *Mya truncata* above and below the peat lamina. Sample was expected to date a postglacial transgression. The stratigraphy is discussed by Feyling-Hanssen (1955, p. 109-115). Coll. 1950 and subm. 1960 by R. W. Feyling-Hanssen, Norsk Polarinstitut and Norges Geologiske Undersökelse, Oslo, Norway. *Comment*: the humus, which was extracted with NaOH will be dated later.  $\delta C^{13} = -27.0\text{‰}$ .

**U-187. Gipshuken 6014 635 ± 90**

Wood from Gipshuken (78° 27' N Lat, 16° 20' E Long), Isfjorden, Spitsbergen; ca. 5.5 m alt. Sample from a root (ca. 70 cm long and 25 cm thick), partly overgrown by vegetation and that left an imprint in the ground. A bone sample was collected at the same alt., a few m from this sample. Small pieces of wood, lying loose on the surface and showing traces of human activity, were found nearby. This sample was gathered in the area where Feyling-Hanssen and Jørstad (1950, p. 55-58) previously had observed grayish wood samples which they thought should be ancient. Coll. 1960 by R. W. Feyling-Hanssen, Norges Geologiske Undersökelse, Oslo, Norway, and Ingrid Olsson.  $\delta C^{13} = -24.4\text{‰}$ .

**U-188. Gipshuken 6015 1150 ± 100**

Wood from Gipshuken (78° 27' N Lat, 16° 22' E Long), Isfjorden, Spitsbergen; ca. 6 m alt. Sample from root end of a split, partly buried log ca. 4 m long. The small bay below this location was exposed to the wind. Coll. 1960 by

R. W. Feyling-Hanssen, Norges Geologiske Undersökelse, Oslo, Norway, and Ingrid Olsson.  $\delta C^{13} = -23.3 \text{ ‰}$ .

**U-189. Ekholmvika 6018 b** **21,300 ± 500**

Fragments of *Mya truncata* and *Saxicava arctica* from Ekholmvika ( $78^{\circ} 35' \text{ N Lat, } 16^{\circ} 40' \text{ E Long}$ ); Billefjorden, Spitsbergen; 84.5 m alt. Sample from surface layer at landward edge of marine terrace, 77.0 to 84.5 m alt, as determined by Feyling-Hanssen (1955, p. 76-81). Coll. 1960 by R. W. Feyling-Hanssen, Norges Geologiske Undersökelse, and Ingrid Olsson. *Comment*: condition of shells (small pieces) was such that one might expect contamination to produce a minimum age. Inner 60% was used.  $\delta C^{13} = + 0.6 \text{ ‰}$ .

**U-190. Ekholmvika 6018 a** **18,100 ± 500**

Shell layer surrounding part used for sample U-189. *Comment*: layer corresponds to 35% of the shells; 5% was removed by washing.  $\delta C^{13} = -1.9 \text{ ‰}$ ,

**U-186. Talavera O<sub>4</sub> p** **6000 ± 400**

Peat, 2.33 m below surface of a marine terrace, Talavera ( $78^{\circ} 15' \text{ N Lat, } 20^{\circ} 50' \text{ E Long}$ ), Barentsöya, Spitsbergen; peat at 12.1 m alt. Sample gathered in a peat lamina, 3 cm thick, below fossil bearing sand and above fossil bearing sand and clayey silt. Sample was expected to date a postglacial transgression in Spitsbergen. Coll. 1960 by J. Büdel, Geographisches Institut, Würzburg, Germany; subm. by R. W. Feyling-Hanssen, Norges Geologiske Undersökelse, Oslo, Norway. *Comment*: before being subm. the sample was treated with  $H_2O_2$  and  $CCl_4$ , in order to separate any foraminifera that might be present. The humus, which was extracted with NaOH, will be dated later. Diluted.  $\delta C^{13} = -27.0 \text{ ‰}$ .

*C. North America*

*Sample of Special Palynologic Interest*

**U-176. Weber Lake, Minnesota, 720 to 740 cm depth** **10,180 ± 160**

Clay-gyttja from a sediment core from southern edge of Weber Lake, Lake County, Minnesota, 0.5 mi W of State Highway 2, 31 mi N of Two Harbors (or one mi S of Mount Weber Lookout Tower), in sec. 36, T 58 N, R 11 W ( $47^{\circ} 28' \text{ N Lat, } 91^{\circ} 40' \text{ W Long}$ ). Sample from 720 to 740 cm below reference level (ice). A strong birch-pollen maximum and also the upper end of the late-glacial part of the profile rich in non-arboreal pollen (Fries) were found at the sampling level. Another sample (710 to 750 cm level) from same core (out of a split part of core), has been dated by the U. S. Geol. Survey Laboratory (W-873,  $10,550 \pm 300$ , USGS V). Two samples of same core taken 440 to 447 cm and 620 to 633 cm, respectively, below reference level, have been dated by Uppsala II: U-163,  $7300 \pm 140$ ; U-164,  $9150 \pm 130$ . Coll. 1959 by H. E. Wright, Jr., Univ. of Minnesota, Minneapolis, U. S. A. and Magnus Fries, Uppsala Universitets Växtbiologiska Institution, Uppsala, Sweden; subm. by Fries.  $\delta C^{13} = -16.6 \text{ ‰}$ .

## II. ARCHAEOLOGIC SAMPLES

*Sweden***U-168. Ö. Vemmerlöv no. 11 (LUHM 28568:18) 3085 ± 120**

Charcoal, from grave 18 at Ö. Vemmerlöv no. 11 (55° 35' N Lat, 13° 14' E Long), Ö. Vemmerlöv parish, Skåne, Sweden. Charcoal was found with burnt bone in an urn, the type of which indicates fifth period of the Bronze Age (Montelius' system). Coll. 1939 by B. M. Vifot, Lunds Universitets Historiska Museum, Lund, Sweden; subm. by Berta Stjernquist, Lunds Universitets Historiska Museum, Lund, Sweden. *Comment*:  $\delta C^{13} = -24.2\%$ .

**U-184. Dragby 1<sup>1</sup>:G:22 2045 ± 110**

Resin from grave G from Dragby (59° 59' N Lat, 17° 35' E Long), Skuttunge parish, Uppland, Sweden. Resin was found with burnt bone. Preliminary results of the excavation are discussed from different points of view by Stenberger (1960), Maj-Britt and Sten Florin (1960), Olsson (1960b) and Gräslund (1961). Coll. 1960 by Bo Gräslund, Uppsala Universitets Institution för Nordisk och Jämförande Fornkunska; subm. by Märten Stenberger, Uppsala Universitets Institution för Nordisk och Jämförande Fornkunska, Uppsala, Sweden. This sample belongs to Dragby series for which the first 10 dates have already been published (Uppsala II).  $\delta C^{13} = -26.0\%$ .

## III. ATOMIC BOMB EFFECT

The values are related to the international reference standard sample (95% of the activity of oxalic acid) and corrected for deviation in the  $C^{13}$  content, according to Broecker's suggestion (Lamont VI). Results give the per mil excess over corrected reference sample. The  $C^{14}$  content of these samples, and those previously measured in Uppsala (I and II), agrees with the content measured by Broecker and others (1959 and 1960); Lamont VI; Bien and Suess (1959); Münnich and Vogel (1959); Tauber (1960); and Willis (1960).

**U-191. Typha 60  $\Delta C^{14} = + 266 \pm 12\%$** 

*Typha latifolia* from Ekensberg (59° 48.5' N Lat, 17° 34.5' E Long), Uppsala, Sweden. The plant was gathered July 10, 1960 by Ingrid Olsson.  $\delta C^{13} = -27.6\%$ .

**U-192. Kvalöya, birch 6001  $\Delta C^{14} = + 252 \pm 12\%$** 

Birch leaves from Kvalöya (69° 39' N Lat, 18° 41' E Long), Troms, Norway. Leaves were gathered July 23, 1960 by Ingrid Olsson.  $\delta C^{13} = -26.7\%$ .

**U-193. Templet, grass 6010  $\Delta C^{14} = + 272 \pm 9\%$** 

Grass from Templet (78° 24' N Lat, 16° 47' E Long), Spitsbergen. Coll. July 29, 1960 by Ingrid Olsson.  $\delta C^{13} = -26.5\%$ .

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