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GLIWICE RADIOCARBON DATES VI

MIECZYSŁAW F PAZDUR, ANNA PAZDUR,
and ANDRZEJ ZASTAWNY

Institute of Physics, Silesian Technical University, PL-44-100 Gliwice,
ul Krzywoustego 2, Poland

Results presented in this date list have been obtained from Jan 1977 to Dec 1977, but some earlier measurements are also included. All calculations are based on a contemporary value equal to 0.95 of the activity of NBS oxalic acid standard and on the Libby value for the half-life of radiocarbon. Ages are reported as conventional radiocarbon dates in years before AD 1950. No corrections for $^{13}C/^{12}C$ ratio were made for measurements reported in this list. Errors quoted ($\pm 1\sigma$) included estimated overall standard deviations of count rates of the unknown sample, contemporary standard and background (Pazdur & Walanus, 1979). Counting equipment and experimental procedures have been described earlier (Mościcki & Zastawny, 1976, 1977; Pazdur *et al*, 1978; Pazdur & Pazdur, 1979a). Sample descriptions are based on information provided by the submitters.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Lake sediments

Samples of calcareous gyttja from several profiles of lake sediments from N Poland were dated for paleomagnetic studies made jointly by Dept of Geophysics, Edinburgh Univ, UK, and Inst of Geophys, Pol Acad of Sci, Warsaw. All samples coll in 1976 with Mackereth corer (Mackereth, 1969) by J E Mojski, Piotr Tuchołka and Eric Hogg, subm 1977 by Zdzisław Małkowski, Inst of Geophys, Pol Acad of Sci, Warsaw.

Raduńskie Lake series

Core 2 from Raduńskie Górne Lake (54° 14′ N, 17° 59′ E).

Gd-442A. RADG 2/I-1-5 ORG **6620 ± 180**
Depth from 135 to 165cm, organic fraction.

Gd-442B. RADG 2/I-1-5 ORG **6600 ± 250**
Duplicate run on 2nd counter.

Gd-454. RADG 2/I-1 CARB **7430 ± 190**
Depth from 145 to 155cm, carbonate fraction.

Gd-446. RADG 2/II-1-5 ORG **9360 ± 300**
Depth from 325 to 355cm, organic fraction.

Gd-439. RADG 2/II-1 CARB **9470 ± 270**
Depth from 335 to 355cm, carbonate fraction.

Gd-438. RADG 2/II-2-3 CARB **9740 ± 300**
Depth from 330 to 350cm, carbonate fraction.

Gd-449. RADG 2/III-1-3 ORG **9940 ± 210**
Depth from 440 to 460cm, organic fraction.

Gd-445. RADG 2/III-1 CARB **9610 ± 210**
Depth from 445 to 455cm, carbonate fraction.

Charzykowskie Lake series

Calcareous gyttja sediments, Core 6, from Charzykowskie Lake (53° 47′ N, 17° 28′ E).

Gd-451. CHAR 6/I-1-3 ORG **2850 ± 170**
Depth from 140 to 160cm, organic fraction.

Gd-475. CHAR 6/I-1-3 CARB **3270 ± 160**
Depth from 140 to 160cm, carbonate fraction.

Gd-452. CHAR 6/II-1-3 ORG **4870 ± 150**
Depth from 340 to 360cm, organic fraction.

Gd-476. CHAR 6/II-1 CARB **6220 ± 120**
Depth from 345 to 355cm, carbonate fraction.

Gd-460. CHAR 6/III-1 CARB **7770 ± 220**
Depth from 495 to 505cm, carbonate fraction.

Gd-458. CHAR 6/IV-1 CARB **8670 ± 220**
Depth from 555 to 565cm, carbonate fraction.

Mikołajskie Lake series

Calcareous gyttja, Core 2, from Mikołajskie Lake (53° 46′ N, 21° 35′ E).

Gd-461. MIK 2/I-1-3 ORG **1640 ± 140**
Depth from 215 to 235cm, organic fraction.

Gd-471. MIK 2/I-1-3 CARB **1850 ± 120**
Depth from 215 to 235cm, carbonate fraction.

Gd-472. MIK 2/II-1-5 ORG **3150 ± 130**
Depth from 435 to 465cm, organic fraction.

Gd-464. MIK 2/II-1-3 CARB **2740 ± 150**
Depth from 440 to 460cm, carbonate fraction.

Gd-470. MIK 2/II-4-5 CARB **2700 ± 130**
Depth from 435 to 440cm and from 460 to 465cm, carbonate fraction.

Gd-459. MIEDWIE 3/I-1-3 CARB 2370 ± 150

Calcareous gyttja from Miedwie Lake (53° 17′ N, 14° 13′ E), Core 3, depth from 160 to 180cm, carbonate fraction.

General Comment: in all cores significant apparent age has been found. Values of apparent ages and sedimentation rates for profiles RADG2, CHAR6 and MIK2 were determined by 2-stage correction procedure described by Pazdur & Pazdur (1979c). In 1st stage, results were smoothed by least squares line, and the approx values of apparent ages and sedimentation rates were calculated. Dates obtained by subtraction of apparent age were then corrected for long-term variations of radiocarbon, according to calibration tables of Damon *et al* (1973) and smoothed again by least squares line. Resulting final values of sedimentation rate, apparent age and percent initial activity of radiocarbon are listed in table 1.

TABLE 1

Estimated values of apparent age, initial ^{14}C activity and sedimentation rate for three dated cores

	Raduńskie Górne Lake[a]	Charzykowskie Lake[b]	Mikołajskie Lake
Apparent age (y)	5140 ± 170	1315 ± 120	430 ± 100
Initial ^{14}C concentration	0.577	0.849	0.983
Sedimentation rate (cm/100y)	7.89 ± 1.28	6.82 ± 0.36	17.5 ± 3.5

[a] values based on all dates listed.
[b] only dates for carbonate fraction were used in calculations.

B. Other geologic samples

Gd-420. Bór na Czerwonem 1976 6930 ± 240

Peat from base of peat bog site Bór na Czerwonem (49° 29′ N, 20° 02′ E) near Nowy Targ, depth 4.85m. Coll June 1976 by Marian Wójcikiewicz, subm by Marian Horawski, Inst Amelioration, Acad Agric, Cracow.

Varanger series

Samples coll July 1974 and subm 1976 by Alfred Jahn, Inst Geog, Wrocław Univ, Wrocław, dated for investigations of periglacial processes in Varanger peninsula (72° 40′ N, 30° 00′ E), N Norway.

Gd-490. Varanger V-1-74 1790 ± 80

Black peat from hill of thufur type, depth ca 50cm.

Gd-492. Varanger V-5-74 830 ± 110

Peaty fossil soil at depth from 45 to 70cm, overlain by gravels and turf.

Gd-473. Labrador L-1-75 3230 ± 120

Peat from palsa in permafrost region near Scheffersville, Labrador, Canada (55° 00′ N, 66° 00′ W). Coll Sept 1975 and subm 1976 by Alfred Jahn.

Gd-474. Isfiordflya S-6a-74 **2150 ± 100**

Peat from frozen black and brown peat layer at depth ca 70cm in hill of palsa type, of height ca 1m and 4m diam, on terrace of Isfiord, Isfiordflya, Spitsbergen (78° 10′ N, 13° 30′ E). Coll June 1974 and subm 1976 by Alfred Jahn.

II. ARCHAEOLOGIC SAMPLES

Milanówek-Falecin series

Site 1 of iron foundry settlement at Milanówek-Falęcin (52° 09′ N, 20° 40′ E), on floodplain terrace of Rokitnica R. Excavations were conducted in 1974 and 1975 over ca 350m² area. 210 smelting furnaces, 2 limekilns and 1 pit dwelling were discovered. Settlement is dated to 1st century BC/3rd century AD (Woyda, 1977). Coll 1975 and subm 1976 by Stefan Woyda, Mus Ancient Metallurgy Masovien Dist, Pruszków.

Gd-447. Milanówek-Falecin Furn 41 **2400 ± 170**

Charcoal from base of smelting cupola furnace No. 41, Trench I/75, below large heaps of ferrugineous slag, ca 80cm below present surface.

Gd-448. Milanówek-Falecin Pit 1 **2450 ± 180**

Charcoal from layer consisting of clay and lime at base of limekiln pit No. 1, Trench I/75, ca 180cm below present surface.

Biskupice series

Site 1 of iron foundry settlement, dated to 1st century BC/4th century AD, at Biskupice near Brwinów (52° 10′ N, 20° 43′ E), on floodplain terrace of Zimna Woda R. Excavations started in 1976 in 7000m² area and resulted in discovery of 580 smelting furnaces, 3 limekilns and 10 pit dwellings (Woyda, 1977). Coll and subm 1976 by Stefan Woyda.

Gd-436. Biskupice Furn 23 **2020 ± 155**

Charcoal from smelting furnace No. 23.

Gd-437. Biskupice Furn 56 **1940 ± 150**

Charcoal from smelting furnace No. 56.

Dobrzeń Mały series

Charcoal from Site B of iron foundry settlement dated to period of Roman influence at Dobrzeń Mały, near Opole (50° 45′ 00″ N, 17° 52′ 45″ E), NE of prevalley of Odra R. Samples from base of furnace pits at depth ca 80cm. Coll 1975 by Antoni Pawłowski, subm 1976 by Jerzy Rozpędowski, Inst Hist Architectural Arts & Tech, Wrocław Tech Univ, Wrocław.

Gd-489. Dobrzeń Mały ob 722 **1760 ± 70**

From object No. 722, ar 191/192.

Gd-488. Dobrzeń Mały ob 685 **1720 ± 70**

From object No. 685.

General Comment: compare other dates from this site: Object 19, Gd-263, 1770 ± 140; Object 25, Gd-298, 1660 ± 120 (R, v 20, p 407).

Łazy series

Charcoal from set of primitive iron smelting furnaces, Site 6 of ordered type (Bielenin, 1977) at Łazy near Nowa Słupia (50° 85′ N, 21° 08′ E), excavated on SE slope of Łysa Góra Mt. Lowest parts of furnace basins occur in undisturbed loess at depth 45 to 60cm below present surface of arable soil. Coll and subm Aug 1976 by Kazimierz Bielenin, Archaeol Mus, Cracow. Botanical id of samples by Irena Gluza.

Gd-431. Łazy 6, Furn 76 **1790 ± 150**

Mixed charcoal pieces (*Fagus silvatica* and *Abies alba* Mill) from furnace No. 76, left draught.

Gd-427. Łazy 6, Furn 83 **1970 ± 150**

Charcoal pieces of conifers (mostly *Abies alba* Mill) from furnace No. 83, right draught.

Gd-428. Łazy 6, Furn 27 **1730 ± 140**

Charcoal pieces of conifers (mostly *Abies alba* Mill) with bark fragments, from furnace No. 27, right draught.

Gd-432. Łazy 6, Furn 58 **1895 ± 160**

Charcoal pieces (*Abies alba* Mill) from furnace No. 58, right draught. *General Comment* (KB): 2 fragments of hand-molded ceramics were found in this site, which may be dated to period of Roman influence.

III. GEOCHEMICAL SAMPLES

A. Water samples

Water samples coll by lab staff in 1976 and 1977 were measured to trace origins of water outflow from inrushes in deep coal mines of Katowice coal region. Earlier measurements from Rybnik coal region were reported in our previous lists (Mościcki & Zastawny, 1976, Mościcki, 1977, Mościcki *et al*, 1978). PM (Percent Modern) is here defined as % of 0.95 A_{ox} NBS.

Lab no.	Sample	Depth (m)	Colln date	PM
Gd-411	CG/S18/S18A-1	ca 600m	Sept 1976	24.9 ± 1.1
Gd-426	CG/S18/S18A-2	"	Dec 1976	20.6 ± 1.1
Gd-412	CG/H2-1	ca 380m	Sept 1976	25.3 ± 0.9
Gd-434	CG/H2-2	"	Dec 1976	21.5 ± 1.2
Gd-417	CG/S-1	surface	Sept 1976	66.3 ± 1.4
Gd-433	CG/S-2	"	Dec 1976	59.8 ± 1.7
Gd-456	GG/PP-46-1	ca 600m	Feb 1977	43.2 ± 1.1
Gd-462	GG/PP-46-2	"	May 1977	41.7 ± 1.0
Gd-457	GG/GIII-1	ca 400m	Feb 1977	59.5 ± 1.7
Gd-467	GG/GIII-2	"	May 1977	61.9 ± 1.3
Gd-466	GG/PP-VI-2	ca 600m	May 1977	52.3 ± 1.2

B. Contemporary stalagmite samples

Some recently formed stalagmites and stalactites were coll in deep coal mine in region of great water outflow at depth 400m, near sampling point RJ-1. Measurements of ^{14}C concentration in water bicarbonates were made from 1972 to 1975, indicating low and stable level of ^{14}C concentration, 2.0 ± 0.3% of modern (Mościcki, 1977). Geol characteristics of site was given by Jureczko *et al* (1974). Measurements of $\delta^{13}C$ and $\delta^{18}O$ were made by Stanisław Hałas, Inst Physics, Univ Maria Curie Skłodowska, Lublin. X-ray analysis of powdered Stg 1 sample indicates crystallographic structure of purest calcite. Results of measurements are given in table 2. Stk 1 denotes stalactite sample measured as a whole. Results for stalagmites Stg 1 and Stg 2 are listed from outer layer to central part of stalagmite.

TABLE 2

Results of ^{14}C concentration measurements in stalagmite samples. Values of $\delta^{13}C$ and $\delta^{18}O$ are given vs PDB standard

Lab no.	Sample	$\delta^{13}C$	$\delta^{18}O$	PM
Gd-292	Stk 1	—	—	62.0 ± 1.3
Gd-288	Stg 2, outer layer	—	—	100.3 ± 1.7
Gd-289	Stg 2, 1st interm layer	—	—	85.3 ± 1.6
Gd-290	Stg 2, 2nd interm layer	—	—	74.8 ± 1.6
Gd-291	Stg. 2, inner layer	—	—	59.1 ± 1.1
Gd-483	Stg 1, outer layer	−37.02	−24.9	69.5 ± 1.5*
Gd-484	Stg 1, interm layer	−36.32	−22.4	55.8 ± 1.2*
Gd-481	Stg 1, inner layer	−35.04	−22.0	48.8 ± 1.1*

* values uncorrected for $\delta^{13}C$.

General Comment (MFP): evident trend in ^{14}C concentration as well as in $\delta^{13}C$ and $\delta^{18}O$ values indicates that ^{14}C activity of calcite samples, ca 20 to 50 times greater than ^{14}C activity of water bicarbonates, is caused by adsorption of ^{14}C-enriched atmospheric CO_2 on outer surface. Subsequent diffusion of ^{14}C-labelled carbon atoms towards center of stalagmite and isotopic exchange with initially inactive carbon atoms occurs in $CaCO_3$ crystals (Pazdur & Pazdur, 1979b).

C. Other geochemical samples

Gd-480. Gs/090474 **134.9 ± 1.6% PM**

Atmospheric CO_2 sample coll 9 April 1974 in Gliwice by Elzbieta Kostkiewicz, Inst Physics, Silesian Tech Univ, Gliwice. *Comment* (MFP): sample coll in urban area, industrial effect is clearly visible.

Gd-493. Jawornik Polski JP40/50 **103.0 ± 0.8% PM**

Wool, probably grown from AD 1940 to 1950, rural region of SE Poland. Coll and subm 1977 by Anna Pazdur.

Gd-494. Jawornik Polski JP76/77 **149.7 ± 1.4% PM**

Beeswax coll 1976/1977 in rural region of SE Poland, at Jawornik Polski village. Coll and subm by Anna Pazdur.

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KÖLN RADIOCARBON MEASUREMENTS II

J C FREUNDLICH, H SCHWABEDISSEN, and W E WENDT

^{14}C Laboratory, Institut für Ur- und Frühgeschichte, Universität zu Köln, D-5 Köln 41, West Germany

Since the publication of our first date list (R, 1966, v 8, p 239-247), our ^{14}C laboratory has produced about 1500 radiocarbon dates, including several hundreds of concordant double determinations, the majority of which were on archaeologic samples. The greater part of the other dates concerned dendrochronologic samples from our Tree Ring Laboratory (Schmidt, 1977; Freundlich, 1977). Several archaeologic dates have already been published in articles on archaeology, preferentially by the respective excavators, in a few instances also by us (eg, Schwabedissen and Freundlich, 1968; Faruggia *et al*, 1973; Kuper, 1975; Lüning and Zürn, 1977; Hohenschwert, 1978). An extensive compilation of Neolithic dates is in preparation.

We believe that it is not very promising just to compile lists of dates "from the shelf" without detailed descriptions of archaeologic samples and their widely differing traits, along with the context of the excavation site. Such "listed ages" would be almost meaningless, eg, Dümmer (*cf* Wendt *et al*, 1962, 106).

Chemical preparation of the samples and measurement procedures did not change essentially since our previous list. Only our final purification of carbon dioxide gas (Freundlich and Rutloh, 1972) was changed to a modified form of De Vries' copper method (see Vogel and Waterbolk, 1967). Table 1 shows the properties of our proportional counters.

TABLE 1

Set no.	Anode material	Volume (liter)	Filling pressure (atm)	Background (cpm)	95% NBS standard (cpm)
I	copper	2.0	0.9	8.5	11.8
II	copper	2.3	0.8	6.3	12.5
III	guilded quartz	0.51	3.0	0.7	10.3
			1.0	0.6	3.4
IV	steel (*)	0.46	3.0	1.3	9.3
			0.8	1.1	2.4

* See Faltings, 1952.

Several minor effects (one described by Freundlich, 1972; *cf* also Neustupny, 1970) influenced some of our earlier dates. All of our previous dates were reviewed, recalculated and/or redetermined from the original sample. These doubly checked dates are marked with an "I." preceding the laboratory number. For numbers higher than KN-999 (or KN-I.999), this was no longer necessary.

Tolerance value given with each date represents the one sigma value as determined from results of radioactivity assay of sample, background, and contemporary standard. All dates are expressed in the BP scale (=before AD 1950) using the Libby half-life of 5568 years. Concerning the cor-

rections for De Vries' effect, the reader is referred to the literature, eg, Suess, 1970; Damon *et al*, 1972; Ralph *et al*, 1973; Olsson *et al*, 1974; Watkins, 1975; Damon *et al*, 1978.

All sites mentioned in the following date list have been excavated by author W E Wendt in collaboration with State Museum Windhoek, for a continuing archaeologic research program in South West Africa between 1968 and 1974.

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SAMPLE DESCRIPTIONS

A. Sites in SW districts of SW Africa

Apollo 11—Cave series, SW Africa

Excavation, begun in 1969, continued in 1972, of cave in Upper Nuob River of W Huns Mts (27° 45′ S, 17° 06′ E) 145 km SE of Aus, Lüderitz dist, SW Africa.

General Comment: cave contains longest and most complete sequence of cultural layers excavated so far in SW Africa; Africa's oldest dated works of art ("art mobilier") have also been discovered here. Forty ^{14}C dates have been obtained (27 KN dates, 13 Pta dates). In order to present all relevant data, a schematic sec of main cultural layers appears in Fig 1, showing positions of all dated samples in relation to each other and to interfaces. Laboratory numbers of all 40 dates are listed in Table 2.

Fuller details and interpretative material have already been pub (Vogel, ms in preparation; Wendt, 1972, p 20-22; 1974, p 1-42; 1976, p 5-11. Some dates pub earlier (Wendt, 1972, p 21-22) have been modified. Samples coll 1969 and 1972, subm 1970, 1973, 1974, and 1975 by W E Wendt.

KN-I.608. Apollo 11 P. 1 **490 ± 45**

Concentrated charcoal lumps at 3 to 5cm depth in Sq B 8 assoc with Upper Pottery Layer A (Fig 1, no. 2).

KN-I.846. Apollo 11 P. 18 **1460 ± 55**

Nest with uncharred twigs at 6 to 10cm depth in Sq B 8-9 assoc with Lower Pottery Lens B (Fig 1, no. 3).

KN-I.870. Apollo 11 P. 26 **1670 ± 55**

Uncharred twigs and grass scattered in spit at 12 to 17cm depth in Sq A 8 X_2 assoc with Lower Pottery Lens B (Fig 1, no. 4).