GLIWICE RADIOCARBON DATES VI

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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 (Mośicki & Zastawny, 1976, 1977; Pazdur et al, 1978; Pazdur & Pazdur, 1979a). Sample descriptions are based on information provided by the submitters.

SAMPLE DESCRIPTIONS

1. GEOLOGIC SAMPLES

A. Lake sediments


Raduński Lake series

Core 2 from Raduński 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/I-1.5 ORG 9360 ± 300
Depth from 325 to 355cm, organic fraction.

Gd-439. RADG 2/I-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 350 cm, carbonate fraction.

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

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

Charzykowskie Lake series
Calcereous 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 160 cm, organic fraction.

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

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

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

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

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

Mikołajskie Lake series
Calcereous 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 235 cm, organic fraction.

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

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

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

Gd-470. MIK 2/II-4-5 CARB 2700 ± 130
Depth from 435 to 440 cm and from 460 to 465 cm, carbonate fraction.
Gd-459. **MIEDWIE 3/I-1-3 CARB**  
2370 ± 150

Calcereous 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

<table>
<thead>
<tr>
<th></th>
<th>Raduńskie Górne Lake^a</th>
<th>Charzykowskie Lake^b</th>
<th>Mikolajskie Lake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent age (y)</td>
<td>5140 ± 170</td>
<td>1315 ± 120</td>
<td>430 ± 100</td>
</tr>
<tr>
<td>Initial ^14^C concen.</td>
<td>0.577</td>
<td>0.849</td>
<td>0.983</td>
</tr>
<tr>
<td>Sedimentation rate (cm/100y)</td>
<td>7.89 ± 1.28</td>
<td>6.82 ± 0.36</td>
<td>17.5 ± 3.5</td>
</tr>
</tbody>
</table>

^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**


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-Falecin (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.

**Dobrzen Mały series**

Charcoal from Site B of iron foundry settlement dated to period of Roman influence at Dobrzen 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 Pawlowski, subm 1976 by Jerzy Rozpędowski, Inst Hist Architectural Arts & Tech, Wrocław Tech Univ, Wrocław.

**Gd-489. Dobrzen Mały ob 722**  
1760 ± 70  
From object No. 722, ar 191/192.

**Gd-488. Dobrzen 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).

Lazy series

Charcoal from set of primitive iron smelting furnaces, Site 6 of ordered type (Bielenin, 1977) at Lazy near Nowa Ślupia (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. Lazy 6, Furn 76 1790 ± 150
Mixed charcoal pieces (Fagus silvatica and Abies alba Mill) from furnace No. 76, left draught.

Gd-127. Lazy 6, Furn 83 1970 ± 150
Charcoal pieces of conifers (mostly Abies alba Mill) from furnace No. 83, right draught.

Gd-428. Lazy 6, Furn 27 1730 ± 140
Charcoal pieces of conifers (mostly Abies alba Mill) with bark fragments, from furnace No. 27, right draught.

Gd-432. Lazy 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 Aox NBS.

<table>
<thead>
<tr>
<th>Lab no.</th>
<th>Sample</th>
<th>Depth (m)</th>
<th>Colln date</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gd-411</td>
<td>CG/S18/S18A-1</td>
<td>ca 600m</td>
<td>Sept 1976</td>
<td>24.9 ± 1.1</td>
</tr>
<tr>
<td>Gd-426</td>
<td>CG/S18/S18A-2</td>
<td>&quot;</td>
<td>Dec 1976</td>
<td>20.6 ± 1.1</td>
</tr>
<tr>
<td>Gd-412</td>
<td>CG/H2-1</td>
<td>ca 380m</td>
<td>Sept 1976</td>
<td>25.3 ± 0.9</td>
</tr>
<tr>
<td>Gd-434</td>
<td>CG/H2-2</td>
<td>&quot;</td>
<td>Dec 1976</td>
<td>21.5 ± 1.2</td>
</tr>
<tr>
<td>Gd-417</td>
<td>CG/S-1</td>
<td>surface</td>
<td>Sept 1976</td>
<td>66.3 ± 1.4</td>
</tr>
<tr>
<td>Gd-433</td>
<td>CG/S-2</td>
<td>&quot;</td>
<td>Dec 1976</td>
<td>59.8 ± 1.7</td>
</tr>
<tr>
<td>Gd-456</td>
<td>GG/PP-46-1</td>
<td>ca 600m</td>
<td>Feb 1977</td>
<td>43.2 ± 1.1</td>
</tr>
<tr>
<td>Gd-462</td>
<td>GG/PP-46-2</td>
<td>&quot;</td>
<td>May 1977</td>
<td>41.7 ± 1.0</td>
</tr>
<tr>
<td>Gd-457</td>
<td>GG/GIII-1</td>
<td>ca 400m</td>
<td>Feb 1977</td>
<td>59.5 ± 1.7</td>
</tr>
<tr>
<td>Gd-467</td>
<td>GG/GIII-2</td>
<td>&quot;</td>
<td>May 1977</td>
<td>61.9 ± 1.3</td>
</tr>
<tr>
<td>Gd-466</td>
<td>GG/PP-VI-2</td>
<td>ca 600m</td>
<td>May 1977</td>
<td>52.3 ± 1.2</td>
</tr>
</tbody>
</table>
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, $2.0 \pm 0.3\%$ of modern (Mościcki, 1977). Geol characteristics of site was given by Jureczko et al (1974). Measurements of $\delta^{18}$C and $\delta^{18}$O were made by Stanislaw Halas, Inst Physics, Univ Maria Curie Sklodowska, 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>
<thead>
<tr>
<th>Lab no.</th>
<th>Sample</th>
<th>$\delta^{13}$C</th>
<th>$\delta^{18}$O</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gd-292</td>
<td>Stk 1</td>
<td>--</td>
<td>--</td>
<td>62.0 ± 1.3</td>
</tr>
<tr>
<td>Gd-288</td>
<td>Stg 2, outer layer</td>
<td>--</td>
<td>--</td>
<td>100.3 ± 1.7</td>
</tr>
<tr>
<td>Gd-289</td>
<td>Stg 2, 1st intern layer</td>
<td>--</td>
<td>--</td>
<td>85.3 ± 1.6</td>
</tr>
<tr>
<td>Gd-290</td>
<td>Stg 2, 2nd intern layer</td>
<td>--</td>
<td>--</td>
<td>74.8 ± 1.6</td>
</tr>
<tr>
<td>Gd-291</td>
<td>Stg 2, inner layer</td>
<td>--</td>
<td>--</td>
<td>59.1 ± 1.1</td>
</tr>
<tr>
<td>Gd-483</td>
<td>Stg 1, outer layer</td>
<td>--37.02</td>
<td>--24.9</td>
<td>69.5 ± 1.5*</td>
</tr>
<tr>
<td>Gd-484</td>
<td>Stg 1, intern layer</td>
<td>--36.32</td>
<td>--22.4</td>
<td>55.8 ± 1.2*</td>
</tr>
<tr>
<td>Gd-481</td>
<td>Stg 1, inner layer</td>
<td>--35.04</td>
<td>--22.0</td>
<td>48.8 ± 1.1*</td>
</tr>
</tbody>
</table>

* 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-180.** Gs/090474  
134.9 ± 1.6% PM

Atmospheric CO$_2$ sample coll 9 April 1974 in Gliwice by Elżbieta 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

REFERENCES


KÖLN RADIOCARBON MEASUREMENTS II

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Since the publication of our first date list (R, 1966, v 8, p 239-247), our 14C laboratory has produced about 1500 radiocarbon dates, including several hundreds of concordant double determinations, the majority of which were on archaeological samples. The greater part of the other dates concerned dendrochronologic samples from our Tree Ring Laboratory (Schmidt, 1977; Freundlich, 1977). Several archaeological 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 archaeological 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>
<thead>
<tr>
<th>Set no.</th>
<th>Anode material</th>
<th>Volume (liter)</th>
<th>Filling pressure (atm)</th>
<th>Background (cpm)</th>
<th>95% NBS standard (cpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>copper</td>
<td>2.0</td>
<td>0.9</td>
<td>8.5</td>
<td>11.8</td>
</tr>
<tr>
<td>II</td>
<td>copper</td>
<td>2.3</td>
<td>0.8</td>
<td>6.3</td>
<td>12.5</td>
</tr>
<tr>
<td>III</td>
<td>guilded</td>
<td>0.51</td>
<td>3.0</td>
<td>0.7</td>
<td>10.3</td>
</tr>
<tr>
<td>IV</td>
<td>quartz</td>
<td>0.46</td>
<td>1.0</td>
<td>0.6</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>steel (*)</td>
<td></td>
<td>3.0</td>
<td>1.3</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.8</td>
<td>1.1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

* 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.

ACKNOWLEDGMENTS

We are indebted to Deutsche Forschungsgemeinschaft, Bonn, for a grant that completely funded all the field research requirements, and to Stiftung Volkswagenwerk, Hannover, for funding part of our radiocarbon dating equipment. Erika Spiess did most of the sample preparations; Ing Pavel Velicky assisted in supervising and maintenance of the dating equipment. Peter Breunig helped decisively with documentation and correspondence.

SAMPLE DESCRIPTIONS

A. Sites in SW districts of SW Africa

Apollo 11—Cave series, 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 14C 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.


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 X2 assoc with Lower Pottery Lens B (Fig 1, no. 4).