

**INSTITUT ROYAL DU PATRIMOINE ARTISTIQUE
RADIOCARBON DATES VI**

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This list includes results of measurements made during 1974-1978. When requested, MASCA corrected dates (Ralph *et al*, 1973) are reported.

I. GEOLOGIC SAMPLES

Ground water series

Water from coastal aquifer, W Vlaanderen, Belgium. Coll by J Beeckman and subm 1974 by W De Breuck, Inst Geol, Univ Gent, Belgium.

IRPA-172. Wenduine **3050 ± 130**

Wenduine (51° 18' 32" N, 3° 5' 52" E), at 20m depth.

IRPA-173. Blankenberge 1 **3290 ± 130**

Blankenberge (51° 17' 35" N, 3° 7' 13" E), at 5m depth.

IRPA-174. Blankenberge 2 **3930 ± 160**

Blankenberge (51° 17' 35" N, 3° 7' 13" E), at 17m depth.

IRPA-175. Blankenberge 3 **570 ± 30**

Blankenberge (51° 19' 16" N, 3° 9' 50" E), at 15m depth.

IRPA-197. Brugge 1 **1850 ± 100**

Brugge (51° 19' 23" N, 3° 9' 49" E), at 23m depth.

IRPA-198. Brugge 2 **2560 ± 140**

Brugge (51° 19' 19" N, 3° 13' 27" E), at 19.5m depth.

IRPA-199. Oudenburg **2800 ± 140**

Oudenburg (51° 11' 54" N, 3° 1' 3" E), at 9.5m depth.

General Comment: dates used to study ground water formation in W Vlaanderen (De Breuck & De Moor, 1974). Correction for specific activity of ocean carbonate is applied (Arnold & Anderson, 1957).

II. ARCHAEOLOGIC SAMPLES

Apamee series, Syria

Bone fragments from tell of Qal at el-Mudiq (Hama), Syria (35° 25' N, 36° 24' E), alt 210m. Coll 1973 by M Otte and subm 1974 by J Ch Balty, Mus Royal Art & Hist, Brussels, Belgium. Collagen extracted by Longin method (1970).

IRPA-168. **5380 ± 210**

Animal bones from Layer IV. MASCA corrected date, 4475 to 3990 BC.

IRPA-170. 4280 ± 240

Human bones from Layer IIIb, in Grave 3. MASCA corrected date, 3270-3350 to 2630-2670 BC.

General Comment: dates agree with pottery analysis and lithic industry (Collon *et al*, 1975).

IRPA-178. Huise 2500 ± 120

Charcoal from palisade pile found in hole, at Huise, E Vlaanderen, Belgium (55° 54' N, 3° 35' E). Coll by Czepiec and subm 1974 by J De Laet, Sem Archeolog, Univ Gent, Belgium. *Comment:* date agrees with archaeol data.

Neufvilles-les-Soignies series

Fossil wood from Gué du Plantin site at Neufvilles, Hainaut, Belgium (50° 34' 32" N, 0° 21' 24" E). Coll 1969 by P Haesaerts and subm 1974 by J de Heinzelin, Inst Geol, Univ Gent, Belgium.

IRPA-186. 4740 ± 170

Excavation Sq H lim 4/5 Unit TA, at end of Atlantic period. MASCA corrected date, 3720 to 3370 BC.

IRPA-187. 4740 ± 220

Excavation Sq I 6, Unit S, Neolithic period. MASCA corrected date, 3750 to 3240-3340 BC.

IRPA-188. 4800 ± 240

Wood (*Quercus*) from Roman fort, Unit WA. MASCA corrected date, 3800 to 3370 BC.

IRPA-189. 4840 ± 220

Excavation Sq I 6, Unit E, Neolithic period. MASCA corrected date, 3880 to 3390-3450 BC.

IRPA-190. 4150 ± 200

Excavation Sq G5, Unit TA, at end of Atlantic period. MASCA corrected date, 3510 to 2560 BC.

IRPA-191. 1110 ± 60

Wood assoc with iron fragments, Unit YA, Carolingian period. MASCA corrected date, AD 780-800 to 940.

IRPA-192. 4650 ± 230

Excavation Sq C 2, Unit UB, at end of Atlantic period. MASCA corrected date, 3500 to 3180 BC.

IRPA-193. 4400 ± 220

Excavation Sq H 6, Unit TA at end of Atlantic period. MASCA corrected date, 3400-3470 to 2930-2950 BC.

IRPA-194.**3820 ± 180**

Excavation Sq H 6, Unit TA at end of Atlantic period. MASCA corrected date, 2610 to 2110-2030 BC.

General Comment: IRPA-188 is too old but it is possible to have fossil wood from Atlantic period incorporated in Roman fort. IRPA-194 and -190 are too young. Dates are discussed elsewhere (de Heinzelin *et al*, 1977).

IRPA-201. Marche-les-Dames**23,460 ± 500**

Animal bones from grotto de la Princesse, at Marches-les-Dames, Belgium (50° 28' 58" N, 4° 57' 10" E). Assoc industry: Aurignacian. Coll 1922 by Rahir and subm 1975 by M Otte, Serv Archeol Prehist, Univ Liège, Belgium. *Comment:* dated with carbonate because of insufficient collagen. Date is too young, probably because of carbonate contamination.

Spy series

Animal bones from grotto de Spy, at Spy, Namur, Belgium (50° 28' 45" N, 4° 40' 28" E). Coll 1909 by de Loe and subm 1975 by M Otte.

IRPA-202.**20,680 ± 450**

Upper level. Assoc industry: Perigordian.

IRPA-203.**25,300 ± 510**

Middle level. Assoc industry: Old Aurignacian.

General Comment: dated with carbonate because of insufficient collagen. Dates are too young.

Tell ed-Dêr series, Iraq

Samples in muddy clay from occupied ground of tell, alt 36 to 37m, at Tell ed-Dêr, Iraq (33° 5' 8" N, 44° 14' 35" E). Coll 1970 by H Gasche and subm 1976 by L De Meyer, Sem Archeolog, Univ Gent Belgium.

IRPA-221. DPr15**4040 ± 330**

Boring B, Loc 1, Phase Ia at 1.3m below tell. *Comment:* carbonaceous earth; dilution: 38% sample. Expected date: 2000 BC.

IRPA-222. DPr10**9860 ± 270**

Boring A, Loc 1, Phase Ie, at 0.55m below tell. *Comment:* carbonaceous earth; dilution: 47% sample. Expected date. 1800 BC.

IRPA-223. DPr12**33,090 ± 780**

Boring A, Loc 15, Phase Ig, at 0.9m below tell. *Comment:* gray earth very carbonated. Expected date: 1800 BC.

IRPA-225. DPr17**4460 ± 210**

Boring A, Loc 1, Phase Ig, at 1m below tell. *Comment:* carbonaceous earth. Expected date: 2000 BC.

IRPA-226. DPr19 **>45,000**

Boring A, Loc 1, Phase I i-g, at 1.2m below tell. *Comment:* gray earth very carbonated. Expected date: 2000 BC.

IRPA-228. DPr58 **3440 ± 230**

Boring A, Loc 50, Phase Ie, at 0.7m below tell. *Comment:* carbonaceous earth; dilution: 59% sample. Expected date: 1800 BC.

IRPA-230. DPr90 **3510 ± 180**

Boring A, Loc 10, Phase Ii, at 1.8m below tell. *Comment:* carbonaceous earth. Expected date: 2000 BC.

IRPA-231. DPr186 **4240 ± 190**

Boring A, Loc 2, level 33.25m, at 3.6m below tell. *Comment:* carbonaceous earth. Expected date: 2100 BC.

IRPA-235. DPr211 **4430 ± 250**

Boring A, Loc 2e, level 32.15m, at 4.8m below tell. *Comment:* carbonaceous earth; dilution: 53% sample. Expected date: 2100 BC.

IRPA-236. DPr267 **3930 ± 230**

Boring A, Loc 77, level 33.25m, at 3.1m below tell. *Comment:* carbonaceous earth. Expected date: 2100 BC.

IRPA-237. DPr268 **3420 ± 190**

Boring A, Loc 71, level 33.35m, at 3 m below tell. *Comment:* carbonaceous earth; dilution; 60% sample. Expected date: 2100 BC.

IRPA-239. DPr273 **4030 ± 190**

Boring A, Loc 5, level 33.6m, at 3.6m below tell. *Comment:* carbonaceous earth. Expected date: 2100 BC.

IRPA-241. DPr319 **3940 ± 310**

Boring A, Loc 91, level 33.9m, at 3.1m below tell. *Comment:* carbonaceous earth; dilution: 40% sample. Expected date: 2000 BC.

IRPA-243. DPr411 **4430 ± 330**

Boring A, Loc 95, level 34m, at 3.1m below tell. *Comment:* carbonaceous earth; dilution: 40% sample. Expected date: 2000 BC.

IRPA-244. DPr412 **>45,000**

Boring A, Grave 232 B below Phase Ii, at 3.2m below tell. *Comment:* gray earth very carbonated. Expected date: 1900 BC.

IRPA-245. DPr250 **3610 ± 180**

Boring E, Loc 9, Layer D, at 1.3m below tell. *Comment:* carbonaceous earth in rubbish layer from burning. Expected date: 1650 BC.

IRPA-246. DPr301 **12,580 ± 430**

Boring E, Grave 222, at 2m below tell. *Comment:* gray earth very carbonated; dilution: 70% sample. Expected date: 1700 BC.

IRPA-251. DPr240 2550 ± 160

Boring E, Loc 1, level 33.65m, at 1.5m below tell. *Comment:* carbonaceous nodules; dilution: 67% sample. Expected date: 1650 BC.

IRPA-252. DPr241 4200 ± 260

Boring E, Layer 8-3-1, at 1.2m below tell. *Comment:* fragments of charcoal in rubbish layer from burning; dilution: 70% sample. Expected date: 1650 BC.

IRPA-253. DPr244 11,740 ± 410

Boring E, Layer 8-7, at 1.5m below tell. *Comment:* gray earth very carbonated. Expected date: 1700 BC.

IRPA-254. DPr248 5660 ± 270

Boring E, Loc 9, level 36.6m, at 0.75m below tell. *Comment:* fragments of charcoal in rubbish layer from burning; dilution: 86% sample. Expected date: 1650 BC.

IRPA-255. DPr381 1810 ± 130

Boring E, Layer 19-3, at 1.45m below tell. *Comment:* carbonated nodules. Expected date: 1600 BC.

IRPA-256. DPr382 2310 ± 140

Boring E, Layer 18-3, at 1.15m below tell. *Comment:* carbonated nodules in rubbish layer from burning; dilution: 76% sample. Expected date: 1650 BC.

IRPA-257. DPr383 2970 ± 180

Boring E, Layer 18-3, at 1.05m below tell. *Comment:* carbonated nodules in rubbish layer from burning. Expected date: 1650 BC.

IRPA-258. DPr384 2750 ± 160

Boring E, Layer 27-3-1, at 0.75m below tell. *Comment:* carbonated nodules in rubbish layer from burning. Expected date: 1650 BC.

IRPA-259. DPr386 3290 ± 200

Boring E, Layer 15-3, at 0.6m below tell. *Comment:* carbonaceous earth in rubbish layer from burning. Expected date: 1650 BC.

IRPA-260. DPr387 3560 ± 190

Boring E, Layer 18-3, at 1m below tell. *Comment:* carbonaceous earth in rubbish layer from burning. Expected date: 1650 BC.

IRPA-261. DPr388 3430 ± 190

Boring E, Layer 18-3, at 1m below tell. *Comment:* carbonaceous earth in rubbish layer from burning. Expected date: 1650 BC.

IRPA-262. DPr389 3250 ± 180

Boring E, Layer 16-3, at 1.3m below tell. *Comment:* carbonaceous earth in rubbish layer from burning. Expected date: 1650 BC.

IRPA-263. DPr390 3030 ± 170

Boring E, Layer 24-3, at 1m below tell. *Comment:* carbonated nodules in rubbish layer from burning. Expected date: 1650 bc.

IRPA-264. DPr501 2730 ± 150

Boring E, Layer 21-3, at 1.2m below tell. *Comment:* carbonated nodules in rubbish layer from burning. Expected date: 1650 bc.

General Comment: significance of results is not conclusive; archaeologists and geologists have not concurred fully yet. It is safe to say that gray earth samples are too old. These give age of soil's carbonation. Other samples are too young. Aquifer below tell, at 30 to 32m alt, carbonates sediments after deposit and forms carbonated nodules which are more recent.

III. QUALITY CONTROL SAMPLES

Vinegar series

Study of vinegar falsification, coll and subm 1970 by J Kufferath Lab Intercommunal Chimie, Brussels, Belgium. Vinegar comes from oxidation of fructose alcohol but addition of acetic acid from petroleum falsifies fructose vinegar. ¹⁴C activity permits measurement of quantity of fructose vinegar present in sample.

Ref fructose vinegar (cpm)	Samples (cpm)	% fructose vinegar
11.97 ± 0.22	IRPA-98: 11.92 ± 0.28	99.5 ± 3.8
11.97 ± 0.22	IRPA-100: 11.35 ± 0.24	94.8 ± 3.8
11.97 ± 0.22	IRPA-101: 5.22 ± 0.21	52.0 ± 2.8
11.72 ± 0.30	IRPA-102: 11.13 ± 0.31	95.0 ± 5.1
11.72 ± 0.30	IRPA-103: 12.37 ± 0.27	105.3 ± 5.0
11.72 ± 0.30	IRPA-104: 11.95 ± 0.32	101.9 ± 5.4
11.97 ± 0.22	IRPA-105: 11.95 ± 0.27	99.8 ± 4.2
11.97 ± 0.22	IRPA-109: 12.01 ± 0.26	100.3 ± 4.0
12.90 ± 0.25	IRPA-112: 6.25 ± 0.24	48.5 ± 2.0

General Comment: vinegar is oxidized with potassium bichromate and sulfuric acid. Results agree. Only IRPA-101 and -112 are very falsified.

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