

UNIVERSITY OF GRANADA RADIOCARBON DATES I

CECILIO GONZÁLEZ-GÓMEZ, JUAN de D LÓPEZ-GONZÁLEZ,
and MARÍA DOMINGO-GARCÍA

Radiocarbon Dating Laboratory, Radiochemistry Section, Faculty
of Science, University of Granada, Spain

The Radiocarbon Dating Laboratory of The Granada University was established to support the work of archaeologists and geologists. The method of dating is benzene synthesis and liquid scintillation counting developed by a number of investigators (Polach and Stipp, 1967; Tamers, 1969; Pietig and Scharpenseel, 1966) with sample combustion in pure oxygen (Switsur, 1974).

Samples dated thus far have been primarily charcoal or peat, although some bone samples have been dated. Pretreatment of charcoal is a standard acid-alkali procedure, using 2% ClH and 0.5% NaOH at elevated temperature. Peat is subjected to treatment with acid only. The collagen of bone samples is obtained by the Longin (1971) method. Contaminating materials such as rootlets and pebbles are mechanically removed. Counting is done in a Nuclear Chicago Isocap 300 liquid scintillation system Model 6870 with a background of 9 to 10cpm for 5ml benzene samples, using a 20ml low ⁴⁰K counting vial. Efficiency is approximately 70%, using the part of spectrum above the end point of tritium.

$\delta^{13}\text{C}$ values are based on data reported in RADIOCARBON (Stuiver and Polach, 1977). Errors are reported as 1σ which include only the combined counting uncertainty of the background, modern, and sample and the error of estimating $\delta^{13}\text{C}$. Dates reported here are based on 95% of the activity of NBS oxalic acid standard and the Libby half-life of 5568 years. Ages of check samples determined in this laboratory agree with the results of other laboratories. Reproducibility of multiple runs is satisfactory.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

Padul series II

Peat and clay samples from peat bog at Padul, Granada, Spain, which represent considerable part of Pleistocene. Samples from eight cores coll and subm 1978 by Empresa Nac Electricidad SA (ENDESA) are reported in Table I. Earlier dates on peat from Padul were reported (Vogel and Waterbolk, 1972). Results of preliminary palynologic investigation were pub (Menendez Amor and Florschütz, 1962; 1964).

II. ARCHAEOLOGIC SAMPLES

Spain

El Malagón series

Charcoal from El Malagón (37° 37' 33" N, 2° 25' 18" W) prov Granada. Samples coll 1975 and subm by F Molina, Dept Prehistory, Univ Granada to date beginning of metallurgy in Upper Andalucía.

UGRA-11. CB 2118 **4520 ± 220**

Charcoal at 0.95m depth.

UGRA-12. CB 2323 **4070 ± 150**

Charcoal.

General Comment: dates agree with expected ages.

Cerro de la Encina series

Wood and charcoal from Cerro de la Encina (37° 08' 16" N, 3° 32' 51" W) prov Granada. Samples coll 1970 and subm by F Molina to date Bronze age in Upper Andalucía.

UGRA-14. M 1931 **3290 ± 140**

Charcoal at 3.3m depth.

TABLE I
Padul Series II

Sample	Core no.	Coordinates	Core depth (m)	¹⁴ C age
UGRA-40	24	37° 01' 16" N, 3° 36' 32" W	1.10	5660 ± 160
UGRA-41	24	"	2.10	3860 ± 150
UGRA-42	24	"	3.10	5660 ± 150
UGRA-43	24	"	4.12	5160 ± 150
UGRA-44	24	"	6.02	8800 ± 350
UGRA-49	24	"	7.82	15,370 ± 260
UGRA-50	24	"	9.32	6030 ± 140
UGRA-51	24	"	11.12	15,150 ± 300
UGRA-55	25	37° 01' 06" N, 3° 36' 26" W	1.5-1.6	12,480 ± 220
UGRA-56	25	"	12.16-12.51	14,750 ± 240
UGRA-57	25	"	19.26-19.96	18,180 ± 350
UGRA-36	26	37° 01' 03" N, 3° 36' 03" W	1.70	3860 ± 140
UGRA-37	26	"	3.55	3560 ± 140
UGRA-38	26	"	6.60	7190 ± 160
UGRA-39	26	"	9.95	7730 ± 190
UGRA-26	29	37° 00' 53" N, 3° 36' 42" W	2.00	4670 ± 170
UGRA-27	29	"	3.20	4970 ± 140
UGRA-28	29	"	6.20	8540 ± 160
UGRA-29	29	"	9.00	16,000 ± 280
UGRA-31	29	"	10.40	10,180 ± 180
UGRA-32	29	"	12.50	31,000 ± 2600
UGRA-58	31	37° 00' 37" N, 3° 36' 33" W	0.85-1.20	2170 ± 150
UGRA-59	31	"	5-6	8300 ± 150
UGRA-22	33	37° 00' 49" N, 3° 37' 12" W	1.30	4280 ± 150
UGRA-23	33	"	1.80	4940 ± 160
UGRA-24	33	"	2.80	9180 ± 160
UGRA-33	35	37° 00' 17" N, 3° 36' 20" W	4.50	15,140 ± 210
UGRA-34	35	"	5.80	17,130 ± 310
UGRA-35	35	"	7.85	41,000 (apparent age)
UGRA-9	37	37° 00' 00" N, 3° 36' 20" W	3.50	6110 ± 140
UGRA-8	37	"	4.00	9990 ± 160
UGRA-7	37	"	4.50	24,000 ± 600
UGRA-6	37	"	5.00	24,000 ± 450
UGRA-5	37	"	5.50	31,000 ± 1000
UGRA-4	37	"	6.00	39,000 ± 2700

UGRA-15. M 16067 **3620 ± 130**
Wood at 3m depth.

UGRA-16. M 26277 **3550 ± 140**
Charcoal at 2.8m depth.

General Comment: age for M 1931 probably too young.

Motilla del Azuer series

Charcoal from Motilla del Azuer (39° 03' 14" N, 3° 29' 48" W) prov Ciudad Real. Samples coll and subm by F Molina to date Bronze age.

UGRA-19. D 37 **3260 ± 140**
Charcoal at 1.25m depth.

UGRA-20. D 328 **3480 ± 140**
Charcoal at 0.85m depth.

UGRA-21. D 443 **3500 ± 140**
Charcoal at 3.2m depth.

UGRA-97. D 475 **3490 ± 180**
Charcoal at 4.05m depth.

General Comment: age for D 37 probably too young.

El Raso de Candeleda series

Charcoal from El Raso de Candeleda (40° 07' 00" N, 5° 19' 10" W) prov Avila. Samples coll and subm 1979 by F Fernández, Archaeol Mus Sevilla to date pre-Roman town.

UGRA-45. El Raso 1 **2190 ± 130**
Charcoal at 1.1m depth.

UGRA-46. El Raso 3 **1840 ± 140**
Charcoal at 1.4m depth.

Morra del Quintanar series

Five samples from Morra del Quintanar site (39° 01' 05" N, 2° 27' 15" W) prov Albacete. Coll 1979 and subm 1980-81 by C Martín, Subdir Gen Arqueol, Madrid.

UGRA-47. Q 227-79 **3610 ± 140**
Charcoal at 1.25m depth.

UGRA-78. Q 849-80 **3670 ± 120**
Charcoal at 2.35m depth.

UGRA-79. Q 1639-80 **3630 ± 130**
Charcoal at 0.66m depth.

UGRA-100. Q 455a-80 **3490 ± 150**
Charcoal at 3.5m depth.

UGRA-101. Q 642-80 **3610 ± 130**

Charcoal at 1.36m depth.

General Comment: dates agree with expected ages.

Las Angosturas series

Charcoal from Las Angosturas site (37° 21' N, 3° 50' W) prov Granada. Samples coll and subm 1981 by M Botella, Diputación prov Granada to date Eneolithic period in E Andalucía.

UGRA-80. Ag 41038 **3860 ± 140**

Charcoal at 3.7m depth.

UGRA-81. Ag 42433 **4150 ± 170**

Charcoal at 3.69m depth.

UGRA-82. Ag 42698 **4210 ± 140**

Charcoal at 3.8m depth.

General Comment: dates agree with expected ages.

UGRA-70. Peñafior I **2540 ± 160**

Charcoal from Peñafior site (37° 44' N, 5° 15' W) prov Sevilla. Sample coll and subm 1980 by F Fernández to date foundation of Celfi town (Ponsich, 1979).

UGRA-72. Valencina **3380 ± 150**

Bone from Valencina (37° 25' 40" N, 6° 04' 30" W) prov Sevilla, coll at 2m depth. Sample coll and subm 1980 by F Fernández to date beginning of Campaniforme culture.

Portugal

Castelo de Santa Justa series

Samples from Cerro do Castelo de Santa Justa (37° 29' N, 7° 29' W) Alcoutim, Faro. Coll and subm 1981 by V Gonçalves, Centro Hist, Univ Lisboa.

UGRA-90. E 17 **4310 ± 170**

Charcoal.

UGRA-77. H 14 **3960 ± 180**

Charcoal at 1.32m depth.

UGRA-75. I 16 **3990 ± 130**

Charcoal at 0.35m depth.

UGRA-89. I 15 **5180 ± 160**

Charcoal at 0.53m depth.

UGRA-76. J 14 **3920 ± 130**

Seed at 0.6m depth.

UGRA-91. K 18	4100 ± 140
Charcoal at 0.55m depth.	
UGRA-86. L 18	3910 ± 120
Charcoal at 0.28m depth.	
UGRA-85. M 18	3890 ± 130
Charcoal at 0.25m depth.	

General Comment: expected ages: 4150 to 4950 (Gonçalves, 1980).

REFERENCES

- Gonçalves, V, 1980, Cerro do Castelo de Santa Justa (Alcoutim) Escavações de 1979. Extractos do caderno de campo: CLIO: Rev Centro Hist Univ Lisboa, v 2, p 133-141.
- Longin, R, 1971, New method of collagen extraction for radiocarbon dating: Nature, v 230, p 241-242.
- Menendez Amor, J and Florschütz, F, 1962, Un aspect de la vegetation en Espagne meridionale durant la dernière glaciation et l'Holocène: Geol Mijnbow, v 41, p 131-134.
- 1964, Results of the preliminary palynological investigation of samples from a 5m boring in southern Spain: Real Soc Española Hist Nat (Geol) Bol, v 62, p 251-255.
- Pictig, Von F and Scharpenseel, H W, 1966, Altersbestimmung mit dem Flüssigkeits-Szintillations-Spektrometer. Ein neuer Katalisator zur Benzolsynthese: Atompraxis, v 12, p 95-97.
- Polach, H A and Stipp, J J, 1967, Improved synthesis techniques for methane and benzene radiocarbon dating: Internatl Jour Appl Radiation Isotopes, v 18, p 359-364.
- Ponsich, M, 1979, Implantation rurale antique sur le Bas Guadalquivir: Paris, De Boccard.
- Stuiver, Minze and Polach, H A, 1977, Discussion: Reporting of ¹⁴C data: Radiocarbon, v 19, p 355-364.
- Switsur, V, Burleigh, R, Meeks, N, and Cleland, J M, 1974, A new sample combustion bomb for radiocarbon dating: Internatl Jour Appl Radiation Isotopes, v 25, p 113-117.
- Tamers, M A, 1969, Instituto Venezolano de Investigaciones Cientificas natural radiocarbon measurements IV: Radiocarbon, v 11, p 396-423.
- Vogel, F C and Waterbolk, H T, 1972, Groningen radiocarbon dates X: Radiocarbon, v 14, p 6-110.