

FLORENCE RADIOCARBON DATES I

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The Florence Radiocarbon Dating Laboratory was built in 1970 under the direction of Consiglio Nazionale delle Ricerche at the Istituto di Antropologia, Università di Firenze.

C^{14} is measured in 2 gas proportional counters after conversion to highly purified CO_2 . The counters are mounted within an anticoincidence Oring consisting of plastic scintillation material, surrounded by a boron-loaded paraffin shield (66% paraffin, 34% boron) 10cm thick, and finally, by a shield 22cm thick of low radioactive steel. All electrical equipment are solid-state devices except for the H.V. supplies and we will use, for subsequent measurements, another counter with new solid-state electrical devices.

Scintillations are detected by 2 12.5cm diam. photomultiplier tubes and the resultant pulses are used in anticoincidence with the pulses from sample counters. Electrolytic copper is used for proportional counter bodies, the technical data are as follows: efficient volume 1.5L, internal diam. 60 mm, wire diam. 0.05mm, effective length of the anode 510mm, background, respectively, 18.24 ± 0.12 cpm and 6.98 ± 0.08 cpm, net counting 17.60 ± 0.28 cpm and 18.18 ± 0.17 cpm.

Our dates are not corrected for isotopic fractionation because we do not have a mass-spectrometer. We obtain CO_2 in its purest form by purification combined with initial precipitation as $CaCO_3$ of CO_2 resulting from combustion of samples (Alessio *et al.*, 1970). All samples undergo standard boiling pretreatment with 10% HCl, the sample is then leached with 3-5% NH_4OH , followed by another HCl treatment, and is finally washed with distilled water. The ages of samples are calculated using the conventional half-life of 5568 ± 30 years and the error is stated in terms of one standard deviation of counting statistics. A full description of laboratory and procedures used has been given (Azzi, 1972).

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SAMPLE DESCRIPTIONS

I. CROSS-CHECK SAMPLES

Samples for cross-checking were given to us by C. Cortesi, Radiocarbon Dating Laboratory of Rome, in 1971. The ages obtained by the 2 laboratories, considered to be in satisfactory agreement, are compared in Table 1.

TABLE 1

Sample		C ¹⁴ age	C ¹⁴ age	References
Rome	Florence	Rome	Florence	
R-92B	F-1	1850 ± 85	1860 ± 125	(R., 1964, v. 6, p. 82)
R-78	F-2	4735 ± 50	4810 ± 115	(R., 1968, v. 10, p. 356)
R-608 _{a1}	F-3	3190 ± 50	3510 ± 105	(R., 1971, v. 13, p. 396)
R-339	F-4	950 ± 50	1240 ± 95	(R., 1968, v. 10, p. 357)
R-304	F-5	9130 ± 75	9480 ± 170	(R., 1968, v. 10, p. 360)
R-231	F-6	>47,000	>38,000	(R., 1970, v. 12, p. 613)
R-265	F-7	6280 ± 120	6010 ± 130	(R., 1968, v. 10, p. 354)
R-267	F-8	6470 ± 120	6050 ± 130	(R., 1968, v. 10, p. 354)
R-394A	F-9	1590 ± 50	1685 ± 100	(R., 1971, v. 13, p. 401)

II. ARCHAEOLOGIC SAMPLES

A. Italy

S. Reparata series (outside)

Charcoal coll. and subm. by J. Herrmann, Comm. Rescue of Italian Art, in excavating S. Maria del Fiore cathedral, Florence. Samples are from area bordered by N wall facade of present cathedral and by N wall and projecting transept of earlier church on site, S. Reparata (Bargellini, Morozzi, and Batini, 1970).

1820 ± 130**F-10. S. Reparata, XIII A, 11B****A.D. 130**

Charcoal, coll. and subm. 1970 by J. Herrmann, from fill leveling area in front of Roman building with external masonry bench 1.30 to 1.50m from N wall, 11.40 to 11.70m from facade and 2.32 to 2.38m under floor of S. Maria del Fiore. Fill dates from late 4th or perhaps 5th century; coin of Emperor Valentinian I (A.D. 364 to 375) was found in layer below. Fill contains both contemporary and earlier material. Wood belongs to group of much earlier material in fill.

1610 ± 105**F-11. S. Reparata, IX, 8****A.D. 340**

Charcoal, coll. and subm. 1971 from probable hearth beside heap of marble pieces 60 to 90cm from N wall, 6.20 to 6.40m from facade and 1.72m under pavement of S. Maria del Fiore. Charcoal was covered by and incorporated in layer created when pile of marble was roughly leveled. Marble deposit contained fragments of pilaster capitals and pavement slabs dating from 1st to 4th centuries. Coin of Emperor Gratian (A.D. 367 to 383) was found in layer below. Two tiny Early Christian coins were found in layer with charcoal. Although coins are illegible, charcoal layer is unlikely to be much after late 6th century Langobard conquest, when minting of bronze coinage ceased in Italy (Lopez, 1961). C¹⁴ test implies that layer dates from earlier part A.D. 367 to 600 range established by coin finds.

S. Reparata series (inside)

Six samples of charcoal and wood coll. and subm. 1971 by F. Toker of S. Reparata excavation. Most probable date of church falls in last quarter of 5th century or in 1st quarter of 6th. Two of the charcoal samples were subm. to confirm date of mosaic floor, a 3rd relates to the large Roman house which preceded S. Reparata on the site, and a 4th helps date many gaps later which formed in mosaic floor. Two wooden samples were taken from much younger medieval tombs placed in church.

1615 ± 90

F-12. S. Reparata, H 200 **A.D. 355**

Charcoal from levels -2.71 to -2.90m below floor of the Cathedral of Florence, from immediately N of main wall of Roman house cleared away for construction of S. Reparata. Charcoal was in undisturbed earth well below mosaic floor of church, and confirms a date about mid-4th century for enlargement of house, already suggested by coin and ceramic analysis.

1495 ± 90

F-13. S. Reparata, H 222 **A.D. 455**

Charcoal below Sample F14.; almost 1m below mosaic floor of S. Reparata. Date suggests site was still open in time, providing "terminus post quem" for church.

1430 ± 40

F-14. S. Reparata, H 119, Zone H, S 3 **A.D. 520**

Charcoal, fairly dry, from level -2.47m directly below mosaic floor of the Early Christian church. Sample may have belonged to stratum of hard-packed earth which formed part of preparation for mosaic. Sample date falls within stylistic limits determined earlier for mosaic, in 1st quarter of 6th century.

1300 ± 80

F-15. S. Reparata, J, S 1 **A.D. 650**

Humid charcoal below pink "cocciopesto" (crushed brick) floor at level ca. -2.20m, which appears to have been one of several restorations of Early Christian mosaic. One of 3 tombs set below mosaic, can be dated to late 7th or early 8th centuries because of easily identifiable glass chalice which it contained. Near sample, at same level, Langobard manufactured buckle of 2nd half of 6th or 7th century was found. Date agrees with 2 probable dates for gaps in the mosaic.

480 ± 50

F-17. S. Reparata, Tomb 42 **A.D. 1470**

Wood from tomb of Giovanni di Alamanno de' Medici (died 1353) Sample age differs considerably from true age which must precede 1353.

900 ± 60

F-16. S. Reparata, Tomb 39 **A.D. 1050**

Wood from tomb of 1st half of 14th century. Date may refer to re-use of old wood for bier on which coffin rested.

Levanzo series

Shells (*Patella ferruginea*) from lower part of outer chamber of Grotta dei Genovesi, W coast of Levanzo, I. Egadi Archipelago, ca. 15km off W coast of Sicily (38° 00' N Lat, 12° 20' E Long) at +30m. Coll. 1953 and subm. 1970 by P. Graziosi, Ist. Italiano Preistoria e Protostoria, Firenze.

10,175 ± 300

F-18. Levanzo, 5 A **8225 B.C.**
Shells from lower level, Cut 5° A. Epigravettian age.

11,710 ± 295

F-19. Levanzo, 6 A **9760 B.C.**
Shells from lower level, Cut 6° A. Epigravettian age.

10,110 ± 300

F-20. Levanzo, 6 **8160 B.C.**

Shells from lower level, Cut 6. Epigravettian age. *Comment:* 50% of weight of shells were destroyed by HCl before dating. Since engraved stone of lower layer in fore-chamber with *Patella ferruginea* shells is believed related to engravings on walls of inner chamber, C¹⁴ dates Paleolithic art of "Provincia Mediterranea" style at Levanzo (Graziosi, 1960, 1962, 1968) and agrees with dates hitherto available for other sites in Italy where some prehistoric art was found: Grotta Romanelli, Apulia, R-56: 11,960 ± 320, (Bella *et al.*, 1958-61) and R-58: 11,800 ± 600, (R., 1964, v. 6, p. 79-80), Grotta del Romito, Calabria, R-300: 11,150 ± 150, (R., 1967, v. 9, p. 358). Shells from same level of Levanzo deposit were dated: Pi-119: 9694 ± 110, (R., 1961, v. 3, p. 99); R-566: 11,180 ± 120, (R., 1970, v. 12, p. 607).

Grotta della Cala series

Grotta della Cala (40° 00' 02" N Lat, 15° 22' 52" E Long) at +9m, faces sea on SW side of calcareous promontory, il Poggio, between Lentiscella Beach and Marina di Camerota Bay, cave is near Grotta del Poggio and Nicchia Gamba shelter (see F-25). Samples from Layer Q in heap of skeletal remains in fine brown earth, underlying a stratigraphic series of Evolved and Late Epigravettian age. Layer Q may be compared to Evolved Gravettian age with Noailles burins of Mochi shelter. Layer contained ornaments made with valves of *Pectunculus*, *Colombella rustica*, and *Cyclonassa neritea*. Layer H, formed by mounds of brown earth with small calcareous frame from 0 to 15cm thick, contained charcoal from hearths and Late Epigravettian industry.

12,030 ± 220

F-21. Grotta della Cala, H **10,080 B.C.**
Charcoal from Layer H, weight: 10g. Cultural stage: Late Epigravettian age.

- 27,530 ± 2360**
25,580 B.C.
- F-22. Grotta della Cala, Q I, Q II, Q III**
Burned bones from Layer QI, QII, Q III, weight: 4.5g. The resulting errors were due to small sample sizes; counting was executed at reduced pressure (2 atm). Cultural stage: Evolved Gravettian age.
- 28,230 ± 2460**
26,280 B.C.
- F-23. Grotta della Cala, Q IV**
Burned bones from Layer Q IV, weight: 4g. Cultural stage: Evolved Gravettian age.
- 27,400 ± 1720**
25,450 B.C.
- F-24. Grotta della Cala, Q V, Q VI**
Burned bones from Layer Q V, Q VI, weight: 4.5g. Cultural stage: Late Gravettian age.
- 11,630 ± 230**
9680 B.C.
- F-25. Nicchia Gamba**
Shells (*Cardium* and *Patella ferruginea*) from Nicchia Gamba (40° 00' 02" N Lat, 15° 22' 54" E Long), shelter near Grotta della Cala (see F-21-24). Sample comes from a first sounding at top of Riparo del Poggio and was coll. in a layer full of shells between Bronze age and Evolute Epigravettian layers. Coll. and subm. 1970 by A. Palma di Cesnola, Ist. Antropol. Siena. *Comment*: date agrees with cultural stage.
- 13,760 ± 330**
11,810 B.C.
- F-26. Grotta dell'Acqua Fitusa**
Charcoal from Grotta dell'Acqua Fitusa, Cammerata, prov. Agrigento, Sicily (37° 38' 15" N Lat, 13° 40' 55" E Long). Coll. 1969 and subm. 1970 by P. Gambassini, Ist. Antropol. Siena. Sample came from different cuts in one hearth with concretions of CaCO₃; hearth was found in single layer between a bed of stones and a layer disturbed during Eneolithic age and more recent periods. Area around sample had no evidence of humans. *Comment*: sample probably belongs to Evolute Epigravettian age; date agrees with estimates.
- 11,960 ± 330**
10,010 B.C.
- F-27. Grotta Perciata**
Marine shells (*Patella ferruginea*, *Monodonta turbinata*) from Upper Paleolithic layer in outer chamber of Grotta Perciata (38° 12' 43" N Lat, 13° 19' 28" E Long), N coast of Sicily 500m NE of Mondello, prov. Palermo, at +35m. Coll. and subm. 1970 by E. Borzatti von Löwenstern, Ist. Antropol. Firenze. *Comment*: shells, carefully chosen, were partially (45 to 50%) dissolved by 10% HCl before CO₂ was used for dating. Date agrees with estimates.
- 1150 ± 145**
A.D. 800
- F-28. Monte Longo**
Charcoal from a terrace at +326m along Ombrone R., exposed to S near km 106 of state rd. No. 73 (43° 20' 10" N Lat, 13° 18' 43" E Long). Coll. and subm. by E. Borzatti von Löwenstern. *Comment*: estimated age:

ca. 17,000 to 19,000 yr (pers. commun., E. Borzatti von Löwenstern). Recent age was obtained because some pieces of charcoal from more recent layers contaminated those of the Final Gravettian age hearths.

4100 ± 120
2150 B.C.

F-29. Buca del Beato Benincasa

Charcoal from 1st sounding in Buca del Beato B., cave in calcareous gorge, near Monticchiello, 0.5km from Pienza (43° 05' 05" N Lat, 13° 10' 18" E Long). Coll. and subm. 1971 by E. Borzatti von Löwenstern. Sample was from Bronze age hearth between 2 layers of sand; traces of upper layer appear on surface. In hearths were found ceramic fragments, burnt ovine bones along with one burnt human ulna probably that of a young child. Human bones of Bronze age tombs were found throughout cave, no doubt due to clandestine excavations.

5420 ± 210
3470 B.C.

F-30. Fossacesia, 1, B, 1

Charcoal from Hut 1, Sec. B, Cut 1, in Neolithic village of Fossacesia, near Chieti (Abruzzo), (42° 12' 20" N Lat, 14° 29' 18" E Long). Coll. 1970 by G. Cremonesi, Univ. Lecce, and subm. by C. Tozzi, Ist. Antropol., Pisa. Sample was from floor of hut excavated from whitish earth containing black zones of earth; archaeological material in hut belongs to final phase of Ripoli culture (see R-665: 5560 ± 150; R-664: 5630 ± 80, R., 1971, v. 13, p. 397; Hut 3 of Ripoli village was dated by Pisa (unpub.), 5100 ± 120, (Cremonesi, 1965). This village is probably contemporaneous with S. Maria in Selva. Date is probably too old with regard to final phase of Ripoli culture.

5110 ± 210
3160 B.C.

F-31. Ripoli, 21

Charcoal from Hut 21 in Neolithic village of Ripoli, on left side of Vibrata R. valley, prov. Teramo, Abruzzi, (42° 49' 30" N Lat, 13° 33' 23" E Long). Coll. 1970 by G. Cremonesi, and subm. by C. Tozzi. Industry of Ripoli culture, in Middle and Upper Neolithic, was particularly stylized and various types of pottery determined different phases of cultural development of Ripoli. *Comment:* date agrees with that of more recent group of huts in village: Hut 6, R-665: 5560 ± 150; Hut 12, R-664: 5630 ± 80, (R., 1971, v. 13, p. 197), Hut 3, Pi-unpub: 5100 ± 120, (Cremonesi, 1965).

4070 ± 180
2120 B.C.

F-32. Villaggio di Ortucchio

Charcoal coll. 1969-70 by A.M. Radmilli, Ist. Antropol. Paleontol. umana, Pisa, during excavation in Eneolithic village of Ortucchio, 20km SE of Avezzano, Abruzzo (41° 57' 18" N Lat, 13° 36' 53" E Long) and subm. 1970 by C. Tozzi. Sample is composed of fragments of charcoal, from some layer in different areas of village; a single area did not contain enough charcoal for dating. Level of charcoal sample can be compared to that of Grotta dei Piccioni (Pi-50: 4306 ± 105, R., 1961, v. 3, p. 101) where

traces of Ortucchio culture are found. F-32 is comparable with Pisa date at Eneolithic level of Grotta dei Piccioni.

Grotta delle Soppressate series

Cave near Positano, Salerno (40° 36' N Lat, 14° 28' E Long) contains deposits of "chiocciolaio" with Mesolithic industry, divided in 22 cuts. In Cuts 1-2 were found many marine shells and in Cuts 13-22 many terrestrial shells. Coll. 1966 and subm. 1971 by A. M. Radmilli.

	7540 ± 135
F-33. Grotta delle Soppressate B, 4	5590 B.C.
Shells from Sec. B, Cut 4. Mesolithic level.	

	9320 ± 180
F-34. Grotta delle Soppressate, C I, 6	7370 B.C.
Shells from Sec. CI, Cut 6.	

	10,780 ± 405
F-35. Grotta delle Soppressate, A, 11	8830 B.C.
Shells from Sec. A, Cut 11.	

	9530 ± 170
F-36. Grotta delle Soppressate, D I, 12	7580 B.C.
Shells from Sec. D I, Cut 12.	

Comment: samples were leached in HCl, resulting weight half of original.

Grotta Erica series

Shells from Layer C, Mesolithic "chiocciolaio", (same structure of Grotta delle Soppressate, Cuts 1-12), this layer is subdivided in 5 cuts, each ca. 10cm thick. Cave near Colle S. Piero, Villa Rocca Fiorita, near Positano, Salerno (40° 36' N Lat, 14° 26' E Long). Coll. 1968 by G. Cremonesi, and subm. 1971 by A. M. Radmilli.

	15,360 ± 290
F-37. Grotta Erica, C, B, 2	13,410 B.C.
Shells from Layer C, Sec. B, Cut 2.	

	11,725 ± 360
F-38. Grotta Erica, C, B, 3	9775 B.C.
Shells from Layer C, Sec. B, Cut 3.	

	11,690 ± 370
F-39. Grotta Erica, C, B, 4	9740 B.C.
Shells from Layer C, Sec. B, Cut 4.	

	12,400 ± 400
F-40. Grotta Erica, C, C, 4	10,450 B.C.
Shells from Layer C, Sec. C, Cut 4.	

F-41. Grotta La Porta**9810 ± 275
7860 B.C.**

Shells from Cut 5 of "Grotta La Porta" in La Porta, near Positano, Salerno, above the Amalfi drive (40° 37' N Lat, 14° 28' E Long) at +120m. Coll. 1956 and subm. 1971 by A. M. Radmilli. Sample is from Cut 5, middle of Layer B. *Comment:* Mesolithic Romanellian tradition is present in Layer B and C; in Layer H Late Paleolithic Romanellian with fauna and macromammals.

General Comment of Mesolithic deposits: Grotta delle Soppressate (F-33-36), Grotta Erica (F-37-40) and Grotta La Porta (F-41).

The stratigraphy of these caves can be correlated in the following manner: lower levels prevail in terrestrial shells, and upper levels contain marine shells. This phenomena is caused by a sea-level rise during a phase of Würm glaciation, which brought the coast line near the entrance to the caves. An identical situation occurs in Grotta della Madonna, at Praia a Mare (Blanc *et al.*, 1958-1961), where terrestrial shells were prevalent in Cuts 57-58, dated by Rome C¹⁴ lab. (R-186: 10,030 ± 90, R-185: 10,120 ± 70;) whereas Cuts 49-50 containing marine shells were 9000 yr old (R-286: 9020 ± 125; R-287: 9035 ± 100; R-288: 8600 ± 120; R-288A: 9800 ± 140). Thus all dates for Grotta Erica are too old (Cuts 1-2, prevalence of marine shells; Cuts 3-5, prevalence of terrestrial shells). In Grotta delle Soppressate Cuts 1-12, is present prevalence of marine shells; Cuts 13-22 prevalence of terrestrial shells. Sample F-35, Cut 11, seems too old given that an analogous situation occurs with Cuts 57-54, Grotta della Madonna. Date of sample from middle part of Layer B, Grotta La Porta, seems too old compared with date of Cuts 49-50, Grotta della Madonna and shells from Layer B of Grotta La Porta (Pi-10: 8619 ± 200). Dates of mollusk valves seem erroneous compared to samples from Cuts 49-50 Grotta della Madonna (R-288: 8600 ± 120; R-288A: 9800 ± 140) and samples from Layer B of Grotta La Porta (Pi-10: 8619 ± 200; F-41: 9810 ± 275) (C. Tozzi, pers. commun.).

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