

UNIVERSITY OF ROME CARBON-14 DATES XII

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This list includes age measurements carried out from January 1972 to December 1973 with previously described CO₂-proportional counters (Alessio *et al*, 1970). All archaeological and geologic samples but one come from Italian territory.

Charcoal and wood samples underwent standard pretreatment by boiling with 5 to 10% HCl; α -labeled samples were given additional leaching with 0.2N NaOH.

The activity of our "modern standard", wood grown near Rome between 1949 and 1953, is checked repeatedly with 95% of the counting rate of NBS oxalic acid and measurements are found coincident within 1 σ . For each sample of CO₂, the counting rate was corrected according to mass-spectrometrically measured ¹³C/¹²C ratio as described previously (Alessio *et al*, 1969). Dates are reported in conventional radiocarbon years, using the Libby half-life of 5568 \pm 30 yr, with 1950 as the standard year of reference.

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SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC AND HISTORIC SAMPLES

A. Italy

Fimon-Molino Casarotto series

In 1943 G Trevisiol found Neolithic artifacts in peat bog near Molino Casarotto, Valli di Fimon, Berici Mts, 7km S Vicenza, Veneto (45° 28' 56" N, 11° 32' 00" E) (Trevisiol, 1944-45). Excavations were made 1969-70 and 1972 by B Bagolini, Mus Sci Nat, Trento, L H Barfield, Ancient Hist and Archaeol Dept, Birmingham Univ, and A Broglio, Ist Geol, Paleont and Paleont Umana, Univ Ferrara, on behalf of Soprintendenza Venezia, revealing a Neolithic peri-lacustrine settlement. Three dwelling areas were uncovered, mainly built on large stacked timber platforms or "bonifica" with central superimposed hearths and surrounded by several posts set up in lacustrine lime mud, probably hut structures or platform supports; also found were large shell-middens and settlement debris. Stone industry, bone artifacts, and pottery from the 3 areas are similar and belong to early phase, Finale-Quinzano, of Square-mouthed pottery culture, Middle Neolithic (Fogolari and Broglio, 1969; Broglio and Fogolari, 1970; Barfield and Broglio, 1971; Broglio, 1973; Fogolari,

Barfield and Broglio, 1972; Bagolini, Barfield and Broglio, 1973). Pollen and wood analyses (Durante Pasa, 1972; Jones, 1973) sedimentologic studies (Magaldi, 1973) and studies of human finds, flora, and fauna (Capitanio, 1971; Jarman, 1971; Jarman & Jarman, 1971) were made. Charcoal and wood coll and subm 1969-1970 by B Bagolini, L H Barfield, and A Broglio. Other samples from settlement were dated at Birmingham Lab (R, 1970, v 12, p 397; 1973, v 15, p 11).

Site 4, 1st dwelling area, main hearth

R-746. Fimon-Molino Casarotto 1

5690 ± 50

3740 BC

$\delta^{13}C = -24.4\%$

R-746 α . Fimon-Molino Casarotto 1

5570 ± 50

3620 BC

$\delta^{13}C = -25.1\%$

Charcoal from Site 4, Sqs 39K and 38-39L, Cut 4, Phase F of main hearth, 1st dwelling area.

R-747 α . Fimon-Molino Casarotto 2

5510 ± 50

3560 BC

$\delta^{13}C = -26.0\%$

Charcoal from Site 4, Sq 38K, Cut 5, Phase E of main hearth, 1st dwelling area.

R-748. Fimon-Molino Casarotto 3

5440 ± 50

3490 BC

$\delta^{13}C = -23.5\%$

R-748 α . Fimon-Molino Casarotto 3

5570 ± 50

3620 BC

$\delta^{13}C = -23.5\%$

Charcoal from Site 4, Sq 38K, Cut 5, Phase D of main hearth, 1st dwelling area.

R-757 α . Fimon-Molino Casarotto 28, 29

5800 ± 50

3850 BC

$\delta^{13}C = -26.2\%$

Charcoal and wood fragments from Site 4, Sq 38K, Cut 8B, Phase A of main hearth, 1st dwelling area. *Comment:* similar sample dated 1973 at 1973 at Birmingham Lab: Birm-263, Fimon-Molino Casarotto 18, 5525 ± 200 BP.

R-756 α . Fimon-Molino Casarotto 27

5690 ± 50

3740 BC

$\delta^{13}C = -25.1\%$

Charcoal from Site 4, Sq 38L, Cut 11, Phase A of main hearth, 1st dwelling area. *Comment:* similar sample dated 1973 at Birmingham Lab: Birm-262, Fimon-Molino Casarotto 17, 5820 ± 135 BP.

360 M Alessio, F Bella, S Improta, G Belluomini, G Calderoni,
Site 4, 1st dwelling area, zone surrounding main hearth

R-749. Fimon-Molino Casarotto 4
5560 ± 50
3610 BC
 $\delta^{13}C = -24.8\text{‰}$

R-749α. Fimon-Molino Casarotto 4
5490 ± 50
3540 BC
 $\delta^{13}C = -24.6\text{‰}$

Charcoal from Site 4, Sq 38J, Cut 3, anthropic horizon at bottom of peaty level around main hearth, 1st dwelling area.

R-750. Fimon-Molino Casarotto 5
5260 ± 50
3310 BC
 $\delta^{13}C = -25.3\text{‰}$

R-750α. Fimon-Molino Casarotto 5
5140 ± 50
3190 BC
 $\delta^{13}C = -25.1\text{‰}$

Charcoal from Site 4, Sq 37J, Cut 3, anthropic horizon at bottom of peaty level around main hearth, 1st dwelling area.

R-758α. Fimon-Molino Casarotto 30
5730 ± 50
3780 BC
 $\delta^{13}C = -25.8\text{‰}$

Charcoal from Site 4, Sq 41L, Cut 6, lower part of shell midden S main hearth, 1st dwelling area.

Site 4, 1st dwelling area, peripheric hearth

R-761. Fimon-Molino Casarotto 33
5610 ± 50
3360 BC
 $\delta^{13}C = -23.8\text{‰}$

Charcoal and wood from Site 4, Sqs 35-36O, Cut 3B, shell midden in lower level of peripheric hearth, 1st dwelling area.

R-763α. Fimon-Molino Casarotto 35
5570 ± 50
3620 BC
 $\delta^{13}C = -27.3\text{‰}$

Wood fragments from Site 4, Sq 31O, Cut 3, belonging to “bonifica” of peripheric hearth, 1st dwelling area.

R-762. Fimon-Molino Casarotto 34
5640 ± 50
3690 BC
 $\delta^{13}C = -25.5\text{‰}$

Charcoal from Site 4, Sqs 34-35-36/S-T-U, Cut 3B, belonging to “bonifica” in zone surrounding peripheric hearth, 1st dwelling area.

Site 4, 2nd dwelling area

R-764. Fimon-Molino Casarotto 36
5370 ± 50
3420 BC
 $\delta^{13}C = -25.7\text{‰}$

Wood fragments from Site 4, Sq 33FF, Cut 4, anthropic horizon in zone surrounding hearth, 2nd dwelling area.

R-765 α . Fimon-Molino Casarotto 37, 39 **5580 \pm 50**
3630 BC
 $\delta^{13}C = -25.4\text{‰}$

Charcoal from Site 4, Sqs 34/FF-GG, and 38GG, Cut 4, anthropic horizon in zone surrounding hearth, 2nd dwelling area.

R-766 α . Fimon-Molino Casarotto 38 **5530 \pm 50**
3580 BC
 $\delta^{13}C = -25.7\text{‰}$

Charcoal from Site 4, Sq 38FF, Cut 3, anthropic horizon in zone surrounding hearth, 2nd dwelling area.

Site 3, 3rd dwelling area

R-753 α . Fimon-Molino Casarotto 8 **5680 \pm 50**
3730 BC
 $\delta^{13}C = -25.6\text{‰}$

Partially carbonized wood from Site 3, Trench 2, Cut 2, belonging to "bonifica" of hearth recognized by Trevisiol, 3rd dwelling area.

Site 6, burial

R-754. Fimon-Molino Casarotto 9 **5960 \pm 50**
4010 BC
 $\delta^{13}C = -24.8\text{‰}$

Charcoal from Site 6, burial ca 150m from dwelling areas, with same pottery as found therein.

Site 1

R-752. Fimon-Molino Casarotto 7 **5590 \pm 50**
3640 BC
 $\delta^{13}C = -25.8\text{‰}$

Partially carbonized wood from Site 1, trench without finds, at bottom of peat level overlying lacustrine lime mud.

General Comment: 2 ages of samples pretreated with both 5% HCl only and with additional leaching by 0.2N NaOH (α -labeled samples) are generally coincident within 1 σ : humic fraction obtained should not be regarded as contaminating but as belonging to partial humified material.

Rome Lab dates, from ca 6000 to 5100 BP, with a marked accumulation between 5750 and 5500, confirm 1973 Birmingham Lab dates (R, 1973, v 15, p 11). Moreover dates, most of which belong to 1st dwelling area, suggest: a) ca 250 yr between lower and upper levels of main hearth; b) correlation of peripheric hearth with middle and upper levels, F-D phases, of main hearth; c) that the 3 dwelling areas are essentially coeval whereas the burial appears older. Dates are consistent with ages of same phase of Square-mouthed pottery in Italy: Caverna delle Arene Candide, Layers 16 to 19, R-103, 5465 \pm 50 BP (R, 1966, v 8, p 402) and Grotta Aisone, R-95, 5825 \pm 75 BP (R, 1965, v 7, p 231).

R-952. Girella, Bagnoregio **2180 ± 50**
230 BC
 $\delta^{13}C = -24.3\%$

Charcoal from probable sacrificial level embedded in stone, closing a well, found during excavations by Soprintendenza all' Etruria Meridionale in Etruscan settlement at Girella 9.7km along state rd No. 71 (Umbro-Casentinese), Bagnoregio, prov Viterbo, Latium (42° 07' 06" N, 12° 01' 06" E). Coll 1972 and subm 1973 by M Cagiano de Azevedo, Ist Archeol, Univ Cattolica, Milan. *Comment*: archaeol deposits, consisting of building material and furnishings, and a "sacred" stone, probably from burnt building, filled well and cistern excavated in tuff and subsequently sealed by stone in 2 stages, as evidenced by embedded charcoal and ashes. Pottery dates settlement between 9th and beginning of 4th century BC (M Cagiano de Azevedo, pers commun). Corrected ^{14}C date (Ralph, Michael, and Ham, 1973) (from 410 to 360-210 BC) agrees well with upper limit of expected age.

R-897 α . Catacomba di S Gennaro, Napoli **1470 ± 50**
AD 520
 $\delta^{13}C = -25.7\%$

Badly impaired wood (*Castanea vesca Gaertn*) id by E Corona (pers commun), fragment of head-piece of beam *in situ* in upper part of side wall of M gallery of St Gennaro's lower catacomb, Capodimonte, Naples. Coll 1971 and subm 1972 by Padre U M Fasola, Secr Pontificia Comm Archeol Sacra. *Comment*: M gallery, originally for burials, was reinforced by masonry arches and a beam, almost completely destroyed today, 285cm long and 20×25cm diam, measured by E Corona, since in the upper catacomb a hypogean basilica was erected and partially laid upon M gallery (Fasola, 1972; 1973). Corrected ^{14}C age of beam (AD 450 to 570) (Ralph, Michael, and Ham, 1973), in agreement with archaeol data, is extremely important historically.

B. Turkey

R-956 α . Topakli, Level S **2520 ± 50**
570 BC
 $\delta^{13}C = -22.2\%$

Slightly darkened wood (*Juniperus* sp) id by M Follieri, Ist Bot, Univ Rome (pers commun), fragment of wooden pile, 38cm long, 7×3.5cm diam, from inside enclosure wall, Level S, of Phrygian town. Coll 1972 by Italian Archaeol Mission in Hôyük of Topakli, Central Anatolia, Turkey (39° 01' 30" N, 34° 54' 00" E); subm by L Polacco, Ist Antropol, Univ Padua. *Comment*: wooden piles reinforced rough-cast enclosure wall, 4.60m thick and preserved up to a height of ca 3m (Polacco, 1972-73). Corrected ^{14}C date (Ralph, Michael, and Ham, 1973), from 800 to 740 BC, agrees with expected age for enclosure wall (700 BC) based on pottery from Level S, 900 to 700 BC.

II. GEOLOGIC SAMPLES

A. Italy

Campi Flegrei, Napoli

This series includes 3rd group of dates of carbonized wood and humified paleosol layers interbedded in pyroclasts recognized as eruptive products of Campi Flegrei volcanic region, 1st Phlegrean period. Preceding date lists (R 1971, v 13, p 403-409; 1973, v 15, p 171-176) reported the more significant outlines of long activity and structure of this volcanic system and essential bibliography.

R-857. Cava Crescenzo I-3	39,500 ± 2500
	37,550 BC
	$\delta^{13}C = -24.1\%$
R-857_{β/1}. Cava Crescenzo I-3	34,500 ± 1500
	32,550 BC
	$\delta^{13}C = -24.5\%$
R-857_{β/2}. Cava Crescenzo I-3	33,700 ± 1300
	31,750 BC
	$\delta^{13}C = -24.3\%$
R-857_{β/3}. Cava Crescenzo I-3	33,000 ± 1200
	31,050 BC
	$\delta^{13}C = -24.6\%$
R-857_{β/4}. Cava Crescenzo I-3	31,500 ± 1000
	29,550 BC
	$\delta^{13}C = -25.0\%$

Carbonized wood embedded in humified layer underlying pumice-lapilli beneath base of Campanian gray tuff (Di Girolamo, Rolandi, and Stanzione, 1973) from Crescenzo tuff quarry near church of St Anna, ca 7km N Nocera Inferiore, prov Salerno, Campania (40° 46' 42" N, 14° 38' 58" E). Coll and subm 1971 by G Calderoni and C Cortesi, Ist Geochim, Univ Roma and P Di Girolamo and A Scherillo, Ist Min, Univ Napoli. *Comment:* R-857 sample pretreated with only 5% HCl since humic charcoal was nearly completely soluble in 0.2N NaOH. Tentatively however after acid pretreatment, another part of sample underwent subsequent extractions by 0.2N NaOH and humic acid precipitated again by boiling with dilute HCl (R-857_{β/1-4}).

Owing to age of overlying R-565 charred wood >40,000 (R, 1971, v 13, p 404), for R-857 and other previously dated samples of same humified layer, contamination by younger humic materials can be inferred (see, R-577A, -716, -716A, -717: R, 1971, v 13, p 404-405). Of these dates, R-857, 39,500 ± 2500 BP, is most reliable but, due to assumed contamination, is minimum. At Cava Crescenzo, contamination of underlying old humified layer by young humic material from present soil percolating down through fractures of Campanian gray tuff is very likely.

Tufo grigio campano or "Ignimbrite Campana" series

Two pieces of carbonized wood from Campanian gray tuff from Monte della Taglia tuff quarry ca 2km NW Cicciano, prov Naples, Campania (40° 58' 10" N, 14° 33' 58" E).

R-821A. Monte della Taglia, Cicciano I-1 **38,000 ± 2000**
36,050 BC
 $\delta^{13}C = -22.9\text{‰}$

R-821 α . Monte della Taglia, Cicciano I-1 **42,000 ± 4000**
40,050 BC
 $\delta^{13}C = -23.0\text{‰}$

Fragments of branch or small trunk, (cfr *Staphylea* sp) id by M Follieri (pers commun), embedded in middle-upper part of Campanian gray tuff, yellow facies. Coll and subm 1971 by G Calderoni, C Cortesi, M Fornaseri, P Di Girolamo, and A Scherillo. *Comment:* R-821A is further sampling of R-821 (R, 1973, v 15, p 171-172).

R-856. Monte della Taglia, Cicciano I-2 **36,200 ± 1800**
34,250 BC
 $\delta^{13}C = -22.6\text{‰}$

R-856 α . Monte della Taglia, Cicciano I-2 **35,200 ± 1600**
33,250 BC
 $\delta^{13}C = -22.8\text{‰}$

Fragment of large trunk (*Pinus* sp *silvestris-montana* group) id by M Follieri (pers commun) embedded in middle-upper part of Campanian gray tuff, yellow facies, near R-821A and approx same level. Coll and subm 1971 by G Calderoni, C Cortesi, P Di Girolamo, and A Scherillo. *General Comment:* R-821A and R-856 dates confirm once more Würm age of Campanian gray tuff (Campanian Ignimbrite) formation, placing it between 30,000 and >42,000 BP (cf, R, 1971, v 13, p 404; 1973, v 15, p 171-172).

Monte Somma-Vesuvio series

The following dates (R-935 and R-937 to R-940) include humified layers of paleosols interbedded in pyroclasts of Mt Somma-Vesuvius volcano, taken from Campanian quarry secs where more or less complete series are exposed (Di Girolamo, 1968; Di Girolamo *et al*, 1972). Samples were pretreated with 8N HCl; humic acids were extracted with 0.2N NaOH and precipitated again by boiling with dilute HCl. Coll and subm by C Cortesi, M Fornaseri, P Di Girolamo, and A Scherillo.

R-935. Codola 1 **25,100 ± 400**
23,150 BC
 $\delta^{13}C = -25.6\text{‰}$

Sec in pozzolana quarry at Codola, 3.3km along state rd No. 266, about mid-way between Nocera Inferiore and Castel S Giorgio, prov Salerno, Campania (40° 46' 15" N, 14° 39' 33" E). Exposed series of stratified pumice and ash, products of ancient and more recent activity of

Somma-Vesuvius overlying Campanian gray tuff, yellow facies, with interbedded paleosols. Humic acids from humified layer in lower part of sec embedded between Campanian gray tuff and interbedded layers of leucite-phonolite pumices and presumably phonolitic-trachyte ashes. *Comment:* R-935 date is acceptable: all Somma-Vesuvius products, including oldest ones to which R-935 belongs, being superimposed to Campanian gray tuff dated between 30,000 and >42,000 BP (see R-821A and R-856, *General Comment*, above).

Cava dell'Arciprete series

Sec, ca 4m high, in Arciprete tuff quarry, 77.8km along state rd No. 7bis, prov Avellino, Campania (40° 54' 13" N, 14° 45' 12" E) exposes stratified upper pumices and ashes of Somma-Vesuvius with 3 interbedded humified layers overlying Campanian gray tuff, yellow facies. Samples are from upper part of thick humified layers.

R-937. Cava dell'Arciprete 1

7870 ± 50
5920 BC
 $\delta^{13}C = -25.5\text{‰}$

Humic acids from humified layer underlying prehistoric pumices overlying Campanian gray tuff, yellow facies.

R-938. Cava dell'Arciprete 2

3870 ± 50
1920 BC
 $\delta^{13}C = -25.9\text{‰}$

Humic acids from humified layer underlying white and gray pumice attributed to AD 79 Plinian eruption of Vesuvius (Booth *et al.*, 1971) and overlying prehistoric pumice.

R-939. Cava dell'Arciprete 3

1630 ± 50
AD 320
 $\delta^{13}C = -24.1\text{‰}$

Humic acids from humified layer overlying above mentioned white and gray pumices, underlying scoriae and lapilli belonging to more recent unidentified eruption of Vesuvius.

General Comment: dates confirm stratigraphic position of the whole series overlying Campanian gray tuff. R-937, relatively recent compared to Campanian gray tuff, can be explained by a probable erosion of more ancient products of Mt Somma, present in secs of surrounding areas. R-938 is consistent with R-940, below, both underlying products of probable Plinian age. Recent age of R-939 is also acceptable.

R-940. Altavilla Irpina 1

4340 ± 50
2390 BC
 $\delta^{13}C = -25.8\text{‰}$

Humic acids from humified layer overlying reworked pumice superimposed on Campanian gray tuff, mainly in gray facies, and underlying white and gray pumice attributed to AD 79 Plinian eruption of Vesuvius. Sec in tuff quarry along Pietrastornina stream, ca 1km W Altavilla Irpina,

prov Avellino, Campania (41° 00' 28" N, 14° 46' 03" E). *Comment:* see R-938, *General Comment*, above.

B. Pontine Islands

R-943. Ventotene

>41,000

$\delta^{13}C = -24.0\%$

Carbonized wood, fragment of branch embedded in lower level of chaotic pumice at Parata Grande, cliff NW coast of Ventotene I, E Pontine Is, Tyrrhenian Sea (40° 47' 50" N, 13° 25' 38" E) at + 4 to 6m. Coll 1972 and subm 1973 by P Di Girolamo. The pyroclastic complex, ca 30m high, NE dip direction, overlies trachy-basalt lava and exposes from top: a) more or less lithified tuffs, ca 10 to 15m thick; b) chaotic pumice stratum, ca 6m thick, with embedded charred branches, 10 to 20cm diam; c) various interbedded levels of paleosols and pumice, ca 7 to 8m thick. *Comment:* 2 K/Ar dates are available for trachy-basalt lava, also outcropping on large areas in SW Is, 1.7m yr and <2m yr (Barberi *et al*, 1967). Nevertheless R-843 date was requested since no data were available for age of overlying pyroclastic complex which, despite age of lava, might also be the product of a much more recent eruption.

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