

UNIVERSITY OF ROME CARBON-14 DATES V

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The list of age measurements given below was obtained from December 1965 to October 1966. Nearly all archaeological samples dated come from Italian territory, a few from Europe, Asia, and Africa. Some of the series continue or complete measurements published in previous lists (Rome II, III and IV) and refer to important deposits whose material, the result of several excavation campaigns, has been submitted at different times to our laboratory. All geologic samples come from Italian territory.

The pretreatment given to samples, the production of pure CO_2 , the physical techniques and counters used for these measurements, are essentially the same as the ones previously employed, and have already been described elsewhere (Bella and Cortesi, 1960; Alessio, Allegri and Bella, 1960; Alessio, Bella and Cortesi, 1964).

The errors, quoted as in Rome IV, are the 1σ statistical errors. Age has been calculated using Libby's half-life of 5568 ± 30 yr, with 1950 as the standard year of reference. As in all previous measurements, the same modern wood, grown near Rome between 1949 and 1953, has been taken as modern standard: recently its activity has once again been carefully checked and judged satisfactory.

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SAMPLES DESCRIPTIONS

I. ARCHAEOLOGIC SAMPLES

A. Italy

Grotta Arma dello Stefanin series

Charcoal and burnt bones from Grotta Arma dello Stefanin deposit, Val Pennavaira, province of Savona, Liguria ($44^\circ 06' 13''$ N Lat, $8^\circ 01' 05''$ E Long, 440 m above sealevel). Cave No. 257 in "Catalogo Speleologico Ligure." Coll. 1956 to 1961 and subm. 1964 by M. Leale Anfossi, Ist. Italiano di Paleontologia Umana, who carried out excavations from 1952 to 1961. Throughout deposit, 4.85 m thick, pottery and flint industry, suggesting two main cultural horizons, were found together with bones of cold-type wild fauna, food refuse, and several hearths. From

top downward 17 layers were singled out: I-II, 35 cm thick, sterile; III, 7 cm thick, containing atypical pottery, on the whole regarded as Late-Middle Neolithic, scarce flint implements together with wild animals bones, food refuse, and one single hearth; IV-V, 28 cm thick, Epipaleolithic: large flint industry with microliths of Epigravettian type, wild animals bones, food refuse, and numerous superimposed hearths; VI-VII, 47 cm thick, scarce flint implements of same Epigravettian type and bone bits; VIII, 53 cm thick, sterile; IX, 15 cm thick, rare flint implements of not clearly defined Upper Paleolithic type and hearths; X to XVII, 3 m thick, down to rock bottom of cave, sterile and semi-sterile layers; only few animal remains, horns and teeth of *Ibex*, were found in XV-XVI layers (Leale Anfossi, 1953, 1956, 1958-61c, 1958-61d, 1959, 1962).

R-124. Arma dello Stefanin IIIa **5600 ± 80**
3650 B.C.

R-143. Arma dello Stefanin IIIb **5180 ± 70**
3230 B.C.

R-143D. Arma dello Stefanin IIIc **5480 ± 80**
3530 B.C.

Charcoal from different zones of Layer III, referred to Late-Middle Neolithic.

R-145. Arma dello Stefanin IV **8800 ± 300**
6850 B.C.

Charred bones from Layer IV, Epipaleolithic, industry of Epigravettian type. *Comment:* bone bits, carefully chosen and washed, were partially (ca. 10%) dissolved in 5% HCl, mineral components of bones then completely destroyed by treatment with dilute HCl, the residual blackish matter being wholly soluble in 6% NH₄OH.

R-126. Arma dello Stefanin Va **8100 ± 90**
6150 B.C.

Charcoal from different zones of Layer V, Epipaleolithic, Epigravettian type industry.

R-148. Arma dello Stefanin Vb **8400 ± 100**
6450 B.C.

Charcoal from different zones of Layer V, Epipaleolithic, Epigravettian type industry.

General Comment: R-124, R-143 and R-143D are consistent and confirm Late-Middle Neolithic age for Layer III. R-145, R-126 and R-148 dates ascribe the single cultural horizon of Layer IV and V to VII millennium B.C. and agree with a rather late industry of Epigravettian type. First date Layer IV: R-109 7800 ± 100 (Rome III).

Grotta del Pertusello series

Charcoal from Grotta del Pertusello deposit, Val Pennavaira, province of Savona, Liguria (44° 06' 16" N Lat, 8° 00' 55" E Long, 570

m above sealevel). Cave No. 304 in "Catalogo Speleologico Ligure." Coll. August 1963 and subm. 1964 by M. Leale Anfossi. Excavation, started in 1952 by G. Chiappella (Chiappella, 1962) was continued and concluded 1957-63 by M.L.A. Throughout deposit pottery, flint and bone implements were found together with numerous hearths, ash-heaps, bones of domestic and wild animals, food refuse. From top downward three archaeol. levels were identified, belonging to Iron age, Eneolithic, and Late-Middle Neolithic; and five layers were distinguished: Layers I-II, 30 cm average thickness, coarse corded pottery of Iron age, bones of prevailing domestic animals, food refuse, hearth formed by flat stones, piled up ash-heap. Layer III, average thickness ca. 30 cm, Eneolithic or Late-Neolithic, polished pottery of "Lagozza" type, together with fragments of a bell-beaker; flint blades, little blades, barbed-and-tanged and transverse arrowheads; bones of wild and domestic animals, food refuse, several hearths, and ash-heaps. Layer IV, 20 cm average thickness, Middle Neolithic, hemispheric-bottomed pottery with cardial and ribbed decoration, few flint blades; bones of prevailing wild animals, food refuse, hearths, and ash-heaps. Layer V, 0.90 to 1.50 m depth, sterile sediments; rock bottom of cave has not been reached (Leale Anfossi, 1958-61a, 1958-61b, 1959, 1962).

R-150. Pertusello I

2260 ± 60

310 B.C.

Charcoal from Layer I, Sec. D-C. Iron age.

R-152. Pertusello IIa

1570 ± 50

A.D. 380

Charcoal from Layer II, Sec. A-D and D-B coll. August 1959. Iron age. *Comment:* evident contamination of sample, by mixing of younger material.

R-153. Pertusello IIb

2680 ± 60

730 B.C.

Charcoal from Layer II, Sec. D-C, 20 to 40 cm below surface. Iron age.

R-155. Pertusello III

4390 ± 70

2440 B.C.

Charcoal from Layer III, Sec. D-C. Eneolithic or Late Neolithic, pottery of "Lagozza" type.

R-157. Pertusello IV

5400 ± 90

3450 B.C.

Charcoal from Layer IV, Sec. D-C. Middle Neolithic, cardial pottery. *General Comment:* dates obtained for each layer are somewhat older than the ones previously measured for this deposit (see Rome II, p. 80-81) and seem to correlate better with cultural horizons. R-150 and R-153 well agree with Iron age. Also R-155 (Layer III) and R-157 (Layer IV) dates are consistent enough with the type of pottery at these levels.

We have to point out for this deposit, that the singling out of archaeol. horizons and subsequent sampling for dating was particularly difficult, for in several sections stratigraphy was deranged, as shown also by unpublished astraying dates. Dated samples, coll. 1963, come from undisturbed section of deposit.

Polada series

In 1872 diggings for holocene peat bog, covering to some extent the old intermorainal, now dried-up, lacustrine basin of Polada, 1.5 km E Lonato, province of Brescia, Lombardy (45° 27' 35" N Lat, 10° 30' 00" E Long) brought to light for first time numerous archaeol. artifacts including pottery, flint implements, wood, bone, and few metal objects. Further on, until 1876 non-systematic excavations were carried out by G. Rambotti, who made large collection of these archaeol. materials judged to be of prehistoric lacustrine settlement: dwelling probably built either on wooden packwork or on dried, hardened peat-soil (Anonimi, 1875; Munro, 1908; Cornaggia Castiglioni and Toffoletto, 1958). About 1940, through study of pottery found at Polada and in some lake dwellings of Po Plain, a typical culture spreading over this region was identified, attributed to Lower-Middle Bronze age and named Polada culture (Laviosa Zambotti, 1939; 1940). Objects from Polada lacustrine settlement, subm. Febr. 1966 by M. O. Acanfora, Direttrice alle Antichità, Mus. Preistorico Etnografico L. Pigorini in Rome, belong to Rambotti colln., since 1886 at this mus.

R-294. Polada

3330 ± 65

1380 B.C.

Well-preserved wood, fragment of handled wooden bowl.

R-295. Polada

3220 ± 55

1270 B.C.

Braided wicker-work, fragment of a big artifact, probably wicker basket.

R-296. Polada

3245 ± 55

1295 B.C.

Charred bread, whole sub-oval shaped small loaf, particularly uncommon finding.

General Comment: the identical dates obtained are the first on Polada culture in Polada site, and they agree well with ages of various lake dwellings scattered in Po Plain, where the culture has been identified: Barche di Solferino, Pi-87, 3341 ± 115 (Pisa II); Lago di Ledro, Pi-88, 3137 ± 105 (Pisa II) and R-7, 3310 ± 210 (Rome II); Cavriana, R-25, 3495 ± 60 (Rome III).

Torcello series

In 1961 and 1962, entrusted by Fondazione Giorgio Cini of Venice, in collaboration with Soprintendenza alle Antichità delle Venezie of

Padua, excavations were carried out in Torcello Island, Lagoon of Venice (45° 29' 50" N Lat, 12° 26' 18" E Long) to find the oldest testimony on the origin and history of Venice; in fact, Torcello Is. was in early Middle Ages, an important cultural, political, and economic center in the lagoon. Under direction of the late G. P. Bognetti, Fondazione Giorgio Cini of Venice, excavations were performed by L. Leciejewicz, S. Tabaczynski and E. Tabaczynska, Polish Acad. of Sci., with partial assistance of A. Marcello, Istituto di Studi Adriatici in Venice, and of N. Spada, Centro Nazionale di Studi Talassografici C.N.R. in Venice. Two diggings were carried out in 1961 to depth of ca. 3.40 m and at distance of 130 m from each other. Digging I (5 x 2.5 m) was done in lawn behind Cathedral (S. Maria Assunta), near little church of S. Marco; Digging II (6 x 2.5) in small square between S. Fosca church and Palazzo del Consiglio and enlarged in 1962 campaign. In both diggings eight archaeol. layers have been identified, the upper ones (1-2) belonging to recent age and partially deranged; the lower ones (3-8), of Middle Ages and Roman period, have been doubtfully dated from 13th-12th to 4th-2nd centuries A.D., mostly on basis of potsherds; virgin soil was found beneath. In Digging I, Layer 6, human burial and mooring-piles probably belonging to small landing-wharf were found. In Digging II, Layer 4, were several graves, belonging to a cemetery; in Layer 5, remains of brick and stone building identified as old glass manufacturing furnace, through analyses of vitrified matter and remains of glassware; in Layer 6 to 8, various small wooden posts, probably for boats mooring (Bognetti *et al*, 1961; Marcello, 1963; Leciejewicz *et al*, 1963-64). Findings of coins, pottery, glass and metal objects, animal bones, shells, remains of cultivated and spontaneous vegetation, have been identified and illustrated (Marcello, 1965; Manzoni, 1965), and pedological tests were made on sediments (Comel, 1965). Some sub-fossil wood and a piece of charred, coll. May-July 1961 during excavations, have been subm. March 1965 by A. Marcello, through E. Francini Corti, Direttrice Ist. Botanico, Univ. of Florence; they have been identified by A. M. Fabbri Tarchi and P. Paladino (Fabbri Tarchi and Paladino, 1967).

1030 ± 45

R-234. Torcello I-6 ME30

A.D. 920

Darkened wood, *Quercus* cfr. *pedunculata* Ehrh., from Layer 6, Digging I, 1.07 m below medium sealevel, measured 1896 by Ist. Geografico Militare.

1210 ± 55

R-235. Torcello I-6a ME41

A.D. 740

Darkened wood, *Quercus* sp. (deciduous), fragment probably from coffin of human burial, from Layer 6, Digging I, at same depth as sample R-234.

650 ± 130

R-236. I-6b ME51

A.D. 1300

Darkened wood, *Crataegus* or *Sorbus* sp., from Layer 6, Digging I,

at same depth as R-234 and R-235. *Comment:* when compared with R-234 and R-235, R-236, far too young. Sample apparently belongs to deranged part of layer.

R-238. Torcello I-8 ME29

**1150 $\pm$ 150
A.D. 800**

Small bits of both charred and darkened wood, including fruits and seeds belonging to different species, among which are *Quercus* sp. (deciduous) and *Prunus persica* from Layer 8, Digging I, 1.92 to 2.12 m below medium sealevel, 1896, I.G.M.

R-233. Torcello II-5 ME36

**1110 $\pm$ 45
A.D. 840**

Charred wood, fragment of trunk belonging to *Populus* sp. from Layer 5, Digging II, 0.42 m below medium sealevel, 1896, I.G.M., found in remains of old glass-manufacturing furnace.

R-237. Torcello II-8 ME48

**1290 $\pm$ 50
A.D. 660**

Brownish wood, *Quercus* sp. (deciduous), from Layer 8, Digging II, 1.12 m below medium sealevel, 1896, I.G.M.

R-239A. Torcello II-8a ME52

**1350 $\pm$ 55
A.D. 600**

R-239B. Torcello II-8a ME52

**1315 $\pm$ 55
A.D. 635**

Wood, *Quercus* sp. (deciduous), fragment of small wooden mooring post from Layer 8, Digging II, at same depth of sample R-237. R-239B was taken from darkened outer part, R-239A from well-preserved light inner part.

R-240. Torcello II-8b ME35

**1200 $\pm$ 80
A.D. 750**

Darkened wood, *Alnus* cfr. *glutinosa* Gaertn., fragment of small wooden mooring-post from Layer 8, Digging II, at same depth as R-237 and R-239.

General Comment: all samples were given only dilute HCl pretreatment: abundant Fe^{++} was detected, probably ferrous humate, since samples were devoid of CO_3^{--} and S^{--} . An additional leaching with 6% NH_4OH was not deemed necessary, as plentiful humic fraction was judged not to be contaminating but as a result of wood impairment, as proved by identical ages of samples R-239A, from inner well-preserved wood, and R-239B, from outer-impaired one.

Dates obtained for R-234 and R-235 are younger than uncertain archaeol. age estimated for Layer 6, Digging I (5th to 6th centuries A.D.). Also R-238 date is too young if compared with presumed archaeol. date of Layer 8, Digging I (4th to 5th centuries A.D. ?). R-233 dates the glass-manufacturing furnace and agrees with archaeol. date of Layer 5, Digging II (7th to 8th centuries A.D.). R-237, R-239A/B and R-240 dates

are almost consistent but younger than uncertain archaeol. age for Layer 8, Digging II (2nd to 4th centuries A.D.). R-239A/B and R-240, wooden posts fragments, also date mooring-posts. Dating of mooring-piles from Layer 6, Digging II, is being carried out.

Dating of identified both charred and sub-fossil wood proved that mesophilous hardwood plain forest, with *Quercus* predominant, and the same species of fruit plant as nowadays were spread through the region during the Middle Ages.

3265 ± 55

R-275. Arcevia 5

1315 B.C.

Charcoal from Layer 5 of open-air archaeol. deposit at S. Giovanni Battista locality (Giacometti quarry), half-way up SE side of Arcevia hill, province of Ancona, Marche (43° 29' 30" N Lat, 12° 56' 38" E Long). Coll. 1965 and subm. Nov. 1965 by A. Palmieri, Ist. di Paletnologia, Univ. of Rome, who carried out excavation (Puglisi, 1965). Seven cultural layers have been identified throughout deposit, from top downward: Layers 1 to 4, whose stratigraphy appears deranged probably from sliding, contain remains dating from Middle Ages, Roman period and Iron age. In Layer 5 was pottery showing characters both of Proto-Apennines culture and lake dwelling Po Plain cultures, Bronze age; in Layer 6, flint industry and pottery, the latter similar to Layer 4 of Attiggio di Fabriano and to lower levels of Fossato di Conelle deposits cultural horizon, in Marche territory (Lollini, 1962-65); in Layer 7, Upper Neolithic flint industry and pottery, which might be compared to Ripoli and Lagozza type pottery. *Comment:* R-275 date agrees well with cultural horizon in Layer 5, and can be compared with those of Polada culture; see Polada, R-294, R-295 and R-296 in this list, which includes more Polada dates.

Roman Forum series

Samples found during excavation in the *Regia*, Roman Forum, Rome (41° 53' 28" N Lat, 12° 28' 52" E Long), carried out by F. E. Brown, Director of Am. Acad. in Rome, for Soprintendenza alle Antichità Roma IV, Soprintendente G. Carettoni, Coll. from June to Dec. 1964 by F. E. Brown; subm. Febr. 1965 by F.E.B. and G. Carettoni.

2505 ± 45

R-202. Roman Forum Regia 1

555 B.C.

Regia, Sounding 4NW, Level VI. Charred wood, possibly from roof-beams of temple. *Comment:* supposed historic age (575-550 B.C.) agrees with date obtained.

2215 ± 50

R-204A. Roman Forum Regia 2

265 B.C.

Regia, Sounding 6b, s. 4. Well. Fragment of matting. *Comment:* presumed historic age (ca. 250 B.C.) agrees with date obtained.

2330 $\pm$ 50
380 B.C.

R-206. Roman Forum Regia 3

Regia, Sounding 3s, Level VI. Small bits of charcoal and charred wheat from stratum of burnt matter. Presumed historic age (575-550 B.C.) does not agree with date obtained; contamination of sample is possible by mixing of younger material.

2280 $\pm$ 50
330 B.C.

R-207. Roman Forum Regia 4

Regia, Sounding 6c, s, Level IX. Small bits of charcoal from thatch of hut. *Comment:* presumed historic age (650-600 B.C.) does not agree with date obtained; contamination of sample by younger material (root-lets) seems probable.

General Comment: the above samples, and wood, and charred wheat, formerly dated at Rome lab. (see Rome II, p. 83) and charcoal dated at Stockholm (St-315, Stockholm II) are the only materials, from different archaeol. layers of Roman Forum, yet dated.

Battistero Lateranense series

Wood, belonging to framework of Battistero Lateranense, Rome ($41^{\circ} 53' 12''$ N Lat, $12^{\circ} 30' 26''$ E Long). Coll. 1944 by G. B. Pelliccioni, architect, during restoring and archaeol. and structural researches in Battistero Lateranense site, under direction of Pontificia Commissione per la Tutela dei Monumenti; subm. autumn 1964 by V. Federici, Gabinetto Ricerche Scientifiche of Vatican Museums, Rome.

1380 $\pm$ 50

R-198. Battistero Lateranense A

A.D. 570

Well-preserved wood belonging to beam fixed into masonry by deep groove. Masonry overtops brick load-bearing arch built at height of 12 m from present floor level, on second row of columns, belonging to small central octagon of Battistero. As for its location, beam is supposed to have been set-in from 6th to 16th centuries A.D. *Comment:* date obtained agrees with older presumed age.

1380 $\pm$ 50

R-199. Battistero Lateranense B

A.D. 570

Wood from a still *in situ* wooden platband, belonging to original window which opens on left wall of room made out, at height of 10 m on Battistero floor-level, over present floor-covering of Battistero atrium. From style and structure analysis, wall construction and platband setting can be dated from end of 11th to first half of 12th centuries A.D. *Comment:* wood tissue was not impaired but worm-eaten; owing to plentiful supply of sample, wood was carefully chosen from well-preserved parts. Date obtained is older than presumed age.

R-200. Battistero Lateranense C

< 200

Well-preserved wood belonging to timber of piling enclosing masonry foundations, found on outside of Battistero at 2.5 m under ground

level. Foundations, at first considered to belong to old Roman terme, were subsequently dated to much more recent time (ca. end of 19th century). *Comment:* date obtained well agrees with second attribution.

Grotta del Santuario della Madonna series

The following series continues project for dating material from archaeol. levels of Grotta del Santuario della Madonna deposit, at foot of Mt. Vinciolo, in village of Praia a Mare, on Thirrenian coast of Calabria, 297.9 km along State Road No. 18 (Tirrena Inferiore), province of Cosenza, Calabria (39° 53' 43" N Lat, 15° 47' 11" E Long, ca. 52 m above sealevel). Excavation of deposit was begun in 1959-60 by the late A. C. Blanc and L. Cardini, Ist. Italiano di Paleontologia Umana (Blanc and Cardini, 1957, 1958-60; Blanc *et al.*, 1958-61) and continued 1962-66 under direction of L. Cardini. The 1965-66 campaigns were sponsored by Consiglio Naz. delle Ricerche. Deposit, owing to sequence of discovered cultural horizon, appears to be among most important ones yet discovered for knowledge of prehistory in Central and Southern Italy. Through deposit hitherto excavated, 10.30 m thick, beneath disturbed upper levels, ten archaeol. layers have been identified containing pottery, flint industry, charcoal, bones of domestic and wild animals, and mollusc shells, food refuse, the latter identified by F. Settepassi. From top downward: I, Roman period; II, Bronze age, Apennines culture; III, Eneolithic, Piano Conte culture; IV, culture not yet identified; V, Late Neolithic, Diana culture; Middle Neolithic: VI, 3rd phase, Serra d'Alto culture; VII, 2nd phase, Capri culture; VIII, 1st phase, pottery with red-band painted decoration and scarce impressed pottery; IX, Mesolithic; X, Upper Paleolithic, Gravettian industry, various levels (Tinè, 1965; Cardini and Cassoli, 1967; Cardini, Cassoli and Biddittu, 1967; Cardini, Taschini and Cassoli, 1967). Datings of samples belonging to Layers IV, IX and X, Sections 45-46, have been reported and discussed in preceding date list (Rome IV, p. 403-404); following dates refer to material from Layers II, V, VI, VIII and X, other sections. Samples coll. summer-autumn 1965 by L. Cardini and P. F. Cassoli, Ist. Italiano di Paleontologia Umana; subm. Dec. 1965 by L. Cardini.

2575 ± 45

R-281. Grotta della Madonna II-10

625 B.C.

Charcoal from Sec. 10c of Layer II, 1.70 to 1.80 m below surface. Apennines culture, Bronze age; bones of domestic animals. *Comment:* R-281 age together with R-282 and R-190β ages are first dates for Apennines culture spread over Central and Southern Italy.

2820 ± 60

R-282. Grotta della Madonna II-11

870 B.C.

Well-preserved carbonized acorns from Sec. 11 of Layer II, 1.80 to 1.90 m below surface. Apennines culture, Bronze age; bones of domestic animals. *Comment:* see sample R-281.

2700 $\pm$ 300
750 B.C.

R-190 β . Grotta della Madonna II-11a

Humified charcoal found in Layer II together with carbonized acorns, R-282. Sample coll. 1963 and subm. Dec. 1963 by L. Cardini. *Comment:* dilute HCl pretreatment was given; R-190 β represents very abundant humic fraction, i.e. nearly the whole of charcoal, obtained through additional leaching by 6% NH_4OH and precipitated again by dilute HCl. Owing to scarce sample, measurements were not sufficiently precise and did not permit statistical treatment of results, so error is "maximum"; nevertheless, age agrees with R-282 and R-281 dates for Apennines culture.

5110 $\pm$ 70
3160 B.C.

R-283. Grotta della Madonna V

Charcoal from Sec. 29 of Layer V, 3.50 to 3.60 m below surface. Semi-sterile Sec. 26-28, 3.20 to 3.50 m below surface, separates archaeol. Layer V from upper Layer IV. Late Neolithic, Diana culture; bones of domestic animals. *Comment:* R-283 age is first date for Diana culture hitherto found at Lipari, Aeolian Islands, Sicily and in Southern and Central Italy. Layer IV, Sec. 20 to 25, 2.70 to 3.20 m below surface, showing undefined cultural elements of probably alien origin, was dated 4770 ± 55 (Rome IV, R-189).

5555 $\pm$ 75
3605 B.C.

R-284. Grotta della Madonna VI

Charcoal from Sec. 33, Layer VI, 3.90 to 4.00 m below surface. Middle Neolithic, 3rd phase, Serra d'Alto culture; bones of domestic animals. *Comment:* R-284 age is first date for Serra d'Alto culture, hitherto found at Lipari, Sicily, Southern Italy and Tuscany.

7555 $\pm$ 85
5605 B.C.

R-285. Grotta della Madonna VIII

Charcoal from Sec. 40-41 of Layer VIII, 4.60 to 4.80 m below surface. Middle Neolithic 1st phase, pottery with red-band painted decoration and scarce impressed pottery; bone of domestic animals. *Comment:* R-285 age is first date for this cultural horizon.

Layer IX, Mesolithic, Sec. 44-47, 5.00 to 5.40 m below surface, was dated: R-187, 8735 ± 80 (charcoal), R-187 α , 8875 ± 85 (charcoal) and R-188, 9070 ± 80 (burnt bones) (Rome IV).

The whole Layer X, Upper Paleolithic, Sec. 48-72, 2.50 m thick, contains different horizons of industry of Gravettian type; wild Pleistocene fauna with extinct species together with numerous shells of marine and fresh water molluscs; from top downwards, fresh water shells keep same proportion, while marine ones tend to reduce.

9020 $\pm$ 125
7070 B.C.

R-286. Grotta della Madonna X 49-50a

Charcoal from Sec. 49-50 of Layer X, 5.50 to 5.70 m below surface. Upper Paleolithic, Gravettian type industry, levels with crescents. *Comment:* see R-287.

R-287. Grotta della Madonna X 49-50b **9035 $\pm$ 100**
7085 B.C.

Burnt bones found in Layer X, Sec. 49-50, together with charcoal R-286. *Comment:* bone bits for dating purpose were carefully chosen; after accurate washing and partial solution (10%) by 5% HCl, mineral components of bones were completely destroyed by treatment with hot dilute HCl, residual blackish matter being wholly soluble by 6% NH_4OH . R-286 and R-287 dates are coincident and seem to agree with type of industry at these levels.

R-288. Grotta della Madonna X 49-50c **8600 $\pm$ 120**
6650 B.C.

R-288A. Grotta della Madonna X 49-50d **9800 $\pm$ 140**
7850 B.C.

Shells of marine molluscs, food refuse, *Trochus* (R-288) and *Patella* (R-288A) found in Layer X, Sec. 49-50, together with charcoal R-286 and burnt bones R-287. *Comment:* shells, carefully chosen, were partially (25 to 30%) dissolved by 5% HCl before employing CO_2 for dating. R-288 date is somewhat younger and R-288A older than R-286 and R-287 found at same levels. Discrepancy may be ascribed to these molluscs' shore-habitat.

R-289. Grotta della Madonna X 54-55a **10,300 $\pm$ 100**
8350 B.C.

Charcoal from Sec. 54-55 of Layer X, 6.00 to 6.20 m below surface. Upper Paleolithic, Gravettian type industry, levels with triangles. *Comment:* see R-290.

R-290. Grotta della Madonna X 54-55b **9750 $\pm$ 100**
7800 B.C.

Burnt bones found in Layer X, Sec. 54-55, together with charcoal sample R-289. *Comment:* for sample pretreatment see R-287. Dates of charcoal R-298 and burnt bones R-290 in these levels are rather different. Since there are not elements to deem charcoal or burnt bones contaminated, an average age of ca. 10,000 yr can be temporarily assigned to these levels. Checking on dates will be done.

Lower Sec. 57-58 of Layer X, 6.30 to 6.50 m below surface, were dated: R-185, 10,120 $\pm$ 70 (charcoal); R-186, 10,030 $\pm$ 90 (burnt bones) (Rome IV).

R-291. Grotta della Madonna X 54-55c **10,450 $\pm$ 100**
8500 B.C.

Shells of marine molluscs (prevailing *Patella*), food refuse, found in Layer X, Sec. 54-55, together with charcoal sample R-289 and burnt bone sample R-290. *Comment:* for sample pretreatment see R-288 and R-288A. Date of shells in the particular case is consistent with charcoal age in these levels.

R-292. Grotta della Madonna X 64-65**10,850 ± 100
8900 B.C.**

Charcoal from Layer X, Sec. 64-65, 7.00 to 7.20 m below surface. Upper Paleolithic, lower horizon with industry of Gravettian type. *Comment*: date agrees with lower horizon.

R-293. Grotta della Madonna X 71-72**12,100 ± 150
10,150 B.C.**

Charcoal from Layer X, Sec. 71-72, 7.70 to 7.90 m below surface. Upper Paleolithic, semi-sterile levels still with industry of Gravettian type, under a sterile level, Sec. 66-70, 0.50 m thick. *Comment*: R-293 dates lowest levels of deposit where first testimony of cave dwelling has been found. In fact, digging carried on to depth of 10.30 m has showed only sterile levels. Rock bottom of cave has not been reached.

Ages of different levels of Layer X are stratigraphically consistent and date several Gravettian-industry horizons, found in this deposit, between 9000 to 12,000 yr. For further dates on different facies of Gravettian or Epigravettian industry in Italian territory see: Grotta Romanelli and Palidoro (Rome II, p. 79-80); Grotta delle Arene Candide and Grotta del Romito (Rome IV, p. 402, and 404-405); Ugento and Grotta del Romito (this list).

General Comment: all archaeol. layers of deposit were dated except Layers III and VII, where hitherto no charcoal or burnt bones were found. On the whole, ages obtained are coincident with stratigraphy and generally agree with ages presumed of related cultures. Moreover for nearly all layers, dates of charcoal and burnt bones are consistent; dates of marine shells were less consistent, as expected. For cultures found in deposit, ascribed to Bronze age (Apennines culture) and to Neolithic (Diana culture, Serra d'Alto culture, cultural horizon with pottery with red-band painted decoration), measured ages are the former. Since succession of these cultures is of great importance, further datings will be carried out on new material obtained from enlarging of the still in course excavation.

Grotta del Romito series

Excavations in Grotta del Romito, near Papasidero, 54.6 km W Castrovillari, province of Cosenza, Calabria (39° 52' 12" N Lat, 15° 54' 23" E Long) were continued both in cave and front shelter deposits in 1965 by Ist. Italiano di Preistoria e Protostoria, P. Graziosi President, with collaboration of Soprintendenza alle Antichità della Calabria. The 1961 discovery, in rock shelter deposit, of a limestone block with fine engraving of Upper Paleolithic type representing a bull, and subsequent systematic excavations in 1963-64 have been already illustrated and first radiocarbon dates reported in preceding date list (see Rome IV, p. 404-405) (Graziosi, 1961, 1962a, 1962b, 1963, 1964a, 1964b). 1965, third excavation campaign confirmed the following stratigraphy of both cave and shelter deposits: a) Upper layers, ca. 1.00 m thick, with pottery, on

first analysis ascribed to Late and Middle Neolithic, were present only in cave deposit; they had previously been completely removed from shelter deposit. b) Lower layers, Epipaleolithic and Upper Paleolithic with industry of Gravettian type, are much thicker in cave deposit (more than five metres so far explored) than in shelter, being from surface to rock bottom 1.45 m thick. In these lower layers, at about same archaeological level, six human skeletons were found. Two of them were set in double burial in cave deposit (discovered 1964) at 1.60 m below surface, i.e. ca. 0.65 m from top of Epipaleolithic layers; other four were in two double burials in shelter deposit (discovered 1963 and 1965) 1.25 m below surface and almost lying on rock bottom (Graziosi 1965, 1966). New datings of charcoal, coll. July 1965 and subm. Feb. 1966 by P. Graziosi, have been carried out.

R-298. Romito 1

**10,250 ± 450
8300 B.C.**

Charcoal from Level 5, Epipaleolithic layers of shelter deposit, ca. 0.75 m below surface.

R-299. Romito 2

**11,500 ± 200
9550 B.C.**

Charcoal from Level 6a, Epipaleolithic layers of shelter deposit, ca. 1.00 m below surface.

R-300. Romito 3

**11,150 ± 150
9200 B.C.**

Charcoal from Level 7, Epipaleolithic layers of shelter deposit, directly on top of burials and in them, ca. 1.10 to 1.25 m below surface.

R-297. Romito III

**18,750 ± 350
16,800 B.C.**

Earth within nearly powdered charcoal from Level 34, in lower part of Upper Paleolithic layers of cave deposit, with Gravettian industry of more ancient facies.

General Comment: Level 6 with Middle Neolithic pottery of cave deposit upper layers was dated: R-223, 6420 ± 70 (Rome IV). Level 13b, Epipaleolithic layers of cave deposit, ca. 30 cm above double burial in levels 15-16, was also dated: R-221, 10,960 ± 350 (Rome IV). R-298, R-299 and R-300, in good agreement with R-221, confirm that all burials, hitherto found in cave as in shelter deposits, are contemporary as presumed. R-297 dates the lower part of Upper Paleolithic layers of cave explored up to 1965; yet this date, owing to questionable material, will have to be checked.

Ugento series

In spring 1961 during digging of water-well, a new Paleolithic deposit was discovered at Fondo Foccone locality, ca. 8 km SW of Ugento, 200 m from Ionian sea-coast, Penisola Salentina, province of Lecce,

Apulia (39° 54' 12" N Lat, 18° 5' 20" E Long). From Oct. 1961 to summer 1963, archaeol. excavations of deposit have been carried out by Ist. Italiano di Paleontologia Umana, under direction of L. Cardini, P. F. Cassoli assistant, with collaboration of Comitato Speleologico Salentino. Beneath vegetal soil and 3 m thick stratum of calcareous fossiliferous tufa, deposit is formed by 1.5 m thick brown earth layer, containing particularly in central part abundant wild-animal bone bits, food refuse, flint industry, and signs of hearths; at bottom brown earth was observed to gradually change from reddish-brown to sterile red clayey. Throughout deposit, single cultural horizon and uniform fauna complex were encountered. Flint industry with microliths has been identified as new facies (Ugentian?) of Italian Gravettian industry, preceding Romanellian facies; fauna is transitional one (*Equus caballus* together with *Equus hydruntinus*) between Pleistocene "warm" fauna and Holocene "cold" steppe fauna in the region, the latter found together with Romanellian industry in "terra bruna" formation of Grotta Romanelli deposit in Apulia (Cardini, 1962-65). Samples coll. 1963 and subm. July 1965 by L. Cardini and P. F. Cassoli, Ist. Italiano di Paleontologia Umana.

R-271. Ugento I-II**14,170 ± 170****12,220 B.C.**

Burnt bones from Cuts I and II of Pozzo Zecca in Fondo Focene locality.

R-272. Ugento III-IV**13,870 ± 110****11,920 B.C.**

Burnt bones from Cuts III and IV of Pozzo Zecca in Fondo Focene locality.

General Comment: carefully chosen bone bits, of compact tissue, were partially (10%) dissolved in 5% HCl, in order to remove contaminations; mineral components of bones were then completely destroyed by boiling them with diluted HCl, the residual blackish matter being almost entirely soluble by 6% NH₄OH.

Dates obtained nearly agree as expected, and confirm view that Gravettian industry facies is older, in this site, than Romanellian one, which has been dated in "terra bruna" of Romanelli cave by humus and charcoal at Rome and Groningen Labs. 10,000 to 12,000 yr (see Bella *et al.*, 1958-61; Rome II, p. 79; Groningen IV, p. 170).

*B. France***R-136. Lac de Paladru****1035 ± 35****A.D. 915**

Fragment of wooden post from lake dwelling, Lac de Paladru, Isère (45° 27' N Lat, 5° 33' E Long). Coll. and subm. 1960 by F. Jourdan. *Comment:* lake dwelling was presumed to belong to Carolingian age; date confirms attribution.

R-137. Chomerac

< 100

Fragments of charcoal from building, Chomerac, Ardèche, (44° 43' N Lat, 4° 38' E Long). Coll. and subm. 1960 by F. Jourdan. *Comment:* date was requested since building, which seemed old, held several cubic metres of charcoal powder and fragments; it was considered furnace of Iron age, and there were no certain elements for dating other than C¹⁴ age. Defective sampling on surface is also possible.

*C. Afghanistan***R-274. Darrā Kalon III****9475 ± 100
7525 B.C.**

Italian Archaeol. Mission at Samagan, Afghanistan, sponsored by IsMEO (Ist. Italiano per il Medio ed Estremo Oriente), entrusted by G. Tucci, President of IsMEO, to S. M. Puglisi, Director of Ist. di Paletnologia, Univ. of Rome, since 1961 has been carrying out excavations in archaeol. area of Hazār Sum Valley, 16 km NW Samangan (= Aibaq), province of Mazar-i-Sharif, North Afghanistan (ca. 36° 15' N Lat, 68° 05' E Long). Islamic layers of this site have been dated (Rome IV, p. 407-8). In autumn 1965 new archaeol. site was discovered, 9 km SW Hazār Sum, near confluence of the now completely dried-up stream-beds of Darrā Kalon (= great river) and Chakhmakh Darrā (= flints river). Excavations have been carried out through deposit of single wide rock shelter, among many others scattered along Darrā Kalon, at foot of interbedded limestone-sandstone fluvial terrace, ca. 30 m high. From surface downward, five different layers were identified and two cultural horizons distinguished. In upper Layers I to III flint industry was found, including cores, burins, scrapers of various types, denticulated tools, points and microblades, last ones typical of industry in these upper layers; animal bones (antelope) present. In Layer IV and V a lower flint industry with coarse flakes, blades and scarce keeled scrapers. Charcoal from Layer III, coll. autumn 1965 and subm. Nov. 1965 by S. M. Puglisi. *Comment:* date obtained agrees with Layer III industry and is to be compared to radiocarbon age, Hv-425, 8650 ± 100 (Hannover III) of Gravel 2 upper layers, from prehistoric-historic deposit of Gar-i-Mar rock shelter near Aq Kupruk, 100 km S Mazar-i-Sharif, North Afghanistan, in which sequence of two industries similar to that of Darrā Kalon has been found (Duprée, 1964).

After previous review of C¹⁴ dates in Afghanistan territory (see Rome III, p. 408) only present date and ages of four samples from prehistoric site of Mundigak, measured at Gsy Lab. (Gsy I, Gsy-50 to 53), are to be added.

D. Pakistan

Since 1956 Italian Archaeol. Mission in Pakistan, sponsored by IsMEO, entrusted by G. Tucci to D. Faccenna, Head of Mus. of Oriental Art in Rome, is carrying out systematic campaigns in state of Swat, W.

Pakistan, by terms of agreement with Dept. of Archaeol. of Pakistan. Among important archaeol. remains hitherto brought to light, Barama urban settlement and necropolis of Butkara II were dated last year at Rome Lab. (see Rome IV, p. 408-409). Dating of Katelai and Loebanr necropolises, belonging to same archaeol. area in neighborhood both of Saidu Sharif and Mingora towns, are reported in this list.

In Butkara II, Katelai I, and Loebanr I necropolises, structure of graves and funerary rites are essentially the same. Cremation and inhumation tombs were found, latter largely prevailing on the whole. Both kinds of tombs consist of an upper rectangular-shaped cavity, from which a smaller one opens at bottom and is kept separate by shist slabs. Lower cavity of inhumation tombs hold one (single burial tomb) or two (double burial tomb) skeletons; in the latter sometimes one skeleton is either deranged or its broken bones are piled up at a side of cavity (successively used tomb or "secondary burial"). In lower cavity of cremation tombs, burnt bones reduced to bits were placed in various-shaped terracotta funerary jars covered with a lid, together with some grave-goods. Grave furniture was found near skeletons or around funerary jars: it consists mainly of handsome pottery as vases, beakers, cups, bottles of different types containing offering, plus copper, iron, bone, and stone objects. For all necropolises essentially one single cultural horizon was acknowledged. Furthermore, four typological groups of grave furniture were singled out and their succession was determined from relative position of superimposed tombs to which they had belonged. On same criterion it was found that, in long run, proportion between cremation and inhumation tombs changed. With regard to these main distinguishing features a chronological sequence of three periods was fixed (Stacul, 1966).

2120 ± 45

R-279. Katelai I T-39

170 B.C.

Burnt human bones from cremation tomb No. 39, of Katelai necropolis, halfway up hills overlooking Katelai village, on left side of Saidu River beyond its confluence with Jambil River, 1 km ca. S Mingora, Swat, W Pakistan (34° 46' 10" N Lat, 72° 21' 08" E Long). Coll. 1962 by C. Silvi Antonini, Ist. Orientale, Univ. of Rome; subm. Dec. 1965 by D. Faccenna, Head of Ital. Archaeol. Mission in Pakistan, on behalf of G. Tucci. Graveyard, excavated during 1962 campaign C.S.A. Director, was only a small part of necropolis; altogether 45 inhumation and 2 cremation tombs found. In two new excavation campaigns, 1963, E. Castaldi, Ist. di Paletnologia, Univ. of Rome, Director, and 1964-65, G. Stacul Director, other 190 tombs were explored with inhumation ones prevailing considerably. Particularly at Katelai, tombs are repeatedly superimposed very near to each other and hardly fit shape of terrain; this shows that cemetery was used during very long period. Around necropolis are walls of Buddhist period and Buddhist stupas (Silvi Antonini, 1963; Faccenna, 1964; Stacul, 1966). *Comment:* carefully chosen bits of bone were dissolved (10%) by leaching them with 5%

HCl, then their mineral components were completely destroyed by treatment with hot dilute HCl; in this particular case black residual matter was insoluble in 6% NH_4OH . Date obtained for tomb No. 39 is somewhat younger than presumed for this necropolis and also than Butkara II date: R-194, 2425 ± 40 (Rome IV).

Loebanr I series

Burnt human bones from cremation tombs of Loebanr I necropolis, between Loebanr village and left bank of Jambil River, ca. 4 km upstream from Mingora, Swat, W Pakistan ($34^\circ 44' 55''$ N Lat, $72^\circ 23' 30''$ E Long). Coll. 1962 by C. Silvi Antonini, 1964 by G. Stacul; subm. Dec. 1965 by D. Faccenna, on behalf of G. Tucci. 1962 excavation campaign, C. Silvi Antonini Director, carried out on wide cemetery surface, altogether brought to light 65 cremation and inhumation tombs, in almost equal number (Silvi Antonini, 1963; Faccenna, 1964). In 1964-65 excavations, G. Stacul Director, 116 cremation and inhumation tombs were found, latter largely prevailing, some of them superimposed (Stacul, 1966).

2380 ± 50

R-278. Loebanr I T-87

430 B.C.

Burnt human bones from funerary jar, tomb No. 87, found Oct. 1964. Jar was preserved sealed until Dec. 1965, when sample was subm.

2460 ± 50

R-276. Loebanr I T-28

510 B.C.

Burnt human bones from cremation tomb No. 28, found Feb. 1962. *General Comment:* samples were given same pre-treatment as R-279. Dates obtained for tombs No. 87 and 28 of Loebanr I are consistent with average date of seven cremation tombs of Butkara II: R-194, 2425 ± 40 (Rome IV).

E. Ghana, W Africa

Kumasi series

Samples from archaeol. excavation of open-air site at Kumasi, Ghana (ca. $6^\circ 45'$ N Lat, $1^\circ 40'$ W Long). Coll. 1959 and subm. 1960 by R. B. Nunoo, Director of Ghana Mus. and Monuments Board, Accra.

Below surface, section showed from top downwards: (a) wood embedded in ca. 30 cm thick peaty level; (b) charcoal in sandy and clayey sediment; (c) level with Neolithic facies, presumed age 4000 yr.

210 ± 50

R-134. Kumasi I

A.D. 1740

Branch of well-preserved wood, from peaty level overlying charcoal and Neolithic level; sample devoid of carbonate matter and humic fraction.

R-133. Kumasi 2**330 ± 50
A.D. 1620**

Charcoal in sediment between upper peaty level and Neolithic level below.

General Comment: ages obtained show recent material and are of no significance for identifying supposed Neolithic cultural horizon found below, in this deposit.

So far in Ghana territory there are only two C¹⁴ dates referring to an Iron age site at Ntereso (SR II).

Cajamarquilla series*F. Peru*

Italian Archaeol. Mission in Peru, Head P. C. Sestieri, Soprintendente alle Antichità Roma V, carried out in 1963-65 three archaeol. excavation campaigns in NW and SE areas of ancient pre-Incaic city of Cajamarquilla, Valley of Rimac River, ca. 15 km N Lima, Central Coast of Peru (11° 59' S Lat, 76° 55' W Long). Cajamarquilla was big city, situated in a now deserted region; its ruins were built of large blocks of sunbaked clay (tapia), but small rectangular unbaked bricks (adobes) have often been found scattered on the site; these are identical to ones found in *huacas* (pyramids) at Maranga (Kroeber, 1954). So far there is no plan of city but its large extension is shown by air photographs. Buildings were in great number and close to each other, but, being irregularly placed, a true road system or urban grid did not exist. The juxtaposition of these houses, enlarged in course of time without a well-defined plan, led us to suppose that in many cases the tops of their walls were used as roads. There are also several squares and pyramids; the latter, as they have never been explored, may be either religious or civic buildings; on the other hand pyramids in Mexico are always temples (Sestieri, 1963, 1964a, 1964b; Kroeber, 1954; Jijon Caamaño, 1949). Charcoal from two different sites coll. 1965 by M. Taschini, Ispettore della Soprintendenza alle Antichità Roma V, and subm. 1966 by P. C. Sestieri.

R-301. Cajamarquilla I**1100 ± 100
A.D. 850**

Charcoal, Zone α, Trench B, Level 65 to 85 cm below surface, from layer immediately over basic *yapana* (dried, hardened mud) in sounding trench opened into rectangular precinct, SE area of town. Precinct belongs to large building unit, containing a little *huaca* with plenty of worked pebbles around. Stratigraphy of deposit does not show cultural variations: pottery of Nieveria type together with more common Maranga type. Pebble industry appears in whole deposit.

R-302. Cajamarquilla II**1160 ± 50
A.D. 790**

Charcoal from Trench I, *Huaca* A, Sec. VI of deposit (immediately above *yapana*) that leans against a wall now looking as if it encloses the

huaca at its base. Stratigraphy of deposit does not show cultural variations: mainly black pottery, few orange or reddish sherds.

General Comment: dates obtained confirm Cajamarquilla is pre-Incaic and belongs to Early Intermediate period. However somewhat older date was expected since into a deeper strata sounding Maranga was associated with Coast Chavin. On the matter J. Muelle reports that at Maranga a small rubbish pyramid was associated with "Chavinoid" pottery (Patterson, 1966, p. 111). Anyway this is only dating so far and has to be confirmed; diggings are still continuing.

II. GEOLOGIC SAMPLES

Italy

R-232. Laguna di Venezia A9 **1135 ± 45**
A.D. 815

R-232A. Laguna di Venezia A9 **1145 ± 45**
A.D. 805

Well-preserved wood, *Alnus glutinosa* Gaertn., large fragment of subfossil trunk (Arena, 1959; sample A9), from alluvial deposit now undergoing erosion, paleo-Brenta estuary area, central part of Lagoon of Venice, Torson di Sopra-Battioro Canal (45° 21' 15" N Lat, 12° 12' 43" E Long, 0.82 m below medium sealevel, 1896, Ist. Geogr. Militare). Coll. Aug. 1952 by N. Spada; subm. by A. Marcello, through E. Francini Corti. *Comment:* sample was devoid of carbonate and humic matter; R-232 was given pre-treatment by dilute HCl, R-232A was given no pre-treatment. Radiocarbon dates old alluvial formation containing widely scattered stumps, mostly *Alnus Glutinosa* (Arena, 1959), where nowadays alluviation is impossible. According to historians, date agrees with known period of alluviation.

Polverina series

Humified lignite and peat from clay of lacustrine deposit near Polverina, Chienti Valley, province of Macerata, Marche (43° 05' 10" N Lat, 13° 06' 31" E Long). Coll. autumn 1964 and subm. July 1965 by A. V. Damiani, Ist. Mineralogia and Geologia, Univ. of Camerino. Several terraced outcrops of lacustrine deposits, considered to belong to a single lacustrine basin, occur over 10 km, between Ponte di Legno and Valdiea, along River Chienti which has partially dissected them. Near Polverina, complete exposure of deposit, brought to light during diggings for barrage works, shows calcareous bluish-grey clayey lenses, containing peat, rare twigs and small bits of humified lignite, imbedded in sand and gravel rich in travertine concretions. Lacustrine deposit lies on "Bisciario" formation.

R-242. Polverina I **26,800 ± 700**
24,850 B.C.

Twigs of humified lignite from lenticular clayey layer. Sample was given only standard pre-treatment with dilute HCl.

R-242 α . Polverina IA**30,150 $\pm$ 1200****28,200 B.C.**

Small bits of humified lignite and peat from lenticular clayey layer. Sample was given pre-treatment with dilute HCl and additional leaching by 6% NH_4OH .

General Comment: by pollen analysis of peaty lignite and organic fraction of clayey layers from two outcrops farther upstream, the lacustrine deposit has been assigned to Günz/Mindel interglacial (Paganelli, 1954; Paganelli and Sollazzi, 1961). Later, geological work indicates a younger age, probably Würm, as terraces belonging to Günz/Mindel intergl. were identified at 200 m above the present thalweg (Damiani and Marchetti, 1967). Dates obtained seem to confirm newer view.

Difference between R-242 and R-242 α suggests two rather different ages for samples. Perhaps the abundant humic fraction, removed by 6% NH_4OH leaching, may have contaminated R-242; however it is dubious since humic fraction of samples appears to be result of wood impairment rather than an external contamination, clayey lenses being nearly devoid of humus.

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