

UNIVERSITY OF ROME CARBON-14 DATES VIII

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This list includes age measurements carried out from December 1968 to October 1969. Archaeologic samples are from Italian and Swat (W Pakistan) territories. All geologic samples come from Italian territory. Chemical techniques remain the same (Bella and Cortesi, 1960; Alessio, Bella, and Cortesi, 1964).

At present four counters are used for dating: of which three of 1.5 L, 1 L and 0.5 L, respectively, have been described (Bella and Cortesi, 1960; Alessio, Allegri, and Bella, 1960; Alessio *et al.*, 1968). A new 1 L counter, similar to the previous one, was recently constructed of suitable materials. All samples are measured by two different counters.

The activity of our "modern standard," wood grown near Rome between 1949 and 1953, was checked with 95% of the counting rate of NBS oxalic acid, and measurements were found coincident within 1σ . For each sample of CO_2 , the counting rate was corrected according to mass-spectrometrically measured $\text{C}^{13}/\text{C}^{12}$ ratio, as described previously (Alessio *et al.*, 1969). Age was calculated using the Libby half-life of 5568 ± 30 yr, with 1950 as the standard year of reference.

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SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC AND HISTORIC SAMPLES

A. Italy

Riparo Tagliente series

In 1961 F. Tagliente discovered archaeol. deposit in rock shelter at foot of W slope of Mt. Trignago, Lessini Mts., left side of Progno di Valpantena R., Stallavena di Grezzana, ca. 11 km N Verona, Veneto ($45^\circ 32' 25''$ N Lat, $11^\circ 00' 20''$ E Long) at +250 m. First diggings in deposit were carried out 1962-64 (Zorzi, 1962; Zorzi and Mezzena, 1963; Pasa and Mezzena, 1964; Mezzena, 1964). Since 1967 excavations have been led by P. Leonardi, Dir., G. Bartolomei, and A. Broglio, Ist. di Geol., Univ. of Ferrara, and A. Mezzena, Mus. Civico di Storia Naturale of Verona (Leonardi and Ruffo, 1967-1969). Two trenches were dug; 5 layers were distinguished, and archaeol. horizons id. containing Upper- and Middle Paleolithic flint industry, some hearths and bones of wild animals. From top downward: V) disarranged layer, 0 to 100 cm. IV)

uneven layer with cavities containing remains of historic flint industry. III) prehistoric layer, Cuts 1 to 20, ca. 1.80 m thick, of rubble lenses, series of superimposed hearths with charcoal and mostly flint implements, bone bits, food refuse, and remains of micromammals. Flint industry belongs to a unit of Evolute Epigravettian including older lower level, Cut 15, with still very rare “à cran” blades and upper levels, Cut 5, characterized by short nail-shaped scrapers, backed-and-truncated blades and points, backed blades, and “piquant-trièdre” (Broglia, 1969). Fauna is from top downward as follows: Cuts 4 to 10, abundant *Cervus elaphus*, frequent *Capreolus*, sparse *Rupicapra*, *Marmota*, and *Sus*; Cuts 11 to 14, abundant *Alces alces*, frequent *Capra ibex* and *Marmota*, sparse *Bos*, *Cervus*, and *Ursus* sp.; micromammal fauna is being studied. II) coarse fluvial gravels, 10 to 50 cm thick, sterile. I) aeolian layer of unknown thickness, containing flint implements of not yet studied Middle Paleolithic industry; rocky bottom of shelter not reached (Leonardi and Ruffo, 1967-1969; Broglia, 1969). Charcoal from hearths of Layer III coll. 1967-1969 by G. Bartolomei, A. Broglia, and F. Mezzena; subm. 1968 and 1969 by P. Leonardi.

R-371. Riparo Tagliente Tr. 1, III, 8-10 **12,040 ± 170**
10,090 B.C.
 $\delta C^{13} = -24.3\%$

Charcoal from Cuts 8-10, Layer III, Trench I; middle level of Evolute Epigravettian series.

R-604. Riparo Tagliente Tr. 1, III, 14 **12,000 ± 400**
10,050 B.C.
 $\delta C^{13} = -23.4\%$

Charcoal from Cut 14, Layer III, Trench I, considered same level as Cut 13 with hearth.

R-605. Riparo Tagliente Tr. 1, III, 15-16 **13,330 ± 160**
11,380 B.C.
 $\delta C^{13} = -24.1\%$

R-605 α . Riparo Tagliente Tr. 1, III, 15-16 **13,430 ± 180**
11,480 B.C.
 $\delta C^{13} = -23.7\%$

Charcoal from hearth in Cuts 15 and 16, Layer III, Trench 1; lower level of Evolute Epigravettian series. *Comment:* R-605 only pretreatment with 10% HCl was given; R-605 α additional leaching with 6% NH₄OH was given; sample appears uncontaminated.

General Comment: C¹⁴ dates can be accepted for Evolute Epigravettian culture. Different assoc. of hunting mammal fauna present at various levels of Layer III seem to indicate transition through 3 climatic phases: a) arid steppe, Cuts 16 to 15; b) damp and colder “taiga” type climate, Cuts 14 to 11; c) damp and warm increasing to more temperate forest climate, Cuts 10 to 4. a) and b) phases should be dated to period of ca. 1500 yr.

C^{14} ages of Riparo Tagliente can be compared with dates of Evolute Epigravettian industry in deposits of Central and S Italy from 14,000 to 10,000 yr, e.g., Grotta Romanelli, Apulia, R-56, $11,960 \pm 320$ (Bella *et al.*, 1958); and R-58, $11,800 \pm 600$ (Radiocarbon, 1964, v. 6, p. 79-80); Grotta Ortucchio, Abruzzo, Pi-23, $12,619 \pm 410$ (Radiocarbon, 1959, v. 1, p. 106); Grotta La Punta, Abruzzo, Pi-153, $10,581 \pm 100$ and Pi-152, $14,488 \pm 800$ (Radiocarbon, 1961, v. 3, p. 99-100); Grotta della Madonna, Calabria, Upper Paleolithic levels, R-289, $10,300 \pm 100$; R-292, $10,850 \pm 100$, and R-293, $12,100 \pm 150$ (Radiocarbon, 1967, v. 9, p. 356-357); Grotta del Romito, Calabria, Epipaleolithic layers, R-221, $10,960 \pm 350$ (Radiocarbon, 1966, v. 8, p. 405); R-298, $10,250 \pm 450$; R-299, $11,500 \pm 200$, and R-300, $11,150 \pm 150$ (Radiocarbon, 1967, v. 9, p. 358); Palidoro, Lazio, R-83, $13,000 \pm 700$ (Radiocarbon, 1966, v. 6, p. 79). For Lower Epigravettian industry “à cran” implements, one C^{14} date is available so far: Grotta del Romito, lower level of Upper Paleolithic layer, R-297, $18,750 \pm 350$ (Radiocarbon, 1967, v. 9, p. 358).

R-458. Chiozza di Scandiano P-E

6000 ± 200

4050 B.C.

$\delta C^{13} = -25.2\%$

Excavations, 1939-41, in clay quarry at Chiozza di Scandiano, 16 km SSE Reggio nell'Emilia ($44^{\circ} 35' 30''$ N Lat, $10^{\circ} 41' 13''$ E Long) uncovered Neolithic hut settlement with pits and underlying inhumation tombs: cultural horizons could not be id. with certainty. In 1968, new excavations were made by Ist. di Paleol., Univ. of Rome, The British School of Rome, and Soprintendenza alle Antichità dell'Emilia on SW side of enlarged clay quarry of Fabbrica Laterizi Albioni. One archaeol. level, at 80 cm depth, resting on compact clay layer, again revealed Middle Neolithic open-air settlement: flint implements and pottery of types peculiar to Chiozza culture and Fiorano type, with “figulina” yellowish unpainted pottery of Ripoli culture were found (Gentili, 1968; Manfredini, 1970). Charcoal from Pit E coll. and subm. 1968 by A. Manfredini and A. Palmieri, Ist. di Paleol., Univ. of Rome. *Comment:* chronologic sequence of Fiorano and Chiozza cultures, particularly at Chiozza site, is not clearly defined (Barfield and Broglio, 1965, 1966; Peroni and Radmilli, 1963; Radmilli, 1954; Manfredini, 1970). R-458 is from Pit E where only coarse, reddish, atypical pottery was found; date agrees with Fiorano culture in deposit and can be compared with C^{14} ages of prehistoric settlements of Fiorano or related cultures: Ripoli culture, prehistoric village of Ripoli, Hut 3, dated by Pisa Lab. (unpub.), 5100 ± 120 (Cremonesi, 1965); Grotta dei Piccioni, Abruzzo, Level 1 with pottery of early phase of Middle Neolithic culture, Pi-46, 6247 ± 130 (Radiocarbon, 1961, v. 3, p. 100); Grotta dei Piccioni, Level 3 with Ripoli-type pottery, Pi-49, 4770 ± 110 (Radiocarbon, 1961, v. 3, p. 100-101); Penne di Pescara, Abruzzo, older level with impressed and Ripoli-type pottery of beginning of Middle Neolithic, Pi-101, 6578 ± 135 (Radiocarbon, 1961, v. 3, p. 100); Luni archaeol. site,

Lunigiana, level with pottery of Sasso type, St-1344, 5395 ± 80 (Radio-carbon, 1965, v. 7, p. 285; Ostenberg, 1967). See also Ripabianca di Monterado, this list.

Grotta del Prete series

Grotta del Prete is a small shelter in Senonian limestone at foot of N slope of Mt. Civitella, 737 m high, near W mouth of Gola di Frasassi, right side of Sentino R., Pianello di Genga, 8 km NNE Fabriano, prov. of Ancona, Marche ($43^{\circ} 24' 16''$ N Lat, $12^{\circ} 56' 39''$ E Long) at +228 m. Excavations were carried out 1962 by D. G. Lollini, Soprintendenza alle Antichità delle Marche, and 1966 by G. Bartolomei, A. Broglio, and D. G. Lollini. Deposit inside shelter, at present 1.50 m thick, formed by limestone rubble from crumbling of vault; it is connected outside shelter with minute debris cones and partly underlies clayey cone deposits formed by water percolating down slope and resting against right wall of shelter; latter deposit is of Holocene age and contains Sub-Eneolithic pottery. Deposit inside shelter, from surface downward, consisted of 3 thin archaeol. horizons with upper hearth, Cuts 1, 3, and 5, and lower one, Cut 6; rocky soil of shelter not reached. Statistical study of flint implements found in Levels 1, 5, and 6 showed one Evolute Epigravettian complex with similar characteristics in all levels: a few burins, sparse scrapers, and many thick, retouched implements, mainly backed points and backed-and-truncated blades, very sparse geometrics. Modest fauna remains (*Capra ibex*, *Marmota marmota*, *Cervus elaphus*, and *Sus* sp.) present in all levels, rare micromammal fauna (Lollini, 1964a, 1966; Broglio, pers. commun., 1969).

R-644 α . Grotta del Prete B'-1

5910 \pm 50

3960 B.C.

$\delta C^{13} = -24.9\%$

Charcoal from hearth in upper Layer 1, Zone B'. Coll. 1962 by D. G. Lollini and subm. 1969 by G. Bartolomei, A. Broglio, and D. G. Lollini. *Comment*: C^{14} date far too young; to be discarded due to incompatibility with Evolute Epigravettian industry and fauna in deposit. Sample presumably was mixed with younger materials.

R-645. Grotta del Prete G-6

9990 \pm 190

8040 B.C.

$\delta C^{13} = -25.8\%$

Charcoal from hearth in lowest Layer 6, Zone G. Coll. 1966 and subm. 1969 by G. Bartolomei, A. Broglio, and D. G. Lollini. *Comment*: C^{14} age acceptable as regards industry of deposit (compare Riparo Tagliente, this list).

Ripabianca di Monterado series

In 1962 and 1964 excavations were made in archaeol. deposit 800 m W Mulino di S Costanzo, left side of Cesano R., Ripabianca di Monterado, prov. of Ancona, Marche ($43^{\circ} 43' 03''$ N Lat, $13^{\circ} 05' 48''$ E Long) at +40 m. Complex of cavities excavated in sterile agricultural

soil and filled with archaeol. materials brought to light within an area 10×8 m wide. Three human skeletons in distinct burials outside boundary of archaeol. area were found (Corrain and Capitanio, 1968). Archaeol. finds, of one cultural horizon, comprise a) flint blades with new-type burin classified as variety of angle burin (Broglia and Lollini, 1963); b) impressed and "figulina" pottery with red-painted bands without black edge. Pottery assoc. attributes cultural horizon of deposit to early phase of Middle Neolithic (De Sanctis, 1961; Broglia and Lollini, 1963; Lollini, 1962a, 1964b, 1962-1965). Charcoal from largest and deepest cavity coll. 1962, 1965 and subm. 1969 by D. G. Lollini.

R-598. Ripabianca di Monterado 2

6210 ± 75

4260 B.C.

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

R-598 α . Ripabianca di Monterado 2

6140 ± 70

4190 B.C.

$\delta C^{13} = -25.3\%$

Charcoal from upper part of archaeol. deposit in largest and deepest cavity. *Comment:* only 10% HCl pretreatment was given R-598; additional leaching with 6% NH_4OH was given R-698 α ; consistent dates show abundant humic fraction removed was not contaminating but belonged to charcoal humic fraction.

R-599 α . Ripabianca di Monterado 3-b

6260 ± 85

4310 B.C.

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

Charcoal from bottom of archaeol. deposit in largest and deepest cavity.

General Comment: R-598 and R-599 dates are consistent and agree with archaeol. attribution of deposit: Early phase of Middle Neolithic. Comparable to age for lower cultural Horizon 1 of Grotta dei Piccioni, Abruzzo, where pottery of same type was found: Pi-46, 6247 ± 130 (Radiocarbon, 1961, v. 3, p. 100).

R-643 α . Maddalena di Muccia S-4, 6

6580 ± 75

4630 B.C.

$\delta C^{13} = -24.7\%$

Charcoal from archaeol. cavity S, Cuts 4 and 6, in Neolithic deposit on fluvial terrace, right side of Chienti di Gelagna R., Maddalena, ca. 2 km ESE of Muccia, prov. of Macerata, Marche ($43^\circ 04' 26''$ N Lat, $13^\circ 03' 48''$ E Long) at +425 m. Coll. 1965 and subm. 1969 by D. G. Lollini. Deposit consisted of numerous cavities filled with archaeol. materials: they do not appear to be dwelling remains, but must be related to similar cavities in "Bandkeramik villages" of Central Europe. Archaeol. finds: a) flint industry of Paleo-Mesolithic tradition, b) impressed pottery with lustrated black pottery and keeled vases. Pottery assoc. attributes cultural horizon to a late phase of Neolithic with impressed pottery (Lollini, 1962b, 1962-65, 1965). Sparse bones of one human skeleton were also found (Corrain and Capitanio, 1968). *Comment:* C^{14} date

agrees with attribution and age of prehistoric village of Penne di Pescara, Abruzzo, where impressed and “figulina” unpainted pottery were found: Pi-101, 6578 ± 135 (Radiocarbon, 1961, v. 3, p. 100) and with more recent age for Ripabianca di Monterado deposit, Marche, containing impressed pottery of more evolute type (see R-598, R-598 α , and R-599, this list).

Cattedra di S. Pietro series

The Cattedra di S. Pietro (Chair of St. Peter), an ancient wooden seat adorned with ivories, was until recently of uncertain origin, since there was no documentary evidence about its early history. Between XIIth and XIVth centuries it was believed to date back to the apostolic age and became an object of veneration. It is known to have been kept in the old St. Peter's and then moved to the new Basilica where, in 1667, it was enclosed in Bernini's bronze chair adorning the apse. In 1867 the Chair was inspected, especially the style and iconography of the narrow bands of carved and perforated ivory, probably applied originally as ornament to the wooden structures. The Chair was first id. as a Carolingian throne from the time of Charles the Bald (Garrucci, 1873-1881; De Rossi, 1867); in the last years it was further studied. (Schramm, 1956; Balboni, 1967). In July 1968, a committee from various nations under direction of Mons. M. Maccarrone, Pres. Comitato Pontificio di Sci. Storiche, aided by F. Vacchini, Head of the office of Rev. Fabbrica di S. Pietro, was empowered by Pope Paul VI to undertake a new examination of Chair and subject it to historical, archaeol., artistic, and scientific-technical tests, including dendrochronologic and radiocarbon dating of some wooden parts. Conclusions are as follows (Maccarrone, Ferrua, and Romanelli, 1969): it was confirmed that the Chair was originally a Carolingian throne from 2nd half of the 9th century A.D.; presumably brought to Rome by Charles the Bald for his coronation as Emperor and was left by him as a gift for Pope John VIII. At present, the Chair consists of original throne enclosed in wood structures, later added as work of restoration. Wood from different parts of Chair sampled and subm. 1969 by M. Maccarrone and F. Vacchini.

800 \pm 50

R-600. Cattedra di S. Pietro R.F. 1

A.D. 1150

$\delta C^{13} = -25.4\text{‰}$

Light wood (*Pinus* sp. *pinca* group) id. by M. Follieri (pers. commun.) from outer front-left upright; sample removed from inner side of upright in contact with throne, ca. 30 cm from the ground. *Comment:* wood tissue not impaired but worm-eaten; sample carefully chosen, portion pulverized by wood worm being discarded. True sample age: 740 ± 50 , A.D. 1210 (Stuiver and Suess, 1966). Contrary to earlier opinion (De Rossi, 1867), the outer structure consisting of 4 uprights of light pine-wood linked by cross-pieces and fitted with iron rings is believed to be a later addition to protect and facilitate transport of

Carolingian throne. C¹⁴ date agrees with presumed age of outer restoration, ca. 12th-13th centuries A.D.

R-600A. Cattedra di S. Pietro R.F. 1 **890 ± 50**
A.D. 1060
 $\delta C^{13} = -25.5\%$

Pulverized material, filling cavities made by wood worm in Sample R.F. 1. *Comment:* as expected, date agrees with wood R-600; true sample age: 800 or 740 ± 50, A.D. 1150 and 1210 respectively.

R-601. Cattedra di S. Pietro R.F. 2 **950 ± 50**
A.D. 1000
 $\delta C^{13} = -25.5\%$

Well-preserved wood (*Castanea sativa* Mill.) id. by M. Follieri (pers. commun.) from rear supporting cross; sample removed from upright, ca. 5 cm below the arms. *Comment:* true sample age: 890 ± 50, A.D. 1060. Wood also belongs to a later portion of restoration work to Chair. Age does not differ significantly from date measured for outer pine-wood upright, R-600 and R-600A samples.

R-602. Cattedra di S. Pietro R.F. 3 **1520 ± 50**
A.D. 430
 $\delta C^{13} = -22.1\%$

Well-preserved wood (*Cupressus sempervirens* L.) id. by M. Follieri (pers. commun.) near right end of cross-piece supporting the 4 boards joined together and inserted later between inner front uprights, carrying the 18 panels of engraved ivory once formed part of a more ancient object. *Comment:* true sample age probably 1470 or 1420 ± 50, A.D. 480 and 530, respectively. Style and iconography of panels, representing the labors of Hercules and 6 animals or fantastic beings, suggest origin in Egypt of later classical antiquity, 6th-7th centuries A.D. C¹⁴ date suggests wooden cross-piece could either belong to original supporting structure of ivory panels, or, more likely, be made by reusing older wood.

R-603. Cattedra di S. Pietro R.F. 4 **925 ± 50**
A.D. 1025
 $\delta C^{13} = -25.0\%$

Wood (*Quercus* sp. *caducifolia* group) id. by M. Follieri (pers. commun.) from inner lower, back-right upright; from front side of upright below seat insertion and below a narrow groove (on the upright itself) ca. 20 cm from ground. *Comment:* the wood somewhat worm-eaten, sample was carefully chosen from well-preserved part; true sample age probably 860 or 750 ± 50, A.D. 1090 and 1200, respectively. Inner oak uprights are thought to belong to original Carolingian throne assigned to 2nd half of 9th century A.D. C¹⁴ age is ca. 2 to 3 centuries younger than expected.

R-352. Grotta del Cavallo E, II-I **>31,000**
 $\delta C^{13} = -25.0\%$

Charcoal from Layer E, Levels II-I, with Middle or Evolute Uluzzian industry of Grotta del Cavallo (or delle Giumente), Uluzzo Bay, Ionian

Coast of Penisola Salentina, ca. 3 km NW Santa Caterina di Nardò, prov. of Lecce, Apulia (40° 09' 15" N Lat, 17° 57' 36" E Long) at ca. +5 m. Coll. 1966 and subm. 1967 by A. Palma di Cesnola, Ist. Italiano di Preistoria e Protostoria. Excavations were carried out from 1963 to 1966. Deposit, ca. 7.35 m thick, revealed numerous Paleolithic cultural horizons, wild fauna remains, food refuse, and hearths. From bottom upward: N, Tyrrhenian beach, max. thickness 1.15 m, hard-cemented limestone block and pebble conglomerate. Lower strata, M to F, total thickness ca. 4.40 m, with Mousterian industries of La Quinoid, denticulate, etc. type (Palma di Cesnola, 1967). Middle strata, E to D, with archaic Upper Paleolithic industries of Uluzzian facies, total thickness ca. 80 cm. Upper strata B and A, total thickness ca. 1.50 m, with Upper Paleolithic and Mesolithic industries of Romanellian facies (Palma di Cesnola 1963a, 1963b, 1964, 1966b; Palma di Cesnola and Borzatti von Löwenstern, 1964). *Comment:* Uluzzian culture, facies of archaic Leptolithic in Apulia, named from Uluzzo Bay where 1st recognized, can be considered peculiar Mediterranean facies of Châtelperron cultures of W Europe. Three facies were distinguished: a) Lower or Archaic Uluzzian (Stratum E, III) comprises abundant implements, scrapers, denticulated etc., still of Mousterianoid type, with rare coarse 1st Leptolithic elements of Upper Paleolithic type. b) Middle or Evolute Uluzzian (Stratum E, II-I), increase of Leptolithic implements on fine flint of Upper paleolithic type; small half-moon backed points, bone industry, rough cylindrical lance points, are also present. c) Upper or Late Uluzzian (Stratum D), flint limestone and quartzite implements, decrease of elements peculiar to Middle Uluzzian, implements recalling Aurignacian types, and abundant denticulates. Faunal data suggest changes of climatic conditions during Uluzzian period (Palma di Cesnola, 1965, 1966a, 1967). C¹⁴ date represents upper limit of Middle Uluzzian, assuming its survival into very early Upper Paleolithic time. Compare with date for charred bones from Level VIII, evolute Châtelperron industry, of Grotte du Renne, Arcy-sur-Cure, Yonne, France: Gro-1736, 33,500 ± 400 and Gro-1742, 33,640 ± 250 (or GrN-1742, 33,680 ± 250) (Movius, 1960; Leroi-Gourhan, A., 1961; Radiocarbon, 1963, v. 5, p. 166; Pradel, 1966).

B. Sardinia

| | |
|--|---------------------------|
| | 2770 ± 60 |
| R-492. Grotta A.S.I. or Pirosu | 820 B.C. |
| | $\delta C^{13} = -25.7\%$ |
| | 2680 ± 60 |
| R-492α. Grotta A.S.I. or Pirosu | 730 B.C. |
| | $\delta C^{13} = -25.8\%$ |

Charcoal from soil of inner votive chamber, so-called "Tempio ipogeo di Santadi", in Grotta A.S.I. formerly Grotta Pirosu, Benatzu, ca. 5 km S Santadi, prov. of Cagliari (39° 03' 03" N Lat, 8° 42' 19" E Long) at ca. +180 m. Coll. by A. Assorgia, Assoc. Speleologica Iglesiente, for C. Maxia, Ist. di Sci. Antropol., Univ. of Cagliari; subm. 1968

by C. Maxia. Exploration carried out by speleologists of A.S.I. of this karst cave in Cambrian dolomite revealed an inner small chamber id. as a votive place, probably an hypogean nuragic temple for magic religious rites; sole discovery of this kind made intact in Sardinia. More than 1800 used small pottery vases destined as votive offering were arranged in 3 heaps near imposing stalagmite used as altar on ledge of which were laid a variety of used metal nuragic objects, largely of copper, also destined as votive offerings. Much charcoal was heaped on rocky soil of cavity (Maxia, 1968, 1969a, 1969b). *Comment:* R-492 received standard pretreatment with 10% HCl; R-492 α received additional leaching with 6% NH₄OH: 2 measurements were consistent; abundant humic fraction removed should not be regarded as contaminating but as belonging to humic charcoal. Since magic religious rites were celebrated in nuragic hypogeum temple in 1st millennium B.C. but before Carthaginian invasion, 500 B.C., C¹⁴ date agrees with presumed age.

R-677. Grotta dell'Acqua Calda

3690 ± 60

1740 B.C.

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

Charcoal from archaeol. layer (burial) of deposit in inner chamber of Grotta dell'Acqua Calda, karst cave in Senonian-Eocene limestone, near Marchesa Mine, 500 m NE Acquacadda, Nuxis, prov. of Cagliari (39° 10' 37" N Lat, 8° 45' 18" E Long). Coll. 1968 and subm. 1969 by M. L. Ferrarese Ceruti, Ist. di Antichità, Archeol. e Arte, Univ. of Cagliari. Deposit showed one archaeol. level consisting of sepulchral layer with human bones, probably in secondary burial, resting on charcoal level, and pottery, mainly fragments of large vases of Monte Claro culture type. *Comment:* Monte Claro culture is mainly diffused in SW Sardinia, Sulcis and Campidano areas, as far as Oristano (Atzeni, 1959-1961; Atzori, 1958-1959; Lilliu, 1967; Lilliu and Ferrarese Ceruti, 1958-1959). Date agrees with C¹⁴ age for same culture at Nuraghe Brunku Mādili or Madugui near Gesturi: Gsy-243, 3770 ± 250 (Radiocarbon, 1966, v. 8, p. 86). Two dates available place Monte Claro culture among Sardinia pre-Nuragic cultures.

C. Egadi Islands

R-566. Levanzo

11,180 ± 120

9230 B.C.

$\delta C^{13} = +2.8\%$

Shells (*Patella ferruginea*) from lower layer with Epigravettian industry in outer chamber of Grotta dei Genovesi at foot of limestone cliffs, W coast of Levanzo I., Egadi Archipelago, ca. 15 km off W coast of Sicily, prov. of Trapani (38° 00' N Lat, 12° 20' E Long) at +30 m. Coll. 1953 and subm. 1969 by P. Graziosi, Ist. Italiano di Preistoria e Protostoria. Cave consists of 2 wide chambers, the front one connected by narrow shaft to inner chamber with walls bearing pictures, mainly black schematic figures, attributed to Eneolithic or Bronze age (Graziosi, 1950). In fore-chamber archaeol. excavation, 1953, revealed from surface

downwards: a) superficial disturbed layer, 40 cm thick; b) upper layer, 50 cm thick, with charcoal, fauna of domestic animals with abundant fresh water (*Helix*) and marine (*Patella*, *Trochus*) mollusc shells, food refuse; blade flint industry and Neolithic pottery of Diana type; c) lower layer, 80 cm thick, with abundant wild fauna (*Cervus elaphus*, *Bos primigenius*, *Equus asinus hydruntinus*) with marine mollusc shells of *Patella ferruginea*; blade flint industry of Epigravettian type. In deeper level of c) layer a limestone block with engraving of ox on flat surface of Upper Paleolithic type (Graziosi, 1954): 1st evidence of cave dwelling at this level; d) underlying sandy-clay sediment, sterile. In 1950 naturalistic engravings of wild animals, and some male figures, belonging to Upper-Epipaleolithic prehistoric art of "Provincia mediterranea" style were identified on walls of inner chamber (Graziosi, 1960, 1962, 1968). *Comment*: 35% of weight of shells were destroyed by dilute HCl before using material for 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 age dates Paleolithic art of "Provincia mediterranea" style at Levanzo and agrees with dates hitherto available for other sites in Italy where same prehistoric art was found: Grotta Romanelli, Apulia, R-56, 11,960 ± 320 (Bella *et al.*, 1958-1961) and R-58, 11,800 ± 600 (Radiocarbon, 1964, v. 6, p. 79-80); Grotta del Romito, Calabria, R-300, 11,150 ± 150 (Radiocarbon, 1967, v. 9, p. 358). Shells (*Patella ferruginea*) from same level of Levanzo deposit were dated: Pi-119, 9694 ± 110 (Radiocarbon, 1961, v. 3, p. 99).

D. Pakistan

From 1960 to 1965 Italian Archaeol. Mission of IsMEO in Pakistan carried out excavations in urban settlement of Barama and pre-Buddhist necropolises of Butkara II, Loebanr I, and Katelai I, all belonging to same archaeol. area along Jambil and Saidu R. valleys near Saidu Sharif and Mingora towns, Swat (W Pakistan) (Silvi Antonini, 1963; Faccenna, 1964; Stacul, 1966; Castaldi, 1968; Silvi Antonini Colucci and Stacul, 1969). All charcoal coll. at Barama and available burnt bones found in cremation tombs of Butkara II as well as some cremation tombs of Katelai I and Loebanr I necropolises were dated at Rome Lab. (Radiocarbon, 1966, v. 8, p. 408-409; 1967, v. 9, p. 360-362). As already mentioned in previous lists (Alessio *et al.*, 1966, 1967), in all necropolises, structures of graves and funerary rites are essentially the same with handsome grave furniture in cremation and inhumation tombs. One cultural horizon was acknowledged for all; but different typological groups of grave furniture place them in archaic, middle, and late cultural phases (Stacul, 1966, 1969a). Anthropologic studies on human bones from 3 necropolises are being made (Alciati, 1967; Alciati and Viscoli, 1970). More recently discovered cemeteries in neighboring regions of Swat seem to be contemporary with Butkara, Loebanr, and Katelai (Stacul, 1967, 1969b). This list contains dates of presently available burnt bones from additional cremation tombs of Loebanr and Katelai necropolises.

Following pretreatment was given: carefully chosen bits of compact bone tissue were dissolved (10%) by leaching them with 5% HCl and solution discarded; their mineral component were destroyed by treatment with hot dilute HCl; blackish residual matter to be dated was nearly insoluble in 6% NH₄OH.

2390 ± 70**R-474. Loebanr I T-21****440 B.C.** $\delta C^{13} = -19.6\%$

Burnt human bones from Cremation Tomb 21 of Loebanr I necropolis, between Loebanr village and left bank of Jambil R., ca. 4 km upstream from Mingora; Swat, W Pakistan (34° 54' 55" N Lat, 72° 23' 30" E Long). Coll. 1962 by C. Silvi Antonini, Ist. Orientale, Univ. of Rome; subm. 1966 by D. Faccenna, Head of Mus. of Oriental Art in Rome, for G. Tucci, Pres. of IsMEO. In 1962-1964-65, 183 cremation and mostly inhumation tombs were excavated, some superimposed (Silvi Antonini, 1963; Faccenna, 1964; Stacul, 1966). *Comment*: based on furniture typology, Tomb 21 was classified as archaic phase of necropolis. C¹⁴ date agrees with ages obtained for Tombs 28 and 87, judged to belong to middle phase: R-276, 2460 ± 50 and R-278, 2380 ± 50, respectively (Radiocarbon, 1967, v. 9, p. 362).

Katelai I series

Burnt human bones from cremation tombs of Katelai I necropolis, halfway up hills overlooking Katelai village, on left side of Saidu R. beyond its confluence with Jambil R., ca. 1 km S Mingora, Swat, W Pakistan (34° 46' 10" N Lat, 72° 21' 08" E Long). In 1962-1965 237 cremation and mostly inhumation tombs were explored (Silvi Antonini, 1963; Faccenna, 1964; Stacul, 1966; Castaldi, 1968; Silvi Antonini Colucci and Stacul, 1969). Particularly at Katelai tombs are repeatedly superimposed near each other and hardly fit shape of terrain.

2250 ± 50**R-479. Katelai I T-39****300 B.C.** $\delta C^{13} = -19.9\%$

Burnt human bones from Cremation Tomb 39. Coll. 1962 by C. Silvi Antonini; subm. 1966 by D. Faccenna for G. Tucci. *Comment*: C¹⁴ date agrees with age for other sample from same Tomb 39: R-279, 2120 ± 45 (Radiocarbon, v. 9, p. 361). Two ages, although somewhat young, agree with dates of other tombs judged, as Tomb 39, to belong to middle phase (see R-474 comment, this list).

2870 ± 60**R-477. Katelai I T-48****920 B.C.** $\delta C^{13} = -18.7\%$ **2750 ± 50****R-477A. Katelai I T-48****800 B.C.** $\delta C^{13} = -19.2\%$

Burnt human bones from Cremation Tomb 48. Coll. 1963 by E. Castaldi, Ist. Paletnol., Univ. of Rome; subm. 1966 by D. Faccenna for

G. Tucci. *Comment:* R-477 was formed from chosen bits of compact bone tissue, R-477A from fragments of spongy bone tissue more difficult to separate from contaminant materials; the 2 dates are consistent and assign Tomb 48, without furniture, to archaic phase of necropolis.

3150 ± 150
1200 B.C.
 $\delta C^{13} = -20.0\%$

R-476. Katelai I T-64

Burnt human bones from Cremation Tomb 64. Coll. 1963 by E. Castaldi; subm. 1966 by D. Faccenna for G. Tucci. *Comment:* date assigns Tomb 64, without furniture, to archaic phase of necropolis and is oldest age measured for cremation tombs at Katelai and Loenbanr necropolises.

General Comment: for Katelai Necropolis, all dates at Rome Lab. confirm expected long life-cycle, >millennium, of cemetery. Age is not maximum since tombs held to belong to more recent cultural phase have not been dated. For Loenbanr I necropolis similar long period of use is shown: tombs dated at Rome Lab., average age ca. 2400 B.C., belong to middle cultural phase (see R-474 comment, this list); tombs belonging to archaic phase, dated at British Mus. Lab., gave: BM-195, LI, T-54, 2950 ± 150 and BM-196, LI, T-61, 2850 ± 150 (Radiocarbon, 1969, v. 11, p. 292; Stacul, 1969a). Comparison can be made also with ages measured at Heidelberg Lab. for bones of 2 human skeletons in double Burial 101 of Timargarha cemetery, Dir., W Pakistan, whose furniture seems to correspond to cultural phase of archaic tombs of Swat necropolises: 3380 ± 60 and 2805 ± 60 (Dani, 1968; Stacul, 1969a).

II. GEOLOGIC SAMPLES

Italy

2870 ± 50
920 B.C.
 $\delta C^{13} = -23.6\%$

R-617A. Colle del Sestriere, Val Chisone

2930 ± 50
980 B.C.
 $\delta C^{13} = -24.4\%$

R-617 α . Colle del Sestriere, Val Chisone

Slightly darkened wood (*Piceoxilon Gothan ex Larix decidua* Mill.) id. by G. Charrier (1967) from wood horizon at -100 cm underlying peat bog of Colle del Sestriere, Val Chisone, Alpi Cozie, prov. of Turin, Piedmont (47° 57' 16" N Lat, 6° 53' 36" E Long) at +2030 m. Coll. 1965 and subm. 1969 by G. Charrier, Ist. di Giacimenti Minerari, Politecnico of Turin. Profile is from surface downward: 0 to -10 cm, actual surface soil; -10 to -50, sand sediment with interbedded thin levels of peat; -50 to -90 peat layer, more compact and dark toward bottom, mainly formed by leaf remains of marsh *Cyperaceae* and *Gramineae*; -90 to -110 wood horizon resting on thin clay layer, latter transition to underlying moraine. Sestriere peat bog belongs to series of

Lowmoor bogs. *Comment:* R-617A received no pretreatment, R-617 α was pretreated with 5% HCl and additional leaching with 6% NH₄OH. R-617A and R-617 α complete dating of peat layer overlying wood horizon: R-53, 2020 \pm 100 (Radiocarbon, 1964, v. 6, p. 86) and confirms climatic and vegetation history indicated by pollen and stratigraphical analyses (Charrier, 1967). *Larix* wood dated ca. 1380 B.C. (R-617A, R-617 α) belongs to Sub-Boreal and proves existence of *Laricetum* above present forest line. Wood probably carried into basin of Colle del Sestriere during transition from Sub-Boreal to Sub-Atlantic. Peat layer overlying wood, as shown by pollen analysis, belongs to early Sub-Atlantic (Zone X, Firbas) and validates further stage of vegetation dynamics in progress. Wood horizon was believed much older than overlying peat layer and, thus, earlier than 1000 B.C. (Charrier, 1967); dates agree with expectation.

680 \pm 50**R-619. Lago delle Rovine, Valle Gesso****A.D. 1270** $\delta C^{13} = -24.7\%$

Well-preserved wood (*Cedroxylon* Kraus ex *Abies alba* Mill.) id. by G. Charrier (pers. commun.) from core of R1 drilling, 2.50 to 2.90 m below top of core, water depth 16.90 m, in bottom sediments of Lago delle Rovine, Alta Valle Gesso, Alpi Marittime, prov. of Cuneo, Piedmont (44° 10' 42" N Lat, 7° 19' 29" E Long) at +1522 m; coordinate system U.T.M. 32-TLP-67779325. Coll. 1968 and subm. 1969 by G. Charrier. Core R1, one among 10 core drillings made by ENEL, 1968, in area of Lago delle Rovine, was 13.90 m long and revealed from lake bottom surface downward: 0 to -0.40 m, silt; -0.40 to -2.12 m, sandy-silt, more compact toward lower level; -2.12 to -2.50 m, interbedded silty-sandy thin layers; -2.50 to -2.90 m silt containing wood fragments of various species and other plant remains; -2.90 to -9.42 m silt and sand thickly interbedded; -9.42 to -13.90 m, interbedded silt, sand, and gravel; rock bottom or boulder at -13.90 m. Core R1 being studied by G. Charrier. *Comment:* C¹⁴ dates presence of *Abies alba* in Upper Gesso R. Valley at end of secondary Post-Glacial climatic optimum and gives further chronologic datum in history of *Abies alba* in Piedmont previously established by pollen analysis (Charrier, pers. commun.).

790 \pm 50**R-618A. Cava Crosetto, Moncalieri****A.D. 1160** $\delta C^{13} = -24.6\%$ **900 \pm 50****R-618. Cava Crosetto, Moncalieri****A.D. 1050** $\delta C^{13} = -25.1\%$

Well-preserved wood (*Salix alba*) from large trunk, 7 m long and 1.60 m diam., id. by G. Charrier (pers. commun.) in alluvial Layer VI with large trunks, S boundary sec. at gravel and sand quarry of Crosetto and Co., in recent alluvial plain on right side of flood river-bed of Po R., near Cascina Molinello, Moncalieri, prov. of Turin, Piedmont

(44° 58' 36" N Lat, 7° 41' 30" E Long) at +222 m. Coll. 1968 by L. Peretti, Ist. di Giacimenti, Politecnico of Turin; subm. 1969 by G. Charrier. Sec. in quarry, 7 m deep, shows profile of alluvial formation (differs somewhat in various exposures) from top downwards: I) 221 to 219.10 m above sea level, disturbed surface layer; II) 219.10 to 217.70, silty sand; III) 217.70 to 216.70, silty fine sand; IV) 216.70 to 215.50, interbedded sand layers and cross-bedding pebble-and-gravel lenses; V) 215.50 to 214 and downwards, coarse gravel and pebble together with thin sand layer including numerous large sub-fossil trunks (*Salix*, *Quercus*) lying in nearly horizontal position, some up to 13 m long. At 218.20 to 217 m, a blue-gray silty-clay lens containing bivalve shells as *Unio pictorum* is interbedded with surface of erosion on top. At various levels peat beds are also present. Excavation below 214 m exposed mammal fauna (*Elephas antiquus* and *Cervus* cfr. *megaceros*). *Comment*: R-618 pretreated with 5% HCl, R-618A was not pretreated. See discussion of date in R-622, Cascina Monache, general comment, this list.

1580 ± 50

R-622A. Cascina Monache, Casale Monferrato

A.D. 370

 $\delta C^{13} = -24.7\text{‰}$

1595 ± 50

R-622 α . Cascina Monache, Casale Monferrato

A.D. 355

 $\delta C^{13} = -25.8\text{‰}$

Slightly darkened wood (*Quercus robur* L. *pedunculata* Ehrh.) id. by G. Charrier (pers. commun.) in gravel III, sec. through sand and gravel quarry, alluvial Holocene plain left side and ca. 2 km from present stream bed of Po R., near Cascina Monache, Grassi, Casale Monferrato, prov. of Alessandria, Piedmont (45° 09' 40" N Lat, 8° 26' 48" E Long) at +112 m. Locality is ca. 20 km downstream from Crosetto quarry at Moncalieri (see R-618). Quarry sec., 11 m high, shows following average stratigraphic series, from surface downwards: I) 112 to 111.50 m above sea level, sandy-silty colluvial brown soil, partially disturbed; II) 111.50 to 107 m, gray silty sand; III) 107 to 101 m, interbedded sand and coarse gravel beds, which include several large sub-fossil trunks lying nearly horizontal, many up to 7.5 m long. *Comment*: R-622A not pretreated; R-622 α 5% HCl pretreated with additional leaching with 6% NH₄OH. *General Comment*: dates of R-618 and R-622 exclude correlation believed possible between large trunks at Moncalieri and similar wood horizon at Cascina Monache. Discrepancy indicates succession of 2 distinct alluvial phases in Po plain during recent Atlantic: at beginning, ca. 400 A.D. (Moncalieri), and towards end, ca. 1070 A.D. (Casale), of secondary Post-Glacial climatic optimum.

Cava Nocentini and Buoncompagni, S. Leo, series

Heavily darkened wood fragments from lower part of sec. throughout Würm terrace in sand and gravel quarry Nocentini and Buoncompagni, S. Leo, 4 km W Arezzo, Tuscany (43° 28' 20" N Lat, 11° 05' 00"

E Long) at +321 m. Coll. 1965 by G. A. Ferrari, F. Mancini, and G. Sanesi, Ist. di Geol. Applicata, Univ. of Florence; subm. 1965 by M. Follieri, Ist. di Botanica, Univ. of Rome. Eight m sec. in quarry showed following profile of Würm terrace, from top downward: 0 to 2.50 m, gray-brown podzolic Alfisol with clear textural differentiation between A and B horizons; lower part intense calcium carbonate accumulation indicated by hard, irregularly shaped concretions; 2.50 to 7.8 m, gradual transition to gravels and pebbles of limestone and marl, size of which increases downward, in yellowish coarse sand. In lower level, 2 m thick, wood pieces up to 70 cm long and up to 15 cm diam. are present often partially covered by silt and grayish clay cemented by iron sulfides, many id. by M. Follieri (pers. commun.). Series presents variable thickness in different sites and in general overlies lacustrine clay of Pleistocene age; it constitutes a terrace considered of Würm age along valleys of many rivers in Tuscany and represents main morphologic unit visible over present alluvial plain from which it is clearly separated by a well-preserved escarpment.

R-227. Cava Nocentini Buoncompagni, S. Leo 2 >47,000
 $\delta C^{13} = -27.5\%$

R-227 α . Cava Nocentini Buoncompagni, S. Leo 2 >47,000
 $\delta C^{13} = -27.6\%$

Heavily darkened wood (*Larix* sp.) id. by M. Follieri (pers. commun.).

R-228 α . Cava Nocentini Buoncompagni, S. Leo 3 >47,000
 $\delta C^{13} = -26.7\%$

Heavily darkened wood (*Larix* sp.) id. by M. Follieri (pers. commun.).

R-229 α . Cava Nocentini Buoncompagni, S. Leo 4 >40,000
 $\delta C^{13} = -28.7\%$

Heavily darkened wood (*Corylus* sp.) id. by M. Follieri (pers. commun.).

R-231. Cava Nocentini Buoncompagni, S. Leo 6 >47,000
 $\delta C^{13} = -27.9\%$

R-231 α . Cava Nocentini Buoncompagni, S. Leo 6 >47,000
 $\delta C^{13} = -28.5\%$

Heavily darkened wood (*Ulmus* cfr. *montana* Stokes in With.) id. by M. Follieri (pers. commun.).

General Comment: no carbonate present in all evenly darkened wood fragments; very abundant Fe^{++} , Fe^{+++} and SO_4^{--} soluble in water, probably $FeSO_4$ and $Fe_2(SO_4)_3$ as oxidation products of ferrous sulfides originally present in woods. By boiling with hot dilute HCl some H_2S and SO_2 evolved Fe^{++} and Fe^{+++} ions, presumably present as humates, were completely removed. α -labeled samples were given additional leach-

ing with 6% NH₄OH: abundant humic fraction removed appeared not contaminating.

Dates measured for defining age of formation of terraces; ages obtained indicate upper limit and agree well with field observations and with general outline of history of Tuscan rivers; terraces long considered of Early Würm age.

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