

UNIVERSITY OF ROME CARBON-14 DATES VII

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We list measurements carried out between June and November 1968. Archaeologic samples are from Italian and Swat (W Pakistan) territories; all geologic samples are from Italian territory.

Chemical preparation of samples, measurement technique, and the modern standard are unchanged (Bella and Cortesi, 1960; Alessio, Bella, and Cortesi, 1964; Alessio *et al.*, 1968).

For each sample of CO₂ the counting rate was corrected according to mass-spectrometrically measured C¹³/C¹² ratio. Isotopic analyses were carried out with a 6 in., 60°-sector, double-collecting mass spectrometer, designed and built by G. Boato at Ist. di Fisica, Univ. of Genoa (Boato *et al.*, 1960) and now in use at Ist. di Geochim., Univ. of Rome. C¹³/C¹² ratio is reported as δ -value, the deviation in parts per mil of the C¹³/C¹² ratio of sample from the PDB standard:

$$\delta \text{ C}^{13}\text{‰} = \left(\frac{\text{R sample}}{\text{R standard}} - 1 \right) \cdot 1000$$

where $\text{R} = \text{C}^{13}/\text{C}^{12}$.

δ -values have also been corrected for O¹⁷ contribution to mass 45 and other instrumental factors, as described by Craig (1957). The uncertainty in the δ -values is $\pm 0.1\text{‰}$

Our modern standard (wood grown near Rome between 1949 and 1953) has $\delta\text{C}^{13} = -24.9\text{‰}$, coincident, within the analytical uncertainty, with the one of average wood ($\delta \text{ C}^{13} = -25\text{‰}$) (Craig, 1961). δC^{13} of R-180, R-181, R-182 and R-489 α samples has not been measured.

Age has been calculated using the Libby half-life of 5568 ± 30 yr, with 1950 as the standard year of reference.

ACKNOWLEDGMENTS

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SAMPLE DESCRIPTIONS

II. GEOLOGIC SAMPLES

Italy

Inghiottitoio series

Fragment of charred wood from materials filling a paleo-sinkhole in Messinian selenitic gypsa of Bolognese Pedepennine, 150 m NE “Il Castello” locality, Comune di Croara, ca. 6 km S Bologna, Emilia (44°

26° 31' N Lat, 11° 22' 47" E Long) at +240 m. Coll. and subm. 1967 by G. Pasini. Sec. cut by helicoidal saw in selenitic gypsum quarry across vertical funnel-shaped cavity, 12 m deep, of karst paleo-sinkhole now entirely sealed. It was presumably set at bottom of dolina but now by inversion of relief opens nearby at top of hillock. Sec. throughout deposit, 9 m thick, and resting partly on selenitic gypsum rock floor a), shows, from bottom upward: Lower formation, ca. 4 m thick, including: b) calcareous stalagmitic horizon, ca. 10 cm thick; c) to f) gypsiferous sandy-clayey silt, ca. 2 m thick; at 1.50 m, Level d), and at 2 m, Level f), from bottom, 2 thin dark-brown layers, containing fragments of charred wood and other vegetal remains; g) to i) clayey-silty very fine sand, ca. 2 m thick. Upper formation, ca. 5 m thick, includes: 1) thin gray, silty sand layer containing fragments of charred wood; m) to o) graded breccia, ca. 2 m thick, made by silty-clayey elements in gypsiferous-sandy cement, latter increases upward; p) gypsiferous sand ca. 3 m thick; q) surface humic soil. In Lower formation, mainly between d) and f) horizons with charcoal, bones of Upper Pleistocene cold fauna, including: *Mustela erminea*, *Marmota marmota primigenia*, *Lepus* cf. *timidus*, *Megaceros giganteus*, *Bison Superbison* sp., ?*Bos primigenius*, *Capreolus pygargus*; scarce remains of this fauna have also been found 1 m under d) and 1 m upper f) horizons. As sinkhole could not serve for housing, charred wood must be considered result of fire and brought by runoff into sinkhole (Pasini, 1968). Pollen analysis of lower level shows only pollen of *Pinus* (75%) and *Betula* (25%) and wood of *Pinus* sp.; at middle levels pollen showed *Pinus*, *Alnus*, *Ulmus* and *Quercus* and at upper levels pollen of *Corylus* and *Quercus* were id. (Bertolani Marchetti, 1960).

R-361. Inghiottitoio 108

11,150 ± 650

9200 B.C.

$\delta C^{13} = -23.1\%$

Fragments of charred wood, Sample 108 in Level 1), gray silty sand at bottom of Upper formation just under breccia at ca. 4 m above rock floor. *Comment*: 10% HCl pretreatment only was given: charcoal heavily penetrated by gypsum and devoid of carbonates.

R-362. Inghiottitoio 113

15,000 ± 150

13,050 B.C.

$\delta C^{13} = -23.2\%$

Fragment of charred wood, Sample 113 in Level f), dark-brown clayey-sandy silt in Lower formation, ca. 2 m above rock floor. *Comment*: only 10% HCl pretreatment; charcoal was penetrated by gypsum and devoid of carbonates.

R-363. Inghiottitoio 170

18,200 ± 200

16,250 B.C.

$\delta C^{13} = -23.1\%$

Fragments of charred wood, Sample 170, in Level d), dark-brown clayey sandy silt in Lower formation at ca. 1.50 m above rock floor. *Com-*

ment: only 10% HCl pretreatment; charcoal was penetrated by gypsum and devoid of carbonates.

General Comment: C¹⁴ ages date Lower formation and show sinkhole to have been filled from Main Würm phase to Alleröd, Pollen Zone II in central Europe, according to C¹⁴ chronology. R-363 and R-362 dates also agree with Upper Pleistocene cold fauna and pollen assoc. found at these levels.

*To be used in conjunction with:
Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.

Ranges marked with a * are suspect due to impingment on the end of the calibration data set

PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, PG Blackwell,
C Bronk Ramsey, CE Buck, GS Burr, RL Edwards, M Friedrich, PM Grootes,
TP Guilderson, I Hajdas, TJ Heaton, AG Hogg, KA Hughen, KF Kaiser, B Kromer,
FG McCormac, SW Manning, RW Reimer, DA Richards, JR Southon, S Talamo,
CSM Turney, J van der Plicht, CE Weyhenmeyer (2009) Radiocarbon 51:1111-1150.

Samcode **R-363**

Description

Radiocarbon Age **18200±200**

Calibration data set: intcal09.14c

Reimer et al. 2009

One Sigma Ranges: [start:end] relative area
[**cal BP 21499:** **cal BP 22036**] 1,

Two Sigma Ranges: [start:end] relative area
[**cal BP 21306:** **cal BP 22285**] 1,

Samcode **R-362**

Description

Radiocarbon Age **15000±150**

Calibration data set: intcal09.14c

Reimer et al. 2009

One Sigma Ranges: [start:end] relative area
[**cal BP 18052:** **cal BP 18371**] 0,765703
[**cal BP 18399:** **cal BP 18500**] 0,234297

Two Sigma Ranges: [start:end] relative area
[**cal BP 17869:** **cal BP 18599**] 1,

Samcode **R-361**

Description

Radiocarbon Age **11150±650**

Calibration data set: intcal09.14c

Reimer et al. 2009

One Sigma Ranges: [start:end] relative area
[**cal BP 12147:** **cal BP 12192**] 0,017613
[**cal BP 12211:** **cal BP 12358**] 0,060032
[**cal BP 12367:** **cal BP 13787**] 0,922355

Two Sigma Ranges: [start:end] relative area
[**cal BP 11218:** **cal BP 14865**] 1,

Ranges marked with a * are suspect due to impingment on the end of the calibration data set