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## The radiocarbon chronology of the neolithic and copper age of northern italy

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B Bagolini, Paolo Biagi

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## THE RADIOCARBON CHRONOLOGY OF THE NEOLITHIC AND COPPER AGE OF NORTHERN ITALY

*Summary. Until twenty years ago the chronology of the Neolithic and Copper Age settlement of Northern Italy was almost exclusively based on the stratigraphical sequence of the Arene Candide cave in Liguria. The research carried out since the sixties has strongly increased our knowledge of the earliest farming communities and the first copper using people who inhabited the country between the end of the seventh and the beginning of the fourth millennium BP. This article considers the available evidence for this period which is now supported by a good set of radiocarbon dates.*

### INTRODUCTION

Our knowledge of the Neolithic and Copper Age settlement of Northern Italy has increased during the last twenty years largely due to the reexamination of the assemblages stored in national and local museums and to the excavation of some of the more important sites. Nevertheless, relatively little attention has been paid to the radiocarbon dating of the archaeological cultures of this region even though several articles have been devoted to this problem (Broglia 1972; Barfield 1974; Renfrew and Whitehouse 1974; Whitehouse 1978; Bagolini *et al.* 1979; Biagi 1980; Alessio *et al.* 1983; Sargent 1984; Bagolini and Biagi 1986; 1987a; Allegri *et al.* 1987).

### THE CULTURAL/CHRONOLOGICAL SEQUENCE

The presence of Mesolithic hunter/gatherers in Northern Italy has been known since 1961 (Radmilli 1983) along the coast of the Trieste

Gulf (Cannarella and Cremonesi 1967). At the end of the sixties some sites were accidentally discovered in the Adige Valley around Trento. Since then programmed surveys have been carried out in the central eastern Alpine arch and along the northern Apennine watershed between Tuscany and Liguria, where dozens of Mesolithic camps have been discovered and partly excavated (Biagi *et al.* 1980; Bagolini *et al.* 1983; Baffico *et al.* 1983). The most complete series known so far are those of Grotta Benussi in the Trieste Karst (Cremonesi 1978–81) and Romagnano III in Trentino (Broglia 1971). At Grotta Benussi the appearance of industries with trapezes and notched blades of 'Castelnovian' type is dated to  $7620 \pm 150$  BP (6600–6270 BC) (R-1044), and to  $7850 \pm 60$  BP (6781–6591 BC) (R-1137) at Romagnano III (Figs. 1 and 2). Similar assemblages occur around the mid eighth millennium BP (R-1525a:  $7380 \pm 130$  BP, 6400–6090 BC) in the Tuscan Apennines,

Figure 1  
Dispersion diagram of the Late Mesolithic and Early Neolithic uncalibrated BP dates

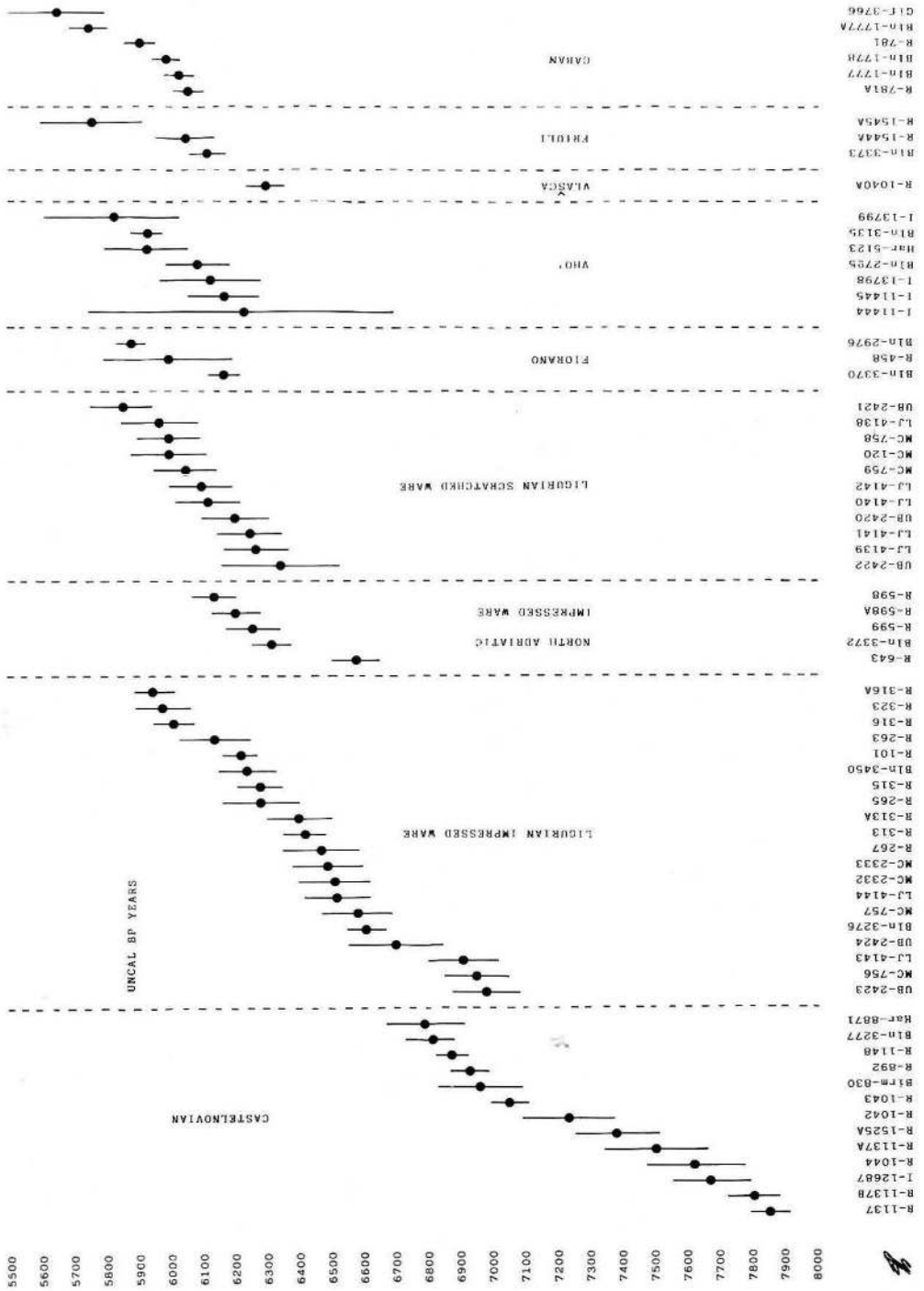
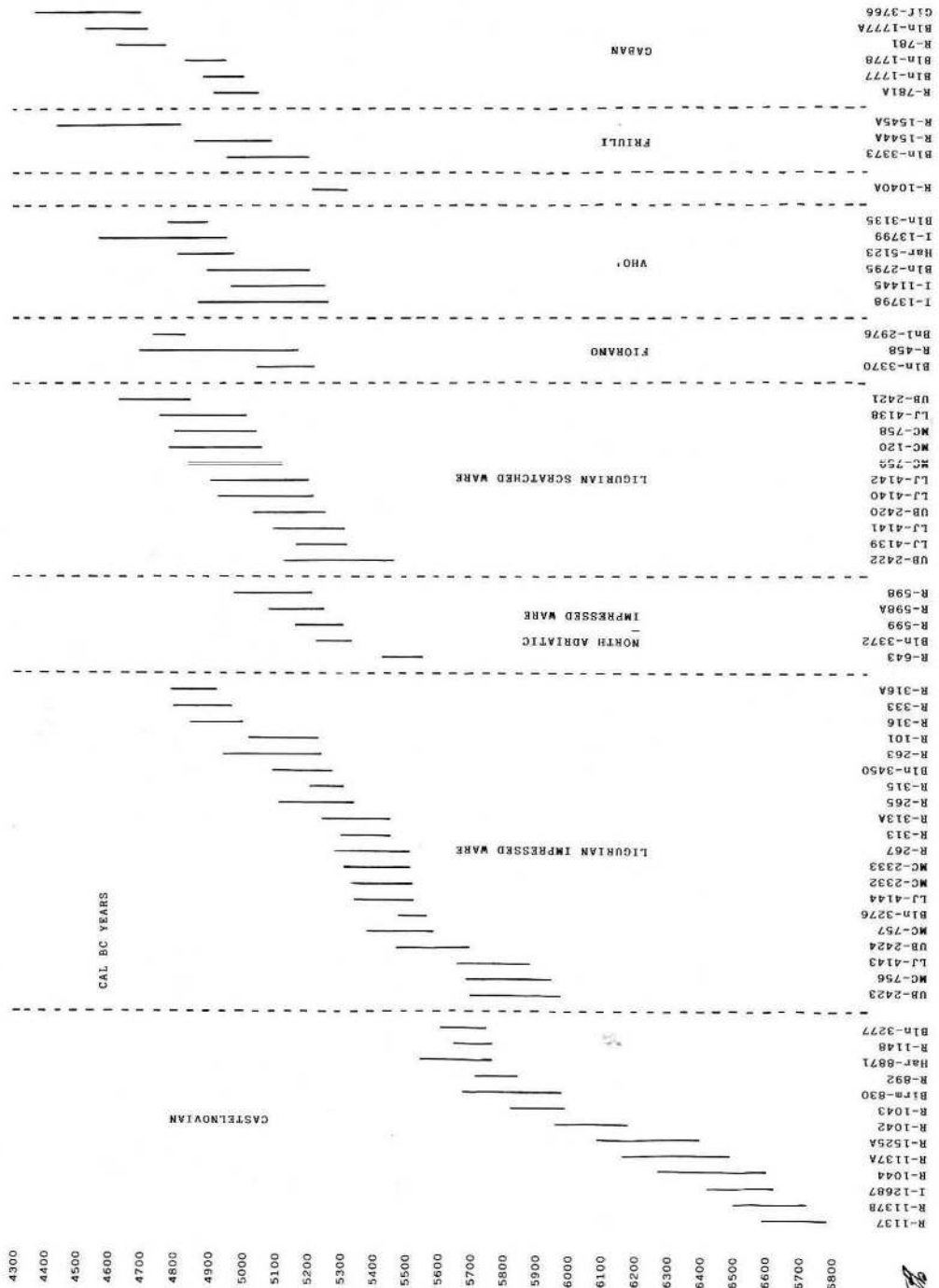


Figure 2  
Dispersion diagram of the Late Mesolithic and Early Neolithic calibrated BC dates



where the valley bottom site of Isola Santa was systematically resettled after the end of the Late Glacial. In the 'red earth' layer of Monte Bagioletto, a pass in the Emilian Apennines at 1700 m above sea level, the first trapezes make their appearance around  $7670 \pm 120$  BP (6620–6420 BC) (I-12687) (Cremaschi *et al.* 1981–82). Mid and high altitude blade and trapeze 'Castelnovian' camps have also been excavated at Passo della Comunella (1619 m) in the Emilian Apennines (Birm-830:  $6960 \pm 130$  BP, 5980–5680 BC), at Sopra Fienile Rossino in the central Pre-Alps (925 m) (Bln-3277:  $6810 \pm 70$  BP, 5749–5611 BC) (Accorsi *et al.* 1986) and at Laghetti del Crestoso, a hunting stand at 2000 m in the Brescian Alps (Har-8871:  $6790 \pm 120$  BP, 5770–5550 BC) (Baroni *et al.* 1989). A layer with notched blades and trapezes was found in the Grottina dei Covoloni del Broion in the Berici Hills (Cattani 1977), quoted as R-892:  $6930 \pm 60$  BP, 5850–5719 BC.

The origin and development of the Impressed Ware Culture along the western Ligurian (Bernabo' Brea 1956; Lewthwaite 1981; 1985; 1986; Biagi and Nisbet 1986) and the Northern Adriatic coastlines (Bagolini and von Eles 1978) has been discussed in several articles (Antoniazzi *et al.* 1986; Biagi 1987). The more ancient absolute dates so far known for this culture come from Arene Candide (UB-2423;  $6980 \pm 115$  BP, 5980–5700 BC) and from the nearby Caverna Pollera (MC-756:  $6950 \pm 100$  BP, 5950–5690 BC). More recent dates, covering almost the entire seventh millennium BP, come from these as well as from four other western Ligurian caves of the Finalese and Val Pennavaira. Along the northwestern Adriatic coastline a set of C14 dates has been obtained from the Impressed Ware settlements of Maddalena di Muccia (Barker 1975), Ripabianca di Monterado (Broglio and Lollini 1963) and Fornace dei Cappuccini (Antoniazzi *et al.* 1986). Maddalena di Muccia gave the

result of  $6580 \pm 75$  BP (5562–5434 BC) (R-643), while the other two sites fall into the second half of the seventh millennium BP. Similar dates, ranging between the last centuries of the seventh and the beginning of the sixth millennia BP were obtained from sites of the various Groups of the Po and Friuli plains and Trentino/South Tyrol, namely Fiorano, Vhò, Fagnigola and Gaban. As revealed by layer 8b of Grotta dei Ciclami (R-1040a:  $6300 \pm 60$  BP, 5328–5225 BC), the Vlašca or Vasi a Coppa Group of the Trieste Karst is also to be attributed to the same horizon.

The end of the Impressed Ware Culture in Liguria is marked by the appearance of a new pottery style of black burnished fabric, with scratched ornamentations, similar to the ceramics of the Po Plain Groups of the end of the seventh millennium BP (Maggi 1977). The start of the sixth millennium BP sees the spread of the Square Mouth Pottery Culture which flourished over the whole of Northern Italy a few centuries later. This culture was first subdivided into three main phases (Barfield 1973) and later into pottery styles based on the ceramic decorations (Bagolini *et al.* 1979). Several C14 dates are now available for this culture. Many of them come from the lake-side village of Fimon Molino Casarotto in the Berici Hills (Bagolini *et al.* 1973; Barfield and Broglio 1986) and others have been obtained from the Arene Candide and Romagnano III stratigraphical sequences. Dalmatian-type ornamentations always occur around the middle of the sixth millennium BP. This happens at many sites in the Po Valley and the Alpine arch, including Campegine, La Vela (Bagolini and Biagi 1976), Romagnano and Castelgrande in the Ticino Canton (CH) (Donati 1986). A few C14 dates are also available for the Isolino *facies* which, according to the material assemblage, is more or less contemporary with the spiral/meander

style of the SMP Culture. In the Trieste Karst, a region in the sphere of the Dalmatian and Danubian Cultures, layer 8 of Grotta del Mitreo, with Danilo type pottery, has been dated to  $5770 \pm 60$  BP (4737–4550 BC) (R-904) and to  $5770 \pm 50$  BP (4729–4574 BC) (R-904a) (Figs. 3 and 4). A few C14 dates are also available for the last moments of the SMP culture as it is known from eastern Lombardy, the Veneto and Trentino regions. The advent of the Chassey and the slightly later Lagozza Cultures (Biagi 1982; Bagolini 1986) happened around the end of the sixth and the beginning of the fifth millennia BP. At present we have only two dates for the pure Chassey Culture (Figs. 5 and 6). The first comes from Arene Candide (R-104:  $5075 \pm 45$  BP, 3968–3805 BC) and the second from the open settlement of Spilamberto (Bagolini 1981) along the northern fringe of the Emilian Apennines (I-11817:  $4995 \pm 100$  BP, 3950–3690 BC). A more extensive set is known for Lagozza, where the eponymous site produced the best evidence (Barfield 1974).

The number of C14 dates known for the Chalcolithic has greatly increased during the last decade. The heterogeneity of the site types and locations as well as the material employed for dating is clearly visible in Table 1 'Chalcolithic'. Human bones have been used from the burial cave of Val Frascaese (Maggi and Formicola 1978). Of extreme interest are the results from the wooden pick from the prehistoric Ligurian mine of Libiola (Isetti 1964) discovered at the end of the last century (Issel 1892) which confirm that it had already been exploited during the Chalcolithic (Bl-3367:  $4610 \pm 50$  BP, 3382–3342 BC; Gif-7213:  $4490 \pm 90$  BP, 3354–3035 BC) (Maggi and Vignolo 1989). Four Beaker sites produced only acceptable C14 dates, while those from Arma di Nasino in Liguria (Barfield 1974) and from the megalithic cemetery of Aosta (Mezzena 1981) are highly questionable.

## CONCLUSIONS

The beginning of the Atlantic period is marked by the appearance of Mesolithic communities with a Castelnovian tool-kit characterised by trapezes, notched blades and other instruments chipped from pyramidal bladelet cores. The C14 chronology of these communities is well known, even though a gap still exists around the final stages in the development of this culture. The more recent dates belong to the beginning of the seventh millennium BP, while the first pottery-making peoples settled in the Po Valley around the end of the same millennium. A different picture is apparent for Liguria, where the Impressed Ware Culture makes its appearance at the beginning of the seventh millennium BP as documented both from the Arene Candide and Pollera caves. Recent discoveries along the nearby French coastline demonstrate that most of the Late Mesolithic and Early Neolithic sites were destroyed by the last sea-level rise (Geddes *et al.* 1983; Mills 1983). Many Castelnovian camps are known at middle/high altitudes on the Alpine (Baroni *et al.* 1989) and Apennine Ligurian watershed (Biagi *et al.* 1989), while only cave sites of the Impressed Ware Culture exist in this latter region. The radiocarbon evidence suggests a partial contemporaneity of these cultural traditions in Liguria, and is supported by contemporary ethnographic data (Orme 1981). More recent dates come from the settlements of the Adriatic stream of the Impressed Ware Culture and by the Vlašca cave of Grotta dei Ciclami. Imports of *Figulina* painted flasks of Ripoli style are recorded from the late seventh millennium BP layer 13 of the Arene Candide sequence (Tinè 1974), during the centuries when the central Italian Ripoli and the north Italian Fiorano Cultures seem to have reached their apex. Relationships were maintained between the Po Plain SMP Culture and that of the peninsular

Figure 3  
Dispersion diagram of the Middle Neolithic uncalibrated BP dates

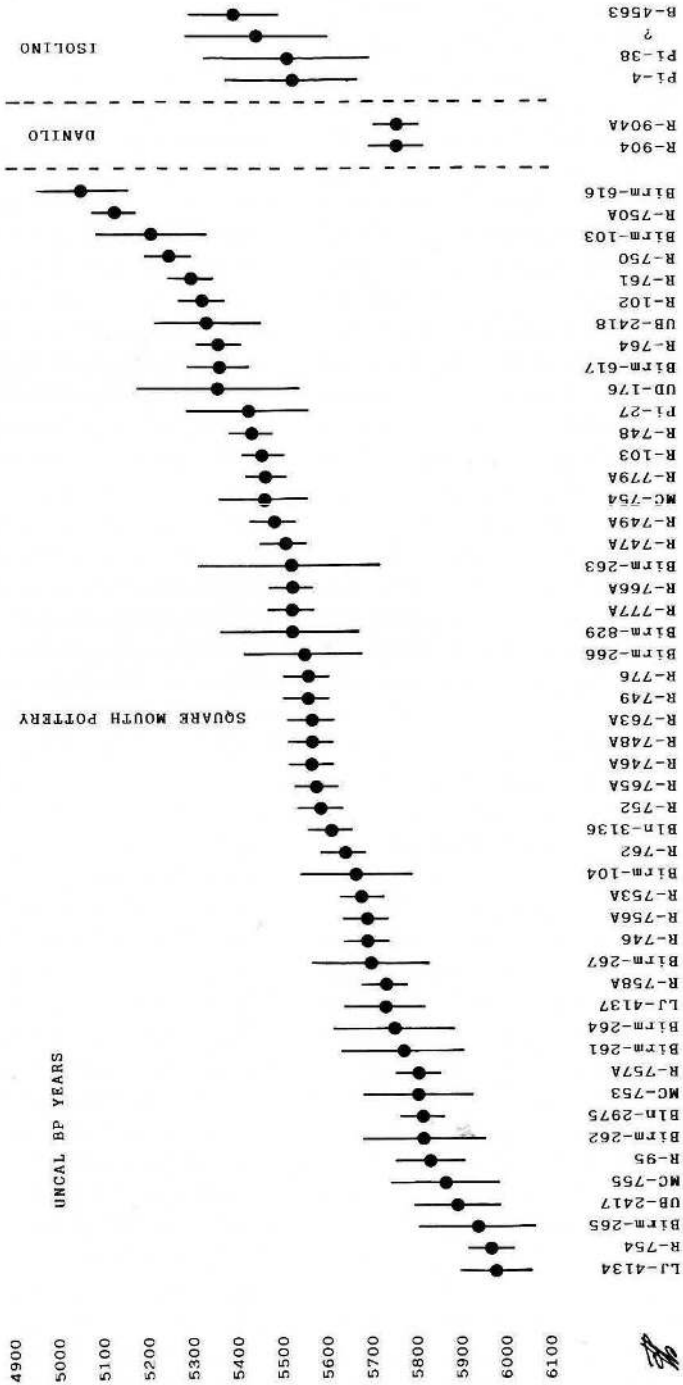
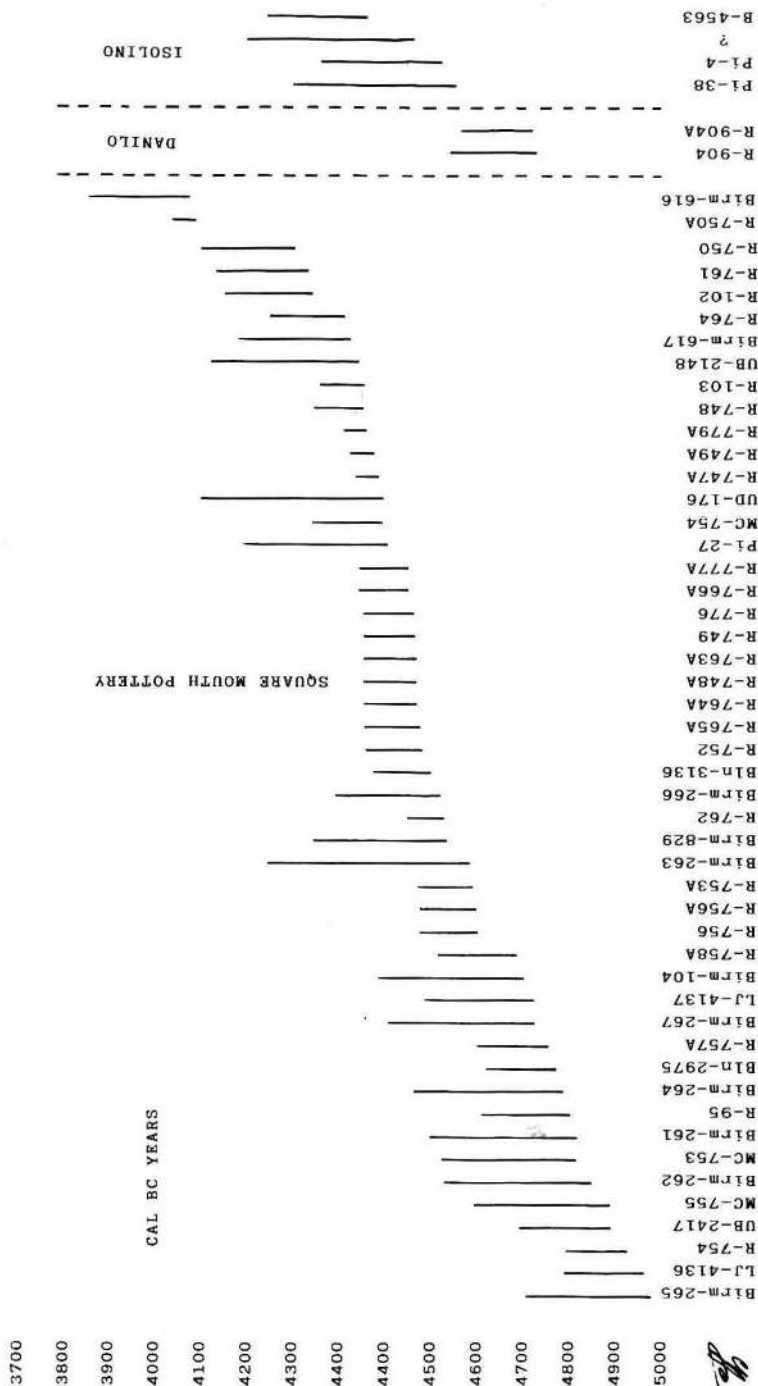


Figure 4  
Dispersion diagram of the Middle Neolithic calibrated BC dates





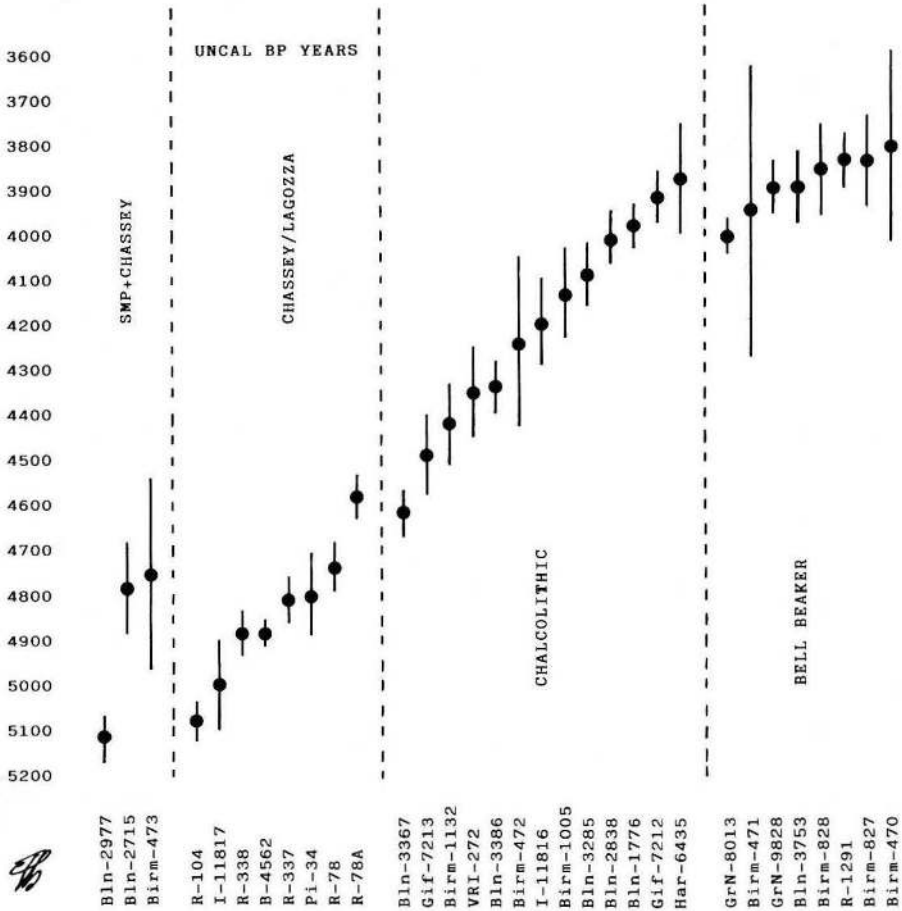


Figure 5  
Dispersion diagram of the Late Neolithic and Copper Age uncalibrated BP dates

Serra d'Alto during the following millennium (Whitehouse 1978; 1985). Serra d'Alto unpainted and painted pottery has been recorded from typical Square Mouth sites, also in the shape of complete vessels at La Vela, for instance (Bagolini 1989). The role played by the Adige valley in the transalpine trade has been demonstrated by the discovery of central European artefacts at La Vela and Rivoli (Barfield 1970) and by characteristic orna-

mentation on some square mouth vases of South Tyrol (Niederwanger 1984).

The radiocarbon evidence for the mid sixth/mid fifth millennium BP is still rather scanty. In fact it is impossible to follow the advent and development of Chassey and Lagozza Cultures and the fall of the SMP on the basis of the data currently available. The spread of the Diana Culture further to the north, as far as Romagna, also occurred in this period.

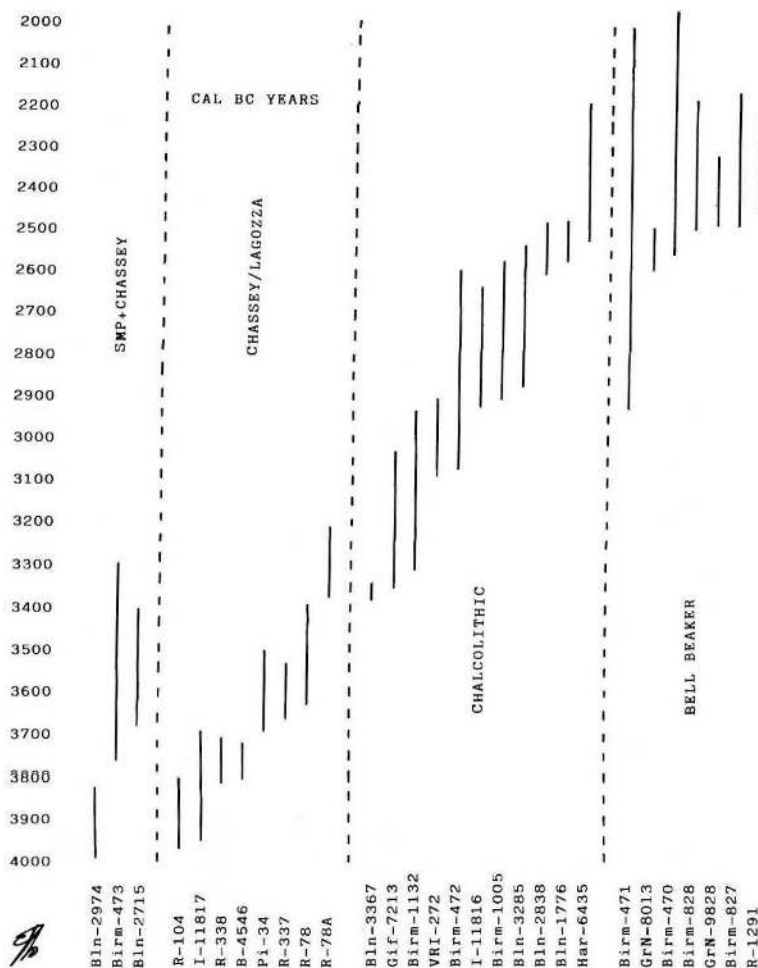


Figure 6  
Dispersion diagram of the Late Neolithic and Copper Age calibrated BC dates

The Copper Age of northern Italy is represented by the cemeteries of Remedello type (Colini 1898–1902), by the settlements and graveyards of the Spilamberto *facies* distributed south of the river Po (Bagolini 1981) and by the burial caves and rock shelters of the alpine and apennine regions (Barfield 1985; Cocchi Genick and Grifoni Cremonesi 1985). The C14 dates now available indicate

that between the second half of the fifth and the beginning of the fourth millennia BP, several *facies*, strongly related to each other, were present in northern Italy. Comparisons can be extended to the Rinaldone and Gaudo Cultures of the Tyrrhenian coast which produced bifacial, tanged, flint arrowheads, copper halberds (Barfield 1969) and knives very similar to those from Remedello. Knives

TABLE 1  
LIST OF THE RADIOCARBON DATES

Site name	Uncal BP years	Cal BC years (1 $\sigma$ )	Lab n
CASTELNOVIAN LATE MESOLITHIC			
Romagnano III	7850 $\pm$ 60	6781-6591	R-1137
Romagnano III	7500 $\pm$ 160	6490-6160	R-1137A
Romagnano III	7800 $\pm$ 80	6717-6500	R-1137B
Benussi	7050 $\pm$ 60	5991-5824	R-1043
Benussi	7230 $\pm$ 140	6180-5960	R-1042
Benussi	7620 $\pm$ 150	6600-6270	R-1044
Bagioletto	7670 $\pm$ 120	6620-6420	I-12687
Isola Santa	7380 $\pm$ 130	6400-6090	R-1525A
Comunella	6960 $\pm$ 130	5980-5680	Birm-830
Covoloni del Broion	6970 $\pm$ 60	5850-5719	R-892
Pradestel	6870 $\pm$ 50	5769-5654	R-1148
Fienile Rossino	6810 $\pm$ 70	5749-5611	BIn-3277
Laghetti del Crestoso	6790 $\pm$ 120	5770-5550	Har-8871
LIGURIAN IMPRESSED WARE CULTURE			
Arene Candide	6980 $\pm$ 115	5980-5700	UB-2423
Arene Candide	6910 $\pm$ 110	5890-5660	LJ-4143
Arene Candide	6700 $\pm$ 145	5700-5480	UB-2424
Arene Candide	6520 $\pm$ 100	5530-5350	LJ-4144
Arene Candide	6220 $\pm$ 55	5241-5163	R-101
Grotta Pollera	6950 $\pm$ 100	5950-5690	MC-756
Grotta Pollera	6580 $\pm$ 110	5590-5390	MC-757
Stefanin	6610 $\pm$ 60	5575-5480	BIn-3276
Arma di Nasino	6470 $\pm$ 120	5520-5290	R-267
Arma di Nasino	6420 $\pm$ 65	5461-5311	R-313
Arma di Nasino	6400 $\pm$ 105	5460-5250	R-313A
Arma di Nasino	6280 $\pm$ 120	5350-5120	R-265
Arma di Nasino	6280 $\pm$ 70	5317-5217	R-315
Arma di Nasino	6140 $\pm$ 110	5250-4950	R-263
Arma di Nasino	6015 $\pm$ 65	5010-4847	R-316
Arma di Nasino	5980 $\pm$ 85	4979-4797	R-333
Arma di Nasino	5955 $\pm$ 65	4930-4787	R-316A
Arma dell'Aquila	6240 $\pm$ 90	5283-5098	BIn-3450
Grotta dell'Edera	6510 $\pm$ 110	5530-5340	MC-2332
Grotta dell'Edera	6490 $\pm$ 110	5520-5320	MC-2333
NORTH ADRIATIC IMPRESSED WARE CULTURE			
Maddalena di Muccia	6580 $\pm$ 75	5562-5434	R-643
Cappuccini	6320 $\pm$ 60	5339-5230	BIn-3372
Ripabianca	6260 $\pm$ 85	5312-5167	R-599
Ripabianca	6210 $\pm$ 75	5256-5085	R-598A
Ripabianca	6140 $\pm$ 70	5223-4978	R-598
LIGURIAN "SCRATCHED" WARES			
Arene Candide	6345 $\pm$ 180	5470-5130	UB-2422
Arene Candide	6270 $\pm$ 100	5330-5170	LJ-4139

Material	Site type	Feature	Reference
Charcoal	Rock-shelter	Layer AB2-1	Alessio et al. 1978: 249
Charcoal	Rock-shelter	Layer AB2-1	Alessio et al. 1978: 249
Charcoal	Rock-shelter	Layer AB2-1	Alessio et al. 1978: 249
Charcoal	Cave	Layer 3	Alessio et al. 1978: 251
Charcoal	Cave	Layer 3-4	Alessio et al. 1978: 251
Charcoal	Cave	Layer 4	Alessio et al. 1978: 251
Charcoal	Open site	Red earths	Cremaschi et al. 1981-82: 18
Charcoal	Open site	Layer 4a	Alessio et al. 1978: 251
Charcoal	Open site		Biagi et al. 1980: 17
Charcoal	Cave	Layer	Alessio et al. 1978: 251
Charcoal	Rock-shelter	Layer D3-1	Alessio et al. 1978: 248
Charcoal	Open site	Pit	Accorsi et al. 1986: 251
Charcoal	Open site	Hearth	Baroni et al. 1989 (in press)
Charcoal	Cave	Layer 14	Biagi and Maggi 1983: 166
Charcoal	Cave	Layer 14-13	Maggi 1977: 211
Charcoal	Cave	Layer 14	Mallory pers. comm. 1979
Charcoal	Cave	Layer 15-14	Maggi 1977: 211
Charcoal	Cave	Layer 26-25	Alessio et al. 1966: 402
Charcoal	Cave	Layer XXX	Tinë 1974: 52
Charcoal	Cave	Layer XXIX	Tinë 1974: 52
Charcoal	Cave	Layer 2	Biagi et al. 1987: 11
Charcoal	Rock-shelter	Layer IXi	Alessio et al. 1968: 354
Charcoal	Rock-shelter	Layer VIII	Alessio et al. 1968: 355
Charcoal	Rock-shelter	Layer VIII	Alessio et al. 1968: 355
Charcoal	Rock-shelter	Layer IXs	Alessio et al. 1968: 354
Charcoal	Rock-shelter	Layer IXs	Alessio et al. 1968: 355
Charcoal	Rock-shelter	Layer VIIIa	Alessio et al. 1968: 354
Charcoal	Rock-shelter	Layer IXm	Alessio et al. 1968: 355
Charcoal	Rock-shelter	Layer X	Alessio et al. 1968: 353
Charcoal	Rock-shelter	Layer IXm	Alessio et al. 1968: 355
Charcoal	Rock-shelter	Below layer V	Girod 1989 (in press)
Charcoal	Cave	Hearth	Odetti 1984: 112
Charcoal	Cave	Hearth	Odetti 1984: 112
Charcoal	Open site	Pit	Alessio et al. 1970: 603
Charcoal	Open site	Pit	Bagolini and Biagi 1987b: 217
Charcoal	Open site	Pit	Alessio et al. 1970: 602
Charcoal	Open site	Pit	Alessio et al. 1970: 602
Charcoal	Open site	Pit	Alessio et al. 1970: 602
Charcoal	Cave	Layer 13C	Mallory pers. comm. 1979
Charcoal	Cave	Layer 13	Maggi 1977: 211

## RADIOCARBON CHRONOLOGY OF NEOLITHIC AND COPPER AGE OF NORTHERN ITALY

Site name	Uncal BP years	Cal BC years (1 $\sigma$ )	Lab n
Arene Candide	6250 $\pm$ 100	5320-5100	LJ-4141
Arene Candide	6205 $\pm$ 105	5260-5040	UB-2420
Arene Candide	6120 $\pm$ 100	5230-4930	LJ-4140
Arene Candide	6100 $\pm$ 100	5210-4910	LJ-4142
Arene Candide	6000 $\pm$ 120	5070-4780	MC-120
Arene Candide	5970 $\pm$ 120	5020-4750	LJ-4138
Arene Candide	5855 $\pm$ 95	4850-4627	UB-2421
Pollera	6050 $\pm$ 100	5130-4840	MC-759
Pollera	6000 $\pm$ 100	5050-4800	MC-758
▼ VLASCA GROUP			
Ciclamì	6300 $\pm$ 60	5370-5154	R-1040A
FRIULI EARLY NEOLITHIC GROUPS			
Sammardenchia	6120 $\pm$ 60	5211-4958	Bln-3373
Fagnigola	6050 $\pm$ 90	5097-4857	R-1544A
Fagnigola	5760 $\pm$ 160	4820-4440	R-1545A
FIORANO CULTURE			
Lugo di Romagna	6170 $\pm$ 50	5224-5062	Bln-3370
Chiozza	6000 $\pm$ 200	5180-4690	R-458
Savignano	5880 $\pm$ 50	4831-4730	Bln-2976
VHO' GROUP			
Vhò	6235 $\pm$ 470	5600-4640	I-11444
Vhò	6170 $\pm$ 110	5260-4970	I-11445
Vhò	5930 $\pm$ 50	4900-4781	Bln-3135
Travo	6130 $\pm$ 160	5270-4870	I-13798
Travo	5830 $\pm$ 210	4960-4470	I-13799
Ostiano Dugali Alti	6090 $\pm$ 100	5210-4900	Bln-2795
Cecima	5930 $\pm$ 130	4980-4710	Har-5123
GABAN GROUP			
Riparo Gaban	6030 $\pm$ 45	5012-4883	Bln-1777
Riparo Gaban	5990 $\pm$ 45	4954-4829	Bln-1778
Riparo Gaban	5750 $\pm$ 60	4721-4527	Bln-1777A
Riparo Gaban	5650 $\pm$ 150	4700-4370	Gif-3766
Romagnano III	6060 $\pm$ 50	5061-4918	R-781A
Romagnano III	5810 $\pm$ 50	4774-4618	R-781
SQUARE MOUTH POTTERY CULTURE			
Arene Candide	5970 $\pm$ 80	4965-4793	LJ-4136
Arene Candide	5885 $\pm$ 95	4893-4697	UB-2471
Arene Candide	5860 $\pm$ 120	4890-4600	MC-755
Arene Candide	5800 $\pm$ 120	4820-4530	MC-753
Arene Candide	5730 $\pm$ 90	4727-4490	LJ-4137
Arene Candide	5465 $\pm$ 50	4362-4267	R-103
Arene Candide	5435 $\pm$ 135	4410-4100	Pi-27

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Material	Site type	Feature	Reference
Charcoal	Cave	Layer 13	Maggi 1977: 211
Charcoal	Cave	Layer 13A	Mallory pers. comm. 1979
Charcoal	Cave	Layer 13	Maggi 1977: 211
Charcoal	Cave	Layer 13	Maggi 1977: 211
Charcoal	Cave	Layer 13	Tinë 1974: 52
Charcoal	Cave	Layer 13	Maggi 1977: 211
Charcoal	Cave	Layer 13B	Mallory pers. comm. 1979
Charcoal	Cave	Layer XXIII	Tinë 1974: 52
Charcoal	Cave	Layer XXIV	Tinë 1974: 52
Charcoal	Cave	Layer 8B	Alessio et al. 1978: 86
Charcoal	Open site	Pit	Bagolini et al. 1987: 412
Charcoal	Open site	Pit I	Biagi 1985: 19
Charcoal	Open site	Pit IV	Biagi 1985: 19
Charcoal	Open site	Wooden structure	Bagolini and Biagi 1987b: 219
Charcoal	Open site	Pit	Alessio et al. 1970: 601
Charcoal	Open site	Pit	Biagi and Nisbet 1987: 14
Charcoal	Open site	Pit XVIII	Biagi 1979: 35
Charcoal	Open site	Pit XVIII	Biagi 1979: 35
Charcoal	Open site	Pit XXXII	Biagi 1987b: 388
Charcoal	Open site	Pit	Bernabò Brea 1986: 173
Charcoal	Open site	Pit	Bernabò Brea 1986: 173
Charcoal	Open site	Pit III	Biagi 1987: 474
Charcoal	Open site	Pit	Simone 1987: 474
Charcoal	Rock-shelter	Layer D2	Bagolini and Biagi 1987: 427
Charcoal	Rock-shelter	Layer D8	Bagolini and Biagi 1987: 427
Charcoal	Rock-shelter	Layer D2	Bagolini and Biagi 1987: 427
Charcoal	Rock-shelter	Layer D8	Delibrias pers. comm. 1976
Charcoal	Rock-shelter	Layer T4	Alessio et al. 1978: 81
Charcoal	Rock-shelter	Layer T4	Alessio et al. 1978: 81
Charcoal	Cave	Layer 12	Maggi 1977: 211
Charcoal	Cave	Layer 12	Mallory pers. comm. 1979
Charcoal	Cave	Layer 12c	Tinë 1974: 52
Charcoal	Cave	Layer 12a	Tinë 1974: 52
Charcoal	Cave	Layer 12	Maggi 1977: 211
Charcoal	Cave	Layer 19-16	Alessio et al. 1966: 402
Charcoal	Cave	Layer 20	Alessio et al. 1966: 402

## RADIOCARBON CHRONOLOGY OF NEOLITHIC AND COPPER AGE OF NORTHERN ITALY

Site name	Uncal BP years	Cal BC years (1 $\sigma$ )	Lab n
Arene Candide	5345 $\pm$ 120	4350-4030	UB-2418
Arene Candide	5335 $\pm$ 50	4250-4058	R-102
Arene Candide	5470 $\pm$ 100	4400-4250	MC-754
Aisone	5825 $\pm$ 75	4805-4617	R-95
Casalmoro	5810 $\pm$ 50	4774-4618	B1n-2975
Travo	5610 $\pm$ 50	4506-4381	B1n-3136
Campegine	5530 $\pm$ 150	4540-4250	Birm-829
Fimon M.C.	5930 $\pm$ 130	4980-4710	Birm-265
Fimon M.C.	5820 $\pm$ 135	4850-4530	Birm-262
Fimon M.C.	5800 $\pm$ 50	4762-4604	R-757A
Fimon M.C.	5780 $\pm$ 135	4820-4500	Birm-261
Fimon M.C.	5750 $\pm$ 135	4790-4470	Birm-264
Fimon M.C.	5730 $\pm$ 50	4689-4518	R-758A
Fimon M.C.	5700 $\pm$ 130	4730-4410	Birm-267
Fimon M.C.	5690 $\pm$ 50	4603-4482	R-746
Fimon M.C.	5690 $\pm$ 50	4603-4482	R-756A
Fimon M.C.	5640 $\pm$ 50	4535-4456	R-762
Fimon M.C.	5570 $\pm$ 50	4475-4362	R-764A
Fimon M.C.	5570 $\pm$ 50	4475-4362	R-748A
Fimon M.C.	5570 $\pm$ 50	4475-4362	R-763A
Fimon M.C.	5560 $\pm$ 50	4470-4359	R-749
Fimon M.C.	5555 $\pm$ 130	4530-4300	Birm-266
Fimon M.C.	5525 $\pm$ 200	4590-4150	Birm-263
Fimon M.C.	5510 $\pm$ 50	4387-4341	R-747A
Fimon M.C.	5490 $\pm$ 50	4371-4334	R-749A
Fimon M.C.	5440 $\pm$ 50	4354-4249	R-748
Fimon M.C.	5310 $\pm$ 50	4242-4040	R-761
Fimon M.C.	5260 $\pm$ 50	4212-4006	R-750
Fimon M.C.	5140 $\pm$ 50	4000-3951	R-750A
Fimon M.C.	5530 $\pm$ 50	4455-4349	R-766A
Fimon M.C.	5580 $\pm$ 50	4481-4365	R-765A
Fimon M.C.	5370 $\pm$ 50	4327-4159	R-764
Fimon M.C.	5680 $\pm$ 50	4594-4477	R-753A
Fimon M.C.	5960 $\pm$ 50	4923-4797	R-754
Fimon M.C.	5590 $\pm$ 50	4487-4368	R-752
Rivoli	5665 $\pm$ 125	4700-4390	Birm-617
Rivoli	5370 $\pm$ 70	4332-4087	Birm-617
Rivoli	5220 $\pm$ 120		Birm-103
Rivoli	5070 $\pm$ 100	3990-3770	Birm-616
Romagnano III	5560 $\pm$ 50	4470-4359	R-776
Romagnano III	5530 $\pm$ 50	4455-4349	R-777A
Romagnano III	5470 $\pm$ 50	4364-4320	R-779A
La Vela	5370 $\pm$ 180	4400-4010	UD-176
"ISOLINO" FACIES			
Isolino	5534 $\pm$ 144	4530-4270	Pi-4
Isolino	5526 $\pm$ 180	4560-4210	Pi-38
Isolino	5460 $\pm$ 155	4470-4110	?
Castelgrande (CH)	5410 $\pm$ 100	4370-4150	B-4563
LATE SMP WITH CHASSEY/LAGOZZA			
Mosio	5110 $\pm$ 50	3986-3820	B1n-2977

Material	Site type	Feature	Reference
Charcoal	Cave	Layer 12	Mallory pers. comm. 1979
Charcoal	Cave	Layer 24-21	Alessio et al. 1966: 402
Charcoal	Cave	Layer 8	Tinè 1974: 52
Charcoal	Cave		Alessio et al. 1965: 213
Charcoal	Open site	Pit 1	Quitta pers. comm. 1984
Charcoal	Open site	Pit	Bernabò Brea 1987: 173
Charcoal	Open site	Pit	Barfield pers. comm. 1978
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Wood	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Shotton and Williams 1973: 11
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 359
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 1	Alessio et al. 1974: 360
Charcoal	Lake dwelling	House 2	Alessio et al. 1974: 361
Charcoal	Lake dwelling	House 2	Alessio et al. 1974: 361
Wood	lake dwelling	House 2	Alessio et al. 1974: 360
Wood	Lake dwelling	House 3	Alessio et al. 1974: 361
Charcoal	Lake dwelling	Site 6	Alessio et al. 1974: 361
Wood	lake dwelling	Site 1	Alessio et al. 1974: 361
Charcoal	Open site	Pit Z	Shotton et al. 1970: 397
Charcoal	Open site	Pit PQR	Barfield and Bagolini 1976: 140
Bone	Open site	Pit L	Shotton et al. 1970: 397
Charcoal	Open site	Pit PQR	Barfield and Bagolini 1976: 140
Charcoal	Rock-shelter	Layer T1	Alessio et al. 1978: 81
Charcoal	Rock-shelter	Layer T1	Alessio et al. 1978: 81
Charcoal	Rock-shelter	Layer T2	Alessio et al. 1978: 81
Charcoal	Open site	Layer 1	Bagolini and Biagi 1986: 387
Wood	Lake dwelling	Structure	Ferrara et al. 1959: 106
Wood	Lake dwelling	Structure	Ferrara et al. 1959: 107
Wooden tool	Lake dwelling	cm 260 depth	Guerreschi 1976-77: 494
Charcoal	Open site	Layer 13	Donati 1986: 109
Charcoal	Open site	Pit	Bagolini and Biagi 1986: 387



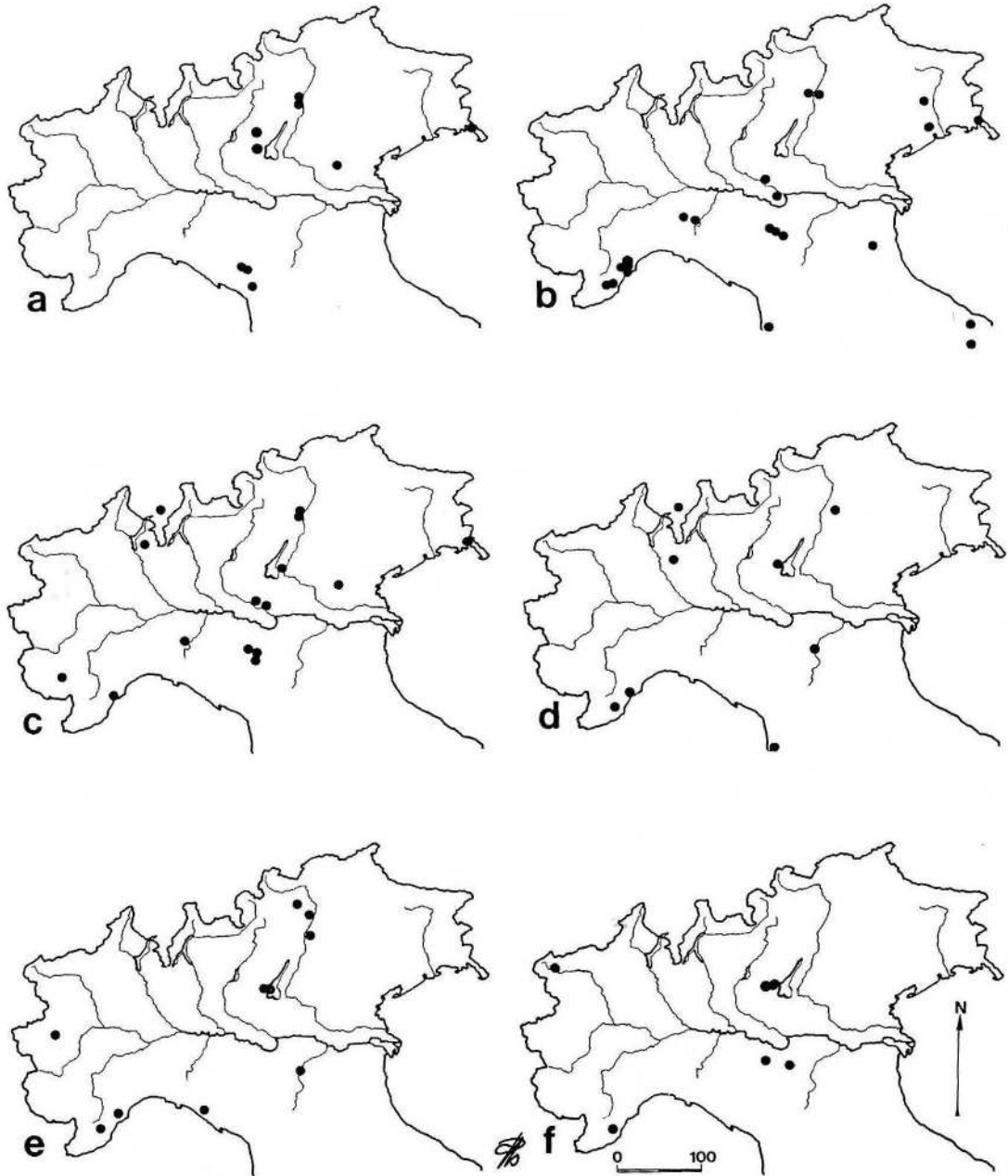
## RADIOCARBON CHRONOLOGY OF NEOLITHIC AND COPPER AGE OF NORTHERN ITALY

Site name	Uncal BP years	Cal BC years (1 $\sigma$ )	Lab n
Monte Covolo	4750 $\pm$ 210	3760-3300	Birm-473
Völseraicha	4780 $\pm$ 100	3680-3400	Bln-2715
DANILO CULTURE			
Mitreo	5770 $\pm$ 60	4737-4550	R-904
Mitreo	5770 $\pm$ 50	4729-4574	R-904A
CHASSEY AND LAGOZZA CULTURE			
Arene Candide	5075 $\pm$ 45	3968-3805	R-104
Spilamberto	4995 $\pm$ 100	3950-3690	I-11817
Castelgrande (CH)	4980 $\pm$ 30	3802-3722	B-4562
Lagozza	4980 $\pm$ 50	3807-3708	R-338
Lagozza	4805 $\pm$ 50	3807-3708	R-337
Lagozza	4794 $\pm$ 90	3687-3502	Pi-34
Lagozza	4735 $\pm$ 50	3626-3388	R-78
Lagozza	4580 $\pm$ 50	3372-3206	R-78A
"CHALCOLITHIC"			
Libiola	4610 $\pm$ 50	3382-3342	Bln-3367
Libiola	4490 $\pm$ 90	3354-3035	Gif-7213
Manerba	4420 $\pm$ 90	3309-2930	Birm-1132
Laas	4350 $\pm$ 100	3090-2900	Vri-272
Val Frascaiese	4340 $\pm$ 60		Bln-3386
Val Frascaiese	3920 $\pm$ 60		Gif-7212
Monte Covolo	4240 $\pm$ 190	3070-2590	Birm-472
Spilamberto	4195 $\pm$ 95	2917-2629	I-11816
Tolerait	4130 $\pm$ 100	2900-2570	Birm-1005
Balm' Chanto	4090 $\pm$ 70	2871-2532	Bln-3285
Balm' Chanto	4010 $\pm$ 60	2603-2475	Bln-2838
Riparo Gaban	3985 $\pm$ 50	2581-2469	Bln-1776
Tana del Barletta	3880 $\pm$ 120	2520-2190	Har-6435
BELL BEAKER CULTURE			
Monte Covolo	4010 $\pm$ 40	2593-2486	GrN-8013
Monte Covolo	3950 $\pm$ 320	2920-2010	Birm-471
Monte Covolo	3810 $\pm$ 210	2550-1970	Birm-470
Rubiera	3900 $\pm$ 60	2481-2314	GrN-9828
S. Ilario	3860 $\pm$ 100	2490-2180	Birm-828
S. Ilario	3840 $\pm$ 100	2480-2160	Birm-827
S. Ilario	3840 $\pm$ 60	2455-2207	R-1291
Ca' dei Grii	3900 $\pm$ 80		Bln-3753

Material	Site type	Feature	Reference
Charcoal	Rock-shelter	Layer 20	Barfield et al. 1977-79: 74
Charcoal	Open site	Layer 3	Bagolini and Biagi 1986: 387
Charcoal	Cave	Layer 8	Alessio et al. 1978: 87
Charcoal	Cave	Layer 8	Alessio et al. 1978: 87
Charcoal	Cave	Layer 13-12	Alessio et al. 1966: 402
Charcoal	Open site	Site VIII	Bagolini 1981: 101
Charcoal	Open site	Layer 5	Donati 1986: 101
Wood	Lake dwelling	Post	Alessio et al. 1968: 356
Wood	Lake dwelling	Tool	Alessio et al. 1968: 357
Wood	Lake dwelling	Post	Ferrara et al. 1961: 102
Wood	Lake dwelling	Post	Alessio et al. 1968: 356
Wood	Lake dwelling	Post	Alessio et al. 1968: 356
Wood	Mine	Tool	Maggi and Vignolo 1989 (in press)
Wood	Mine	Tool	Maggi and Vignolo 1989 (in press)
Wood	Cemetery	MS113	Barfield 1983: 122
Charcoal	Open site		Felber 1974: 227
Human bones	Cave		Maggi 1989 (in press)
Human bones	Cave		Maggi 1989 (in press)
Charcoal	Open site	Layer 13	Barfield et al. 1977-79: 74
Charcoal	Open site	Area X	Bagolini 1989: 133
Charcoal	Open site		Biagi and Nisbet 1987: 16
Charcoal	Rock-shelter	Layer 10	Nisbet and Biagi 1987: 78
Charcoal	Rock-shelter	Layer 6	Nisbet and Biagi 1987: 78
Charcoal	Rock-shelter	Layer C5	Nisbet and Biagi 1987: 78
Charcoal	Cave		Nisbet and Biagi 1987: 78
Charcoal	Open site	Layer 8	Barfield et al. 1977-79: 74
Charcoal	Open site	Layer 8	Barfield et al. 1977-79: 74
Charcoal	Open site	Layer 6	Barfield et al. 1977-79: 74
Charcoal	Open site		Bermond Montanari et al. 1982: 106
Charcoal	Open site		Alessio et al. 1980: 1423
Charcoal	Open site		Alessio et al. 1980: 1423
Charcoal	Open site		Alessio et al. 1980: 1421
Human bones	Cave		Biagi 1989 (in press)

Figure 7

Distribution maps of the North Italian sites from which C14 dates were obtained. a) Late Mesolithic, b) Early Neolithic, c) Middle Neolithic, d) Late Neolithic, e) Chalcolithic, f) Bell Beaker Culture



also decorate the stele-statues of Lunigiana in eastern Liguria and are well known in the alpine megaliths of Sion, Dolmen MVI (Bocksberger 1976) and in the rock engravings of Valcamonica and Valtellina (Anati 1974). Early fourth millennium BP dates come from the Beaker sites of Monte Covolo, Rubiera and Sant'Ilario (Barfield 1987) as well as from the burial cave Cà dei Grii (Biagi 1989), while those from the Beaker levels of Arma di Nasino in Liguria and the megalithic complex of Aosta are not considered acceptable. Also during the Chalcolithic, the Trieste Karst was half way between the north Italian and Dalmatian and Danubian world. In many caves the Copper Age is marked by Vučedol decorated pottery and by Besenstrich and Baden type sherds (Leben 1967). Even though no C14 date is yet available for the Karst Chalcolithic, we know that the Vučedol Culture in Bosnia belongs to the end of the fifth

millennium BP, as reported by Quitta and Kohl (1969: 234), Bln-564:  $4125 \pm 80$  BP, 2890–2593 BC (Fig. 7).

The appearance of the Bronze Age in northern Italy is characterised by the Polada and its related cultures, whose radiocarbon dates are generally more recent than the Beaker ones (Barfield 1974).<sup>1</sup>

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*Dipartimento di Storia della  
Cultura Europea  
Università di Trento (Bagolini)*

*Dipartimento di Scienze Storico  
Archeologiche e Orientalistiche  
Università di Venezia (Biagi)*

#### NOTE

1. All the dates mentioned in this paper are in uncalibrated BP years and in calibrated BC ( $1\sigma$ ) years. Their presentation follows the Radiocarbon 1986 instructions (Stuiver and Reimer 1985). Apart from those mentioned in the text, a number of C14 dates are considered unacceptable to the present authors. They are: Fiorano (Bln-3137:  $5570 \pm 50$  BP, Quitta pers. comm. 1985), Vhò Campo Sera Mattina (Birm-1234:  $5570 \pm 200$  BP, Williams pers. comm. 1977), Arma dell'Aquila (Bln-3449:  $4030 \pm 70$  BP, Quitta pers. comm. 1986), Travo (Bernabò Brea *et al.* 1984: 76), La Vela (Shotton *et al.* 1970: 396), Rivaltella (Bagolini and Biagi 1986: 386), Fimon Molino Casarotto (Shotton *et al.* 1970: 397), Pertusello (Alessio *et al.* 1967: 348) and Civate (Alessio *et al.* 1976: 324).

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