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LYON NATURAL RADIOCARBON MEASUREMENTS X

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INTRODUCTION

This list includes most of the measurements made since the beginning of the compilation of our previous list (R, 1983, v 25, p 59–126), in 1982 and 1983, as well as some earlier measurements of extended geologic or archaeologic studies.

Three ml benzene samples were measured by the liquid scintillation process. When the amount of available carbon was too low, inactive benzene was added; dilution ratio (dr) is the amount of active benzene in the total 3ml. Pretreatment, treatment, and counting procedures remain as previously described (R, 1983, v 25, p 59).

Calculations followed international rules (^{14}C half-life = 5570 ± 0; age error is based on one standard deviation of contemporary standard, background, and sample counts). An isotopic fractionation correction is made only for bones (+80 yr). The published intervals of corrected dates for samples younger than 7250 BP are derived from Klein *et al* (1982) and appear under the BP date with an asterisk (*).

ACKNOWLEDGMENTS

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GEOLOGIC SAMPLES

Samples from Peat Bogs

Ly-2852. Coron, Belley, Ain — **630 ± 160** / **AD1200–1485*

Peat from base of small bog (45° 45′ N, 5° 31′ E), coll 1981 and subm 1982 by J P Bravard, Lab Geog, Univ Lyon III. *Comment* (JPB): as peat bog overlies settlement of Gallo-Roman period or High Middle ages, date proves that peat developed after several centuries and might correspond to "Little Ice Age."

Ly-2851. Le Grand Marais, Les Avenières, Isère — **1260 ± 170** / **AD570–1030*

Peat from base of bog in former bed of Rhône R (45° 36′ N, 5° 31′ E). Coll and subm 1983 by J P Bravard (0.7 dr). *Comment* (JPB): date agrees perfectly with expected age and results from Brégnier-Cordon and Cham-

pagneux (below). It confirms that development of bog began just after change in course of Rhône R which probably occurred during 6th century (Bravard, 1983).

2020 ± 120

Ly-2514. La Touvière, Massignieu de Rives, Ain **375BC–AD215*

Wood from lacustrine clay outcropping on side of Bart Lake (45° 46′ N, 5° 45′ E). Coll and subm 1981 by R Vilain, Lab Geol, Univ Lyon I. *Comment* (RV): date is much younger than expected and proves that wood was brought in by recent colluvia.

Marais de Landes series, Saint-Loup, Charente-Maritime

Samples from three levels of Boring P4 in marsh (46° 10′ N, 0° 38′ W). Coll and subm 1982 by M Mazeau, Fr Geophys Prospection Cie, Limoges.

General Comment (MM): dates show that peat development recently finished. Because clays ("Le Bri") embedding wood (Ly-2692) are of marine origin and may correspond to max of Flandrian transgression, Ly-2691 proves there was relatively long sedimentation hiatus before peat formation.

TABLE 1
Marais de Landes

Sample no.	Depth (m)	Sample	DR	Age BP	Corrected date interval
Ly-2690	0.0–0.1	"Surface" peat	1	640 ± 120	AD1235–1415
-2691	3.0–3.1	Basal peat	0.7	5130 ± 180	4395–3635BC
-2692	3.1–3.2	Wood from clay	0.7	8720 ± 210	

4960 ± 150

Ly-2999. Ichtratzheim, Bas-Rhin **4085–3380BC*

Peat with wood debris interbedded in alluvia of former bed of Ill R (48° 27′ N, 7° 41′ E). Coll and subm 1983 by A Schnitzler, Lab Bot, Univ Strasbourg. *Comment* (AS): date is much older than expected for N extension of Ill R bed, because of geomorphol and hist data; Ill R was assumed to have joined Rhine R much further S in Middle ages.

Marais de Brière series, Loire Atlantique

Samples from several levels in two borings drilled as part of PICG 158b "Lake and Sea environment" proj at Le Butteau-Piquet, near Saint-Lyphard (47° 23′ N, 2° 17′ W) and Penlys (47° 26′ N, 2° 14′ W) near La Chapelle des Marais. Coll and subm 1982 by L Visset, Lab Ecol, Univ Nantes.

General Comment (LV): all dates are a little older than expected. They confirm Sub-boreal age of dated level and regression from edges of former Brière gulf. They may be compared with two other unpub results from same peat bog: Ny-682: 4330 ± 75 in Errand I. (Visset, 1982) from level comparable to that from Le Butteau-Piquet (Ly-2903), and Ny-523: 4120 ± 90 in Canal des Fougères from fossilized tree trunk as Ly-2904.

TABLE 2
Marais de Brière

Sample no.	Boring	Level (cm)	Pollen phase	Sample	Expected age (BP)	Age (BP)	Corrected date interval (BC)
Ly-2906	Penlys	130–140	End of Sub-boreal	Peat and wood	ca3600	4440 ± 120	3480–2985
-2905	Penlys	142–148	Middle of Sub-boreal	Peaty clay	ca4150	4680 ± 110	3765–3160
-2904	Penlys	145	Middle of Sub-boreal	Fragment of tree trunk	ca4150	4710 ± 140	3795–3150
-2903	Butteau-Piquet	222–228	Beginning of Sub-boreal	Peaty clay	ca4300	5010 ± 130	4110–3395

Marais de Syl series, Lavau-sur-Loire, Loire Atlantique

Peat from four levels in boring at "Pré du Fauchais" in bog (47° 20′ N, 1° 56′ W). Coll and subm 1982 by D Voeltzel and L Visset.

General Comment (LV): all dates are much older than expected. They confirm that base of boring (Ly-2907) belongs to Atlantic and upper level (Ly-2910) dates to Sub-boreal. Discrepancies between results and palynol data and results from La Grande Brière peat bog (above) remain unexplained and need further confirmation from other borings.

TABLE 3
Marais de Syl

Sample no.	Level (m)	Pollen phase	Expected age (BP)	Age (BP)	Corrected date interval (BC)
Ly-2910	2–2.08	Sub-atlantic/ Sub-boreal limit	3000	4070 ± 130	3010–2305
-2909	4.42–4.52	Middle of Sub-boreal	4500	5680 ± 140	4920–4145
-2908	5.05–5.15	Beginning of Sub-boreal	5000	5840 ± 140	5185–4425
-2907	5.45–5.53	Sub-boreal/ Atlantic limit	5700	6010 ± 140	5265–4560

Le Marais series, Barrou, Indre-et-Loire

Wood from two depths of peaty levels of fill of former channel (46° 53′ N, 0° 44′ E). Some levels contain well-known Grand Pressigny flint artifacts manufactured locally and assoc with ceramics of Bronze or Neolithic age. Coll 1979 by "Les Amis du Grand Pressigny" Soc and subm 1980 by J Allain and J Despriée, Dir Antiquités Prehist Orléans.

Ly-2307. Le Marais F6 **7340 ± 100**

From upper level, 1.2 to 1.5m depth.

7010 ± 150

Ly-2308. Le Marais F8 **6340–5430BC*

From lower level, 2 to 2.3m depth.

General Comment (JD): dates are close in age and similar to those obtained for other peaty fills in region which were also formed during Atlantic period corresponding to Neolithic. They show that Bronze age remains are intrusive.

Le Pré Maudit series, Gathemo, Manche

Peat from several levels of N400 boring of bog (48° 45′ N, 1° 37′ W). Coll and subm 1983 by C Lechevalier and L Barthélémy, Lab Geog Phys, Univ Paris X, Nanterre; these samples complete previous series (R, 1983, v 25, p 64) (Lechevalier, 1983).

General Comment (CL): all results are within expected range and confirm previously dated series, particularly for beginning of site deposits. Ly-3014 suggests that Ly-2046: 9250 ± 180 may be a little too old due to local colluvia of gray clay deposited during Pre-boreal before peat development.

TABLE 4
Le Pré Maudit

Sample no.	Depth (cm)	Pollen phase and expected climatic phase	DR	Age (BP)	Corrected date interval (BC)
Ly-3012	317–326	VIIa: Atlantic	0.5	6580 ± 170	5825–5215
-3013	329–336	VIIa: Beginning of Atlantic	1	7110 ± 150	6465–5480
-3014	341–345	V: 1st part of Boreal	0.8	8560 ± 190	
-3015	350–358	IV: End of Pre-boreal	0.7	9120 ± 200	

Vallat-Neuf series, Berre l'Etang, Bouches-du-Rhône

Clay with low organic content from three levels of two borings in bog on N side of Etang de Berre gulf (43° 29′ N, 5° 13′ E). Coll 1981 and subm 1982 by H Triat-Laval, Lab Palynol, Univ Aix-Marseille III.

Ly-2685. Vallat-Neuf 180–190 **1770 ± 310**

From 180 to 190cm depth in D4 boring (0.07 dr). Pollen diagram shows Sub-atlantic phase during the extension of olive-tree (*Olea* sp) cultivation. *Comment* (HTL): date confirms that extension of olive cultivation occurred earlier in Provence region than in neighboring W Languedoc region where it was dated at Mauguio site, MC-1404: 1300 ± 60 (Planchais, 1982).

2090 ± 200

Ly-2686. Vallat-Neuf 200–205 **565BC–AD235*

From 200 to 205cm depth in D4 boring (0.3 dr). Pollen diagram shows beginning of continuous curve of *Olea*. *Comment* (HTL): date attributes

beginning of olive cultivation to Historic period following Protohistoric precultivation period (Triat-Laval, 1982).

Ly-2650. Vallat-Neuf 355–362 **7340 ± 270**

From 355 to 362cm depth near base of D3 boring. Pollen diagram suggests beginning of Atlantic climatic phase with thermophilic vegetation and extension of *Quercus* forest. *Comment* (HTL): date confirms expected age and agrees with previous data from W Provence, eg, at Mollègès (R, 1978, v 20, p 20) (Triat-Laval, 1979).

L'Alpe d'Huez series, Isère

Wood from two peaty outcroppings in ski sta (45° 6′ N, 6° 4′ E). Coll and subm by M Chardon, Lab Geog, Univ Grenoble.

3540 ± 160

Ly-2696. Alpes d'Huez, Le Rif **2305–1640BC*

From 1.5m depth in small bog near cablecar sta. Coll and subm 1981.

5090 ± 150

Ly-1967. Alpes d'Huez, Le Lynx **4315–3645BC*

From 0.8m depth at top of peaty and clayey layer in center of village. Coll and subm 1978.

General Comment (MC): both dates indicate that peat formation is relatively old. They also show presence of forest at alt, ca 1800 to 2000m in Les Rousses massif at end of Atlantic and beginning of Sub-boreal, *ie,* several hundred m higher than present timber line in region.

Bonnecombe series, Salces, Lozère

Peat from several levels of bog near Los Pesquio (44° 34′ N, 3° 8′ E). Coll 1980 and subm 1982 by J L de Beaulieu and M Reille, Lab Palynol, Univ Aix-Marseille III.

TABLE 5
Bonnecombe

Sample no.	Depth (cm)	Pollen event	Climatic phase	DR	Age (BP)	Corrected date interval
Ly-2558	20–30	*Fagus* decrease, presence of cereals	Sub-atlantic	0.7	2220 ± 210	775BC–AD205
-2559	105–112	Beginning of *Fagus*	End of Atlantic	0.7	5150 ± 210	4405–3645BC
-2560	200–210	Beginning of *Tilia*	Beginning of Atlantic	0.5	6910 ± 170	6215–5385BC
-2561	285–290	Beginning of *Corylus*	Pre-boreal	0.3	9500 ± 240	
-2562	300–307	*Betula*	Pre-boreal	0.2	9180 ± 290	
-2563	335–345		Pre-boreal	0.5	10240 ± 210	
-2564	355–360	*Pinus*	Beginning of Pre-boreal	0.2	10640 ± 300	

General Comment (JLdeB): except for Ly-2564, which is ca 1500 yr too old for unknown reason, all values are in expected range suggested by pollen diagram. They all agree with previously pub series from peat bog in region (de Beaulieu, Pons, & Reille, in press), eg, Ly-2560 is contemporaneous with Ly-2605: 6990 ± 160 from Brameloup and Ly-2112: 6880 ± 200 from Chaumette bogs.

Cheylane series, Laveissenet, Cantal

Peat from several levels of bog presently submerged in pond at alt 1040m on La Planèze de Saint-Flour plateau (45° 10′ N, 2° 53′ E). Coll 1979 and subm 1980 by J L de Beaulieu.

General Comment (JLdeB): almost all dates agree with expected ages, except Ly-2071, which, because of large statistical margin, is ca 800 yr too old; Ly-2072 is also ca 1000 yr too old for unknown reason. Ly-2068 indicates much older age than in other pollen diagram from region for extension of *Abies* (de Beaulieu, Pons, & Reille, in press).

TABLE 6
Cheylane

Sample no.	Depth (cm)	Pollen event	Climatic phase	DR	Age (BP)	Corrected date interval (BC)
Ly-2067	80–90	Extension of *Fagus*	Sub-boreal	0.7	4180 ± 160	3335–2410
-2068	130–140	Extension of *Abies*	Middle of Atlantic	1	5560 ± 170	4710–3960
-2069	170–180	Appearance of *Tilia*	Atlantic	0.8	6790 ± 190	6125–5270
-2070	220–230	Decrease of *Corylus*	Boreal	1	8220 ± 200	
-2071	250–260	Extension of *Corylus*	Pre-boreal	0.2	7870 ± 360	
-2108	260–270	Extension of *Corylus*	Pre-boreal	0.7	8930 ± 180	
-2109	280–290	Appearance of *Corylus*	Pre-boreal	0.2	9250 ± 350	
-2072	320–330	Appearance of *Betula*	Beginning of Alleröd	0.8	10440 ± 220	

Suc du Lac d'En Bas series, La Godivelle, Puy de Dôme

Gyttja with low organic content from three levels of bog at 1260m alt, Le Cézalier massif (45° 23′ N, 2° 55′ E). Coll and subm 1982 by M Reille and J L de Beaulieu. Samples dated to complete data from three previous borings from region (R, 1983, v 25, p 67).

TABLE 7
Suc du Lac d'En Bas

Sample no.	Depth (cm)	Expected climatic phase	DR	Age (BP)
Ly-2893	910–950	Pre-boreal	0.7	9850 ± 240
-2894	1060–1080 1100–1120	Late Dryas	0.5	10,140 ± 250
-2895	1200–1230	Alleröd	0.15	10,390 ± 560

General Comment (JLdeB): Ly-2893 is as expected. Ly-2894 comes from sec of boring which is too long, and Ly-2895 has too large a statistical margin; they look ca 500 and 1000 yr younger, respectively, compared to pollen data and unpub result from same boring at about same depths: 1025–1050cm: Gif-6216, 10,220 ± 200; 1080–1100cm: Gif-6217, 10,600 ± 200; and 1150–1180cm: Gif-6218, 11,200 ± 150 (de Beaulieu, Pons, & Reille, in press).

Dar Fatma series, Aïn Draham, N W Tunisia

Peat from six levels of boring in small bog at alt 910m in La Kroumirie massif (36° 46′ N, 8° 42′ E). Coll 1977 and subm 1980 by B Ben Tiba, Sylvo-Pastoral Inst, Tunis and M Reille.

General Comment (MR): previous series confirmed that last deforestation was consequence of Arabian invasion: Ly-1650: 700 ± 110 (R, 1979, v 21, p 413) (Ben Tiba, 1980). Ly-2570 shows that first deforestation occurred at end of Atlantic. All other dates are much older than expected and show that boring reached Recent Pleistocene fms which had almost been eroded before Holocene fm of bog. Ly-2238, even with finite age, belongs to Pleistocene series and appears younger due to roots having penetrated from Holocene series (Ben Tiba & Reille, 1982).

TABLE 8
Dar Fatma

Sample no.	Depth (cm)	DR	Age (BP)
Ly-2570	150–170	0.05	4630 ± 580
-2238	200–220	0.5	19,640 ± 530
-2569	225–250	0.5	≥ = 33,000
-2239	360–380	1	≥ = 28,200
-2241	380–400	1	≥ = 31,000
-2240	730–750	0.8	≥ = 33,700

Pompillon series, Lans en Vercors, Isère

Peat from ca 1.5m depth, in middle of lacustrine clayey sediments (45° 6′ N, 5° 28′ E). Coll and subm 1977 by G Monjuvent, Lab Geol, Univ Grenoble.

Ly-1658. Pompillon 6 $\geq 31{,}440 \begin{smallmatrix} +1890 \\ -1560 \end{smallmatrix}$

Ly-2052. Pompillon 6b $\geq 33{,}500 \begin{smallmatrix} +5200 \\ -3100 \end{smallmatrix}$

General Comment (GM): despite apparent contemporaneity, both dates are too young and must be considered as min. Pollen strongly suggests interglacial environment dating to Eemian or Rissian interglacial.

Les Echets series, Miribel, Ain

Clay with high organic content from exploratory borings (1, A, B, and F) and a wider core-boring (G), all drilled in glacio-lacustrine clay, deepest

TABLE 9
Les Echets

Sample no.	Boring	Depth (m)	DR	Age (BP)
Ly-2763	1	3.9–4	0.2	11,910 ± 350
-2764	1	5.5–5.6	0.3	12,190 ± 290
-1908	A	ca 6.5	1	16,250 ± 480
-1909	A	ca 14.5	1	18,560 ± 580
-1747	A	21.8–21.9	0.3	24,300 ± 1100
-1910	B	ca 9.1	1	$32{,}100\ ^{+\ 1100}_{-\ 2300}$
-1746	B	17–18	1	≥35,000
-2061	F	24.5–24.6	1	≥34,000
-2765	G	1.2–1.3	0.5	10,810 ± 230
-2063	G	2.9–3	1	15,050 ± 250
-2766	G	3.6–3.7	1	17,320 ± 250
-2767	G	4.05–4.15	0.5	15,260 ± 290
-3060	G	6.9–7.1	0.5	18,590 ± 410
-2062	G	11.7–11.8	1	17,530 ± 270
-2768	G	15.2–15.5	0.7	18,030 ± 250
-2221	G	20.2–20.3	0.7	20,050 ± 380
-2769	G	21.1–21.2	1	20,420 ± 380
-2770	G	22.1–22.2	0.8	21,120 ± 400
-2771	G	23–23.2	0.5	25,450 ± 550
-3061	G	23.7–23.8	0.4	21,760 ± 650
-2772	G	24.1–24.3	1	24,500 ± 500
-3062	G	25.5–25.6	0.8	≥33,700

sediments in a large bog (45° 53′ N, 4° 55 E). Ancient lake was inside innermost fold of external moraines of fluvio-glacial and glacial Würmian complex in Lyon region (Mandier, 1981). Coll from 1976 to 1979 and subm 1976 to 1983 by P Mandier, CNRS Assoc Lab No.260 and Lab Geog, Univ Lyon II, by G Monjuvent, by J L de Beaulieu and J Evin (Beaulieu *et al,* 1980).

General Comment (JLdeB & PM): eight preliminary results helped to determine best location for main core boring G, 56.6m deep, which sampled sediments from Late Rissian to Late Würmian, as demonstrated by palynol study of all levels (Beaulieu & Reille, 1984) and by ^{14}C dates of upper levels. Most dates for core G are in good strat sequence (fig 1) and suggest average sediment accumulation rate of ca 3m per millennium below 6m in middle part of lake during almost entire end of Late Würmian. Only Ly-2767, -3060, and -2771 are out of sequence. Infinite ages obtained from below 24.5m in boring G and neighboring boring F, and at base of boring B (Ly-1746, –2062, –3062) confirm pollen data that suggest markedly slower sediment accumulation rate and even hiatus just before 25,000 BP. Pollen results also suggest that 24.5m to 29m dates to Würmian II, and 29m to 34.5m, to Würmian I. Entire pollen diagram has been compared to that of La Grande Pile peat bog, NE France, previously studied by Woillard (1975) and dated by Groningen Lab.

Romandie series, Switzerland

Samples from palustrine and lacustrine sediments underlying moraines in Vaud and Fribourg dist. Coll 1979 to 1981 and subm 1980 and 1982 by R Arn, Lab Geol, Univ Lausanne.

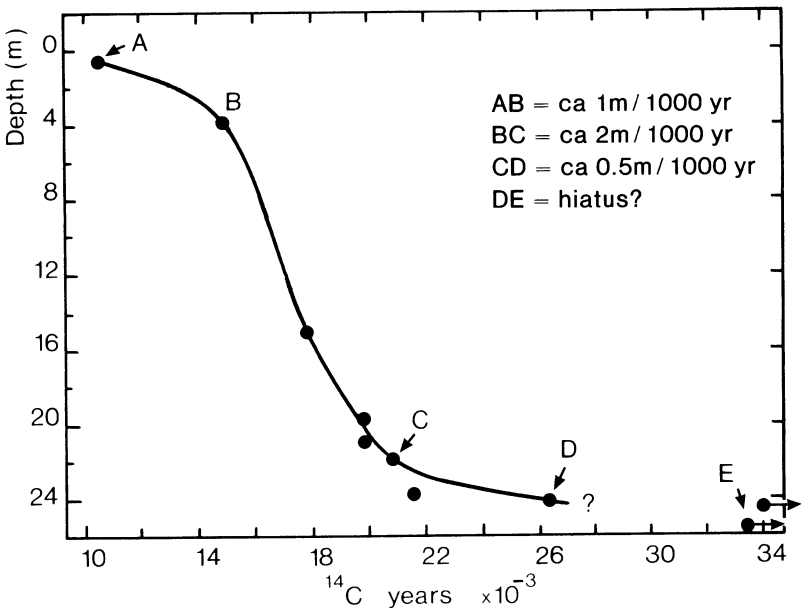

Fig 1. Sediment accumulation rate in boring G of Les Echets site

General Comment (RA): Ly-2580 fits previous measurement: Ly-751: 34,600 $^{+2700}_{-1800}$ from mammoth tusk in lower level of same site (R, 1975, v 17, p 12). The five other results agree with pollen analyses. Peat from Pont-la-Ville contains temperate forest flora attributed to Early Würmian while other sites contain flora of cold climate with many herbaceous plants, and may be attributed either to Middle Würmian or Early Würmian interstadial, Signal de Bougy particularly (Arn, 1981).

TABLE 10
Romandie

Sample no.	Site	Geog coordinates	Sample	Age (BP)
Ly-2059	Signal de Bougy, Vaud	(46° 29′ N, 6° 25′ E)	Peaty slime	≥32,000
-2060	Tartegnin, Vaud	(46° 28′ N, 6° 19′ E)	Peaty slime	≥34,000
-2215	Pont-la-Ville, Vaud	(46° 43′ N, 6° 06′ E)	Wood	≥36,000
-2216	Saumont-Derrière, Fribourg	(46° 31′ N, 6° 55′ E)	Wood	≥36,000
-2350	Senarclans, Vaud	(46° 36′ N, 6° 29′ E)	Peat	≥36,000
-2580	Bettens, Vaud	(46° 37′ N, 6° 35′ E)	Peat	25,090 ± 550

Samples from Caves

W Pyrénées series, Hautes pyrénées and Pyrénées Atlantique

Bones of large mammals from fill of several caves or pits. Subm 1982 by A Clot, Bordère sur Echez, as part of study on extinction of large mammals in Pyrénées massif at end of Würmian period.

TABLE 11
West Pyrénées mammals

Sample no.	Site, village, and dept	Geog coordinates	Collector and colln date	Fauna	DR	Age (BP) and corrected date interval (BC/AD)
Ly-2856	Grotte d'Oillascoa, Saint-Michel, Pyrénées-Atlantique	(43° 04′ N, 1° 14′ W)	Speleol group of Bayonne, 1976	*Ursus spelaeus*	1	18,720 ± 350
-2857	Grotte de l'Oeil du Nez, Rébénacq, Pyrénées-Atlantique	(43° 09′ N, 0° 03′ W)	P Robert, 1978	*Ursus spelaeus*	1	26,000 ± 500
-2858	Grotte de Couraü, Saint-Pé de Bigorre, Hautes Pyrénées	(43° 06′ N, 0° 09′ W)	P Robert, 1947	*Ursus spelaeus*	0.9	28,870 ± 700
-2859	Grotte de Couret, Ilhet, Hautes-Pyrénées	(42° 57′ N, 0° 06′ E)	A Clot, 1967	*Cervus elephas*	1	4230 ± 160 (3350–2425BC)
-2860	Grotte de Peyreignes, Tibiran-Jaunac, Hautes-Pyrénées	(43° 03′ N, 0° 33′ E)	V Ferrer, 1970	*Bison priscus*	1	14,470 ± 230
-2762	Grotte de Permayou, Accous, Pyrénées-Atlantique	(42° 56′ N, 0° 31′ W)	JP Besson & R Cabille, 1972	*Capra pyrenaica*	1	1520 ± 120 (AD240–690)
-2760	Gouffre PT 10, Osse en Aspe, Pyrénées Atlantique	(43° 00′ N, 0° 42′ W)	M Froissardet & H Laborde, 1978	*Capra pyrenaica*	1	5260 ± 120 (4405–3790BC)
-2761	Grotte des Arrats, Saint-Pé de Bigorre, Hautes Pyrénées	(43° 04′ N, 0° 06′ W)	A Clot, 1971	*Capra pyrenaica*	0.5	11,630 ± 280

General Comment (AC): three dates on *Ursus spelaeus* bones confirm that extinction of cave bear was more recent than previously thought, as Ly-2856 dates to end of Würmian III period. Ly-2860 suggests contemporaneity of dated fauna with Magdalenian settlement in neighboring Tiberan painted cave. Three dates on *Capra pyrenaica* show Pyrenean goat was present during entire Holocene (Clot & Evin, 1983).

Anthracology series, W Spain

Charcoal from three levels in fills of two caves; subm by JL Vernet, Lab Bot, Univ Montpellier as part of anthracol study.

Ly-2848. Cova Recambra, IVb **3850 ± 160** **2775–1930BC*

From Layer IVb, in cave near Gandia, Valencia prov (39° 0′ N, 0° 20′ W). Coll 1982 by J Apariocio-Perez (0.5 dr).

Ly-2849. Cova Recambra, VII **5790 ± 220** **5000–4020BC*

From Layer VII, in same cave as Ly-2848. Coll 1962 by E Grau-Almero (0.2 dr).

Ly-2850. Cova Ampla, II **6550 ± 180** **5820–5185BC*

From Layer II, in cave near Alicante, Alicante prov (38°, 23′ N, 0° 30′ W). Coll 1982 by E Barlal-Garcia.

General Comment (JLV): dates confirm data from anthracol analyses that indicate first human deforestation is relatively old, while Ly-2848 appears a little too young from archaeol data.

Ly-2313. Grotte de Bouxès, La Roque-Sainte-Marguerite, Aveyron **9330 ± 200**

Bones from clayey fill of cave (44° 8′ N, 3° 13′ E). Coll and subm 1981 by A Tavoso, Prehist Dept, Univ Marseille. *Comment* (AT): date is younger than expected because assoc cold-climate fauna suggests more Tardiglacial period than Pre-boreal age.

Ly-2614. Grotte du Bois du Cantet, Espèche, Hautes-Pyrénées **10,920 ± 160**

Bird bones from cave gallery (43° 3′ N, 0° 8′ E). Coll 1977 by A Clot, subm by A Clot and C Mourer-Chauviré, Geol Lab, Univ Lyon I. C Mourer-Chauviré attributes cave fill to Tardiglacial period by bird bones study. *Comment* (CM): date agrees with two previous measurements, Ly-1403: 13,370 ± 270 and Ly-1404: 13,060 ± 430 from two other areas of same cave (R, 1979, v 21, p 444) (Clot, 1934).

Ly-3001. Gouffre de Taille-Petit, Sainte-Orse, Dordogne **10,870 ± 330**

Bones from fill of small pit (45° 22′ N, 1° 4′ E). Coll 1982 by C Mourer-Chauviré and subm by M Philippe, Mus Hist Natl, Lyon. *Comment* (MP): date is youngest of all samples from caves and pits of karstic calcareous plateaus, called "Causses" in region (see Gramat and Martel Causse series, R, 1979, v 21, p 416–418) (Philippe, Mourer-Chauviré, & Evin, 1980).

Igue de Barrière series, Miers, Lot

Bones from fill in karstic network (44° 53′ N, 1° 42′ E). Coll 1981 and subm 1983 by M Philippe. Provenience of previously dated bone sample, Ly-1576: 19,940 ± 800 (R, 1979, v 21, p 417) seems doubtful and is probably result of mixing of bone fragments from three other loci in site.

Ly-3030. Igue de Barrière No. 3 **19,340 ± 1850**

From calcified dome at base of Pit 1 (0.1 dr).

Ly-3031. Igue de Barrière No. 1 **24,420 ± 560**

From same area as Ly-3030 (0.7 dr).

Ly-3002. Igue de Barrière No. 4 **27,290 ± 710**

From partially emptied ancient gallery.

Ly-3003. Igue de Barrière No. 5 **1070 ± 120** **AD 770–1190*

From recent gallery which is deepest.

General Comment (MP): large differences in dates and collagen contents indicate that fill of karstic network comprises very complex mix of numerous successive layers of deposits, removals, and redepositions sometimes affecting only oldest sediments, in downward direction (Philippe & Durand, 1984).

Ly-2811. Grotte de la Balme Rousse, Choranche, Isère 26,000 ± 1500

Bones (*Ursus spelaeus*) from Layer E3 at base of cave fill (45° 4′ N, 50° 24′ E). Coll and subm 1982 by P Bintz, Lab Geol, Univ Grenoble (0.2 dr). *Comment* (PB): date corresponds to Würmian III and confirms that *Ursus spelaeus* became extinct in Alpine massif as late as in Pyrénées massif (see West Pyrénées mammals series, above).

Jaurens series, Nespouls, Corrèze

Bones from each extremity of fossiliferous layer of cave fill (45° 2′ N, 1° 41′ E). Coll 1970 and subm 1978 by C Mourer-Chauviré.

Ly-1939. Jaurens, Sec 1 $29{,}700\ ^{+\ 1500}_{-\ 1300}$

From sec 1.

Ly-1938. Jaurens, Sec 20 $32{,}630\ ^{+\ 2900}_{-\ 2100}$

From sec 20.

General Comment (CM): dates are close and agree with two previous results from same site, Ly-359: 29,300 ± 1400 and Ly-892:30,350 $^{+3000}_{-1900}$ (R, 1976, v 18, p 66–67). All four values indicate cave fill is homogeneous and dates to beginning of Würmian III (Guérin, Philippe, & Vilain, 1979).

Ly-2697. Grotte des Camisards, Sumène, Gard ≥35,000

Bones (*Ursus spelaeus*) from top of fill of cave gallery (43° 58′ N, 3° 3′ E). Coll and subm 1981 by A Bonnet, Nîmes. *Comment* (AB): date is older than others for *Ursus spelaeus* bones from caves in area, eg, Grotte Latrone cave, Ly-1966: 29,600 ± 1100 (R, 1983, v 25, p 74) and La Baume Longue cave, Ly-2415: 26,500 ± 1000 (R, 1983, v 25, p 73).

Samples from Fluvial and Fluvio-Glacial Sediments

Ly-2527. Les Touches, Sinard, Isère **Modern $\delta^{14}C = 445 \pm 25‰$**

Stalks of *Equisetum* sp from glacio-lacustrine clay deposit corresponding to max advance of Würmian glacier in Le Trièv region near Grenoble (44° 56′ N, 5° 40° E). Coll and subm 1981 by G Monjuvent, Lab Geol, Univ Grenoble. *Comment* (GM): date shows that despite ancient appearance and depth of burial in sediments, *Equisetum* could have grown quickly in rather compact clays.

La Plaine series, Brégnier-Cordon, Ain

Wood from several levels of Rhône R sediments (45° 39′ N, 5° 36′ E). Coll and subm 1982 by J Evin and J P Bravard, Lab Geog, Univ Lyon III and 1983 (Ly-3051) by G Monjuvent.

Modern

Ly-3051. Brégnier-Cordon No. 4 $\delta^{14}C = -0.1 \pm 15.4‰$

Wood from underlying moraine, coll by boring (0.8 dr).

1050 ± 120

Ly-2777. Brégnier-Cordon No. 1 **AD780–1210*

Wood from fluviatile gravels.

1420 ± 140

Ly-2776. Brégnier-Cordon No. 2 **AD340–880*

Wood from S sec of site, overlying clays that underlay fluviatile gravels.

1660 ± 110

Ly-2775. Brégnier-Cordon No. 3 **AD70–585*

Wood from same level as Ly-2776, in N sec of site (0.7 dr).

General Comment (JPB): Ly-3051 shows this wood does not belong to geol fm. Ly-2776 and -2775 represent end of lacustrine sedimentation in valley which just precedes filling by gravel horizon, 10m deep deposited after sudden change in river course, historically dated to Early Middle ages (Bravard, 1983) agrees perfectly with Ly-2777.

2770 ± 120

Ly-3029. Pont de l'Hers, L'Union, Haute-Garonne **1235–785BC*

Fragment of oak trunk, buried ca 4m deep in Hers R alluvium (43° 39′ N, 1° 28′ E). Coll 1979 and subm 1983 by J C Revel, Lab Pédol, Univ Toulouse (0.8 dr). Assumed to be assoc with overlying Bronze age site (Gif-5499: 3660 ± 100, unpub). *Comment* (JCR): date is much younger than archaeol site and shows that river channel filling is complex, as only few m away, lowest level of fill is much more recent.

4770 ± 180

Ly-1853. Les Crés, Saint-Maurice l'Exil, Isère **3890–3070BC*

Wood from tree trunk found 3m deep in alluvium of small tributary of Rhône R, near Nuclear Power Plant at Saint-Alban-Saint-Maurice (45° 31′ N, 4° 45′ E). Coll and subm 1979 by M Délétie, Electricité France Soc, Paris. *Comment* (MD): date indicates Atlantic age for end of alluvial filling in tributary valley.

Livet series, Isère

Sample from La Romanche R alluvium in its middle valley (45° 6′ N, 5° 56′ E); subm 1982 by M Dubie, Electricité France Soc, Chambery.

590 ± 120

Ly-2648. Tranchée de Livet **AD1250–1430*

Charcoal from trench coll 1982.

Ly-2616. Sondage du Pont de Livet **7460 ± 230**

General Comment (MD): dates represent two stages of postglacial alluviation of valley. Ly-2616 indicates that large stone blocks found very deep in level may come from relatively recent collapse.

La Haute-Romanche series, Hautes-Alpes

Sample from two borings in high alt sediments drilled by hydroelectric equipment in high valley of Romanche R. Coll 1981 by Bachy Soc and subm 1982 by F Rosset, Electricité France Soc, Chambéry.

4870 ± 130

Ly-2854. Plan de l'Alpe, Villar d'Arène **3895–3365BC*

Wood, 9m depth, in Boring VPA-8201 at alt 1960m (45° 1′ N, 6° 22′ E).

5020 ± 140

Ly-2853. Lac de Goléon, La Grave **4100–3580BC*

Peat, 3.5m depth, in Boring VGO-8104 at alt 2440m (45° 5′ N, 6° 19′ E).

General Comment (FR): dates are in expected range, and represent end of Atlantic climatic phase. They prove that forest developed at much higher alt than present in this area, as well as in Alpe d'Huez area (above).

Les Isles series, Champagneux, Savoie

Sample from top and base of sandy formation underlying fluviatile gravels in stream channel of Rhône R (45° 38′ N, 5° 39′ E). Coll and subm 1982 by J P Bravard, Lab Geog, Univ Lyon III.

6330 ± 140

Ly-2778. Les Isles de Champagneux, Tourbe **5575–4965BC*

Water-rolled peat blocks from 10m depth directly overlying fluviatile gravels.

Ly-2779. Les Isles de Champagneux, Bois **8560 ± 190**

Fragment of tree trunk at 12m depth directly overlying glaciolacustrian sediments.

General Comment (JPB): Ly-2779 marks end of lacustrian filling of glacial valley of Rhône R; Ly-2778 marks beginning of fluviatile sedimentation.

Ly-3059. Saint-Marceau, Orléans, Loiret **7300 ± 140**

Wood from tree trunk at 6m depth from boring in alluvium of Loire R (47° 54′ N, 1° 52′ E). Coll and subm 1983 by Y M Allain, Service Espace Verts, Orléans. *Comment* (YMA): date indicates that alluvial substratum of area of Orléans, built several centuries ago, was deposited at beginning of Atlantic period.

Ly-3026. Moulin Tampon, Perreux, Loire **8430 ± 130**

Wood from central part of tree trunk found at ca 2.5m depth in alluvial plain of Loire R (46° 2′ N, 4° 5′ E). Coll 1981 and subm 1983 by M Vaginay, Dir Antiquités Hist Lyon. *Comment* (MV): date is of Boreal period, indicating relatively thick sedimentation in middle Loire valley since beginning of Holocene.

Ly-2981. Saint-Egrève, Isère **10,310 ± 170**

Wood, ca 20m depth, in Isère R alluvia (45° 15′ N, 5° 41′ E). Coll and subm 1983 by M Guimard, Electricité France Soc, Chambéry. *Comment* (MG): date indicates relatively thick alluviation in this valley from beginning of Holocene, coinciding with previous dates on this site, from similar samples, Sa-221: 7300 ± 350 and Sa-220: 9500 ± 400 (R, 1975, v 7, p 239)

Ly-2815. Allaman, Vaud, Switzerland **13,090 ± 160**

Bones (*Bos primigenius*) from terrace of Lake Leman at alt 400m (46° 28′ N, 6° 21′ E). Coll and subm 1982 by M Weidmann, Geol Mus, Lausanne. *Comment* (MW): date suggests Bölling period and confirms presence of this climatic phase in region (Arn, in press a).

Pugneux series, Bressoles, Ain

Vegetal debris from several levels of two sandy clay fms (45° 51′ N, 5° 6′ E). Coll and subm 1981 by R Vilain, Lab Geol, Univ Lyon I and J Evin. Lowest fm is terminal moraine of last Würmian glacier and uppermost fm is lacustrine deposited behind morain dam.

General Comment (RV & JE): Ly-2317 and -2994 confirm paleontol data from rodents and gasteropods, and paleobot data which attribute Miocene origin to vegetal debris redeposited by Würmian glacier in lower fm. Other results are in perfect strat agreement, indicating beginning of Würmian III period as min age for last retreat of Würmian glacier.

TABLE 12
Pugneux

Sample no.	Location in section	DR	Age (BP)
Ly-2997	Middle of upper fm	0.5	17,300 ± 510
-2996	10cm above base of upper fm	0.7	22,580 ± 500
-2995	10cm above base of upper fm	1	22,640 ± 600
-2993	Base of upper fm	0.7	23,440 ± 450
-2318	Base of upper fm	1	24,110 ± 900
-2994	Top of lower fm	1	≥35,000
-2317	Ca 10cm under top of lower fm	1	≥35,000

Ly-2525. Font du Renard, Bras d'Asse, Alpes de Haute Provence **32,300 ± 900**

Fragment of charred tree trunk, ca 4m depth, at base of brown paleosol in Asse R alluvia (43° 55′ N, 6° 17′ E). Coll 1980 and subm 1981 by M Dubar, Centre Recherche Archeol, Valbonne. *Comment* (MD): as sample

was assoc with flora and fauna of temperate climate, date, as expected, may correspond to Würmian II/III interstadial, and shows that overlying cryoclastic sediments were deposited at end of Late Würmian (Dubar, 1983).

Ly-2515. Montagnat, Ain **≥33,000**

Wood, 5m depth, from boring in La Vallière R alluvia (46° 4′ N, 5° 18′ E). Coll 1981 by G Vicherd, Dir Antiquités Hist, Lyon and subm by R Vilain. *Comment* (RV): date is much older than expected as overlying sediments seemed to be of Holocene origin. Thus, pronounced erosion must have occurred during early Quaternary.

Ly-2530. Armoy, Haute-Savoie **≥35,000**

Peat from alt 545m in Drance R valley (46° 21′ N, 6° 31′ E). Coll and subm 1981 by R Arn. *Comment* (RA): date agrees with palynol, which suggests older age for all underlying fms (Arn, in press b) previously attributed to Würmian (Brun, 1977). Other samples, Gif-491: ≥35,000 and Gif-739: ≥35,000 (R, 1969, v 11, p 331) come from neighboring site.

Samples from Various Continental Sediments

La Vieille Citerne series, Bonnevaux, Doubs

Charcoal from soil in dolina containing three levels rich in charcoal, separated by two levels of silts, 10cm thick (46° 50′ N, 6° 11′ E). Coll 1979 and subm 1980 by M Gaiffe, Lab Bot, Univ Besançon.

General Comment (MG): dates indicate filling rate of ca 30cm per millennium for bottom of dolina by material from erosion of neighboring soils (Gaiffe, 1983).

TABLE 13
La Vieille Citerne

Sample no.	Ref no.	Depth (cm)	DR	Age (BP)	^{14}C activity or corrected date interval (AD)
Ly-2362	1	8	0.7	Modern	$\delta^{14}C = -3 \pm 18‰$
-2363	2	30–35	1	Modern	$\delta^{14}C = +9 \pm 14‰$
-2258	3	38–40	0.2	1030 ± 190	620–1280

Vallon du Po series, Tiébelé, Haute-Volta

Black potsherds from 1 to 1.5m depth from top of alluvium of small valley (11° 14′ N, 1° 5′ W). Coll 1982 by M Mietton and subm 1982 by M Chardon, Lab Geog, Univ Grenoble (0.8 dr).

Ly-2802. P B F 1 **930 ± 200** **AD605–1420*

Ly-2803. P B F 3 **840 ± 150** **AD905–1345*

General Comment (MC): despite lack of data on origin of carbon contained in black potsherd (Evin, 1983), both dates agree and indicate alluvium is

recent, and erosion rate has been greater than sedimentation rate since 17th century.

3470 ± 210

Ly-2862. Uré, Ile des Pins, New Caledonia **2305–1410BC*

Bone debris (*Silviornis neocaledoniae*) and other vertebrates from corale breccia filling fossiliferous well in raised reef barrier of island in Kameruna Bay (22° 40′ S, 167° 25′ E). Coll 1980, extracted from breccia cement using formic acid leaching and subm 1983 by F Poplin, Mus Nat Hist Natl Paris. *Comment* (FP): date confirms hypothesis based on previous measurement of cement of breccia from same site, Ly-2105: 19,490 ± 330 (R, 1983, v 25, p 8); breccia should correlate ancient coral elements with very recent bone remains. It also proves *Silviornis* and other assoc animal sp have only recently become extinct, probably at time of human arrival on island (Poplin, Mourer-Chauviré, & Evin, 1983).

Baringo Lake series, Kenya

Clay with low organic content from cores in basal sediments of lake in Gregory rift (0° 36′ N, 36° 6′ E). Coll 1976 and 1978 and subm 1979 by J J Tiercelin, Lab Quaternary Geol, Univ Marseille.

Ly-1822. BAR 78-3, No. 1 **1740 ± 500**

From Levels 1 to 7, 0 to 20cm depth in BAR 78-3 Core (0.1 dr).

Ly-1823. BAR 78-3, No. 2 **920 ± 270**

From Levels 31 to 37, 90 to 112cm in BAR 78-3 Core (0.2 dr).

Ly-1850. 62002 **5330 ± 500**

From 0 to 22cm depth in 62002 Core (0.2 dr).

Ly-1758. 36016/36020 **2670 ± 570**

From 75 to 105cm depth in 36016 and 36020 Cores (0.1 dr).

General Comment (JJT): first three dates appear aberrant. Ly-1822 and -1823 have inverted values for top and base of same core; Ly-1850 seems much too old for upper part of core. This may be due to complex origin of organic component of sediment which may come in part from older soil horizons (Tiercelin *et al,* 1981). Ly-1758 is meaningless because of mixing of sediments from two cores with no strat relationship.

Bogoria Lake series, Kenya

Samples from base of bank sediments of lake in Gregory rift (0° 15′ N, 36° 3′ E). Coll 1977 by J J Tiercelin and R W Renaut, Queen Mary College, London, and subm 1979 by J J Tiercelin.

Ly-1820. BOG 77-83 No. 1 **3900 ± 410**

Clay with low organic content from Levels 1 to 6, 0 to 20cm depth, from BOG 77-83 Core (0.3 dr).

Ly-1821. BOG 77-83 No. 2 **3500 ± 390**

Clay with low organic content from Levels 17 to 22, 48 to 64cm depth, from BOG 77-83 Core (0.2 dr).

Ly-1819. BOG 77-94 **6290 ± 460**

Clay with low organic content from Levels 20 to 24, 59 to 73cm depth from 77-94 Core (0.3 dr).

Ly-1818. BOG 77-62 **6310 ± 440**

Clay with low organic content from Levels 28 to 32, 80 to 95cm depth from BOG 77-62 Core.

3730 ± 180

Ly-1981. Stromatolithe **2645–1700BC*

Stromatolithic calcareous crust from W side of lake at alt corresponding to former high level of lake.

Ly-1982. Shells **15,520 ± 420**

Shells (*Melanoïdes* sp) from W side of lake corresponding to former high level of lake.

General Comment (JJT): Ly-1981 and -1982 agree with expected ages and coincide with other results from identical samples (Young & Renaut, 1979; Tiercelin, 1981). Other measurements from organic clays give less reliable results: Ly-1820 and -1821 are in inverted order, although they come from top and base of same core, whereas Ly-1818 and -1819 give dates which appear much too old compared to levels from core.

Le Grand Etang series, La Réunion Island

Wood from two levels in S3 Boring (18° S, 55° E). Coll 1980 and subm 1981 by P Délétie, Electricité France Soc, Paris.

5650 ± 180

Ly-2368. Le Grand Etang A **4955–3975BC*

From 24m depth above level of volcanic scoria (0.8 dr).

5000 ± 290

Ly-2369. Le Grand Etang B **4955-3975BC*

From 26.8m depth under same volcanic scoria level as Ly-2368.

General Comment (PD): although both dates are very close, they are in inverted strat order. However, they date to ca 5200 BP with volcanic scoria level occurring between them; this level corresponds to eccentric eruption of La Fournaise volcano which agrees with other dates (Bachelery, 1981).

Ly-2809. Blirh, Caïda de Ksabi, Prov Missour, Morocco **8260 ± 180**

Clay with large amount of small charcoal fragments from lacustrine sediments from presently arid region (32° 51° N, 4° 13′ W). Coll 1982 by D Lefevre and subm 1982 by J P Raynal, Lab Quaternary Geol, Univ Bordeaux I. *Comment* (JPR & DL): as expected, date corresponds to beginning

of Holocene, relatively humid climatic period in N Africa. Date confirms another unpub date, SUA-2014: 9220 ± 110 taken from carbonaceous concretions at top of same geol level (Lefevre, 1985).

Izimane series, Hassi Bel Gebbour, Ouargla Willaya, Algeria

Samples from four levels of geol outcropping on slope of isolated mound (26° 45′ N, 6° 54′ E). Coll and subm 1981 (paleosol) and 1984 (calcareous) by A Bonnet, Nîmes.

Ly-3082. Calcaire du Sommet **4200 ± 190** **3360–2330BC*

Dolomitic limestone and gypsum from top of sec (0.6 dr).

Ly-2642. Sommet du Paléosol **6780 ± 140** **6055-5320BC*

Organic matter from upper part of black hydromorphic paleosol, middle part of sec.

Ly-2643. Base du Paléosol **8060 ± 140**

Organic matter from base of same paleosol of Ly-2642.

Ly-3083. Calcaire de la Base **9810 ± 250**

Dolomitic limestone and gypsum from base of sec (0.5 dr).

General Comment (AB): Ly-3082 agrees with expected age and marks end of sedimentation and beginning of present arid period. Ly-2642 perfectly agrees with two other dates from another black paleosol in Tichodaïne region, Ly-407: 6870 ± 150 (R, 1973, v 15, p 146) and Ly-2483: 6010 ± 160 (R, 1983, v 25, p 110). These three values date max of swamp vegetation in region which is now entirely desert. Ly-2643 marks beginning of humid period and confirmed by Ly-3083, which is assumed to come from lateral calcareous level equivalent to base of paleolsol and which may seem older due to influence of surrounding Mesozoic limestone (Roubet & Matheu, 1970).

Ly-3032. Amguid, Tamanrasset Willaya, Algeria **8370 ± 200**

Calcareous tufa from upper part of tufa level of ancient waterfall near Amguid (26° 26′ N, 5° 23′ E). Coll 1982 and subm 1983 by A Bonnet. *Comment* (AB): as waterfall probably flowed for last time during last Saharan Pluvial, date agrees perfectly with expected age of this humid climatic phase, and corresponds to base of Izimane series (above) as well as to another measurement from lacustrine limestone near Hirafok, Gif-325: 8380 ± 300 (Delibrias & Dutil, 1966).

Oued series, N Tunisia

Samples from alluvial sediments from valleys of three wadis. Coll 1977 (Ly-2897) and 1982 and subm 1982 by A Miossec, Lab Geog, Univ Nantes.

Ly-2899. Oued Hamman, Argoub Hassine, Nefza Dept **Modern**
$\delta^{14}C = +7.1 \pm 17.9‰$

Charcoal from base of alluvial cone (41° 14′ N, 7° 55′ E). *Comment* (AM): date shows charcoals do not belong to geol fm.

Ly-2900. Oued El Hamman, Ragoubet Tassera, Nefza Dept **5870 ± 320**
**5305–4140BC*

Gastropod shells from scree slope older than low terrace of wadi (41° 14′ N, 7° 54′ E) (0.2 dr). *Comment* (AM): date shows relatively late Holocene deposit of scree, but difference from Ly-2897 (below) does not seem significant.

Ly-2897. Djebel El Hara, Hedil region, Joumine Dept 8690 ± 280

Small gastropod shells from slope deposit in small wadi valley (41° 1′ N, 7° 89′ E). *Comment* (AM): date agrees with expected age as it shows that slope deposit took place at beginning of Holocene before this deposit of "Rhabian" terrace which is older than series of cones from Nefza region (Ly-2900, above).

Ly-2581. Cours Sablon, Clermont-Ferrand, Puy-de-Dôme ≥32,000

Sandy silts with high organic content from foundation of bldg in city (45° 47′ N, 3° 5′ E). Coll and subm 1981 by J P Daugas, Dir Antiquités Prehist Clermont-Ferrand, and J P Raynal. Level underlies pyroclastic volcanic sediments from the Clermont maar (ancient lake in crater of extinct volcano). *Comment* (JPD & JPR): as expected, result is infinite age because volcanic eruption surely occurred before Würmian period, as suggested by TL date by Clermont Lab: Cler-TL-23: 156,000 ± 17,000 before 1980 (Miallier, 1982).

Samples from Marine and Lagoonal Sediments

Ly-2896. Sondage DJ6, Ahémé lake, Bénin **Modern**
$\delta^{14}C = +8 \pm 18‰$

Shells from Level 6, 30cm depth, from boring in Aho R bank, between Lake Ahémé and sea (6° 19′ N, 1° 58′ E). Coll 1982 by M Oyédé, Univ Cotonou, and subm 1983 by J Lang, Lab Geol, Univ Dijon (0.5 dr). *Comment* (JL & MO): slightly older date was expected. This date shows change in sedimentation rate in N part of Lake Ahémé (Oyédé, 1983).

Bonthe Distric Coast series, Sierra Leone

Shells from top of offshore sand bar in coastal sites. Coll 1979 and 1980 by E Anthony and subm 1981 by P Michel Lab Geol, Univ Strasbourg.

General Comment (EA): dates of ca 2000 BP were expected because of previous measurements made by Gif Lab (Labeyrie & Delibrias, 1976). Dates show that samples come from kitchen middens of recent human settlements and have no relation to sea level change.

TABLE 14
Bonthe District

Sample no.	Site	Geog coordinates	Sample	DR	Age (BP)	Corrected date interval or ^{14}C activity
Ly-2484	Yoni	(7° 29′ N, 12° 30′ W)	*Anadara senelis*	0.7	690 ± 140	AD1190–1480
-2485	Tisana	(7° 35′ N, 12° 37′ W)	*Anadara senelis*	1	Modern	$\delta^{14}C = -15 \pm 18‰$
-2486	Jimaï	(7° 25′ N, 12° 30′ W)	*Anadara senelis*	0.8	Modern	$\delta^{14}C = +29 \pm 19‰$
-2487	Baki	(7° 35′ N, 13° 00′ W)	*Crasostrea gasar* Undetermined	0.7	Modern	$\delta^{14}C = +1 \pm 19‰$

Red Sea coast series, Sudan

Samples from Marsa Odudu (21° 3′ N, 37° 3′ E) and Aydhab (22° 20′ N, 36° 30′ E) on Red Sea coast. Coll and subm 1981 by R Dalongeville, Maison de l'Orient Méditérranéen, Univ Lyon II.

General Comment (RD): all results are very consistent with expected values (Dalongeville & Sanlaville, 1981) but Ly-2466 must be considered according to widest statistical margin.

TABLE 15
Sudan Coast

Sample no.	Site	Ref no.	Sample	DR	Expected age (centuries)	Age (BP)	Corrected date interval or ^{14}C activity
Ly-2465	Marsa Odudu	11	Corals	1	recent	Modern	$\delta^{14}C = +178 \pm 17‰$
-2466	Aydhab	24	Charcoal	0.15	9th–16th	Modern	$\delta^{14}C = +25 \pm 25‰$
-2467	Aydhab	25	Shells	1	9th–16th	790 ± 120	AD1040–1335
-2468	Aydhab	27	Shells	1	5th–10th	270 ± 110	AD1420–1950
-2469	Aydhab	28	Corals	0.6	Holocene	Modern	$\delta^{14}C = +170 \pm 23‰$
-2470	Aydhab	30	Charcoal	0.15	5th–15th	630 ± 200	AD1045–1610

Coast series, La Grande-Terre Island, Guadeloupe

Sample from continental sediments from boring at −5.4m under msl on W coast (Ly-2952) and from raised beaches at +2m and +3m on E

TABLE 16
La Grande Terre Island

Sample no.	Site	Geog coordinates	Ref no.	Sample	Age (BP)	Corrected date interval
Ly-2952	Belle Plaine, Les Abymes	(16° 18′ N, 61° 31′ W)	0	Peat	4010 ± 180	3020–2120BC
-2945	Pointe Gros Boeuf, Ste Anne	(16° 14′ N, 61° 18′ W)	1	Charcoal	2090 ± 120	395BC–AD195
-2947	Pointe Gros Boeuf, Ste Anne	(16° 14′ N, 61° 18′ W)	3	Coral	2480 ± 160	865BC–260BC
-2949	Pointe Gros Boeuf, Ste Anne	(16° 14′ N, 61° 18′ W)	5	Shells	3920 ± 200	2905–1950BC
-2950	Pointe Gros Boeuf, Ste Anne	(16° 14′ N, 61° 18′ W)	6	Beach rock	2650 ± 100	1040–595BC
-2946	Plage Gros Boeuf, St François	(16° 14′ N, 61° 17′ W)	2	Coral	3080 ± 160	1685–910BC
-2948	Porte d'Enfer, Le Moule	(16° 19′ N, 61° 18′ W)	4	Shells	1000 ± 120	AD870–1230
-2953	Baie du Moule, Le Moule	(16° 20′ N, 61° 21′ W)	9	Coral	27,600 ± 650	

coast. Coll and subm 1982 by A Assor and A Klingebiel, Lab Geol, Univ Bordeaux.

General Comment (AK): dates confirm shifting of La Grande Terre I. due to westward movement downward and eastward rising along axis, La Plaine des Abymes-Grand Culs de Sac-Pointe du Château.

Carribee Sea coast series, Colombia

Sample from marine sediments outcropping several m above present msl in Cartagen Bay. Coll 1979 and subm 1981 by T Burel, Lab Geol, Univ Bordeaux I.

General Comment (TB): dates agree with two previous measurements, from Tierrabomba I. (unpub), 2850 ± 150 (Richards & Broecker, 1963), and from Cienaga Honda, S part of Catagena Bay, Gif-5038: 2700 ± 90 (Burel, Klingebiel, & Vernette, 1982). They confirm contemporaneity of deposits of shell conglomerates and building of coral reef during rise in sea level at ca 3000 BP.

TABLE 17
Carribee Sea coast

Sample no.	Site	Ref no.	Geog coordinates	Sample	Age (BP)	Corrected date interval
Ly-2477	Tierrabomba I.	24 bis	(10° 24′ N, 75° 35′ W)	Shell	1930 ± 120	165BC–AD240
-2479	Tierrabomba I.	30	(10° 24′ N, 75° 33′ W)	Coral	2670 ± 120	AD65–585
-2481	Tierrabomba I.	79TB21	(10° 24′ N, 75° 35′ W)	Coral	3690 ± 160	2530–1735BC
-2478	Escuela Naval	333	(10° 25′ N, 75° 30′ W)	Coral	2470 ± 120	810–395BC
-2480	Manzanillo	140	(10° 31′ N, 75° 40′ W)	Shell	1450 ± 130	AD250–865
-2482	Tesoro I.	131	(10° 18′ N, 75° 40′ W)	Coral	1780 ± 120	AD15–440

2170 ± 210

Ly-2633. Moulay Bou Salham, Kénitra Prov, Morocco **760BC–AD215*

Shells from 30 to 35cm depth from boring in sediments of dessicating lagoon (34° 50′ N, 6° 13′ W). Coll 1978 and subm 1982 by C Carruesco, Lab Geol, Univ Bordeaux I. *Comment* (CC): date agrees with Gif-4542: 3490 ± 100 (unpub) from underlying level, 59 to 64cm depth, of same site and marks end of Mellahian transgression, also dated in Oualidia lagoon (below) (Bidet & Carruesco, 1980)

Oualidia series, El Jalida Prov, Morocco

Shell debris from borings in dessicating lagoon (32° 45′ N, 9° 0′ W). Samples come from transgressional marine sediments underlying lagoon sediments. Coll 1977 and subm 1978 by C Carruesco.

TABLE 18
Oualidia

Sample no.	Boring no.	Depth (cm)	DR	Age (BP)	Corrected date interval
Ly-2627	77008	30–35	0.07	4880 ± 490	4325–3035
-2628	77013	50–55	1	2120 ± 130	415BC–AD210
-2629	77014	60–75	1	3840 ± 130	1770–1940BC
-2630	77016	50–55	1	3320 ± 130	1965–1360BC
-2631	77018	80–85	0.25	3330 ± 240	2110–1145BC
-2632	77019	base	0.8	6420 ± 190	5915–4995BC

General Comment (CC): dates mark beginning and max of Mellahian transgression in region, also called Flandrian or Nouakchottian, often dated in Mauritania (Ortlieb, 1980).

Ly-2615. Tin Ouéich, Mauritania **4520 ± 130** **3545–2900BC*

Shells (*Cerastoderma edule*) from lagoonal clayey sand level (18° 4′ N, 15° 49′ W). Coll and subm 1982 by D Carité, Nouakchott. Sample was dated to confirm geol interpretation of site previously based on dates: Ly-2160: $35{,}000\ ^{+\ 1900}_{-\ 1600}$ and Ly-2189: 29,900 ± 600 (R, 1983, v 25, p 64). *Comment* (DC): date corresponding to max of Nouakchottian transgression shows that level dated to Inchirian was later cut by channel before Nouakchottian transgression, which deposited sediment with same facies as Inchirian (Carité, 1983).

Sea coast series, Bahraïn

Samples from two coastal archaeol sites, Ras Hayyan (26° 2′ N, 50° 38′ E) and Qalaat el Bahraïn (26° 14′ N, 50° 31′ E). Coll and subm 1982 by P Sanlaville, Maison Orient Méditérranéen, Univ Lyon II, and R Paskoff, Univ Tunis, during study of sea level changes and human settlements on coast.

General Comment (PS): at Qalaat, except for Ly-2868, which was probably redeposited older material, all dates suggest evolution of sea shore occurred as expected from results of strat study of archaeol sites and agree with most Birmingham dates from same site (Doornkamp, Brunsden, & Jones, 1980). At Ras Hayyen, Ly-2872 fits better with expected value than 4 Birmingham dates, ca 7000 to 6000 BP.

TABLE 19
Bahraïn Sea coast

Sample no.	Site	Sample	Alt (cm)	Age (BP)	Corrected date interval (BC)
Ly-2871	Qalaat	Shells	−80	3430 ± 120	2030–1520
-2870	Qalaat	Shells	+35–15	3260 ± 160	1885–1260
-2869	Qalaat	Shells	+65–35	3030 ± 120	1550–915
-2868	Qalaat	*Vermitidae* crust	+50–100	5960 ± 140	5240–4450
-2867	Qalaat	*Vermitidae* crust	+50–100	4350 ± 160	3470–2650
-2872	Ras Hayyan	Shells	+200	5070 ± 160	4135–3640

Sidi Salhem formation series, Gabès gulf, S Tunisia

Mollusk shells from shelly sands in Sidi-Salhem sandstone dunes, in Jerba I. region. Coll and subm 1982 by R Paskoff and P Sanlaville.

4210 ± 250

Ly-2617. Borj Gourine **3430–2275BC*

Shells (*Helix* sp) from Gourine ancient Borj (33° 39′ N, 10° 56′ E) (0.7 dr).

6890 ± 390

Ly-2618. Borj Gastil **6550–5220BC*

Shells (*Helix* sp, *Lucina* sp) from S coast of Jerba I. (33° 42′ N, 10° 56′ E) (0.15 dr).

General Comment (PS): both dates attribute Holocene age to Sidi-Salhem sandstone, previously assumed to be marine deposit from Middle Würmian (Paskoff & Sanlaville, 1983). They agree with other unpub results from Monaco lab.

Ly-2873. Sidi Fredj, Kerkennah I., S Tunisia 17,850 ± 430

Shells (*Helix* sp) from red sandy silt outcropping on beach in Cherguia I. (39° 49′ N, 11° 8′ E). Coll 1981 and subm 1983 by P Sanlaville and R Paskoff. *Comment* (PS): silts were attributed to Holocene because of presence of Neolithic potsherds. However, date shows they are redeposited Würmian silts. Other measurements showing importance of neotectonics in site were pub previously (R, 1983, v 25, p 83).

Le Tlêt formation series, Gabès gulf, S Tunisia

Samples from Tlêt shelly sandstone outcropping forming slope deposit on sea shore. Coll and subm 1982 by R Paskoff and P Sanlaville.

Ly-2644. Oued Fahmine 20,690 ± 360

Shells of various sp from S shore of Jerba I. (33° 43′ N, 10° 51′ E).

Ly-2645. Guellala and Oued Ogla 23,090 ± 560

Small fragments of ostrich eggs from two sampling areas in Tlêt sandstone, near wadi Ogla R valley on Zarzis peninsula (33° 34′ N, 10° 55′ E) (0.5 dr).

General Comment (PS): agreement of these dates confirms that ostrich eggs may be used as dating material, even in old sediments (Evin, 1983). Although both dates seem ca 2 or 3 milliennia too young, they prove Tlêt fm is not Tyrrenian (ca 85,000 BP), but is rather Würmian, ca 27,000 BP in Gabès gulf region.

Coastal Crete and Naxos I. series, Greece

Samples from S shore of Crete I. at Preveli near Ayla Galini (35° 8′ N, 24° 40′ E), at Akrotiri, near Khania (35° 8′ N, 24° 3′ E), from N shore of Crete I. at Aghia Barbara, near Mallia (35° 16′ N, 25° 30′ E), and from N shore of Naxos I. at Palati cave near Naxos (37° 6′ N, 25° 22′ E). Coll and subm by R Dalongeville, during study of shoreline variation.

General Comment (RD): large age differences are due to variations in influence of neotectonics at different points along shoreline. Thus, Ly-

TABLE 20
Crete and Naxos Islands

Sample no.	Site	Ref no.	Sample	DR	Expected age	Age (BP)	Corrected date interval
Ly-2471	Preveli		*Vermetidae*	1	5th century AD	2320 ± 160	785–45BC
-2472	Aghia Barbara	1	*Vermetidae*	1	ca 1600 BC	1420 ± 120	AD435–785
-2473	Aghia Barbara	2	*Vermetidae*	0.8	ca 1600 BC	22,840 ± 450	
-2474	Aghia Barbara	3	*Vermetidae*	0.8	Holocene	25,530 ± 440	
-2475	Grotta Palati	1	*Cardium* shells	1	2800 BC	5560 ± 160	4710–3960BC
-2476	Akrotiri		*Vermetidae*	1	3000 BC	11,570 ± 170	

2473 and -2474 show some sediments were formed during transgression prior to Flandrian.

N W Mediterranean Sea series

Calcium carbonate from marine sediments from cores from Rhône R delta to W shore of Corsica. Coll 1981 by M Fernex, Lab Marine Geol, Villefranche-sur-Mer, and subm by L Blanc, Lab Quaternary Geol, Univ Marseille and MT Morzadec, Lab Geol, Univ Rennes. All measurements were made on total carbonate fraction even where detritic elements might have been present, as in previous study on Pelagian Sea (Burollet & Winnock, 1979).

General Comment (LB & MTM): for Cores KS3030, MKS7, and KSPF, there seems to be agreement between dates and data from other analytical methods, such as sedimentol, palynol, and *Dinoflagellae* studies, even for samples with possible detritic carbonates. Only Ly-2491 seems too recent for unknown reasons. Results from Cores MKS1 and BRK were not able to be interpreted.

TABLE 21
NW Mediterranean Sea

Sample no.	Core	Geog coordinates	Depth (cm)	DR	Age (BP)
Ly-2493	MKS 1	(42° 59′ N, 5° 12′ E)	44–54	0.5	13,450 ± 290
-2547	MKS 7	(42° 51′ N, 5° 04′ E)	10–20	0.7	14,260 ± 260
-2548	MKS 7	(42° 51′ N, 5° 04′ E)	105–110	1	26,420 ± 550
-2549	MKS 7	(42° 51′ N, 5° 04′ E)	195–205	1	29,730 ± 750
-2545	KSPF 80-04	(42° 21′ N, 4° 55′ E)	90–97	0.7	11,080 ± 220
-2546	KSPF 80-04	(42° 21′ N, 4° 55′ E)	130–142	0.7	21,230 ± 430
-2543	KSPF 79-02	(42° 01′ N, 5° 13′ E)	30–40	0.6	10,760 ± 240
-2544	KSPF 79-02	(42° 01′ N, 5° 13′ E)	65–75	0.8	23,180 ± 470
-2489	K 30-30	(41° 49′ N, 8° 24′ E)	10–20	1	15,720 ± 300
-2490	K 30-30	(41° 49′ N, 8° 24′ E)	29–39	0.8	31,300 ± 1200
-2557	K 30-30	(41° 49′ N, 8° 24′ E)	50–60	0.3	≥34,600
-2491	K 30-30	(41° 49′ N, 8° 24′ E)	60–70	1	31,700 ± 1000
-2492	K 30-30	(41° 49′ N, 8° 24′ E)	130–140	1	≥37,000
-2556	BRK	Undetermined		0.5	16,560 ± 330

Ly-2951. Le Marin, Martinique 29,000 ± 720

Coral outcrops at several m above msl in Le Marin Bay (14° 28′ N, 60° 53′ W). Coll 1982 by A Klingebiel and R Assor and subm 1983 by C

Carruesco. *Comment* (CC): date is older than expected, and indicates local neotectonic influence.

Ly-2898. Sidi El Fallagui, Bizerte Dept, N Tunisia ≥31,000

Marine or lagoonal shells from sandy marl and clayey horizon, outcropping at alt ca 60m, 3km from shore (41° 45′ N, 9° 40′ E). Coll and subm 1982 by A Miossec, Lab Geog, Univ Nantes (0.3 dr). *Comment* (AM): date indicates sediments date from at least Tyrrenian transgression; alts show that tectonic deformation has been marked since this period (Miossec, 1977).

ARCHAEOLOGIC SAMPLES

Historic Period

France

Modern

Ly-2998. Le Parc, Gournay sur Aronde, Oise $\delta^{14}C = -8 \pm 12‰$

Ribs of large horse found in pit in Gallic sanctuary (49° 29′ N, 2′ 40° E). Coll 1980 by JL Brunaux and P Méniel; subm 1983 by P Méniel and F Poplin, Mus Hist Nat Paris. Sample subm to determine horse's origin. Archaeol data suggest horse belonged to Gallic level (Brunaux, Méniel, & Rapin, 1980); osteol data (mainly large size) favors 19th century. *Comment* (FP): date confirms later hypothesis, *ie,* bone is probably from horse of one of Franco-German wars.

Bayeux tapestry series, Bayeux, Calvados

Linen thread from back of Bayeux tapestry from Bayeux Mus (49° 17′ N, 0° 42° W). Coll 1982 and subm 1983 by F Macé de Lépinay, Hist Monuments Dept, Paris, as part of study of known Medieval "Queen Matilda tapestry" which is actually wool embroidered on linen.

390 ± 120

Ly-3047. Fragment de doublure **AD1385–1635*

Threads from piece of lining added during repair (0.7 dr). Corrected date interval from Stuiver (1982): *AD1300 to 1660.

260 ± 90

Ly-3048. Fil de bagage **AD1425–1950*

Threads from attached lining of tapestry. Stuiver corrected date interval: *AD1420 to 1950.

General Comment (FM de L): as expected, study of threads and linen both confirm that repairs occurred long after embroidery (very well-dated to end of 11th century). Large date range obtained after applying both types of correction intervals does not exclude extreme end of Middle Ages as date of weaving of lining, nor 19th century for its final repair.

Dognon series, Le Châtenet en Dognon, Haute-Vienne

Charcoal from two levels in former bldg near Pont du Dognon (45° 56′ N, 1° 30′ E). Coll 1982 by G Cantié and subm by JM Desbordes, Dir Antiquités prehist, Limoges.

Ly-3145. Le Dognon, JI-1/2 — **770 ± 100** **AD 1050–1345*

Sample from pit, subm 1984.

Ly-3004. Le Dognon, KI-1 — **790 ± 100** **AD 1040–1335*

Sample from hearth, subm 1983.

Ly-3005. Le Dognon, SI-1 — **960 ± 120** **AD 885–1245*

Sample from silo, subm 1983.

General Comment (JMD): dates are within same statistical margins; indicating 11th century, *ie,* beginning of date range (11th–15th centuries) expected according to typology of assoc ceramics (Cantié, in press).

Ly-2438. Le Moléron-Sablons, Décines, Rhône — **680 ± 130** **AD 1140–1420*

Charcoal from habitation level at base of feudal mound (45° 47′ N, 4° 59′ E). Coll and subm 1981 by G Marien and JM Monnier, Meyzieu. *Comment* (JM): date is a little younger than that suggested by 10th century coins in same level.

Coyroux series, Aubazine, Corrèze

Charcoal from two superimposed levels in terrace built as basement of Cistercian abbey (Barrière, 1983) (45° 10′ N, 1° 40′ E). Coll 1981 and subm 1983 by JM Desbordes.

Ly-3006. Coyroux-Aubazine, M-18 — **780 ± 170** **AD 935–1405*

From upper level (0.3 dr).

Ly-3007. Coyroux-Aubazine, H-17 — **1100 ± 100** **AD 655–1150*

From lower level.

General Comment (JMC): Ly-3007 agrees with period of abbey's expansion (12th century). Ly-3006 shows relatively old date for beginning of terrace construction.

Ly-2554. Carrière de Beaulieu, Bardouville, Seine Maritime — **820 ± 120** **AD 1030–1325*

Human bones from sand quarry near Late Neolithic collective sepulture (Graindor, 1966) (49° 26° N, 0° 51′ E). Coll and subm 1981 by G Ver-

ron, Dir Antiquités Prehist, Caen. *Comment* (GV): date shows inhumation occurred long after sand was deposited and neighboring Neolithic burials took place; latter were previously dated, Ly-2348: 4550 ± 130 (R, 1983, v 25, p 101).

Ly-2665. Le-Haut-du-Château, Aingeray, Meurthe et Moselle **990 ± 120** **AD875–1235*

Charcoal from Layer C, lowest level of test excavation in fill of barred-spur (48° 45′ N, 6° 0′ E). Coll 1981 and subm 1982 by A Lieger, Toul. *Comment* (AL): two dates were expected, according to ancient texts and structure of fortification—either Late Bronze age or end of Gallo-Roman period. Date represents much later occupation.

La Folie series, Meunes, Loir et Cher

Charcoal from lime plaster kiln of primitive type found in sandy alluvia of Le Cher R (47° 15′ N, 1° 28′ E). Coll 1981 and subm 1982 by J Despriée, Dir Antiquités Prehist, Orléans. No assoc industry.

Ly-2702. La Folie P4 **1030 ± 150** **AD655–1250*

Ly-2703. La Folie P5 **820 ± 150** **AD910–1385*

General Comment (JD): primitive nature of kiln suggested relatively old age, eg, contemporaneous with neighboring sites of "Les Champs d'Urnes" period (Late Bronze age). Date shows kiln is Medieval.

Ly-3008. Champmain, Saint-Léonard de Noblat Haute-Vienne **1190 ± 150** **AD595–1055*

Charcoal from tomb (45° 50′ N, 1° 29′ E). Coll 1981 by M Tandeau de Marsac and subm 1982 by JM Desbordes; assoc with less characteristic Medieval ceramics (Tandeau de Marsac, 1982). *Comment* (JMD): date shows assoc potsherds are Carolingian in age.

Colletière series, Charavines, Isère

Samples from Layer II of Paladru Lake sediments, in area of submerged village site (45° 25′ N, 5° 30′ E). Coll 1977 and subm 1979 by M Collardelle, Archaeol Hist Mus, Grenoble. Coins found on site as well as typol of assoc material and hist evidence indicate settlement of village occurred during 11th century (Collardelle, 1980).

Ly-1869. Colletière, charcoal **1240 ± 140** **AD570–1030*

Ly-1870. Colletière, bark **1200 ± 150** **AD590–1050*

900 ± 110

Ly-1959. Colletière, seeds **AD910–1270*

General Comment (MC): only Ly-1959 agrees exactly with hist age; Ly-1870 and -1869 remain unexplained, as they do not fit dendrochronol data indicating more recent date for wood at site (ca 9th or 11th century). However, this deviation is reduced with corrected dates (Evin & Olive, in press).

La Dent series, Meyzieu, Rhône

Human bones from several graves in cemetery (45° 47′ N, 5° 0′ E). Coll 1979 and subm 1980 and 1981 by J Monnier.

General Comment (JM): although 1st 3 graves were superimposed, all dates except Ly-2330 are very close, suggesting relatively short period for all burials in necropolis, corresponding to "Burgonde" period, or beginning of High Middle Ages, as had been expected from osteol of skeletons.

TABLE 22
La Dent

Sample no.	Ref no.	DR	Age (BP)	Corrected date interval (AD)
Ly-2229	T 37A	1	1480 ± 90	350–650
-2230	T 37B	1	1480 ± 90	350–650
-2231	T 37C	1	1330 ± 110	570–885
-2669	T 43	0.7	1370 ± 150	415–895
-2670	T 7	1	1290 ± 140	465–1015

Cemeteries series, Tours, Indre et Loire

Human bones from several graves in two cemeteries (47° 22′ N, 0° 40′ E) coll 1981 by Lab Archéol Urbaine and subm 1981 by H Galinié, Tours.

General Comment (HG): dates are within same statistical margin and differences in dr of all samples reflect variation in preservation of organic matter in open-air sites. As expected (Galinié & Thureau, 1976), both graves from Saint-Pierre le Puellier cemetery are dated to end of Middle Ages. However, according to archaeol data, which attributes them to 11th or 12th centuries, Ly-2659 is too young by ca 200 yr, and Ly-2660 fits only if its large

TABLE 23
Tours cemeteries

Sample no.	Site	Ref no.	DR	Age (BP)	Corrected interval date (AD)
Ly-2659	St Pierre le Puellier	1-S-269	1	640 ± 100	1235–1415
-2660	St Pierre le Puellier	1-S-372	0.1	720 ± 220	920–1480
-2661	Rue des Ursulines	6-S-2	1	1570 ± 130	160–630
-2662	Rue des Ursulines	6-S-8	1	1540 ± 150	225–750

statistical margin is considered. Both dates from La Rue des Ursulines cemetery are within expected range (4th to 8th centuries). Archaeol evidence attributes Ly-2661 to 4th or 5th century and Ly-2662 was assumed to be from 6th to 8th centuries.

Ly-3039. Maison-Rouge, Marvejols, Lozère **1460 ± 100** **AD400–755*

Human bones from Grave 15 of cemetery (44° 33′ N, 3° 19′ E). Coll 1982 and subm 1983 by J Thomas-Beeching, Marvejols. *Comment* (JTB): date agrees with expected age based on Merovingian style (beginning of Middle Ages) of tombs in region.

Ly-2855. Village d'Agos, Agos-et-Vildalos, Hautes-Pyrénées **1450 ± 160** **AD250–865*

Bones of domestic animals from hearth revealed by excavations near cemetery from High Middle Ages (43° 2′ N, 0° 4′ W). Coll 1981 by R Vié and subm 1982 by A Clot, Bordères/Echez (0.7 dr). *Comment* (AC): date shows that hearth could not have been part of cemetery (Coquerel & Pousthamis, 1977) although it is later than expected from assoc rare Roman tiles (*Tegulae*) (Vié, Koutnetzoff, & Clott, 1983).

Albigny-Condion series, Seyssel, Haute-Savoie

Human bones from several graves in necropolis surrounding funerary basilica (47° 57′ N, 5° 50′ E). Coll 1980 and subm 1982 by B Bizot, Dir Antiquités Hist, Lyon, and J Serralongue, Centre Archéol Annecy.

Ly-2866. Sepulture S-50 **1080 ± 130** **AD645–1200*

From SE part of necropolis (0.8 dr). Expected age: 7th century.

Ly-2865. Sepulture S-89 **1390 ± 90** **AD445–855*

From outside and near W wall of basilica. Expected age: 6th to 9th centuries.

Ly-2864. Sepulture S-90 **1420 ± 120** **AD390–820*

From inside and near N gate of basilica. Expected age: 5th to 7th centuries.

Ly-2863. Sepulture S-48 **1720 ± 130** **AD20–590*

From small necropolis ca 50m from basilica (0.7 dr). Expected age: 3rd to 5th centuries.

General Comment (BB & JS): all dates are in expected range from assoc archaeol material (Bizot & Serralongue, in press). They confirm long use of site and much older age of small adjacent necropolis (Ly-2863).

Ly-2955. Sainte-Colombe le Vieux, Sainte-Colombe, Rhône **1730 ± 150** **1BC–AD584*

Human bones from Grave no. 9 of cemetery (45° 31′ N, 4° 50′ E). Coll 1981 by B Hély and subm 1983 by A Cogoluènhes, Lab Geol, Univ Lyon I (0.7 dr). Necropolis is near Gallo-Roman city, Saint-Romain-en-Gal, former quarter of Vienne. *Comment* (AC): date confirms that necropolis belonged to Gallo-Roman site, despite lack of assoc archaeol material.

La Place series, Villiers-le-Sec, Val d'Oise

Bones from animal sp from refuse pit of house (49° 5′ N, 2° 23′ E). Coll 1981–82 and subm 1982 by R Guadagnin, Arts et Traditions Populaires Mus, Paris.

Ly-2599. Villiers le Sec, No. 2 **1010 ± 160** **AD665–1235*

From Pit 2 (0.5 dr).

Ly-2598. Villiers le Sec, No. 1 **1930 ± 150** **370BC–AD360*

From Pit 1 (0.5 dr).

Ly-2728. Villiers le Sec, No. 1b **1810 ± 150** **150BC–AD550*

From Pit 1 (0.5 dr).

General Comment (RG): Ly-2599 agrees perfectly with assumed age of house (7th century). Ly-2728 from 1982 excavation was to check Ly-2598 which appeared aberrant. Both dates were later confirmed by data from 1983 excavation, which revealed refuse pit from High Roman Empire (1st or 2nd century AD) with Sigillate ceramics and fibula (Guadagnin, in press).

Saône Boats series, Châlon sur Saône, Saône et Loire

Wood from remains of boats submerged in Saône R, coll by river dredging, Châlon-sur-Saône from 1977 to 1981 and subm 1982 by L Bonnamour, Denon Mus, Châlon-sur-Saône.

General Comment (LB): dates show evolution in boat form, which for centuries changed little (Bonnamour, 1978–79, 1980, 1981).

TABLE 24
Saône boats

Sample no.	Site	Geog coordinates	Origin of wood	DR	Age (BP)	Corrected date interval
Ly-2743	Ormes	(46° 38′ N, 4° 56′ E)	Monoxylic barge	1	720 ± 120	AD1180-1400
-2744	Ormes	(46° 38′ N, 4° 56′ E)	Boat timber	0.6	990 ± 170	AD775-1260
-2742	Lux	(46° 45′ N, 4° 52′ E)	Helm oar	1	1910 ± 120	160BC-AD245
-2741	Bragny	(46° 54′ N, 5° 03′ E)	Boat timber	1	1920 ± 130	365BC-AD380

Ateliers Municipaux series, Saintes, Charente Maritime

Human bones from two levels in funeral pit from Gallo-Roman villa (45° 45° N, 0° 37′ W). Coll 1970–72 by M Rouvreau and subm 1983 by M Collillieux, Lab Anthropol, Univ Caen.

Ly-3024. Saintes No. 7 **1990 ± 110** **360BC–AD225*

From 6 to 8m depth in upper level of bone fill of pit (0.7 dr).

Ly-3025. Saintes No. 8 **2030 ± 70** **180BC–AD195*

From 8 to 20m depth in lower level of bone fill of pit.

General Comment (MC): both dates are within same statistical margins, indicating rapid filling rate for all 12m of Roman sediments in pit. They agree well with expected age (Maurin, 1978), 1st or 2nd century AD.

Protohistoric Period

Africa

Ly-3028. Bekrat, El Goléa, Laghouat Willava, Algeria **Modern** **$\delta^{14}C = 26.5 \pm 15.7‰$**

Charcoal from ca 15m depth, under sandy level containing ostrich egg fragments (30° 50′ N, 2° 45′ E). Coll 1982 by M Montanari and subm 1983 by R Leclerc, El Goléa. *Comment* (RL): age corresponding to presence of ostrich in area was expected, but date shows site was disturbed.

Ly-2528. Babanki-Tungo, Le Mézam Dept, Cameroun **Modern** **$\delta^{14}C = 0.0 \pm 16.0‰$**

Charcoal from base of 4m deposit of scoria near smelting furnace at Agric Sta (5° 58′ N, 10° 20′ E). Coll 1980 and subm 1981 by JP Warnier, Univ Yaoundé. *Comment* (JPW): date and strat position of sample shows 4m accumulation of scoria occurred quite rapidly.

Ly-2817. Grand Jacques, Ivory Coast **750 ± 160** **AD1030–1410*

Charcoal from 2.1m in depth of boring in shelly kitchen midden on beach strand at ca 50m from coast (5° 10′ N, 4° 31′ E). Coll and subm 1982 by J Rivallain, Univ Abidjan. Change in style of assoc ceramics in level suggests change in human population. *Comment* (JR): date is older than assumed from oral histories (Rivallain, 1983).

Ly-2687. Bagamoyo, Labattoir, Mayotte Comores I. **820 ± 110** **AD1035–1325*

Human bones from Grave 9 of large necropolis, partly submerged on La Petite Terre I. coast (12° 47′ S, 45° 15′ E). Coll 1981 and subm 1982 by C Allibert, Lyon, A Argant, and J Argant, Bron. Assoc with few scattered pot-

sherds. *Comment* (AA): date precisely confirms age expected from ceramics, 11th or 13th centuries, Hagnoundou period (Allibert, Argant, & Argant, 1983).

House of Koumbi Saleh city, Timbedra, Mauritania

Samples from several archaeol levels of house in S Central area of main tell of Koumbi Saleh (15° 46° N, 7° 59′ W). Site was supposedly capital of kingdom of Ghana. Excavations on site were directed by S Robert, Mauritanian Inst Sci Research; house was excavated 1975, 1976 by S Berthier, Univ Lyon II, who coll samples previously pub (R, 1979, v 21, p 430), and coll and subm 1980 following samples (tables 25a, b). House was probably occupied continuously for six centuries according to following strat:

TABLE 25a
Stratigraphy of House of Koumbi Saleh

Level	Archaeol event	Expected date (century)	Previous dates
V	Abandonment and destruction	End of 14th/or beginning of 15th	
IV			Ly-1521:230 ± 120 -1525:440 ± 180
IVa, b	End of max occupation	14th	-1524:550 ± 230
III	Max prosperity of city	13th	-1526:860 ± 210
II	Max city development	End of 11th beginning of 12th	-1341:1000 ± 150 -1520:590 ± 120
I	Short period of 1st bldg	Middle of 11th	
O	Refuse pit in basal soil	End of 9th or 10th	

TABLE 25b
House of Koumbi Saleh

Sample no.	Ref no.	Level	Depth (cm)	Sample	DR	Age (BP)	Age (AD)	Corrected date interval (AD)
Ly-2509	SB III 41/48	V	190–215	Potsherd	0.5	720 ± 140	1230	1040–1415
-2510	SB III 67	V	190–215	Charcoal	1	530 ± 140	1420	1245–1635
-2540	SB III 80	IVb	140–250	Charcoal	1	1020 ± 150	930	660–1250
-2539	SB III 101	IVa	295–310	Charcoal	1	530 ± 100	1420	1275–1500
-2507	SB III 131	III	315–320	Potsherd	1	750 ± 130	1500	1030–1410
-2508	SB III 130	III	315–320	Charcoal	0.6	780 ± 100	1170	1045–1315
-2506	SB III 247	IIb	430–435	Charcoal	1	710 ± 100	1240	1195–1400
-2505	SB III 249	IIb	445–450	Potsherd	0.2	810 ± 170	1140	915–1395
-2538	SB III 195	IIa	460–470	Charcoal	1	790 ± 120	1160	1040–1335
-2537	SB III 265	IIa	490–510	Charcoal	0.5	880 ± 170	1070	890–1330
-2536	SB III 210	I	520–530	Charcoal	1	850 ± 100	1100	935–1315
-2535	SB III 271	I	530–565	Charcoal	1	800 ± 100	1150	1040–1335
-2534	SB III 274	I	560–570	Charcoal	1	730 ± 140	1220	1035–1415
-3147	SB IV 30	O		Charcoal	1	1620 ± 150	330	60–620
-2533	SB III 289	O	600–610	Charcoal	1	770 ± 150	1180	1020–1405
-2532	SB III 287	O	600–625	Charcoal	1	870 ± 140	1080	920–1290
-2504	SB III 295	O	620–650	Charcoal	0.7	950 ± 130	1000	855–1285
-2503	SB III 305/306	O	620–670	Potsherd	0.2	Modern: $^{14}C = +5 \pm 18‰$		
-3146	SB IV 35	O		Charcoal	1	1270 ± 90	680	590–905

General Comment (SB): results agree better with strat and expected ages than previous series, samples of which were probably too small. Ly-3147, -2540, and -3146 are outside general trend by ca 400 yr, or more (Ly-3147) and remain so even after correction. This may indicate use of ancient wood as fuel at time of destruction of city as was frequent, especially in arid regions (see, eg, Les Kellia Qoucour Isa; Ly-267: 1645 ± 80 and B-988: 1530 ± 100 (R, 1971, v 13, p 55). Dates obtained from potsherds either agree exactly with those from charcoal (Ly-2505, -2538), are somewhat different, but within statistical margin (Ly-2509,-2507), or are completely erratic for unknown reasons (Ly-2503). All dates from Level III, IV, and V are comparable to those from equivalent archaeol levels in neighboring sites excavated by S Robert (R, 1979, v 21, p 430–431), or excavated by A Cros and later pub (R, 1977, v 19, p 162). They confirm that at least area of excavated house was not occupied before end of 10th century, *ie,* Mauny's (1951) Last Pre-Islamic period (Berthier, 1983).

Mutwarubona series, Ndora, Rwanda

Charcoal from 50cm depth in remains of two smelting furnaces (2° 36′ S, 29° 48′ E). Coll and subm 1982 by F Van Noten, Mus Royal Afrique Centrale, Tervuren, Belgium.

Ly-2668. Haut-Fourneaux 2 **1380 ± 170** **AD245–1005*

From smelting furnace No. 2 (0.6 dr).

Ly-2667. Haut-Fourneaux 1 **2020 ± 330** **760BC–AD565*

From smelting furnace No. 1 (0.65 dr).

General Comment (FVN): despite wide statistical margin, both dates agree with expected date range (1BC to AD700), as smelting furnaces were in use since Early Iron age (Van Noten, 1983).

Akagéra National Park, Kinbungo, Mutata Prov, Rwanda

Charcoal from several sites in park: N'Dama Cave (2° 23′ S, 30° 26′ E), Muhororo rock shelter (2° 54′ S, 30° 31′ E) and Mucucu II rock shelter (2° 35′ N, 30° 30′ E). Coll 1978 (Ly-2798) and 1980 and subm 1980 by B Lugan, Hist Dept, Univ Lyon III. Assoc industries were ceramics of recent rolled type, eg, at N'Dama (Lugan, Sirven, & Vérin, 1979), and flint microliths of Wiltonian type, eg, at Muhuroro (Lugan, 1983). Samples indicate occupation from Late Stone age (LSA) with ceramics from end of Early Iron age (EIA) of Uréwé type, ending with Late Iron age (LIA) with rolled ceramics and microliths.

General Comment (BL): Ly-2798 shows that site occupation is only recent. Ly-2382 suggests that majority of microlith industries date from ca 2000 BP or just before EIA. All dates for Mucucu II site agree with age expected from assoc industries, archaeol attribution, and strat despite limited

TABLE 26
Akagéra National Park

Sample no.	Site	Sq or level	Depth (cm)	Assoc industry	DR	Age (BP)	Corrected date interval or activity
Ly-2798	N'Dama	Base level	110	Potsherd	0.7	Modern	$\delta^{14}C = +20 \pm 16‰$
-2450	Muhororo	Sq 1	20–25	Potsherd and microliths	0.10	350 ± 200	AD1305–1950
-2382	Muhororo	Sq 1	55–65	Potsherd and microliths	0.3	1970 ± 190	400BC–AD410
-2449	Mucucu II	Sq 1	10–20	L I A	0.10	1220 ± 220	AD460–1195
-2235	Mucucu II	Sq 1	20–30	E I A	0.15	2380 ± 270	1095BC–AD200
-2383	Mucucu II	Sq 2a	30–35	L S A	0.6	2040 ± 180	415BC–AD250
-2385	Mucucu II	Sq 2, 3	30–35	L S A	0.2	1210 ± 160	AD590–1050
-2384	Mucucu II	Sq 2, 3a	40–45	L S A	0.25	2020 ± 200	410BC–AD335
-2236	Mucucu II	Sq 1	ca 45	L S A	0.5	1880 ± 170	375BC–AD555
-2237	Mucucu II	Sq 1	45–55	L S A	0.10	3940 ± 320	3155–1765BC
-2386	Mucucu II	Sq 3	50–55	L S A	0.6	Modern	$\delta^{14}C = +3 \pm 22‰$
-2387	Mucucu II	Sq 2a	50–60	L S A	0.07	2620 ± 320	1395BC–AD170

amount of dating material. Ly-2449 shows relatively early age for LIA whereas 1st appearance of ceramics occurs at ca 2000 BP, as suggested by Ly-2235 and -2383.

Oceania

1040 ± 110

Ly-2310. La Roche, Maré I., New Caledonia **AD790–1215*

Human bones from collective grave in open-air site near airport (21° 28′ S, 168° 2′ E). Coll 1977 by J P Maitre and subm 1980 by D Frimigacci, Office Recherche Sci Tech, Outre-Mer, Nouméa. *Comment* (DF): date agrees with type of burial and general data on human settlement of island.

Iron Age

France

2380 ± 90

Ly-2780. Gypsum mine, Carcès, Var **780–195BC*

Wood from support timbers of gypsum mine (43° 29′ N, 6° 11′ E). Coll 1980 by G Truc, Lab Geol, Univ Lyon I. Sample dated to check previous result, Ly-2223: 2570 ± 130 (R, 1983, v 25, p 61). *Comment:* date is within statistical margin of previous one, and average of both measurements is 2440 ± 70.

Derrière le Moulin series, Mours, Val d'Oise

Samples from two levels of ditch found in quarry of Mafa Cie (49° 8′ N, 2° 16′ E). Coll and subm 1982 by JL Brulé, Cergy.

General Comment (JLB): as expected, boundary between La Tène II and III is dated at ca 2200 BP. Ly-2976 shows that charcoal from Layer VII may have descended into Layer V, below.

TABLE 27
Derrière le Moulin

Sample no.	Layer	Depth (m)	Expected period	DR	Age (BP)	Corrected date interval
Ly-2977	VII	1	La Tène III	0.7	2120 ± 120	400BC–AD40
-2976	V-AB	2	La Tène II & III	1	2150 ± 110	405BC–AD25
-2975	V-AB	2.5	La Tène II & III	1	2320 ± 110	760BC–AD170

La Pierre d'Appel series, Etival-Clairefontaine, Vosges

Samples from two excavation areas in fortified promontory at top of plateau (48° 23′ N, 6° 51′ E). Coll 1974 from W excavation, inside fortified habitat and 1981 from SW excavation in oldest fortification rampart, subm 1978 and 1982 by A Deyber, Herpiacum Soc, Etival-Clairefontaine (Deyber *et al,* 1984).

General Comment (AD): Ly-1731, from charred beam, does not come from archaeol level. Ly-2705 and -2704 agree with expected age, La Tène II. Ly-1732 is older by ca 300 yr, and comes from structure which is older than main habitation level.

TABLE 28
La Pierre d'Appel

Sample no.	Ref, colln yr	Layer	Sample	Age (BP)	Corrected date interval
Ly-1731	B-22, 1974	Passage 5	Charred beam	690 ± 140	AD1055–1425
-1732	B-22, 1974	Passage 3	Ash	2530 ± 130	1015–390 BC
-2705	B-11, 1981	Level 4g	Charcoal	2220 + 100	545–20BC
-2704	B-11, 1981	Level 4a	Charcoal	2300 ± 100	755–165BC

2340 ± 150

Ly-2874. Caramontron, Sinzelle, Polignac, Haute Loire **790–150BC*

Bones from ditch outcropping along roadside (45° 4′ N, 3° 52′ E). Coll 1978 and subm 1982 by J Vital, Ampilhac-Vernassal. Sample coll as control for two previous measurements, Ly-2036: 2410 ± 130, and Ly-2037: 2520 ± 120 (R, 1983, v 25, p 95), both estimated to be too young in relation to assoc industry from 1st Iron age or Late Bronze age. *Comment* (JV): latest date agrees with two preceding ones, from Middle of Iron age. This may be due to continuation of Late Bronze and Early Iron age industries throughout Iron age (Houdré & Vital, 1981).

2520 ± 140

Ly-2845. La Chauve-Souris cave, Donzère, Drôme **1010–390BC*

Charcoal from Layer 8c/9 of cave fill (44° 28′ N, 4° 41′ E). Coll and subm 1982 by J Vital. Assoc with industry from beginning of Iron age (Vital, 1981). *Comment* (JV): date probably indicates Middle of Iron age, but remains compatible with expected age if max statistical margin is considered.

En Bizier series, Jugy, Saône et Loire

Samples from 10 to 20cm depth in hearth structure of only habitation level (46° 37′ N, 4° 52′ E). Coll 1967 and subm 1983 by A Jeannet, Charnay-lès-Macon.

Ly-3053. En Bizier 1 **2580 ± 150** **1040–405BC*

Charcoal (0.5 dr).

Ly-3054. En Bizier 2 **2510 ± 100** **825–405BC*

Bones (*Ovicapridae*).

General Comment (AJ): dates agree perfectly and are within expected range of assoc Early Iron age industry assumed to come from W Germany or N Switzerland (Jeannet, 1981).

Ly-2529. La Prée tumulus, Thury, Côte d'Or **2300 ± 220** **800BC–AD20*

Charcoal from beneath endmost upright flagstone of sepulture of Tumulus III (47° 2′ N, 4° 30′ E). Coll 1980 and subm 1981 by JP Guillaumet, Centre Natl Recherche Sci, Autun (0.7 dr); assoc with Middle Hallstatt industry. *Comment* (FPG): date seems too young, perhaps due to wide statistical margin (Guillaumet & Maranski, 1982).

Ly-2678. Ravin de Mardou, La Roche-Blanche, Puy de Dôme **2590 ± 120** **1010–425BC*

Bones (*Ovicapridae*) from ditch atop colluvial deposit (45° 43′ N, 3° 9′ E). Coll 1980 and subm 1982 by JP Daugas and JP Raynal, assoc with painted ceramics attributed to beginning of Early Iron age. *Comment* (JPD & JPDR): date agrees with archaeol data (Daugas, Gilbert, & Raynal, 1982) and with measurements obtained from another ditch site, Caramontron (above).

Bronze Age

France

Ly-2698. Champ d'Ile, Assenay, Aube **2450 ± 140** **830–195BC*

Charcoal from 1.25m depth in open-air site (48° 11′ N, 4° 3′ E). Coll 1980 and subm 1981 by JL Coudrot, Troyes (0.3 dr). Assoc with Late Bronze age industry corresponding to end of "Champ d'Urnes" period and assumed to date from ca 700 BC (Chertier, 1981). *Comment* (JLC): date is too young by ca 200 yr but suggests continuation of "Champ d'Urnes" civilization until beginning of Iron age.

Marais de Saint-Clair series, Marchezieux, Manche

Wood from marsh sediments (49° 10′ N, 1° 18′ W) in which eight probably contemporaneous caches of bronze axes "à douille" were found (Verron & Tabbagh, 1983).

Ly-2813. Cache F **1430 ± 150** **AD265–875*

From stake near Cache F.

Ly-2676. Cache B **2470 ± 120** **830–300BC*

From tree branch placed over Cache B, probably to conceal it.

General Comment (GV): Ly-2813 shows stake had no connection with axe caches. Ly-2676 confirms that caches are one of last manifestations of Bronze age, which is contemporaneous with 1st Iron age.

Gué des Plies series, Châlon-sur-Saône, Saône et Loire

Samples from Bronze age habitation excavated from present river bed of La Saône R (46° 48′ N, 4° 50′ E). Coll and subm 1982 by L Bonnamour, Mus Denon, Châlon-sur-Saône.

Ly-2746. Châlon-sur-Saône, No. 2 **2600 ± 130** **1085–410BC*

Wood from upper part of archaeol level, corresponding to site destruction.

Ly-2745. Châlon-sur-Saône, No. 1 **2860 ± 130** **1400–790BC*

Charred branches from middle of archaeol level, assoc with rich Late Bronze age IIIb industry.

General Comment (LB): both dates are within expected range (Bonnamour, 1983). However, Ly-2746 may be slightly later than actual site abandonment.

Chabris Island series, Indre

Charcoal from several areas and depths of open-air site comprising ca 2m ashy layers in sandy alluvia of Le Cher R (47° 17′ N, 1° 37′ E°). Coll 1981 and subm 1983 by J Despriés, Dir Antiquités Prehist, Orléans. Archeol level contains flint and ceramic artifacts attributed to Late Bronze age, as well as two deposits of bronze artifacts (Allain, 1981).

Ly-3040. Chabris D3 425 **2790 ± 160** **1355–630BC*

From 173cm depth, Sq D3 (0.5 dr).

3390 ± 180

Ly-3041. Chabris D5 246 **2165–1360BC*

From 165cm depth, Sq D5 (0.7 dr).

2790 ± 150

Ly-3042. Chabris E3 173 **1355–630BC*

From 110 to 115cm depth, Sq E3 (0.3 dr).

General Comment (JD): Ly-3040 and -3042 completely agree with expected age of assoc industry. Ly-3041 could indicate that site had already been occupied during Middle Bronze age or beginning of Late Bronze age.

Mont Sainte-Odile series, Ottrott, Bas-Rhin

Charcoal from beneath and between foundation stones of long megalithic wall, "Le Mur Païen" (48° 26′ N, 7° 24′ E). Coll 1966 in excavation Site A and subm by H Zumstein, Archéol Mus, Strasbourg. Very diluted samples despite large size, due to solubility at alkaline pretreatment, caused by long exposure to forest soil.

4400 ± 400

Ly-2800. Mont Sainte-Odile A **3900–2300BC*

From 130cm depth, between stones (0.1 dr), subm 1982.

3200 ± 120

Ly-2801. Mont Sainte-Odile B **1780–1190BC*

From 130cm depth, 80cm from Ly-2800 (0.5 dr), subm 1982.

2560 ± 110

Ly-2927. Mont Sainte-Odile 9.3–9.6 **865–415BC*

From under wall (0.8 dr), subm 1983.

General Comment (HZ): statistical margin of Ly-2800 is too large; sample is obviously too old and has no connection with wall. As archaeol data suggest, wall was constructed on Late Bronze age site, with which Ly-2801 fits, either at end of this period, ca 1000 BC, or at beginning of Iron age (Ly-2927).

3520 ± 110

Ly-2812. La Baume Layrou, Trèves, Gard **2160–1670BC*

Wood from top of fill in Sec C of cave (44° 5′ N, 3° 24′ E). Coll and subm 1982 by L Fagès, Florac. Two occupations took place in cave, during Late Neolithic and mainly during Late Bronze age, from evidence of numerous potsherds (Fagès, 1982). *Comment* (GF): date confirms soil of cave remained unmodified since Middle Bronze age or very beginning of Late Bronze age.

Lescar and Lons Tumuli series, Pyrénées Atlantiques

Charcoal from hillock with several tumuli assumed to be from Bronze age (Blanc, 1982) (43° 20′ N, 0° 24′ W), subm 1982 by C Blanc, Pau.

3650 ± 150

Ly-2707. Tumulus T1, Lescar **2520–1695BC*

From 74cm depth in Sq I-13 of tumulus in central part of hillock (0.3 dr). Coll 1982. No assoc industry;

4260 ± 150

Ly-2708. Tumulus T6, Lons **3355–2440BC*

From 35cm depth in all sqs, P-Q/5–6, of tumulus from S part of hillock. Coll 1980 (0.6 dr). Assoc with pebble structure with potsherds.

3510 ± 100

Ly-2709. Tumulus T5, Lons **2150–1665BC*

From 57cm depth, in Zone R-S/7–8, pit near Tumulus 5 in NE part of hillock. Coll 1982.

General Comment (CB): dates from Tumuli T1 and T5 are as expected. Date from Tumulus T6 seems too old although possible as archaeol data are same as for other 2 tumuli; 3 dates are comparable to unpub results from Tumulus BBL I of Boueilh (Gif-5525: 3620 ± 120) and from Tumulus T II of Lescar (Ny-250: 3959 ± 70), unpub.

3710 ± 200

Ly-2641. Le Grand Marais, Bucy le Long, Aisne **2640–1690BC*

Charcoal from 80cm depth at base of pit with cremated remains in funerary urn (49° 23′ N, 3° 25′ E). Coll 1980 and subm 1982 by C Pommepuy, Dir Antiquités Prehist, Amiens (0.2 dr). Pit is part of funerary circle from Early or Middle Bronze age (Pommepuy & Brun, 1984). *Comment* (CP): despite wide margin, date adequately confirms archaeol attribution of remains to Early Bronze age. This result cannot be compared with any others because cremation remains are rarely preserved in this type of site.

3760 ± 130

Ly-2734. Chaleil, Saint-Cernin-de-Larche, Corrèze **2630–1865BC*

Human bones from sepulchral room of dolmen (45° 6′ N, 1° 24′ E). Coll 1981 and subm 1982 by G Mazière, Dir Antiquités Prehist, Limoges. Assoc with remains of pearls and pendants (Mazière, 1983). *Comment* (GM): date indicates beginning of Bronze age and fits well with dates from similar monuments nearby in Quercy prov, such as La Bertrandoune dolmen at Prayssac, Ly-1220: 4170 ± 120 (R, 1978, v 20, p 41), Les Grèzes dolmen at Souillac, Ly-895: 3910 ± 120 (R, 1976, v 18, p 73), and Le Riffat dolmen at Thédirac, Ly-1188: 4090 ± 130 (R, 1978, v 20, p 41).

Switzerland

2680 ± 170

Ly-2922. Horn, Wittnaü, Basel Canton **1275–410BC*

Bones of animal spp from hearth, ca lm depth, in fortified promontory site (47° 28′ N, 7° 7′ E). Coll 1982 by P Gutzwiller and subm 1982 by LR Berger, Univ Basel (0.5 dr). Assoc with ceramic industry from Late Bronze

age IIIb (Gassler, 1982). *Comment* (LRB): date agrees with chronol data from region, which show Iron age began at ca 700 BC. It also confirms dendrochronol dates from Zurich lab.

Spain

S Spain sites series

Samples coll and subm by F Molina, Prehist Dept, Univ Granada.

General Comment (FM): all results agree with expected values and confirm several dates from Groningen lab from other sites in region with same assoc industry. These results suggest relatively late date for end of Copper age (Ly-2653) and date comparable with Middle Bronze age, French equivalent of Spanish Argar B.

TABLE 29a
Spanish sites

Site	Ref	Village	Province	Geog coordinates	Colln yr
Cerros de los Castellones	(C d C)	Laborcillas	Granada	(37° 27′ N, 3° 17′ W)	1973
Motilla des Azuer	(M d A)	Daimiel	Ciudad Real	(39° 03′ N, 3° 30′ W)	1976
Cerro de la Encina	(C d E)	Monachil	Granada	(37° 08′ N, 3° 33′ W)	1977

TABLE 29b
Spanish sites

Sample no.	Site ref	Sample ref	Sample	Depth (m)	Assoc industry	Age (BP)	Corrected date interval (BC)
Ly-2653	C d C	CB5-5125	Charred seed	3–1.4	Late Copper	3500 ± 130	2280–1560
-2654	M d A	D6-6016	Charred seed	1–1.2	Middle Bronze	3530 ± 130	2300–1585
-2655	M d A	D1-327	Charred seed	0.8–0.9	Middle Bronze	3540 ± 130	2305–1640
-2656	C d E	M7-21177	Charcoal	ca 2.8	Middle Bronze	3350 ± 100	1900–1425
-2657	C d E	M17-16053	Charcoal	ca 2.6	Middle Bronze	3520 ± 110	2160–1670

Chalcolithic/Late Neolithic Periods

France

Ly-2964. Fond Pernant, Compiègne, Oise **3890 ± 180** **2890–1900BC*

Bones from 60cm depth from Ditch 28 of open-air site habitation area (49° 24′ N, 2° 48′ E). Coll 1982 by B Lambot and subm 1982 by JC Blanchet, Centre Recherche Archéol Oise, Compiègne. Assoc with Chalcolithic industry of "Groupe des Urnes" type, just before Early Bronze age Atlantic type. *Comment* (JCB): date agrees perfectly with age expected for this type of industry in N France (Blanchet, 1983).

1280 ± 130

Ly-2688. Broum cave, Hérault **AD540–960*

Charcoal from hearth in copper cave mine (43° 35′ N, 2° 48′ E). Coll and subm 1981 by P Ambert, Lab Geog, Univ Aix-Marseille; assoc with Late Neolithic industry of Ferrières type. This site may be oldest copper mine in region (Vasseur, 1911). *Comment* (PA): despite hearth's strat context, date shows it is not part of archaeol level. Another hearth in site analyzed by Gif lab yielded date in expected age range, Gif-6048: 3990 ± 70 (unpub).

3940 ± 160

Ly-2954. Chomérac cave, Chomérac, Ardèche **2880–2120BC*

Human bones from fill of lower part of cave, embedded in recent level of calcareous breccia (44° 43′ N, 4° 39′ E). Coll 1983 by B Aubert and subm 1983 by A Cogoluènhes, Lab Geol, Univ Lyon I (0.5 dr). *Comment* (AC): upper part of cave was used as communal grave during Neolithic, then was occupied during Wars of Religion (16th century). Date indicates fill preserved in lowest part of grave is Neolithic, in fact from Chalcolithic, as are many other such sepulchral caves in region.

Boussargues series, Argelliers, Hérault

Charred acorns from two areas in fortified habitation site (43° 44′ N, 3° 42′ E). Coll and subm 1982 by X Gutherz, Dir Antiquités, Montpellier. Site has only one habitation level, containing Chalcolithic artifacts of Fontbouïsse type.

4170 ± 140

Ly-3016. Boussargues Loc 1 **3160–2405BC*

From Loc 1 near Hut 1 (0.7 dr).

4070 ± 170

Ly-3017. Boussargues Cabane 1 **3160–2405BC*

From center of Hut 1.

General Comment (XG): date agrees perfectly with others obtained for same cultural period and is comparable to dates from fortified sites from region such as Le Lébous at Saint-Martin-de-Tréviers, Hérault, as well as to dates from several unfortified villages, such as Campous at Viols en Laval, MC-719: 3970 ± 90 (unpub).

Claux cave series, Gourniès, Hérault

Charcoal from 2 areas in cave (43° 51′ N, 3° 34′ E). Coll 1981 and subm 1982 by JL Roudil, Dir Antiquités Prehist, Montpellier.

4040 ± 130

Ly-2735. Claux, Zone C **2940–2195BC*

From burial sepulture in superficial hearth, attributed to Chalcolithic of Fontbouïsse type.

4500 ± 170

Ly-2736. Claux, Zone H **3635–2890BC*

From base of archaeol level at ca 15cm depth corresponding to occupation attributed to Late Neolithic of Ferrières type (0.3 dr).

General Comment (JRL): both values agree perfectly with generally accepted age range for assoc industries in both occupation levels of site; they also agree with result from Aven de Jacques (below).

Aven de Jacques series, Chabessière, Lussas, Ardèche

Human bones from two areas in cave near La Chabessière (44° 37′ N, 5° 21′ E). Coll 1981 and subm 1982 by A Héritier, Romans, and A Cogoluènhes. Cave was used for communal burial ground during Late Neolithic to Chalcolithic and until Late Bronze age, because it contains artifacts from these three cultural periods.

3860 ± 130

Ly-2847. Aven de Jacques No. 2 **2730–2050BC*

Ly-2846. Aven de Jacques No. 1 (0.4 dr) **4140 ± 170** **3245–2305BC*

General Comment (AH): both dates agree with archaeol attribution to Chalcolithic period; Ly-2846 corresponds to beginning of period, which may be contemporaneous with Late Neolithic period of Ferrières type, and Ly-2847 marks end of Chalcolithic period and may be contemporaneous with previous date from same site, Ly-2295: 3660 ± 130 (R, 1983, v 25, p 99). All three dates suggest rather lengthy use of cave as burial place, perhaps as late as Early Bronze age.

3900 ± 130

Ly-2689. Roque-Fenètre, Cabrières, Hérault **2815–2075BC*

Charcoal from pit in copper mine (43° 35′ N, 3° 22′ E). Coll and subm 1981 by P Ambert. Assoc with Late Neolithic industry of Verazian type. *Comment* (PA): date is within expected range and may be comparable to many other dates for Fontbouïsse and Verazian Chalcolithic or Late Neolithic industries in region (Gasco & Binder, 1983).

1890 ± 180

Ly-2571. La Pointe aux Oies, Wimereux, Pas de Calais **380BC–AD545*

Human bones from communal burial in covered passage of long dolmen embedded in dunes on sea coast (50° 47′ N, 1° 36′ E). Coll 1979 and subm 1981 by JF Piningre, Dir Antiquités Prehist, Lille. No characteristic artifacts were assoc, but this type of megalithic monument is similar to those from Neolithic of "Seine-Oise-Marne" (SOM) type in Picardie region (Piningre, 1979). *Comment* (JFP): date shows burial occurred much later than construction of megalith, as reworked aspect of monument fill had suggested.

Ly-3023. Villevieille, Demandolx, Alpes de Haute-Provence **3970 ± 140** **2895–2150BC*

Human bones from communal burial in dolmen chamber (43° 52′ N, 6° 35′ E). Coll 1974 and 1975 and subm 1983 by G Sauzade, Dir Antiquités Prehist, Aix en Provence. Assoc with Late Neolithic industry. *Comment* (GS): date is younger than expected and suggests site was in use for prolonged period; no archaeol evidence.

Ly-2980. Cala Barbarina, Tizzano, Corse du Sud **4020 ± 140** **2920–2180BC*

Bones (*Suidae*) from complete skeleton found beside human burial in Layer III of Le Sanglier rock shelter (41° 31′ N, 9° 13′ E). Coll 1980 by A Pasquet and subm 1983 by JD Vigne, Lab Anatomie Comparée, Natl Mus Hist Nat, Paris. Assoc with somewhat characteristic Early or Middle Neolithic industry. *Comment* (JDV): date is younger than expected and dates burial to Late Neolithic.

Ly-2658. Le Trou des Fées, Bayonville-sur-Mad, Meurthe et Moselle **4210 ± 170** **3345–2415BC*

Human bones from peculiar burial in sepulchral cave (49° 1′ N, 5° 58′ E). Coll 1977 and subm 1981 by C Guillaume, Dir Antiquités Prehist, Metz. Burials occurred in cave during two periods, Late Neolithic, corresponding to previous dates, Ly-1622: 4170 ± 200, and Ly-1623: 4280 ± 150 (R, 1979, v 21, p 435), and Early Middle ages (ca 10th century). Skeleton lay at boundaries of both periods and was thought to be assoc with older level. *Comment* (CG): date is within statistical margins of both previous measurements and confirms attribution of burial to Neolithic.

Ly-3021. Le Capitaine, Grillon, Vaucluse **4330 ± 180** **3360–2670BC*

Human bones from collective sepulture below hypogeum (44° 24′ N, 4° 56′ E). Coll 1977 and 1978 by G Sauzade. Assoc with Late Neolithic industry. *Comment* (GS): date agrees perfectly with expected age and results obtained from lowest level of Roaix site, Gif-1620: 4100 ± 140 (R, 1971, v 13, p 219) (Sauzade, 1983).

Ly-2550. Chironlon or Fabrègues cave, Gras, Ardèche **5110 ± 250** **4435–3370BC*

Human bones from sepulchral ditch (44° 24′ N, 4° 38′ E). Coll 1970 by A Héritier, Romans, and subm 1980 by A Cogoluènhes. Communal sepulture with ca 20 individuals and Chalcolithic industry of Fontbouïsse type. *Comment* (AH): date is much older than expected and does not correspond with archaeol data. As site does not contain proof of Middle Neolithic occupation, there may be error in origin of bones, due to long delay between colln and subm of sample.

Middle Neolithic Period

France

Cul-Froid series, Boury-en-Vexin, Oise

Bones from enclosure ditch of habitation (49° 14′ N, 1° 3′ E). Coll by R Martinez and subm 1982 by JC Blanchet.

Ly-2712. Cul-Froid, No. 4 **4570 ± 130** **3660–2995BC*

From Layer D1 at top of fill, coll 1982 (0.6 dr). Assoc with evolved Chassean industry.

Lv-2711. Cul-Froid, No. 1 **5180 ± 100** **4330–3690BC*

From middle layer of fill, coll 1981. Assoc with Middle Chassean industry.

Ly-2961. Cul-Froid, No. 3 **5240 ± 150** **4410–3690BC*

From Layer G2 at base of fill, coll 1982 (0.5 dr). Assoc with Chassean industry with Roessen influence.

General Comment (JCB): three dates agree perfectly with strat and evolution of Chassean industry. They are comparable to dates from samples assoc with similar industries at Camp-de-César site and Le-Coq-Galleux site (below).

Camp de César series, Catenoy, Oise

Bones from several levels and sqs of excavation on edge of plateau of fortified promontory (49° 22′ N, 2° 31′ E). Coll and subm by JC Blanchet (Blanchet & Decormeille, 1984).

General Comment (JCB): dates agree perfectly with strat and evolution of industry. They compare well with 3 dates from Cul-Froid site (above) for same industries.

TABLE 30
Camp de César

Sample no.	Layer	Colln yr	Industry	DR	Age (BP)	Corrected date interval (BC)
Ly-2967	5a	1982	Late Chassean	1	4550 ± 160	3655–2915
-2965	5b	1982	Late Chassean	1	4620 ± 120	3655–3050
-2968	5bc	1982	Chassean	0.7	4820 ± 150	3885–3355
-2713	5c	1981	Middle Chassean	1	4980 ± 120	3935–3565
-2966	5d	1982	Middle Chassean	0.5	5280 ± 140	4420–3785

Ly-3020. Malvoisin, Orgon, Bouches-du-Rhône **5270 ± 140** **4420–3780BC*

Bones from only occupation level of open-air site (43° 48′ N, 5° 1′ E). Coll 1972 by A Carry and subm 1983 by G Sauzade; assoc with Chassean potsherds (Sauzade, 1983). *Comment* (GS): date fits well with expected age and numerous other dates from many Chassean sites in Provence region, particularly with nearby Claparouse site at Lagen, MC-1691: 5380 ± 125 (unpub).

La Vergentière series, Cohons, Haute-Marne

Charcoal from three excavation loci (2 borings and 1 hearth in dolmen) on fortified promontory (47° 46′ N, 5° 20′ E). Coll and subm by L Lepage, Saint-Dizier. Test excavation of archaeol levels reveal Middle Neolithic industry of Bourgogne type, whereas dolmen has no assoc industry (Lepage, 1980).

Ly-2646. La Vergentière S1-R18-117 **5110 ± 130** **4330–3655BC*

From upper part of Level D in Boring S1; coll and subm 1981.

Ly-2647. La Vergentière S2-A7-150 **5270 ± 390** **4565–3560BC*

From lowest level of Boring S2; coll and subm 1981 (0.1 dr).

Ly-3055. La Vergentière, Dolmen 1 **5300 ± 260** **4690–3645BC*

From hearth in tumulus of Dolmen 1; coll and subm 1982 (0.2 dr).

General Comment (LL): despite wide statistical margin for Ly-2647 and -3055, 3 dates are quite similar to previous results from Boring 1, Ly-1859: 5230 ± 300 and Ly-1860: 5350 ± 270 (R, 1983, v 25, p 105). They suggest relatively short occupation of site and contemporaneity of dolmen with habitation level excavated in borings (Lepage, 1982).

Roquefort series, Lugasson, Gironde

Bones from two levels of fortified promontory (44° 44′ N, 0° 9′ W) coll from 1973 to 1976 and subm 1981 by J Roussot-Larroque, Lab Quaternary Geol, Univ Bordeaux I. Site has two parts, Le Plateau and Le Talus. Archaeol levels contain complete sequence from Middle Neolithic of Roquefort group to Late Neolithic of Matigon and Artenacian types.

Ly-2683. Roquefort-Plateau, Layer 2 **3650 ± 190** **2540–1665BC*

From Layer 2, Plateau site; assoc with Matignon Late Neolithic industry (0.25 dr).

5680 ± 200

Ly-2684. Roquefort-Plateau, Layer 3 **5000–4110BC*

From Layer 3, Plateau site, assoc with 1st phase of Roquefort Middle Neolithic (0.2 dr).

General Comment (JRL): Ly-2683 is obviously too young for Neolithic industry. Such aberrant results were already observed for charcoal from same level, Gif-3597: 3960 ± 135 (unpub). Ly-2684 agrees perfectly with other results from both phases of Roquefort group in Talus site, Gif-1732: 5000 ± 140 for Phase 2, and Gif-1731: 4800 ± 140 for Phase 1 (Roussot-Larroque, 1976).

5480 ± 130

Ly-2613. Le Trou qui fume, Saint-Romain, Côte d'Or **4560–3905BC*

Bones (*Bovidae*) from top of fill of small cave (47° 0′ N, 4° 43′ E). Coll 1981 by PY Jacquet and subm 1981 by S Grappin, Dijon. Cave was used only as refuse pit. *Comment* (SG): date confirms homogeneity of fill and end of use of pit in Middle Neolithic (Grappin, 1982).

5300 ± 140

Ly-2970. Le Mont d'Huette, Jonquières, Oise **4425–3790BC*

Bones from base of palisade ditch of fortified habitation (49° 24′ N, 2° 44′ E). Coll and subm 1982 by JC Blanchet. Sample comes from Sec 14, with Early Chassean industry of Paris basin type. *Comment* (JCB): date agrees with expected age and dates from other sites in region with Early Chassean industries (see, eg, Ly-2996 and -2961, above). Three other measurements were made for same site: Gif-1623: 1600 ± 300 (R, 1974, v 16, p 38) and Gif-2918: 4290 ± 100 (unpub) are obviously too young and are from charcoal which may have been polluted by roots; Gif-2929: 5120 ± 130 (unpub) was on bones from same ditch and also fits with same industry as Ly-2970, Early Chassean of Epi-Rocssen type of Menneville.

Le Verger series, Saint-Romain, Côte d'Or

Charcoal from Layer 2 of site at foot of cliff (46° 59′ N, 4° 43′ E). Coll and subm 1982 by S Grappin. Assoc with industry attributed to beginning of Middle Neolithic (Grappin, 1982) (0.3 and 0.8 dr, respectively).

5260 ± 180

Ly-2706. Le Verger No. 4 **4435–3670BC*

5710 ± 140

Ly-2971. Le Verger No. 5 **4945–4370BC*

General Comment (SG): both dates confirm two previous results from samples from same archaeol level, Ly-1985: 5590 ± 130 and Ly-2243: 5860 ± 170 (R, 1983, v 25, p 105). These 4 dates have same statistical margin and their average is 5620 ± 80 BP. This confirms, as presumed, that this type of industry precedes Middle Neolithic Chassean in region (see Chassey series, R, 1983, v 25, p 103) and is contemporaneous with industry from Chichery

site, Yonne, Gif-3354: 5600 ± 120 (unpub) and with Middle Neolithic industries of Cerny type.

Montagne de Comin series, Bourg-et-Comin, Aisne

Charcoal from burned layer assoc with earth mound in open-air fortified habitation atop plateau (49° 25′ N, 3° 40′ E). Coll and subm by Unité Recherche No. 12 Centre de Recherche Archéol, Paris.

5440 ± 160

Ly-2972. BMC No. 6 **4550–3890BC*

From 1.8m depth underlying earth mound (0.5 dr); coll and subm 1982.

4640 ± 220

Ly-2973. BMC No. 7 **3795–2925BC*

From 1m depth at base of earth mound (0.3 dr); coll and subm 1982.

5870 ± 160

Ly-3052. BMC No. 9 **5195–4435BC*

From 1.7m depth at base of earth mound above ditch of palisade (0.5 dr); coll and subm 1983.

General Comment (URA No. 12): three dates, as well as Ly-2525: 4880 ± 120 (R, 1983, v 25, p 102) from 1.2m depth in same layer prove that earth mound dates from prehist period, despite uncertainty of results of strat study. Dates show that burned layer is assoc with oldest occupation period of site, contemporaneous with Middle Neolithic of Michelsberg type industry, previously dated to ca 5100 BP, eg, in two sites in Aisne R valley (R, 1983, v 25, p 106). However, Ly-3051 seems too old even if double statistical margin is used.

Champ de Bataille series, L'Etoile, Somme

Charcoal from open-air habitation surrounded by palisade (50° 2′ N, 2° 39′ E). Coll and subm by B Bréart, Dir Antiquités Préhist, Amiens. Ditches contain fairly sparse industry attributed to beginning of Middle Neolithic, perhaps of "Cerny" type.

5390 ± 100

Ly-2679. Champ de Bataille No. 1 **4430–3895BC*

From base of post hole of palisade; coll and subm 1981.

5990 ± 160

Ly-3058. Champ de Bataille No. 2 **5255–4555BC*

From base of ditch assoc with palisade (0.3 dr). Coll and subm 1983.

General Comment (BB): Ly-2679 agrees with attribution of industry to Middle Neolithic; Ly-3058 is comparable to many dates for Early Neolithic of late Rubané type, and suggests relatively old date for Cerny group, even taking into account double statistical margin.

5380 ± 220

Ly-2969. Le Jocoy, Pontpoint, Oise **4555–3795BC*

Bones from middle of Ditch 1 in river-bank site in Oise R alluvia (49° 20′ N, 2° 39′ E) (Blanchet, Decormeille, & Marquis, 1980). Coll 1982 by A Decormeille and subm 1982 by JC Blanchet. Assoc with Early Neolithic industry of Late Rubané type (0.25 dr). *Comment* (JCB): for unknown reason, date is much too young, by ca 500 yr, as compared, eg, to Le-Coq-Galleux and Cuiry-Les-Chaudardes sites (below).

Les Fontinettes series, Cuiry-les-Chaudardes, Aisne

Bones from two refuse pits in Neolithic village (49° 23′ N, 3° 45′ E). Coll and subm 1981 by Unité de Recherche No. 12, Paris, to complement previously pub series of 13 samples assoc with Early Neolithic Late Rubané type industry (R, 1983, v 25, p 106).

5870 ± 170

Ly-2551. CCF No. 378-2 **5195–4435BC*

Coll 1980 (0.8 dr).

5730 ± 170

Ly-2552. CCF No. 382 **4975–4930BC*

Coll 1981 (0.9 dr).

General Comment (URA No. 12): both dates agree perfectly with all previously pub dates. Bell-shaped curve drawn from 15 results indicates that occupation responsible for this industry was very short, *ie,* 200 yr, and occurred ca 5950 BP (Constantin & Lasserre, 1983).

5910 ± 150

Ly-2838. Balise d'Amélie, Soulac-sur-Mer, Gironde **5215–4450BC*

Oak wood from peaty layer outcrop on offshore sand bar (45° 29′ N, 1° 7′ W). Coll 1982 by J Moreau and subm 1983 by J Roussot Larroque. Assoc with Cardial Early Neolithic industry of Atlantic type. *Comment* (JRL): date is a little younger than other dates from shoreline sites on W French coast, eg, at Les Gouillauds, on Ré I., Gif-4878: 5950 ± 100 (Pautreau & Robert, 1980) and at La-Tranche-sur-Mer, Vendée, Gif-4372: 6300 ± 160 (Jousseaume *et al,* 1979). Both sites also contain Early Neolithic industry, but Balise site shows Middle Neolithic attributes (Roussot-Larroque, 1976) and, thus, may be younger.

5990 ± 200

Ly-2651. Breisberg, Oudrenne, Moselle **5285–4450BC*

Charcoal from 50cm depth in Ditch VIII of habitation site (49° 25′ N, 6° 19′ E). Coll 1981 by T Kleg and subm 1981 by C Guillaume, Dir Antiquités Prehist, Metz. Assoc with Early Neolithic industry of Late Danubian

linear Rubané type (0.7 dr). *Comment* (CG): date agrees with expected value and fits exactly with one from Kirchnaumen, nearby site with same industry, Ly-1181: 6060 ± 200 (R, 1978, v 20, p 43) (Decker, Guillaume, & Michels, 1977). Thus, as expected, it is also a little younger than Late Rubané sites in neighboring regions but similar to Paris basin sites such as Cuiry-Les-Chaudardes (above) and Le-Coq-Galleux (below).

Le Rochas series, Saint-Remèze, Ardèche

Charcoal from three superimposed sub-levels in Layer 4 of cave fill (44° 21′ N, 4° 29′ E). Coll 1981 and subm 1982 by A Beeching, Centre Natl Recherche Sci, Marseille. Layer 4 contains homogeneous Middle or Late Cardial Early Neolithic industry.

Ly-2749. Rochas 4-1/4-2 **5060 ± 250** **4340–3390BC*

Samples from upper sub-levels 4-1 and 4-2; only 0.2 dr despite availability of ca 20g of charcoal before alkaline pretreatment.

Ly-2748. Rochas 4-3 **6090 ± 210** **5365–4565BC*

From lowest sub-level 4-3; only 0.4 dr also after large dissolution of charcoal during alkaline pretreatment.

General Comment (AB): Ly-2748 agrees with expected age for Late Cardial Neolithic and previously obtained results from region, eg, in nearby site, La Baume-Bourbon at Cabrières, Ly-412: 6050 ± 120 and Ly-538: 6180 ± 180 (R, 1973, v 15, p 525–526) or in La Baume rock shelter at Montclus, Ly-303/304: 6220 ± 100 (R, 1971, v 13, p 62). Ly-2749 is obviously too young and may be explained by presence of some charcoal originating from overlying layers which contain industries dating from Chalcolithic to Middle Ages, despite presence of stalagmitic floor overlying Layer 4. Discrepancy may also be due to large statistical margin caused by small dr (Beeching & Thomas-Beeching, 1982).

Rufacher Huben series, Colmar, Haut-Rhin

Bones from several refuse pits of village (48° 2′ N, 7° 20′ E). Coll 1979 by C Bonnet and subm 1982 by A Thévenin, Dir Antiquités Prehist, Stras-

TABLE 31
Rufacher Huben

Sample no.	Site ref	DR	Age (BP)	Corrected date interval (BC)
Ly-2729	RST 13–14	0.4	5990 ± 230	5285–4450
-2730	MN 2	0.5	5860 ± 140	5190–4430
-2731	HI 13–15	0.4	5690 ± 180	5020–4115
-2732	DE 18–20	0.5	6050 ± 200	5325–4550
-2733	CD 13-14-15	1	5740 ± 130	4990–4395

bourg. Assoc with Rubané artifacts. Each pit contains unstrat mixture of bones and potsherds from Early, Middle, and Late Rubané.

General Comment (CB): despite dilution of samples due to low collagen content of most of bones, as is usual for open-air sites, dates are very similar for all pits. This suggests either homogeneous mixture of bones or very short site occupation which was contemporaneous with Late Rubané in Lorraine prov, eg, in Breisberg site (above), or in Paris basin, eg, in Cuiry-les-Chaudardes site (above). Brevity of occupation does not agree with typol data from potsherds mixed in ditches, of which most are Early Rubané and surely older than 6000 BP. Thus, due to lack of strat in ditches, results do not actually date whole site, but demonstrate homogeneity of bone mixture.

Le Coq Galleux series, Compiègne, Oise

Bones from habitation site on lowest terrace of Oise R (49° 24′ N, 2° 48′ E). Coll 1978 (Ly-2714 and -2715) by C Toupet and 1979 by JC Blanchet and subm 1982 by JC Blanchet.

General Comment (JCB): except for Ly-2715, which was sampled at very shallow depth and may, thus, be younger, all dates are perfectly within expected range indicated by strat study and typol of assoc industries (Toupet, 1980; Blanchet & Decormeille, 1980). First phase of site occupation occurred during Early Neolithic (Paris basis Rubané type). Three dates from this period (Ly-2717, 2716, -2720) are very close and similar to those obtained for same industry in many other sites of region, such as Cuiry-Les-Chaudardes (above; R, 1983, v 25, p 106). Second phase of site occupation corresponds to Cerny type Middle Neolithic; both dates from this period agree with similar samples from Paris basin and N France, such as Les Sablins at Etaples, Gif-3701: 5660 ± 120 and Gif-4024: 5690 ± 120

TABLE 32
Le Coq Galleux

Sample no.	Loc in site	Assoc industry	DR	Age (BP)	Corrected date interval (BC)
Ly-2962	Struct 12, pit	Late Neolithic Chalcolithic	0.3	3870 ± 130	2785–1970
-2715	Pit 2	Chassean	1	4450 ± 140	3315–2870
-2714	Level 2 Sec 3	Chassean	1	4950 ± 160	4075–3880
-2718	Struct 14 Camp ditch	Early Chassean	1	5330 ± 110	4415–3875
-2963	Struct 45 Ritual pit	Cerny	0.3	5420 ± 180	4545–3885
-2719	Struct 49	Danubian or Cerny	0.3	5710 ± 180	5050–4125
-2717	Struct 3 Advanced ditch	Danubian Late Rubané	0.2	5920 ± 260	5295–4320
-2716	Struct 2 Main ditch	Late Rubané of Paris basin	1	6080 ± 110	5270–4740
-2720	Struct 4 Refuse pit	Late Rubané	1	5950 ± 120	5210–4565

(Hutrelle & Piningre, 1978), or Pincevent at La Grande Paroisse, Gif-5005: 5630 ± 120 (unpub), or La Grève de Frécul at Barbuisse-Courtavent, Ly-2455: 5530 ± 150 (R, 1983, v 25, p 108). Third phase of occupation is Chassean Middle Neolithic. Three dates from this period, Ly-2718, -2714, -2715, are similar to those from Chassean levels in Boury-en-Vexin and Catenoy sites (above). Fourth phase of site occupation, corresponding to Late Neolithic, has previously been dated by Louvain, Lv-1221: 4250 ± 75 (unpub). Ly-2962 corresponds to Chalcolithic period, probably of "Champs d'Urnes" type. Thus, all these results summarize well entire Neolithic chronology for Paris basin (Blanchet, 1983).

6590 ± 140

Ly-2677. La Madeleine, Pont du Château, Puy de Dôme **5835–5220BC*

Human bones from burial in isolated ditch in silty colluvia overlying low terrace of Allier R (45° 49′ N, 3° 15′ E). Coll 1981 by Lab Regional Ponts et Chaussées, Clermont-Ferrand and subm 1981 by JP Daugas, Dir Antiquités Prehist, Clermont-Ferrand. No assoc industry (0.7 dr). *Comment* (JPD): date confirms Neolithic suggested by burial loc and osteol study by A Gilbert (Daugas, Gilbert, & Raynal, 1982). Date is comparable to Le Creux Rouge sepulture at Clermont-Ferrand, Ly-1944: 6070 ± 140 (R, 1983, v 25, p 108).

Abri de Strette series, Babaghju, Haute Corse

Charcoal from two levels in rock shelter (42° 42′ N, 9° 12′ E). Coll 1982 and subm 1983 by J Magdeleine, Bastia.

6420 ± 300

Ly-2835. Strette No. 4 **5820–4975BC*

From Layer XXb, assoc with Cardial Early Neolithic industry (0.1 dr).

6480 ± 430

Ly-2836. Strette No. 5 **6000–4800BC*

Same layer and assoc industry as previous one (0.2 dr).

Ly-2837. Strette No. 7 **9140 ± 300**

From Layer XXIV, assoc with Pre-Neolithic lithic industry (0.2 dr).

General Comment (JM): average of Ly-2835/2836: 6460 ± 250, corresponding to most dates for Cardial Neolithic in Provence, eg, at Châteauneuf-Lès-Martigues (below). Ly-2837 confirms Pre-Neolithic origin of industry.

La Font des Pigeons series, Châteauneuf-Lès-Martigues, Bouches-du-Rhône

Charcoal from large rock shelter (43° 23′ N, 5′ 10′ E). Coll 1979 and subm 1982 and 1983 by J Courtin, Dir Antiquités Prehist, Aix-en-Provence (0.07 dr only for Ly-2823).

General Comment (JC): three series were previously dated from 1960 excavation by M Escalon de Fonton (1967). One was done by Köln lab from

TABLE 33
Châteauneuf-Lès-Martigues

Sample no.	Layer	Assoc industry	Age (BP)	Corrected date interval (BC)
Ly-2823	1	Chassean, Middle Neolithic	5160 ± 360	4655–3255
-2824	2	Chassean, Middle Neolithic	5460 ± 130	4525–3920
-2825	6	Epicardial, Early Neolithic	5590 ± 120	4700–4170
-2826	12	Late Cardial, Early Neolithic	5900 ± 140	5205–4465
-2827	13	Middle Cardial, Early Neolithic	6200 ± 160	5435–4865
-2828	16A	Early Cardial, Early Neolithic	6550 ± 100	5755–5225
-2829	17	Early Cardial, Early Neolithic	6200 ± 100	5360–4925
-2830	18G	Late Castelnovian, Mesolithic	7260 ± 120	
-2831	19	Late Castelnovian, Mesolithic	6720 ± 140	5970–5290
-2832	19	Late Castelnovian, Mesolithic	7290 ± 130	
-2833	20	Middle Castelnovian, Mesolithic	7630 ± 150	

charcoal: Kn-208: 6700 ± 200, for Late Cardial level, and Kn-182: 7520 ± 240 for Early Cardial level. Latter result suggested very early appearance of Neolithic industries in region (Escalon de Fonton, 1967). Two other series were done by Lyon lab, 7 dates from bones and charcoal from all levels (R, 1977, v 15, p 526–527), and by Monaco lab, MC-2514: 6050 ± 100 from Layer 7–8, MC-2515: 6900 ± 100 from Layer 17, and MC-2516: 7220 ± 100 from Layer 18. All dates from Lyon and Monaco indicate much younger date, by ca 1000, for beginning of Neolithic. New excavation was later carried out by J Courtin to check previous data. New series agrees with Ly and MC results, and with archaeol and chronol data from other sites in region (Courtin, Evin, & Thommeret, in press).

Mesolithic Period

France

La Doue series, Saint-Cernin de Larche, Corrèze

Charcoal from carbonaceous masses (hearth or discharge zones) from rock shelter (45° 5′ N, 1° 24′ E) (Mazière, 1983). Coll and subm 1980 (Ly-2223, -2234) and 1982 by G Mazière, Dir Antiquités Prehist, Limoges.

TABLE 34
La Doue

Sample no.	Loc	Depth (cm)	DR	Assoc industry	Age (BP) and corrected date interval
Ly-2649	O/P-VI	214–220	0.25	Medieval	1430 ± 200 AD230–900
-2818	F-V	98–100	0.2	Early Neolithic	6390 ± 290 5790–4745BC
-2233	H-V	160	1	Sauveterrian	8750 ± 150
-2234	H-V	180	1	Sauveterrian	8880 ± 160
-2819	I-V	178–182	0.3	Sauveterrian	9260 ± 200
-2820	I-V	183–196	0.3	Sauveterrian	8980 ± 210
-2821	I-V	203–208	0.5	Sauveterrian	8860 ± 210
-2822	M-V	478–480	1	Late Magdalenian	11,520 ± 170

General Comment (GM): all dates agree with chronol expected from assoc industries. Ly-2649 corresponds to beginning of Middle Ages. Ly-2818 may be correlated with Ly-1600: 7010 ± 430 (R, 1979, v 21, p 440) from Layer 3 in nearby Chez-Jugie site at Cosnac, which contains some industry, with "Le Martinet" trapezoid type. Sauveterrian dates are very close, at ca 9000 BP. They are identical to those from Les Fieux site at Miers, Lot, Gif-4281: 9060 ± 190 (unpub) and show that industry is much older than at Chez-Jugie (3 dates at ca 8000 BP). Ly-2822 is also identical to two dates from Chez-Jugie assoc with Magdalenian industry with Azilian characteristics, Ly-1572: 11,840 ± 580 and Ly-1601: 11,730 ± 530.

La Vieille Eglise series, La Balme de Thuy, Haute-Savóie

Charcoal from lowest levels of rock shelter (45° 55′ N, 6° 17′ E). Coll and subm by JP Ginestet, Thônes.

Ly-1936. La Vielle-Eglise 6A **8170 ± 160**

From Level 6A; coll 1978 and subm 1979 (0.7 dr). Assoc with Tardenoisian Mesolithic industry.

Ly-2619. La Vielle-Eglise 7A **9820 ± 200**

From Level 7A; coll 1981 and subm 1982. Assoc with Tardenoisian Mesolithic industry.

General Comment (JPG): both dates agree perfectly with expected values. They date intermediate levels, 6B and 6C, at ca 9000 BP. Upper levels, 5A and 5B, containing Middle and Early Neolithic ceramic industry were previously dated, Ly-1934: 5930 ± 210 and Ly-1935: 6500 ± 230 (R, 1983, v 25, p 108–109; Bintz *et al,* 1981).

Allée Tortue series, Fère-en-Tardenois, Aisne

Charcoal from 4 hearths found in middle of open-air site at ca 30 to 50cm depth in sand (49° 13′ N, 3° 31′ E). Coll and subm by JG Rozoy, Charleville-Mézières. Site contains rich Late Tardenoisian Mesolithic flint industry (Rozoy, 1978).

Ly-2738. Allée Tortue J-50 **4070 ± 170** **3010–2305BC*

From deepest hearth J-50; coll 1981 and subm 1982; 0.5 dr despite large sample size before alkaline pretreatment.

Ly-2739. Allée Tortue F-51 NE **3470 ± 130** **2170–1540BC*

From hearth F-51 NE in upper part of archaeol level. Coll 1979 and subm 1982.

Ly-2740. Allée Tortue C-54 NW **3100 ± 210** **1755–835BC*

From hearth C-54 NW in upper part of archaeol level. Coll and subm 1982.

Ly-3149. Allée Tortue I-50 SW **9120 ± 210**

From beneath hearth I-50 SW (0.3 dr).

General Comment (JGR): first three samples date hearth to Chalcolithic and Bronze ages and show that hearths are intrusive in Mesolithic upper layer of site. Such disturbance of archaeol layer was indicated by inside discovery of flint arrow with peduncle and wings. Ly-3149 shows hearth with Later Tardenoisian industry overlying older charcoal, demonstrating human presence at site early in Mesolithic period.

Ly-2814. Campagnol des Neiges cave, Gresse, Isère **9010 ± 200**

Charcoal (*Pinus* sp) from base of gallery of cave opening at ca 1950m alt at foot of Séguret Mt in Les Hauts Plateaux du Vercors massif (44° 52′ N, 5° 31′ E). Coll 1981 and subm 1982 by P Bintz. Gallery contains several skeletons of various animal spp and some Epipaleolithic flints. *Comment* (PB): date confirms age of flint which indicates temporary presence of man in this deep cave, despite high alt and difficult access of site.

Magdalenian Period

France

Ly-2531. La Roche cave, Courchapon, Doubs **8450 ± 150**

Bones and fragments of antlers from fill near entrance of cave (47° 14′ N, 6° 46′ E). Coll 1950 to 1955 by P Ripotot and R Seibel (1958), preserved in Dôle Mus and subm by M Campy, Dir Antiquité Prehist, Besançon. Fauna underlay level containing Late Magdalenian industry. *Comment* (MC): date indicates fauna is not contemporaneous with industry, despite proximity.

Ly-2781. Loubressac cave, Mazerolles, Vienne **9690 ± 160**

Bones from only archaeol layer in fill of terrace of small cave (46° 25′ N, 0° 41′ E). Coll 1947 and subm 1981 by L Pradel, Châtellerault. Assoc with Magdalenian VI_2 industry. *Comment* (LP): date is obviously too young for assoc industry as it corresponds to beginning of Holocene. This discrepancy cannot be explained (Pradel, 1983).

Ly-2314. Le Pré des Forges, Marsangy, Yonne **8440 ± 190**

Gastropod shells from lowest and upper parts of Layer 5 in open-air site (48° 7′ N, 3° 18′ E). Coll 1979 and subm 1980 by B Schmider, Lab Prehist, Coll France, Paris. Layer 5 contains faunal bones without collagen and Magdalenian industry. Gif TL date from burned sandstones is ca 11,700 BP. *Comment* (BS): date is too young but shells were coll from entire layer whereas industry was found in only lowest part of level. It confirms unreliability of terrestrial shells for dating archaeol events (Evin *et al,* 1980; Schmider, 1979).

Abri de Campalou series, Saint-Nazaire-en-Royan, Drôme

Bones from rock shelter (45° 15′ N, 5° 12′ E). Coll and subm 1972 by JE Brochier and JL Brochier (1973), Romans/Isère.

Ly-2286. Campalou 2a **9720 ± 1100**

From Layer 2a in Zone 6–7 (0.07 dr); assoc with Late Magdalenian industry with Azilian characteristics, previously dated, Ly-436: 12,800 ± 300 (R, 1973, v 15, p 148). Date was considered too old by ca 1000 yr, as typol, sedimentol, and palynol data suggest beginning of Alleröd.

Ly-2285. Campalou 3a **9400 ± 500**

From level underlying previous one (0.2 dr); assoc with Late Magdalenian industry attributed to Middle Dryas, ca 12,000 BP.

Ly-1958. Campalou base **13,400 ± 350**

From lowest level of fill (0.7 dr); assoc with Magdalenian industry attributed to Early Dryas or Bölling.

General Comment (JEB & JLB): Ly-2286 and -2285 appear too young by ca 1000 yr while previously pub sample was too old also for unknown reasons. Ly-1958 agrees with expected age.

Ly-2693. Gare de Conduché cave, Bouziès, Lot **12,040 ± 160**

Bones from only black layer of fill in small cave (44° 29′ N, 1° 39′ E). Coll and subm 1982 by M Lorblanchet, Cabrerets Mus. Assoc with Late Magdalenian industry with microlithic remains. *Comment* (ML): date agrees with many others for Late Magdalenian of SW France, except those from nearby site, Sainte-Eulalie at Espagnac, Gif-2193: 10,400 ± 300 and Gif-1697: 10,830 ± 200, which suggested prolonged presence of Magdalenian industry in Quercy region. Date does not confirm latter hypothesis and indicates that more measurements on samples from Sainte-Eulalie site are needed.

Caves and rock shelters of Bordelais series, Gironde

Bones from Magdalenian sites in Bordeaux region (Lenoir 1983). Subm by M Lenoir, Lab Quaternary Geol, Univ Bordeaux I (Table 35a,b).

General Comment (ML): dates are generally as expected from assoc industries. Ly-3148 shows bone-bearing breccia is not part of same archaeol assemblage as underlying Middle Magdalenian levels but is contemporaneous with fills of many neighboring sites containing Late Magdalenian industries, such as La Grotte des Fées (undated). Ly-2632 confirms that lowest level is from beginning of Upper Paleolithic; Ly-2699 agrees with previous dates of samples from neighboring rock shelter Arbi l du Moulin Neuf, Level 2a, Ly-2352: 13,570 ± 260 and Level 2b, Ly-2275: 14,280 ± 440 (R, 1983, v 25, p 114). Ly-2701 suggests that bone may come from underlying level.

Roc La Tour 1 series, Monthermé, Ardennes

Charcoal underlying archaeol level of open-air site (49° 54′ N, 3° 27′ E). Coll and subm 1982 by JG Rozoy. Site contains Late Magdalenian V industry.

TABLE 35a
Bordelais

Site	Village	Geog coordinates	Colln yr	Ref	Subm yr
Abri Faustin	Cessac	(44° 44′ N, 0° 10′ W)	1975	M Lenoir	1982
Vidon	Juillac	(44° 49′ N, 0° 16′ W)	1950	E Prot	1982
Roc de Marcamps	Prignac and Marcamps	(45° 02′ N, 0° 30′ E)	1979	M Lenoir	1980, 1981
Abri 2 du Moulin Neuf	Saint-Quentin de Baron	(44° 49′ N, 0° 16′ W)	1980	M Lenoir	1982

TABLE 35b
Bordelais

Sample no.	Site	Layer	Sq	Assoc industry	DR	Age (BP)
Ly-2700	Abri Faustin	1	K-24	Late Magdalenian	0.7	12,370 ± 220
-2699	Abri 2 du Moulin Neuf	2	M-13	Middle Magdalenian	0.5	13,380 ± 250
-2701	Vidon	B		Late Magdalenian	0.7	14,000 ± 350
-3148	Roc de Marcamps		Breccia		1	11,910 ± 230
-2290	Roc de Marcamps	1b	N-28	Late Magdalenian	1	14,200 ± 190
-2680	Roc de Marcamps	2	N-29	Middle Magdalenian	0.7	13,570 ± 420
-2291	Roc de Marcamps	2	N-26-28	Middle Magdalenian	0.7	14,910 ± 240
-2681	Roc de Marcamps	3b	Core S	Middle Magdalenian	0.3	15,700 ± 450
-2292	Roc de Marcamps	4c	M-30	Middle Magdalenian	1	17,410 ± 310
-2682	Roc de Marcamps	8	M-30 N-30	Aurignacian	0.5	26,520 ± 830

4710 ± 110

Ly-2924. Roc de La Tour N-51 **3775–3175BC*

From Sq N-51.

650 ± 150

Ly-2925. Roc de La Tour F-61 **AD1175–1435*

From Sq F-61.

1990 ± 200

Ly-2926. Roc de La Tour **405BC–AD390*

From Sq L-50 (0.3 dr).

General Comment (JGR): dates show large-scale disturbance of site, frequent in relatively superficial sites where downward migrations of charcoal can occur via root holes or animal burrows.

Ly-3000. La Garenne, Saint-Marcel, Indre **14,270 ± 270**

Bone of microfaunal spp, mainly *Microtus* sp, from Sec B1 and B2 in cave (46° 36′ N, 1° 30′ E). Coll 1955 by J Allain, Dir Antiquités Prehist, Bourges, and subm 1983 by R Desbrosse, Centre Natl Recherche Sci, Blanzy and JF Kosłowsky, Archaeol Inst Jagielonski, Krakow, Poland (0.4 dr). Site contains Magdalenain industry with "navettes" found in several other sites in distant points of Europe. Many dates from this site were erratic (R, 1978, v 20, p 49–50). *Comment* (JK): date confirms feasibility of using microfaunal bones as dating material as collagen content is often higher than in macrofaunal bones. Date falls within range of other sites of

Arlay, Jura, France (R, 1979, v 21, p 446) and Maszyska cave, near Krakow, Poland (R, 1983, v 25, p 115). It confirms contemporaneity of "à Navette" Magdalenian industry in all three sites despite their distance (Desbrosse *et al,* in press). Pollen analysis indicates beginning of warm oscillation attributed to Bölling but date is more likely to be Early Dryas.

Monthaud series, Chalais, Indre

Bones of several spp from three levels of fill of rock shelter (46° 32′ N, 1° 2′ E). Coll 1966 and subm 1980 by L Pradel, Châtellerault (Pradel & Pradel, 1967).

Ly-2757. Monthaud III **13,420 ± 200**

From Layer III, assoc with Late Solutrean industry like one from La Tannerie site, previously dated, Ly-2228: 18,020 ± 270 (R, 1983, v 25, p 116).

Ly-2758. Monthaud II **15,450 ± 290**

From Layer II assoc with Middle Solutrean industry (0.7 dr).

Ly-2759. Monthaud I **16,970 ± 300**

From Layer I assoc with Early Solutrean industry like one from Layer H of Laugerie Haute site, previously dated, GrN-1888: 20,890 ± 300 (R, 1963, v 5, p 167) (0.5 dr).

General Comment (LP): dates fit strat sequence but are in Early Magdalenian rather than Solutrean time range. Date remains unexplained as these two industries have never been contemporaneous.

Ly-2737. Les Guinards, Creuzier le Vieux, Allier **17,420 ± 330**

Reindeer antler from solifluction flow excavated during work on road (46° 11′ N, 3° 25′ E). Coll 1981 by L Magoda, JP Daugas and JP Raynal and subm 1982 by JP Daugas and JP Raynal. *Comment* (JPD & JPR): date suggests Early Magdalenian. Sparse assoc industry with many backed bladelets neither exclude nor confirm such attribution (Daugas & Raynal, 1982) as deposits such as solifluction flows often involve mixing of materials. Date may be compared with several other results from Velay region, such as Les Cottiers site at Retournac, Ly-719: 18,550 ± 150 (R, 1975, v 17, p 27) and Le Rond du Barry site at Polignac, Gif-3038: 17,100 ± 450 (unpub).

Czechoslovakia

Ly-2553. Pekarna cave, Mokra, Moravia **12,940 ± 250**

Bones (*Equus* sp) first attributed to Layer g/h but probably from only Layer g (49° 15′ N, 16° 41′ E). Coll during excavation 1925 to 1930 (Absolon & Czierek, 1932), preserved in Moravic Mus, Brno, and subm 1981 by K Valoch, Anthropol Inst, Brno. Assoc with Moravian Magdalenian with "navettes" industry, attributed to Middle Dryas. *Comment* (KV): date as expected from paleontol study of horse bones by R Musil.

Spain

La Riera series, Posada de Lianes, Asturias

Bones from cave deposit (43° 26′ N, 4° 52′ W). Coll 1977 and subm by LG Straus, Univ New Mexico, and GA Clark, Arizona State Univ.

Ly-1646. La Riera 23 **10,340 ± 560**

From Level 23, Sq H-10, subm 1978; assoc with Upper Magdalenian industry (0.3 dr).

Ly-1645. La Riera 20 **12,360 ± 670**

From Level 20, Sq E-9, subm 1978; assoc with Magdalenian industry (0.1 dr).

Ly-1783. La Riera 1 **20,360 ± 450**

From Level 1, Sq G-10, subm 1979; assoc with Pre-Solutrean industry, may be Late Aurignacian.

General Comment (LGS): La Riera sequence was dated with 28 samples by Gakushuin, Cambridge, British Mus, Riverside, and Lyon labs on both bones and charcoal. Ly-1646 agrees with GaK-6982: 10,890 ± 430, for immediately overlying Level 24. Ly-1645 provides reasonable estimate for Level 20, although 2 other dates, UCR-1273D, which is far too young and GaK-6980: 17,160 ± 440 which is conceivable at 2σ due to depositional hiatus, both sedimentol and palynol detected at this depth. Ly-1783 falls within statistical error of two other dates for Level 1, UCR-1270A: 19,620 ± 390 and BM-1739: 20,860 ± 410. No Solutrean points were found in this basal layer, which is overlain by 16 Solutrean levels with 11 ^{14}C dates ranging from 20,970 ± 620 to 16,900 ± 200 (Straus *et al,* 1981).

Beginning of Late Paleolithic and Middle Paleolithic Periods

France

La Vigne Brun series, Villerest, Loire

Powder of burned bones (Ly-2151 and -2153) and burned bones from hearths in several areas of open-air habitation site (45° 59′ N, 3° 19′ E). Coll and subm by J Combier and JL Porte, Dir Antiquités Prehist, Lyon. In all secs dated, hearths contain rich Upper Perigordian industry and site generally resembles settlements with wall of mammoth bones discovered in W Russia (Combier *et al,* 1982).

General Comment (JC): Ly-2512 comes from much eroded area and is unexplained as it seems there was no human occupation of site after Upper Perigordian period. Ly-2151 and -2153 are too young because powdery material did not allow for thorough cleaning. Sample contained carefully selected large fragments of completely charred bones (Evin, 1982). Thus, last 4 dates mutually agree and suggest relatively short occupation of site at

TABLE 36
Vigne Brun

Sample no.	Loc	Colln yr	Subm yr	DR	Age (BP)
Ly-2152	Sec XX	1979	1979	0.4	16,180 ± 260
-2151	Sq P-16	1979	1979	0.3	19,500 ± 480
-2153	Sq 0-16	1979	1979	0.5	20,840 ± 390
-2637	Sec VIII–IX	1981	1982	0.3	23,450 ± 690
-2638	Sec VIII–IX	1981	1982	1	21,580 ± 600
-2639	Sec VII	1981	1982	0.4	23,230 ± 750
-2640	Sec I–IX	1981	1982	0.1	23,500 ± 1000

ca 23,000 BP. They also agree with previously pub dates from same site, Ly-391: 24,900 ± 2000 (R, 1975, v 17, p 29) and with other results from two sites in same region that contain similar industry: Saint-Martin-sous-Montaigu, Ly-311: 22,900 ± 600 and Ly-309: 24,150 ± 700 (R, 1971, v 13, p 64) and Solutré: 4 dates between 21,600 ± 700 and 24,050 ± 600 (R, 1971, v 13, p 63; R, 1973, v 15, p 518).

Le Flageolet I series, Bézenac, Dordogne

Bones from several archaeol levels of rock shelter (44° 51′ N, 1° 5′ E). Coll 1976 and 1980 by JP Rigaud, Dir Antiquités Prehist, Bordeaux. Site was successively occupied from beginning of Upper Paleolithic until Late Perigordian (Rigaud, 1982).

General Comment (JPR): use of ammonia contaminated by atmospheric CO_2 during lab treatment surely caused all first-measured samples (Ly-1606 to -1608, -1748, -1749) to appear too young. Exact amount of contamination could not be calculated but dates are probably off in proportion to dilution ratio; thus, they must be all considered min ages. All other dates are in mutual agreement and are within expected age range, although some are a little younger than Groningen samples from levels containing similar industries in Abri Pataud rock shelter (R, 1967, v 9, p 114–115; R, 1972, v 14, p 56).

TABLE 37
Le Flageolet I

Sample no.	Layer	Assoc industry	Subm yr	DR	Age (BP)
Ly-1606	I/III	Late Perigordian	1977	0.7	≥22,440 ± 680
-2185	I/III	Late Perigordian	1979	0.3	18,610 ± 440
-1607	IV	Late Perigordian	1979	0.5	≥21,190 ± 920
-2186	IV	Late Perigordian	1979	0.8	22,950 ± 500
-2721	V	Late Perigordian	1977–1981	0.5	22,520 ± 500
-2722	VI	Late Perigordian	1977–1981	0.6	24,280 ± 500
-1748	VII	Late Perigordian	1977	1	≥25,720 ± 610
-2723	VII	Late Perigordian	1977–1981	0.3	26,150 ± 600
-1608	VIII	Aurignacian	1977	1	≥23,280 ± 670
-2724	VIII/1	Aurignacian	1981	0.3	26,800 ± 1000
-2725	VIII/2	Aurignacian	1981	0.8	27,350 ± 1400
-1749	IX	Aurignacian	1977	0.2	≥20,270 ± 1760
-2726	IX	Aurignacian	1981	0.4	27,000 ± 1000
-2727	XI	Early Aurignacian	1977–1981	0.3	≥31,500

Le Fonténioux cave series, Saint-Pierre de Maillé, Vienne

Bones and teeth of animal spp from cave fill (46° 40′ N, 0° 50′ E). Coll 1951 and subm 1982 by L Pradel.

Ly-2785. Fonténioux, No. 2 **25,230 ± 500**

From level containing Upper Aurignacian V industry.

Ly-2784. Fonténioux, No. 1 **25,400 ± 450**

From level containing Upper Perigordian IVa industry (0.7 dr).

General Comment (LP): both dates agree perfectly with expected age (Pradel, 1953). They confirm generally assumed contemporaneity of Late Aurignacian and Perigordian. They also agree with dates from neighboring Laraux site, Ly-1740: 23,510 ± 640 (R, 1979, v 21, p 447).

Le Raysse series, Brive-La-Gaillarde, Corrèze

Bones of several animal spp from rock shelter fill (45° 7′ N, 1° 32′ E). Coll 1964 and subm 1982 by L Pradel (Pradel & Pradel, 1966).

Ly-2782. Le Raysse, No. 4 **25,000 ± 660**

From Layer 4; assoc with Upper Perigordian V_C industry (0.5 dr).

Ly-2783. Le Raysse, No. 3 **23,630 ± 480**

From Layer 3; assoc with Aurignacien I industry (0.5 dr).

General Comment (LP): Ly-2782 is within age generally accepted for Late Perigordian industry but Ly-2783 is obviously too young for Early Aurignacian.

Ly-2752. Les Cottés, Saint-Pierre de Maillé, Vienne **23,420 ± 710**

Bones from animal spp from Layer IV of terrace fill of cave (46° 40′ N, 0° 50′ E). Coll 1958 to 1960 and subm 1980 by L Pradel. Assoc with evolved Early Perigordian industry (Pradel, 1961). *Comment* (LP): date is much younger than those from Layers I, G, and E, dated by Groningen (R, 1967, v 9, p 107–155). It is too young to be attributed to Early Perigordian, but sterile layer overlying Layer E in cave contains scattered Perigordian IVa industry to which date could correspond.

Dousse series, Angles-sur-l'Anglin, Vienne

Bones from fill of two rock shelters in close proximity (46° 42′ N, 0° 51′ E). Coll 1957 and subm 1980 by L Pradel.

Ly-2753. Abri Sabourin **29,300 ± 800**

From only archaeol level of rock shelter; assoc with Mousterian industry without bifaces.

Ly-2755. Abri Rousseau II-3 **≥30,000**

From Level II, Layer 3, upper layer of fill of rock shelter; assoc with Mousterian industry without handaxes, more evolved than previous one.

Ly-2754. Abri Rousseau, I-2 **≥33,200**

From Level I, Layer 2, lower layer of fill of rock shelter; assoc with Mousterian industry without handaxes.

General Comment (LP): Ly-2753 is rather young for Middle Paleolithic industry or could indicate localized continuation of Mousterian contemporaneity with Early Perigordian and Aurignacian industries in neighboring sites, *ie,* at Les Cottés (above). Ly-2755 and -2754 confirm that this Mousterian industry is older than Würmian III stadial.

Ly-2756. L'Ermitage, Lussac-les-Châteaux, Vienne **26,600 ± 600**

Bones of animal spp from only level of cave fill (46° 23′ N, 0° 43′ E). Coll 1953 and subm 1980 by L Pradel. Assoc with Mousterian industry of La Quina or Charentian type (Pradel & Pradel, 1954) (0.8 dr). *Comment* (LP): for unknown reason, date is too young even for very Late Middle Paleolithic.

Ly-2902. Abri Moula, Soyons, Ardèche **20,060 ± 320**

Bones from several sqs at 5.4m depth in fill of rock shelter (44° 43′ N, 4° 50′ E). Coll 1982 by Archaeol Club, Crouzet Cie, and P Payen, Valence. Assoc with Mousterian industry. *Comment* (PP): date is younger than previous result, Ly-2488: 32,200 ± 1500 from overlying level which also gave similar date, Ly-2217: 20,100 ± 310 (R, 1983, v 25, p 118).

Les Pècheurs series, Casteljau, Ardèche

Bones from superimposed hearths (F) of habitation level, from base (S) of fill, from layer at presumed base of isolated hut (L) (Lhomme, Enétério, & Moulin, 1980) in rock shelter (44° 24′ N, 4° 23′ E). Coll 1976 to 1981 and subm 1978 and 1981 (Ly-2343) by G Lhomme, Les Vans.

General Comment (GL): Ly-2339 and -2342 are obviously much too young by ca 10,000 yr. Although other values seem to agree with strat sequence confirmed by amino acid racemization of bones (Lafont, 1984), they all seem a little too young for French sites from beginning of Late Paleolithic, either in Perigord (eg, at Les Eyzies) or in Bourgogne (eg, at Arcy-sur-Cure) (Delibrias & Evin, 1974). This general tendency to younger ages remains unex-

TABLE 38
Les Pècheurs

Sample no.	Loc	Assoc industry	Depth (cm)	DR	Age (BP)
Ly-2337	F-9	Aurignacian I	210–230	0.5	26,760 ± 1000
-2338	F-11-12	Aurignacian 0	225–230	0.6	29,400 ± 900
-2339	F-10-11	Early Aurignacian	230–240	1	23,880 ± 750
-2340	L-1-2	Early Aurignacian or Mousterian	270–300	0.4	29,700 ± 900
-2341	F-13	Early Aurignacian or Mousterian	240–250	0.5	28,440 ± 1280
-2343	F-16	Early Aurignacian or Mousterian	260	1	≥31,000
-2342	5-base	Mousterian	395–420	0.7	24,940 ± 680

plained, maybe due to contaminant in bones which was not eliminated during normal pretreatment.

La Baume de Gigny series, Gigny-sur-Suran, Jura

Bones from middle fill of rock shelter (46° 27′ N, 5° 27′ E). Coll and subm by M Vuillemey, Lons-le-Saunier, to complete and check earlier series (see, eg, R, 1979, v 21, p 447) and to confirm presence of sedimentation hiatus or erosion level beneath Layer VIII, as suggested by sedimentol study (Vuillemey, in press). Later, Layer VIII yielded Ly-789: 28,500 ± 1400 and Ly-566: 29,500 ± 1400, and contains Late Mousterian industry.

Ly-3063. La Baume de Gigny, IX **≥31,500**

Macrofaunal bones from Layer IX, just overlying presumed hiatus or erosion level (0.1 dr).

Ly-1701. La Baume de Gigny, X **27,000 ± 1400**

Microfaunal bones from small Layer X, interbedded with previous one on side of fill, against rockshelter wall.

Ly-2526. La Baume de Gigny, XI **≥33,000**

Microfaunal bones from Layer XI, same level as Ly-3063 (0.15 dr).

General Comment (MB): Ly-1701 is too young for its strat position. Sample may include bones from overlying levels. Ly-3063 and -2526 demonstrate great difference in age between Layer VIII and IX as suggested by sedimentol study and organic content of bones, which is 6 times lower in lowest level of fill, below Layer VIII (Evin, in press).

Saint-Marcel cave series, Bidon, Ardèche

Samples from fill at entrance of rock shelter (44° 19′ N, 4° 37′ E). Coll and subm by R Gilles, Saint-Marcel d'Ardèche. Assoc with Mousterian industry.

Ly-2276. Saint-Marcel E **29,330 ± 650**

Bones from Layer E at ca 2.3m depth; coll 1976 and subm 1979 (0.7 dr).

Ly-2861. Saint-Marcel G1 **23,260 ± 370**

Bones from Layer G at ca 2.5m depth; coll 1979 and subm 1982.

Ly-2901. Saint-Marcel G2 **≥25,000**

Charcoal from Layer G; coll 1979 and subm 1982; 0.1 dr due to extensive dissolution during alkaline pretreatment.

General Comment (RG): Ly-2861 is much too young for assoc industry and cannot be explained. Ly-2901 is too diluted to be conclusive; Ly-2276 is younger than expected but should indicate continuation of Mousterian industry in region.

Czechoslovakia

Dolni-Vestonice series, Mikulov, S Moravia

Charcoal from center of open-air site (48° 48′ N, 16° 39′ E). Coll 1975 and 1977 at base of Würmian III loess at ca 4.5m depth and subm by B Klima, Aücsav, Brno. Assoc with Gravettian industry of Pavlovian type (Klima, 1981).

Ly-1303. Dolni Vestonice, No. 1 **22,250 ± 570**

Ly-1999. Dolni Vestonice, No. 2 **19,640 ± 540**

General Comment (BK): dates are much younger than expected, ca 25,000 BP, corresponding to Tursac interstadial, *ie,* only a little younger than Gro-1286: 25,600 ± 170 (Klima, 1981) from 1928–1929 excavation. According to strat data, such a great discrepancy, ca 3000 yr, cannot be explained by contamination or mixing of material.

Poland

U1 Spadzista series, Krakow

Burned bones from Layer 6, Loc C2 in open-air site (50° 4′ N, 19° 57′ E). Coll and subm 1980 by JK Kozłowski. From silty solifluction layer at base of last Würmian loess or Upper Late Loess. Assoc with Gravettian industry of Kostenk Avdeyevo type.

Ly-2541. U1 Spadzista No. 1 **17,400 ± 310**

From Sqs B1 and B2 at top of Layer 6, underlying base of Layer 5, which is most typical Late Loess, at ca 480cm depth under present soil level, and at 222 to 228cm from excavation ref level "0" (0.6 dr).

Ly-2542. U1 Spadzista No. 2 **21,000 ± 900**

From Sq B7 at base of Layer 6 at ca 420cm under present surface, and at 127 to 137cm from excavation ref level "0."

General Comment (JKK): Ly-2542 is close to Ly-631: 20,600 ± 1050 (R, 1975, v 17, p 29) from Loc B in same site, at base of same Layer 6. Ly-2541 is, as expected, younger than Ly-2542, and marks beginning of typical Late Loess deposits. Apparent inversion of dates with regard to depth occurs because soliflucted sediments slope downward in comparison to present soil level surface.

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