

## GIF NATURAL RADIOCARBON MEASUREMENTS VIII

G DELIBRIAS, M T GUILLIER, and J LABEYRIE

Centre des Faibles Radioactivités  
Laboratoire mixte CNRS-CEA  
91190—Gif-sur-Yvette, France

The following date list consists of samples prepared mainly during 1970 and 1971. Some old measurements, not included in previous lists are added. Ages reported here are calculated using the conventional half-life of  $^{14}\text{C}$ : 5568 years and NBS oxalic acid as recent standard.

Since 1970,  $\delta^{13}\text{C}$  measurements are made by J C Duplessy who developed and directs the stable isotopes section of CFR. Since systematic measurements did not seem very significant,  $\delta^{13}\text{C}$  measurements were made on young samples, on samples from arid regions, and on unidentified plant species for which isotopic fractionation may be important (Lerman, 1972). Some determinations are made for scientific interest without radiocarbon age corrections.

No corrections are applied to marine carbon since isotopic fractionation compensates for the apparent age of surface ocean water. No corrections are applied for fresh water carbonates or shells, the initial  $^{14}\text{C}$  content being variable, although  $\delta^{13}\text{C}$  measurements are usually done in these cases.

### ACKNOWLEDGMENTS

Thanks are due to all who assisted in sample preparations and measurements, especially Mireille Rousseau and Jean-Pierre Garnier.

### I. ARCHAEOLOGIC SAMPLES

#### *A. France*

##### *I. W France*

**Gif-1420. Oissel, Ile Coquet, Seine Maritime** **650 ± 90**  
**AD 1300**

Wood from a paddle dredged in Seine bed, Oissel (49° 20' N, 1° 07' E), Ile Coquet, Seine Maritime. Coll and subm 1969 by J Dastugue, Antiquités Préhist Haute et Basse Normandie, Caen. *Comment*: Bronze age was expected but only  $^{14}\text{C}$  was able to date this medieval object.

**Gif-1917. Colombiers-sur-Seulles, Calvados** **5150 ± 130**  
**3200 BC**

Charcoal from Neolithic barrow, Colombiers-sur-Seulles (49° 16' N, 0° 31' W), Calvados. Coll and subm 1970 by R Caillaud and E Lagnel, Caen, Calvados. *Comment*: quasi-total absence of industry, but good coincidence with the type of architectural structures, parallel to those of the more classic passage-graves.

**Gif-1817. Fermanville, Manche** **1350 ± 90**  
**AD 600**

Charcoal from hearth near print in sand of a boat with numerous

nails and rivets, in dunes at Fermanville (49° 41' N, 1° 26' W), Manche. Coll and subm 1970 by F Scuvée, Digosville, Manche. *Comment*: disagrees with ceramics found nearby; the hearth, younger, must be dissociated from archaeological remains.

**Gif-1787. Saint-Maur-sur-Le-Loir, Eure-et-Loir** **1500 ± 90**  
**AD 450**

Charcoal from passage-grave, Saint-Maur-sur-Le-Loir (48° 09' N, 1° 24' E), Eure-et-Loir. Coll 1885 by M Guillaumin and subm 1970 by Y Chevalier, Paris. *Comment*: dates a late occupation of site, as suggested by industry assoc in upper level.

**Gif-2213. Le Mans, Sarthe** **2180 ± 90**  
**230 BC**

Wood from old timbers and stakes from Gallo-Roman fence around Le Mans (48° 00' N, 0° 12' E), Sarthe. Coll and subm 1971 by D Juhel, Fac Lettres, Tours, Indre-et-Loire. *Comment*: does not agree very well with assoc sigillated ceramics of 1st century AD. Difference may be explained by age of wood at time of use or by re-use of wood at later date.

**La Motte series, Morannes, Maine et Loire**

Charcoal from hearths in Feudal moat, La Motte, Morannes (47° 42' N, 0° 23' W), Maine-et-Loire. Coll 1970 by H Poulain and subm 1971 by J L'Helgouach, Dir Antiquités Préhist Pays de la Loire, Nantes, Loire-Atlantique.

**Gif-2181. La Motte 1** **1150 ± 100**  
**AD 800**  
*Comment*: within expected range 10 to 12th centuries.

**Gif-2182. La Motte 2** **320 ± 95**  
**AD 1630**  
*Comment*: dates a more recent hearth.

**Doué-La-Fontaine series, Maine-et-Loire**

Charcoal from Carolingian Royal Residence at Doué-la-Fontaine (47° 11' N, 0° 16' W), Maine-et-Loire. Coll and subm 1969-1970 by M de Bouard, Centre Recherches Archeol Médiévales, Caen, Calvados (de Bouard, 1971).

**Gif-1568. Doué, 1969-4** **1200 ± 100**  
**AD 750**  
From burnt remains of a nearby building.

**Gif-1820. Doué, 1970-CA-2** **1350 ± 100**  
**AD 600**  
From carbonized board covering cistern.

*General Comment*: a date before 800 AD is historically impossible. Difference may be explained by age of wood.

**Gif-1680. Livré-La-Touche, Mayenne** **360 ± 90**  
**AD 1590**

Carbonized wood in filling of ancient gold mine, Livré-La-Touche (47° 53' N, 1° 00' W), Mayenne. Coll and subm 1970 by J Guigues, Bur Recherches Géol et Min, Rennes. *Comment*: no other clue to age.

**Gif-1546. Le Bois du Rocher, Saint-Helen, Côtes-du-Nord** **200 ± 90**  
**AD 1750**

Charcoal from hearth over sandstone deposit, Saint-Helen, Le Bois du Rocher (48° 30' N, 1° 58' W), Côtes du Nord. Coll and subm 1969 by P R Giot, Lab Anthropol Préhist, Rennes. *Comment*: sandstone deposit mainly quarried at Mousterian and later at Neolithic ages. Charcoal is not related to these periods of exploitation.

**Gif-1547. La-Houle-Notre-Dame, Etables-sur-Mer, Côtes-du-Nord** **Modern**

Charcoal from hearth in shell deposit, without industry, in a cliff cave, La Houle-Notre-Dame, Etables-sur-Mer (48° 37' N, 2° 47' W), Côtes-du-Nord. Coll and subm 1969 by P R Giot. *Comment*: modern hearth in cave though overlain by clayish deposit.

**Gif-1678. La Besizais, Trébry, Côtes du Nord** **2420 ± 110**  
**470 BC**

Charcoal from 1st Iron age sepulture, La Besizais, Trébry (48° 20' N, 2° 34' W), Côtes du Nord. Coll by C T Le Roux and subm 1970 by P R Giot (Le Roux *et al*, 1972). *Comment*: fits very well with expected age of this miniature barrow.

**Gif-1865. Sillon de Talbert, Pleubian, Côtes-du-Nord** **4160 ± 140**  
**2210 BC**

Charcoal from ancient Neolithic soil, just above msl, under pebble bar of Sillon de Talbert (48° 52' N, 3° 55' W), Pleubian, Côtes du Nord. Coll and subm 1970 by P R Giot. *Comment*: agrees well with assoc ceramics and flints.

**Plussulien series, Côtes-du-Nord**

Charcoal from a Neolithic factory for roughed-out axes of dolerite, at Sélédin, Plussulien (48° 13' N, 3° 03' W), Côtes-du-Nord. Coll and subm 1969 to 1971 by C T Le Roux, Fac Sci Rennes. Study of origin and diffusion of polished axes of "Dolérite A" (Le Roux, 1971) in France and W Europe.

**Gif-1542. Plussulien, 00 SE** **4930 ± 130**  
**2980 BC**

**Gif-1871. Plussulien, 00 SE** **4950 ± 140**  
**3000 BC**

Scattered charcoal and hearth from accessory working place, on summit of outcrop.

<b>Gif-1538. Plussulien, N1 SW</b>	<b>4550 ± 140</b> <b>2600 BC</b>
Upper level of the main quarry; probable contamination by late crumbings from Gif-1871 area.	
<b>Gif-1539. Plussulien, N1 SW</b>	<b>4050 ± 130</b> <b>2100 BC</b>
Huge hearth, Late Neolithic quarry.	
<b>Gif-1540. Plussulien, N1 SW</b>	<b>4700 ± 150</b> <b>2750 BC</b>
<b>Gif-1541. Plussulien, N1 SW</b>	<b>4500 ± 130</b> <b>2550 BC</b>
<b>Gif-2328. Plussulien, N1 SE</b>	<b>4790 ± 110</b> <b>2840 BC</b>
Hearths in mass of flaking refuse; stratigraphically just under Soil 3 which marks interruption between Middle and Late Neolithic activities.	
<b>Gif-1875. Plussulien, N1 SW</b>	<b>4960 ± 140</b> <b>3010 BC</b>
<b>Gif-2329. Plussulien, N1 SE</b>	<b>4960 ± 110</b> <b>3010 BC</b>
Scattered charcoal, with imported flint tools and some potsherds.	
<b>Gif-2330. Plussulien, N1 SE</b>	<b>4960 ± 110</b> <b>3010 BC</b>
Hearth; quarry phase closely connected with Gif-1875 and Gif-2329.	
<b>Gif-1872. Plussulien, N1 SW</b>	<b>5100 ± 140</b> <b>3150 BC</b>
<b>Gif-1873. Plussulien, N1 SW</b>	<b>5150 ± 140</b> <b>3200 BC</b>
<b>Gif-1874. Plussulien, N1 SW</b>	<b>5075 ± 140</b> <b>3125 BC</b>
Two hearths and scattered charcoal closely connected with 2 large bench-stones resting on Soil 4 (Middle Neolithic floor of quarry).	
<b>Gif-1876. Plussulien, 01 NW</b>	<b>5150 ± 140</b> <b>3200 BC</b>
Hearth in Soil 4.	
<b>Gif-1877. Plussulien, N2 SW</b>	<b>5270 ± 140</b> <b>3320 BC</b>
Ashy area assoc with working structure, apart from the main quarry but likely to be paralleled with Soil 4; oldest dated level.	

**Gif-1543. Plussulien, 04 SE** **4360 ± 130**  
**2410 BC**

Scattered charcoal from flow zone of material on slope; may well correspond to mixture of grains from different ages.

*General Comment:* this series, obtained as the excavation proceeded, has been invaluable in conducting field work and interpreting stratigraphy. Though lacking in artifacts of chronologic significance, it elucidated a complicated sequence, including re-openings of quarries through refuse of former working phases, otherwise almost impossible to reveal.

**Gif-2178. Valy-Cloistre, La Roche Maurice, Finistère** **1570 ± 100**  
**AD 380**

Charcoal from praefurnium of a Gallo-Roman villa, at La Roche Maurice, Valy-Cloistre (48° 29' N, 4° 10' W), Finistère. Coll and subm 1971 by R Sanquer, Fac Lettres, Brest, Finistère. *Comment:* within expected age range (Sanquer, 1971).

**Gif-2179. Kervenennec en Pont-Croix, Finistère** **1530 ± 100**  
**AD 420**

Charcoal from Gallo-Roman villa, Kervenennec en Pont-Croix (48° 02' N, 4° 33' W), Finistère. Coll and subm 1971 by R Sanquer. *Comment:* slightly younger than dates from coins (AD 330 to 337) and Argonne ceramics (AD 350) found assoc, but suitable because length of site utilization (Sanquer, 1971).

**Kéradennec, Saint-Fregant series, Finistère**

Charcoal from Gallo-Roman villa, Kéradennec, Saint-Frégant (48° 34' N, 4° 22' W), Finistère. Coll and subm 1970 by R Sanquer.

**Gif-1684. Keradennec, Saint-Frégant, SF/I A 3** **1780 ± 100**  
**AD 170**

Under soil of ancient mortar.

**Gif-1685. Keradennec, Saint-Frégant, SF/I A I** **1800 ± 100**  
**AD 150**

From hearth or carbonized beam.

*General Comment:* confirms Gif-1304 (1760 BP, eg, dates occupation period (R, 1972, v 14, p 281; Sanquer, 1971).

**Gif-1867. Goarem-Cosquer, Berrien, Finistère** **2180 ± 110**  
**230 BC**

Charcoal from filling of trenches of protohistoric camp, Goarem-Cosquer (48° 24' N, 3° 24' W), Berrien, Finistère. Coll and subm 1970 by J Briard. *Comment:* presence of Medieval ceramics permitted another interpretation of site.

**Gif-2175. Kermoysan, Plabennec, Finistère** **2350 ± 100**  
**400 BC**

Charcoal from Iron age souterrain, at Kermoysan Plabennec (48° 28' N, 4° 23' W), Finistère. Coll and subm 1971 by C T Le Roux. *Comment:* agrees well with age of ceramics (Leroux and Lecerf, 1971).

- Gif-1682. Toul-Louarn, Guisseny, Finistère** **2420 ± 110**  
**470 BC**  
Charcoal in filling of ditches around habitation structure of 2nd Iron age, Toul-Louarn, Guisseny (48° 37' N, 4° 25' W), Finistère. Coll and subm by P R Giot. *Comment:* agrees with date of ceramics.
- Gif-1969. Keravel, Plouguerneau, Finistère** **2540 ± 110**  
**590 BC**  
Charcoal from Iron age souterrain, Keravel, Plouguerneau (48° 36' N, 4° 42' W), Finistère (Giot and Le Roux, 1971). Coll and subm 1970 by P R Giot. *Comment:* good date for this type of souterrain.
- Gif-1868. Lamphily, Concarneau, Finistère** **2580 ± 110**  
**630 BC**  
Charcoal from souterrain from late Hallstatt age, at Lamphily (47° 55' N, 3° 55' W) Concarneau, Finistère. Coll and subm 1970 by P R Giot. *Comment:* confirms antiquity of this structure (Giot and Lecerf, 1971).
- Gif-1869. Litziez, La Feuillée, Finistère** **2220 ± 110**  
**270 BC**  
Charcoal from bottom of entrance pit to souterrain at Litziez, La Feuillée (48° 23' N, 3° 50' W), Finistère. Coll and subm 1970 by P R Giot. *Comment:* good age for this type of souterrain.
- Landeda, Ile Gaignog series, Finistère**  
Charcoal from Passage-grave IIIc of Cairn III, at Ile Gaignog, Landeda (48° 35' N, 4° 35' W), Finistère. Coll and subm 1970 by P R Giot.
- Gif-1477. Ile Gaignog, Passage IIIc** **3600 ± 110**  
**1650 BC**  
Lower level. *Comment:* contaminated by recent carbon.
- Gif-1870. Ile Gaignog, Chambre IIIc** **5075 ± 140**  
**3125 BC**  
From filling of chamber. *Comment:* good date for passage grave, though oldest date obtained for monument is 5800 BP (Gif-165, R, 1966, v 8, p 76).
- Gif-1866. Ligollenec, Berrien, Finistère** **3500 ± 130**  
**1550 BC**  
Charcoal from an Early Bronze age barrow at Ligollenec (48° 23' N, 3° 43' W), Berrien, Finistère. Coll and subm 1970 by J Briard. *Comment:* agrees well with expected age.
- Gif-2177. Pendreo, Lennon, Finistère** **3550 ± 120**  
**1600 BC**  
Charcoal from flat tomb of Pendreo, Lennon (48° 12' N, 3° 55' W), Finistère. Coll and subm 1971 by C T Le Roux. *Comment:* Bronze age, as expected despite atypical ceramics (Le Roux, 1972).

**Juno Bella, Berrien series, Finistère**

Charcoal under a Bronze age barrow, Juno Bella, Berrien (48° 24' N, 3° 47' W), Finistère. Coll and subm 1969 by J Briard.

**Gif-1544. Juno Bella A** **3900 ± 140**  
**1950 BC**

**Gif-1545. Juno Bella B** **4050 ± 120**  
**2100 BC**

*General Comment:* dates a clearing period of Late Neolithic age before erection of barrow. This activity was already observed in palynologic study of region (Giot, 1970).

**Gif-1679. Le Temple, Limerzel, Morbihan** **860 ± 90**  
**AD 1090**

Charcoal in alluvium in stream bed with tin placer, Le Temple, Limerzel (47° 38' N, 2° 22' W), Morbihan. Coll and subm 1970 by J Guignes. *Comment:* dates unexpected Medieval tin mine.

**Gif-1683. Kerméno, Grandchamp, Morbihan** **2050 ± 110**  
**100 BC**

Charcoal in filling of Kerméno souterrain, at Grandchamp (47° 45' N, 2° 50' W), Morbihan. Coll by J Lecornec and subm 1970 by P R Giot. *Comment:* indicates occupation is slightly later than ceramics (Lecornec, 1970).

**Gif-1681. Le Boccolo, Elven, Morbihan** **3650 ± 130**  
**1700 BC**

Charcoal from hearth near Late Bronze age hoard at Le Boccolo, Elven (47° 43' N, 2° 36' W), Morbihan. Coll and subm 1970 by J Lejards, Soc Polymatique Morbihan, Vannes. *Comment:* shows earlier occupation of site.

**Gif-1864. Roso en Since, Theix, Morbihan** **900 ± 90**  
**AD 1050**

Wooden piece, in marshy mud, Roso en Since, Theix (47° 36' N, 2° 42' W), Morbihan. Coll. by J Lejards and subm 1970 by P R Giot. *Comment:* probably part of apparatus used in medieval epoch for water circulation in marshes (Giot, 1971).

**Pen-er-Malo series, Guidel, Morbihan**

Charcoal from ancient deserted village under sand dunes, at Guidel (47° 45' N, 3° 30' W), Morbihan. Coll by R Bertrand and subm 1970 by P R Giot.

**Gif-1964. Pen-er-Malo, Guidel** **880 ± 100**  
**AD 1070**  
In hearth and food remains.

**Gif-1965. Pen-er-Malo, Guidel** **840 ± 100**  
**AD 1110**  
From House A.

*General Comment:* dates assoc ceramics and desertion of village caused by progression of dunes; agrees with coins of Duc Conan III (AD 1112-1148).

**Gif-1966. Kermené, Guidel, Morbihan** **4390 ± 140**  
**2440 BC**

Charcoal from Late Neolithic barrow, Kermené, Guidel (47° 47' N, 3° 29' W), Morbihan. Coll 1958 and subm 1971 by P R Giot. *Comment:* agrees better with assoc ceramics than with date Gif-73: 4030 ± 110 BP (R, 1966, v 8, p 135; Giot, 1960).

**Gif-1967. Le Cordier, Brandivy, Morbihan** **1930 ± 110**  
**AD 20**

Charcoal from hearth near little Barrow 5, Le Cordier, Brandivy (47° 46' N, 2° 55' W), Morbihan. Coll by J Lecornec and subm 1970 by P R Giot. *Comment:* dates later settlement around tomb.

**Gif-1968. Kervellerin, Cleguer, Morbihan** **3350 ± 120**  
**1400 BC**

Charcoal from ground of Middle Bronze age Barrow III, Kervellerin, Cleguer (47° 51' N, 3° 23' W), Morbihan. Coll 1961 and subm 1971 by P R Giot. *Comment:* agrees well with expected age (Giot and Briard, 1962).

**Gif-2176. Saint-Ouarno, Langoelan, Morbihan** **3400 ± 120**  
**1450 BC**

Charcoal under flat tomb of Bronze age, Saint-Ouarno, Langoelan (48° 03' N, 3° 13' W), Morbihan. Coll and subm 1971 by C T Le Roux. *Comment:* fits very well with expected age (Le Roux, 1971).

**Gif-2183. La Peuplinière, Saint Michel Chef-Chef, Loire Atlantique** **1950 ± 110**  
**0**

Charcoal from kiln of salt pan, at Saint Michel Chef-Chef, La Peuplinière (47° 10' N, 2° 09' W), Loire-Atlantique. Coll by Tessier and subm 1971 by J L'Helgouach, Antiquités Préhist Pays de la Loire, Nantes. *Comment:* date in expected range.

**Fay-de-Bretagne series, Loire-Atlantique**

Important depot of roughly-made ceramics inside wood chest, at Fay-de-Bretagne (47° 25' N, 1° 49' W), Loire-Atlantique. Coll and subm 1969 by J L'Helgouach.

**Gif-1700. Fay-de-Bretagne, H-160, 2 a** **1900 ± 90**  
**AD 50**  
Wood from stake of frame.

**Gif-1701. Fay-de-Bretagne, H160, 2 b** **1980 ± 90**  
**30 BC**  
Wood from another stake.

**Gif-1465. Fay-de-Bretagne, H-160** **3300 ± 110**  
**1350 BC**  
Charcoal layer under ceramics depot.

- Gif-1699. Fay-de-Bretagne, H-160, I** **5180 ± 200**  
**3230 BC**  
Charcoal in peat, in ceramics depot.  
*General Comment:* Gif-1700-1701 fit well with age of roughly-made ceramics and presence of debris of amphora. The 2 other dates suggest an older site under ceramics as confirmed by palynologic study of peat.
- Gif-1827. Potonnier, Loubillé, Deux Sèvres** **2170 ± 110**  
**220 BC**  
Wood from timber, Gallo-Roman site of Potonnier, Loubillé (46° 02' N, 0° 02' W), Deux Sèvres. Coll and subm 1970 by R Proust, Chef-Boutonne, Deux Sèvres. *Comment:* too old for site; may be explained by age of wood at time of use.
- Gif-1730. Pierre-Folle, Thiré, Vendée** **2280 ± 110**  
**330 BC**  
Charcoal from occupation at Iron age of dolmen Pierre-Folle, Thiré (46° 33' N, 0° 59' W) Vendée. Coll by R Jousseume and subm 1970 by J L'Helgouach.
- Gif-1589. Anse de la République, St Hilaire-de-Talmont, Vendée** **4350 ± 130**  
**2400 BC**  
Charcoal from coastal Neolithic site at St Hilaire-de-Talmont (46° 26' N, 1° 39' W), Vendée. Coll by R Jousseume and subm 1970 by J L'Helgouach. *Comment:* a good date for that level just under a "campaniform" layer dated 3950 to 4050 BP (Jousseume, 1969).
- Grotte des Duffaits series, La Rochette, Charente**  
Charcoal from sepulchral Grotte des Duffaits, La Rochette (45° 48' N, 0° 09' E), Charente. Coll by J Gomez and subm 1971 by Y Guillien, Antiquités Préhist Région Poitou-Charente, Paris.
- Gif-2263. Grotte des Duffaits, hearth** **3160 ± 100**  
**1210 BC**  
Bottom of gallery.
- Gif-2264. Grotte des Duffaits, S** **1900 ± 90**  
**AD 50**  
In clay, S part.
- Gif-2265. Grotte des Duffaits, entrance room** **2050 ± 90**  
**100 BC**  
In clay.
- Gif-2266. Grotte des Duffaits, N** **2860 ± 100**  
**910 BC**  
In clay, N part.
- Gif-2344. Grotte des Duffaits** **2970 ± 100**  
**1020 BC**  
Hearth under calcite, in N gallery.
- General Comment:* only 1st and last dates fit this late Bronze age cave;

2860 BP seems slightly too young. As for the 2 other dates, they may be result of contamination, since archaeologists agree that site is very homogeneous.

**Gif-1558. La Petite Aiguille, Thairé, Charente Maritime** **2050 ± 110**  
**100 BC**

Charcoal from salt industry site at La Petite Aiguille, Thairé (46° 05' N, 0° 51' W), Charente Maritime. Coll and subm 1969 by C Gabet. *Comment:* fits well with ceramics assoc.

**La Sauzaie series, Soubise, Charente-Maritime**

Marine shells from archaeological levels in stratigraphy of foreshore site, near dolmen of La Sauzaie, Soubise (45° 53' N, 0° 50' W), Charente-Maritime. Coll and subm 1969 by C Gabet.

**Gif-2245. La Sauzaie II** **3990 ± 110**  
**2040 BC**

From early Bronze age. *Comment:* fits industry of Artenac civilization.

**Gif-1557. La Sauzaie I** **4500 ± 140**  
**2550 BC**

From Neolithic level. *Comment:* agrees with expected age.

**“Chez Reine” series, Sémussac, Charente-Maritime**

Shells from Neolithic encampment, “Chez Reine”, at Sémussac (45° 36' N, 0° 55' W), Charente-Maritime. Coll and subm 1970 by J P Mohen, Mus Antiquités Nationales, Saint-Germain-en-Laye (Mohen, 1970).

**Gif-1717. “Chez Reine”, S IX, 3** **4400 ± 135**  
**2450 BC**

Corresponds to typical regional culture Peu-Richardian II. *Comment:* slightly older than Gif-475: 4250 ± 250, similar sample from same site (R, 1970, v 12, p 435).

**Gif-1719. “Chez Reine”, S X** **4070 ± 110**  
**2120 BC**

Corresponds to Peu-Richardian I. *Comment:* younger than expected, but reworking of levels is possible at destruction period of encampment.

**Gif-1718. “Chez Reine”, S IX, I-2** **4720 ± 110**  
**2770 BC**

Corresponds to civilization of Matignon. *Comment:* confirms antiquity of this civilization on Saintonge coast.

2. SW France

**Gif-2174. La Marauderie, Montgamé, Vienne** **850 ± 90**  
**AD 1100**

Charcoal from Medieval “souterrain” of La Marauderie, Montgamé (46° 40' N, 0° 30' E), Vienne. Coll 1969 by P Piboule and subm 1971

by Y Guillien. *Comment*: 100 yr too young according to ceramics assoc, but in expected date range.

**Gif-1588. Grotte du Bois-Ragot, Gouex, Vienne** **8800 ± 220**  
**6850 BC**

Charcoal scattered in clay in upper Paleolithic habitat soil, Grotte du Bois-Ragot (46° 23' N, 1° 38' W), Gouex, Vienne. Coll and subm 1969 by A Chollet, Chatellerault, Vienne. *Comment* (AC): somewhat younger than expected for Azilian; that period is not yet well dated, however, nor very well known, mainly in this region (Guillien, 1970).

**Fontaine de la Demoiselle series, Saint-Léon-sur-l'Isle, Dordogne**

Open-air Neolithic site of Fontaine de la Demoiselle with archaeological layer, well stratified, 2m thick, underlying red sand 40cm deep, at Saint-Léon-sur-l'Isle (45° 06' N, 0° 30' E), Dordogne. Coll and subm 1970 by J Roussot-Larroque, Fac Sci, Bordeaux.

**Gif-1733. Fontaine de la Demoiselle, Level B<sub>1</sub>** **4250 ± 140**  
**2300 BC**

From 0.85 to 1.65m. *Comment*: presence of microlithic industry.

**Gif-1734. Fontaine de la Demoiselle, Level B<sub>2</sub>** **4210 ± 140**  
**2260 BC**

From 1.70 to 2m, base level.

*General Comment*: dates regional Neolithic civilization of Artenac (Bordes, 1970).

**Gif-1767. Barrow of Chenon, Charente** **2640 ± 100**  
**690 BC**

Carbonized bones from incineration sepulture from barrow of Chenon reutilized at Hallstat period (45° 57' N, 2° 07' W), Charente. Coll and subm 1970 by E Gauron, Angoulême, Charente. *Comment*: assoc with ceramics and artifacts of Bronze and Iron ages (Guillien, 1970).

**Grotte I des Treilles series, Saint-Jean Saint-Paul, Aveyron**

Charcoal from Grotte I des Treilles (43° 37' N, 0° 43' E), Saint-Jean Saint-Paul, Aveyron. Coll and subm 1969 by G Costantini, Millau, Aveyron.

**Gif-1515. Grotte I des Treilles, Level II** **4650 ± 130**  
**2700 BC**

**Gif-1516. Grotte I des Treilles, Level III** **4600 ± 130**  
**2650 BC**

**Gif-1517. Grotte I des Treilles, Level IV** **4600 ± 130**  
**2650 BC**

*General Comment*: all 3 levels are dated to late Chalcolithic, a period expected only for Level IV.

- Gif-1807. Grotte des Fieux, Miers, Lot** **9450 ± 190**  
**7500 BC**  
Charcoal from base Sauveterrian level D<sub>3</sub> from Grotte des Fieux (44° 51' N, 1° 40' E), Lot (Champagne and Espitalié, 1972). Coll and subm 1970 by F Champagne, Paris. *Comment*: correct age if compared to date for low level of Sauveterrian grotte de Rouffignac: 9150 BP (GrN-5514: R, 1972, v 14, p 59).
- Gif-1880. Le Treboulou, Arcambal, Lot** **2450 ± 70**  
**500 BC**  
Charcoal from La Tène site of Le Treboulou, Hut IV, Arcambal (44° 27' N, 1° 30' E), Lot. Coll 1969 and subm 1970 by M Lorblanchet, CNRS, Thémines, Lot. *Comment*: agrees well with expected age.
- Gif-1881. Cahors, Lot** **2690 ± 70**  
**740 BC**  
Charcoal in pit from site of 3rd phase of Urnfield civilization, Cahors (44° 28' N, 1° 42' E), Lot. Coll 1966 and subm 1970 by M Lorblanchet. *Comment*: ca 200 yr too old for this civilization in Quercy.
- Gif-1882. Igue Blanche, Sauliac, Lot** **2800 ± 70**  
**850 BC**  
Charcoal in debris of Late Bronze III age in a cave, Igue Blanche, Sauliac (44° 38' N, 1° 42' E), Lot. Coll and subm 1970 by M Lorblanchet. *Comment*: agrees well with industry.
- Gif-1512. Puy d'Issolu, Vayrac, Lot** **2550 ± 110**  
**600 BC**  
Charcoal from 1st Iron age site, at Puy d'Issolu (44° 57' N, 1° 42' E), Vayrac, Lot. Coll and subm 1969 by M Lorblanchet. *Comment*: agrees well with expected age.
- Grotte de Sainte Eulalie series, Lot**  
Broken bones (fauna) from Grotte de Sainte Eulalie (44° 35' N, 1° 52' E), Lot. Coll and subm 1970-1971 by M Lorblanchet. Decorated cave with Magdalenian industry.
- Gif-2193. Grotte de Sainte Eulalie, Layer I** **10,400 ± 300**  
**8450 BC**  
Bones from fauna, from Level 1, Magdalenian VI, *ie*, late Magdalenian.
- Gif-1697. Grotte de Sainte Eulalie, Layer I** **10,830 ± 200**  
**8880 BC**  
Broken bones from fauna, from same level as Gif-2193. *Comment*: confirms age of Magdalenian VI may be somewhat younger than expected.
- Gif-1745. Grotte de Sainte Eulalie, Layer III** **15,100 ± 270**  
**13,150 BC**  
From Layer III, Middle Magdalenian, probably Magdalenian II. *Comment*: dates mural paintings of cave.

**Gif-2194. Grotte de Sainte Eulalie, Layer C** **15,200 ± 300**  
**13,250 BC**

From Middle Magdalenian layer. *Comment:* confirms Gif-1745 and slightly older than expected for this level of Magdalenian II.  
*General Comment:* set of dates very suitable.

**Gif-2214. Necropolis of Capdenac, Lot** **720 ± 90**  
**AD 1230**

Human bones from ancient necropolis of Capdenac (44° 35' N, 2° 04' E), Lot. Coll and subm 1971 by J Ventach, Capdenac, Lot. *Comment:* dated in attempt to identify Capdenac as an Uxellodunum site, where last battle of Gallic wars took place (51 BC). Date obtained is unrelated to this event.

#### **Grotte de Niaux series, Ariège**

Charcoal from Grotte de Niaux, with Magdalenian rupestral engravings and paintings (42° 51' N, 1° 35' E), Ariège.

**Gif-1938. Grotte de Niaux, 1** **5650 ± 200**  
**3700 BC**

In the gallery, 100m before rotunda of "Salon Noir". Coll and subm 1971 by G Delibrias and J Labeyrie. *Comment:* diluted for measurement. This part of cave was visited at Neolithic age.

**Gif-1937. Grotte de Niaux** **9850 ± 230**  
**7900 BC**

On gravel, at foot of wall of great hall. Coll and subm 1971 by J Clottes, Antiquités Préhist Midi-Pyrénées, Foix, Ariège. *Comment:* wood id by C Jacquot as *Pinus* sp. Diluted for measurement.

**Gif-1939. Grotte de Niaux, 2** **10,100 ± 250**  
**8150 BC**

Fragment of branch lying on rock, at entrance of great hall. Coll and subm 1971 by G Delibrias and J Labeyrie. *Comment:* diluted for measurement.

**Gif-1940. Grotte de Niaux, 3** **10,150 ± 200**  
**8200 BC**

From same place as Gif-1937. Coll and subm 1971 by G Delibrias and J Labeyrie.

*General Comment:* Gif-1937, -1939, and -1940 are pieces of charcoal that look like wood-torch debris, located in a very remote part of cave separated from entrance by a flooded gallery until it was pumped dry in 1970. These 3 dates show that gallery was dry in Magdalenian period; agrees with style of painting of great hall (weasel and bison).

#### **Roquefort sites series, Lugasson, Gironde**

Charcoal from Neolithic site with a well defined stratification, Roquefort (45° 06' N, 0° 36' E), Gironde. Coll and subm 1970 by J Roussot-Larroque.

- Gif-1731. Roquefort O 7, Level C** **4800 ± 140**  
**2850 BC**  
Level C with industry of Matignons, *ie*, Middle Neolithic II.
- Gif-1732. Roquefort Q 7, Level C<sub>2</sub>** **5000 ± 140**  
**3050 BC**  
Lower part of Level C, lying on clay. Industry slightly different from remainder of Level C. Corresponds to initial phase of Middle Neolithic.  
*General Comment:* agrees well with typologic and palynologic studies.
- Gif-2105. Le Morin, Gensac, Gironde** **10,480 ± 200**  
**8530 BC**  
Reindeer bones from Magdalenian VI site at Le Morin rock shelter, Gensac (44° 41' N, 0° 12' E), Gironde. Coll and subm 1971 by J Lahilhanne, Comm Energie Atomique, Le Barp, Gironde.
- Gif-1412. Dayres, Gironde** **2300 ± 100**  
**350 BC**  
Charcoal from hearth in Barrow of Dayres (44° 23' N, 0° 13' E), Gironde. Coll 1968 and subm 1969 by Y Marcadal, Nérac, Lot-et-Garonne. *Comment:* Barrow of Dayres is reputed to be from Hallstatt period and its ceramics are dated from early 4th century BC. Age seems therefore too young. Contamination is not excluded, as penetration of site by roots of a pine was indicated by submitter. It is noteworthy that correction from dendrochronologic calibration carries the date within limits of statistical probability.
3. *SE and S France*
- Gif-1883. Chaos de Targasonne, Cerdagne, Pyrénées Orientales** **2450 ± 700**  
**500 BC**  
Charcoal from late Bronze site of Chaos de Targasonne (42° 29' N, 1° 58' E), alt 1680m, Pyrénées Orientales. Coll 1969 and subm 1970 by Campmajo, Cabestany, Pyrénées Orientales. *Comment:* absence of metal tools suggests older age. Persistence of this archaic civilization, also characterized by its ceramics, can be explained by difficult access to site, causing it to stay apart from main Mediterranean culture (Campmajo and Guilaine, 1971).
- Grotte de La Balme de Montbolo series, Pyrénées Orientales**  
Charcoal from habitat and sepulchral cave of La Balme (42° 30' N, 2° 38' E), Pyrénées Orientales. Coll and subm 1970 by J Guilaine, CNRS, Carcassonne, Aude.
- Gif-1709. Grotte de La Balme de Montbolo** **6450 ± 170**  
**4500 BC**  
Upper gallery.
- Gif-1710. Grotte de La Balme de Montbolo** **4100 ± 140**  
**2150 BC**  
Lower gallery.

*General Comment:* Gif-1709 date is a little too high for this cultural assemblage, which seems to belong to an early phase of Neolithic. Gif-1710 on the contrary, is too young and difficult to explain by occupation of site in Bronze age.

**Gif-1711. Station of Ribos de Bila, Ladern, Aude** **5380 ± 150**  
**3430 BC**

Charcoal from hearth from open-air site of Ribos de Bila, Ladern (43° 07' N, 2° 21' E), Aude. Coll and subm 1970 by J Guilaine. *Comment:* does not fit for a site with "campaniform" Chalcolithic industry.

**Gif-1716. Agde, Hérault** **730 ± 90**  
**AD 1220**

Piece of wooden hook from stone anchor of "Phoenician" type, in Hérault river bed, Agde (43° 19' N, 3° 29' E), Hérault. Coll and subm 1970 by D Fonquerle, Agde, Hérault. *Comment:* younger than expected.

**Gif-1572. Nissan-les-Ensérune, Hérault** **1750 ± 100**  
**AD 200**

Horse mandible in Necropolis 7th to 6th century BC at Nissan-les-Ensérune (43° 18' N, 3° 08' E), Hérault. Coll and subm 1969 by J Giry, Nissan-les-Ensérune, Hérault. *Comment:* confirms expected age for re-utilization of site.

**Gif-2112. Site de Mourre, Saint-Thibery, Hérault** **4410 ± 140**  
**2460 BC**

Charcoal from surface site of Mourre, Late Chalcolithic, "Verazian" (43° 25' N, 3° 25' E), Hérault (Rodriguez, 1970). Coll 1970 and subm 1971 by G Rodriguez, Mus Agde, Hérault. *Comment:* dates 1st occupation of Low-Languedoc by "Verazian" 500 yr earlier than inland (*ie*, at Camprafaud 6: 3920 BP; R, 1972, v 14, p 285).

**Grotte des Serpents series, Saint-Maurice-de-Navacelle, Hérault**

Charcoal from hearth from Grotte des Serpents, Saint-Maurice-de-Navacelle (43° 49' N, 1° 10' E), Hérault. Coll 1970 and subm 1971 by G B Arnal, Montpellier, Hérault.

**Gif-1923. Les Serpents, 2 A** **4640 ± 140**  
**2690 BC**  
Upper level.

**Gif-1924. Les Serpents, 3 A** **4300 ± 140**  
**2350 BC**  
Middle level.

**Gif-1925. Les Serpents, 4 A** **4500 ± 140**  
**2550 BC**  
Lower level.

*General Comment:* stratigraphically too close to be sure; apparent inversion of dates is possibly not significant. Archaeologic context is well-defined only in level 2A, where date fits very well.

**Gif-1918. Soulatget 2 A, Hérault** **4780 ± 140**  
**2830 BC**

Charcoal from hearth in cave, at Soulatget (43° 53' N, 1° E), Hérault. Coll 1970 and subm 1971 by G B Arnal. *Comment* (GBA): very pure Chassean industry assoc., although date corresponds rather to a later phase.

**Gif-1919. Limonesque, BII, Hérault** **5220 ± 150**  
**3270 BC**

Charcoal from hearth in cave, Level III A, at Limonesque (43° 50' N, 0° 59' E), Hérault. Coll 1970 and subm 1971 by G B Arnal. *Comment* (GBA): seems slightly too young, because of a typical Epicardial potsherd assoc.

**Saint-Pierre IV series, Saint-Pierre de la Fage, Hérault**

Charcoal from hearths in stratigraphy, in cave at Saint-Pierre IV, Saint-Pierre de la Fage (43° 09' N, 1° 00' E).

**Gif-2180. Saint-Pierre IV, 2 A** **5520 ± 150**  
**3570 BC**

Upper level of stratigraphy.

**Gif-1922. Saint-Pierre IV, 4 A** **6200 ± 400**  
**4250 BC**

Bottom of stratigraphy. *Comment*: diluted for measurement.

*General Comment*: fits very well date of Epicardial ceramic assoc.

**Pont d'Avignon series, Vaucluse**

Wood is masonry from ancient bridge of Saint-Bénézet, Avignon (43° 56' N, 4° 48' E), Vaucluse. Coll 1969 before destruction of remains for accommodation work of Rhône R and subm 1969 by Cie Natle du Rhône, Villeneuve-lès-Avignon, Vaucluse.

**Gif-1622. Pont d'Avignon, I** **1060 ± 90**  
**AD 890**

From Pile 14.

**Gif-1668. Pont d'Avignon 2** **450 ± 90**  
**AD 1500**

From Pile 15.

**Gif-1669. Pont d'Avignon 3** **770 ± 90**  
**AD 1180**

From Pile 15.

*General Comment*: important diversity in ages (cf Gif-437: 1540 BP, R, 1970, v 12, p 425) obtained for these pieces of wood may be explained by successive stages of construction and rebuilding of famous bridge (Perrot *et al*, 1972).

**Grotte d'Unang series, Malemort-du-Comtat, Vaucluse**

Charcoal from Neolithic layers of Unang cave, Malemort-du-Comtat (44° 00' N, 5° 11' E), Vaucluse. Coll and subm 1970 by M Paccard, Velleron, Vaucluse.

<b>Gif-1793.</b>	<b>Grotte d'Unang, Level 3</b>	<b>5840 ± 130</b> <b>3890 BC</b>
<b>Gif-1794.</b>	<b>Grotte d'Unang, Level 6</b>	<b>5900 ± 130</b> <b>3950 BC</b>
<b>Gif-1795.</b>	<b>Grotte d'Unang, C., Pit 7</b>	<b>5770 ± 130</b> <b>3820 BC</b>
<b>Gif-1796.</b>	<b>Grotte d'Unang, hearth</b>	<b>5950 ± 130</b> <b>4000 BC</b>

*General Comment:* attempt to establish fine stratigraphy in Chassean; in fact, duration of Chassean occupation is too short to be evaluated from radiocarbon dates due to size of statistical errors.

<b>Gif-1855.</b>	<b>Courthezon, Vaucluse</b>	<b>6600 ± 140</b> <b>4650 BC</b>
------------------	-----------------------------	-------------------------------------

Charcoal from Hut I, Cardial open-air site of Courthezon, Le Baratin (44° 05' N, 4° 53' E), Vaucluse (Courtin, 1968). Coll and subm 1970 by J Courtin, CNRS, Marseille. *Comment:* 1st known Cardial open-air site: this civilization is usually found in caves or under rock shelters.

<b>Gif-1910.</b>	<b>Grotte de Prével, Montclus, Gard</b>	<b>2650 ± 110</b> <b>700 BC</b>
------------------	---	------------------------------------

Burnt grains of cereal, in late Bronze age level, Grotte de Upper Prével (44° 17' N, 4° 24' E), Montclus, Gard. Coll 1969 and subm 1971 by J L Roudil, CNRS, Montpellier. *Comment:* younger than expected.

<b>Gif-1909.</b>	<b>Grotte du Traves, Montclus, Gard</b>	<b>4260 ± 140</b> <b>2310 BC</b>
------------------	---	-------------------------------------

Carbonaceous ash, from Level 2 of late Neolithic in Grotte du Traves, Montclus (44° 16' N, 4° 25' E), Gard. Coll 1969 and subm 1971 by J L Roudil. *Comment:* agrees well with date given for site nearby of same "Ferrières" civilization: 4350 BP: Gif-1360 (R, 1972, v 14, p 285).

**Escanin series, Les Baux, Bouches du Rhône**

Charcoal from hearths, Neolithic site, Escanin 2, Les Baux (43° 45' N, 4° 48' E), Bouches du Rhône (Montjardin, 1970). Coll and subm 1971 by R Montjardin, Sète, Hérault.

<b>Gif-1993.</b>	<b>Escanin, Sq III</b>	<b>760 ± 90</b> <b>AD 1190</b>
------------------	------------------------	-----------------------------------

*Comment:* disagrees with Chassean industry assoc. Probably contaminated by recent burnt vegetation.

<b>Gif-1994.</b>	<b>Escanin, Sq GH</b>	<b>2400 ± 100</b> <b>450 BC</b>
------------------	-----------------------	------------------------------------

Intrusion at La Tène period into Chassean level.

- Gif-1995. Escanin, scree** **5160 ± 120**  
**3210 BC**  
Chassean level.  
*General Comment:* lowest level corresponds to level dated 5000 ± 250: Gif-450 (R, 1970, v 12, p 426) and is Chassean but upper parts of site are reworked.
- Gif-1613. Dolmen of Saint-Marc, Aix-en-Provence, Bouches du Rhône** **3950 ± 140**  
**2000 BC**  
Human bones from Dolmen of Saint-Marc (43° 31' N, 5° 27' E), Aix-en-Provence, Bouches du Rhône (Saurin, 1931). Coll 1930 and subm 1969 by E Saurin, Fac Sci Saigon. *Comment:* fits very well with early Bronze—late Neolithic age, as expected from industry.
- Baume Fontbregoua series, Salernes, Var**  
Charcoal from 3 layers selected in 4m-thick strata preserving remains that represent all the evolution of Neolithic in S France, at Baume Fontbregoua (43° 33' N, 6 °14' E), Var. Coll and subm 1970-1971 by J Courtin.
- Gif-2100. Baume Fontbregoua, Layer 8** **3670 ± 110**  
**1720 BC**  
Late Chalcolithic.
- Gif-2101. Baume Fontbregoua, Layer 11** **5050 ± 120**  
**3100 BC**  
Late Chassean.
- Gif-2102. Baume Fontbregoua, Layer 14** **3850 ± 110**  
**1900 BC**  
*General Comment:* Gif-2100 and -2101 agree fairly well with expected ages. However, Gif-2102, being deeper, should be much older, and may have been contaminated by rodents (Courtin, 1972).
- Gif-1690. Pepet, Traize, Savoie** **150 ± 90**  
**AD 1800**  
Wood from site expected to be Gallo-Roman at Pepet, Traize (45° 44' N, 3° 47' E), Savoie. Coll and subm 1970 by L Lagier-Bruno, Yenne, Savoie. *Comment:* does not confirm antiquity of site.
- Gif-1862. Bon-Porté Bay, Mediterranean, MP2** **2520 ± 100**  
**570 BC**  
Wood from Roman wreckage, 35m deep in Bon-Porté Bay, 500m off Taillat Cap (43° 11' N, 6° 40' E), Mediterranean. Coll by P Mazerolles and subm 1970 by F Cambou, Centre d'Etudes Spatiales Rayonnements, Toulouse. *Comment:* amphora remains assoc.
- Basi, Serra-di-Ferro, series, Corsica**  
Basi, Serro-di-Ferro, near Filitosa (41° 45' N, 8° 47' E), SW Corsica, is a defensive site with abundant archaeological remains from Torrean to Cardial periods (Bailloud, 1969). Charcoal coll and subm 1970 by G Bailloud, CNRS, Paris.

- Gif-1846. Basi, Level III<sub>a</sub>** **3350 ± 110**  
**1400 BC**  
Abundant ceramics of classic Torrean type with large flat lips and plates; lithic industry very sparse. Upper levels I and II not dated, belong to an evolved Torrean of Bronze age.
- Gif-1847. Basi, Level III<sub>b</sub>** **3570 ± 110**  
**1620 BC**  
Lower part of Level III. Classic Torrean ceramics, but much lower than in Level III<sub>a</sub> with some obsidian.
- Gif-1848. Basi, Level 5 b<sub>1</sub>** **5200 ± 120**  
**3250 BC**  
Abundant obsidian industry with lamella and ceramic.
- Gif-1849. Basi, Level 5 e<sub>6</sub>** **5250 ± 120**  
**3300 BC**  
Lower part of Level 5 which belongs to original culture of Chalcolithic.
- Gif-1850. Basi, Level 5 b<sub>s</sub>** **5200 ± 120**  
**3250 BC**  
Lower part of Level 5.
- Gif-1851. Basi, Level 7** **7700 ± 150**  
**5750 BC**  
Ceramics similar to Level 5 assoc with shell (*Cardium*) printed ceramics, and flint industry. Only level with fauna: domestic sheep; agriculture is almost absent while well attested in upper levels, belongs to typical "Cardial".  
*General Comment:* the 3 different occupations of site are well separated in time though there was no sterile layer between levels. Fits well with other dates for Torrean in Corsica and for early Neolithic, called here "Basien". Beginning of Torrean settlement in Basi at late Bronze period (Bailloud, 1972).

#### Curacchiaghiu series, L'évie, Corsica

Charcoal from Early Neolithic site under a rock shelter, at Curacchiaghiu (41° 42' N, 9° 18' E), L'évie, Corsica. Coll 1970 and subm 1971 by F de Lanfranchi, L'évie, Corsica.

- Gif-1958. Curacchiaghiu, Layer 2** **2610 ± 110**  
**660 BC**  
Hearth F 1, 0.27m deep. *Comment:* end of occupation of site. Iron age industry assoc.
- Gif-1959. Curacchiaghiu, Layer 3** **3230 ± 130**  
**1280 BC**  
Upper structured hearth, 0.33m deep. *Comment:* Bronze age ceramics assoc.

- Gif-1960. Curacchiaghiu, Layer 5** **4930 ± 140**  
**2980 BC**  
0.70m deep. *Comment:* stabbed ceramics and lithic industry in obsidian assoc Late Neolithic.
- Gif-1961. Curacchiaghiu, Layer 6** **7310 ± 170**  
**5360 BC**  
0.74m deep. *Comment:* stabbed ceramics, obsidian industry, and assoc flint correspond to 2 different facies of Early Neolithic.
- Gif-1962. Curacchiaghiu, Layer 6.** **7600 ± 180**  
**5650 BC**  
0.94m deep. *Comment:* Cardial ceramics assoc.
- Gif-1963. Curacchiaghiu, Layer 7** **8300 ± 130**  
**6350 BC**  
1.20m deep. *Comment:* with preceramic lithic industry assoc.  
*General Comment:* other levels already dated: 0.80m deep: 7300 ± 160 BP; 1.17m deep: 8560 ± 170 BP (Gif-796 and -797, R, 1971, v 13, p 221). Fits very well with Early Neolithic dated at Basi (this list) (de Lanfranchi, 1972). Dates of appearance of ceramics in Corsica are very similar to dates obtained in Central Mediterranean and Ionian seas, in Corfu Is (between 5870 and 5720 BC) and at Knossos in Crete (between 5790 and 5620 BC) (Bailloud, 1972).
- Filitosa series, Sollacaro, Corsica**  
Charcoal from hearths in circular Torrean monument of complex site of Filitosa (41° 44' N, 8° 52' E), Corsica. Coll and subm 1971 by R Grosjean, CNRS, Paris.
- Gif-2398. Filitosa, Level II** **3080 ± 110**  
**1130 BC**  
*Comment:* corresponds to end of Torrean period, *ie*, Torrean III.
- Gif-2399. Filitosa, Level III** **3380 ± 110**  
**1430 BC**  
*Comment:* corresponds to apex of Torrean period, *ie*, Torrean II; fits well with Level 3 at Basi, 3350 BP: Gif-1846 (this list).
- Gif-2103. Stantare, Sartène, Corsica** **2080 ± 110**  
**130 BC**  
Charcoal in packing stones of monolith from menhir alignment, Stantare (41° 31' N, 8° 53' E), Sartène, Corsica. Coll and subm 1971 by R Grosjean. *Comment:* does not date erection of menhir, but probably more recent burning of vegetation.
- Gif-2104. Tappa, Sartène, Corsica** **5650 ± 150**  
**3700 BC**  
Charcoal from hearth, Level VI, base of Torrean levels, in Rock Shelter E A<sub>1</sub>, inside Torrean complex of Tappa (41° 32' N, 9° 13' E),

Sartène, Corsica. Coll and subm 1971 by R Grosjean. *Comment*: dates Torrean implantation at Tappa.

4. E and Central France

**Gif-1528. Ouroux-sur-Saône, Saône et Loire** **3750 ± 120**  
**1800 BC**

Burnt bones from open-air Site I of Late Neolithic, at Ouroux-sur-Saône (46° 42' N, 4° 56' E), Saône et Loire. Coll and subm 1969 by J P Thevenot, Antiquités Préhist Bourgogne, Dijon. *Comment*: agrees well with present knowledge on local Chalcolithic.

**Oppidum of Myard series, Vitteaux, Côte d'Or**

Archaeologic levels from oppidum of Myard (47° 23' N, 4° 31' E), Vitteaux, Côte d'Or. Coll and subm 1969 by J P Nicolardot, CNRS, Paris.

**Gif-1559. Oppidum of Myard, Layer III** **2070 ± 100**  
**120 BC**

Wood from beam used to brace a stone-rampart. *Comment*: this type of construction is typical of La Tène II-La Tène III ages. Fits very well.

**Gif-1560. Oppidum of Myard, Layer V** **4350 ± 130**  
**2400 BC**  
Charcoal from hearth on base-level of site occupation.

**Gif-2343. Oppidum of Myard, 467** **4700 ± 135**  
**2750 BC**  
Charcoal from hearth in settlement level.

**Gif-2341. Oppidum of Myard, 527** **4880 ± 135**  
**2930 BC**  
Burnt wood from fortification structure of oppidum.

**Gif-2342. Oppidum of Myard, 490 a** **5175 ± 135**  
**3225 BC**  
Burnt wood from another structure of fortifications.

*General Comment*: the last 3 dates agree well with assoc Cortailod ceramics. Cortailod civilization is dated between 2800 and 2500 BC in Jura (Gallay and Gallay, 1968; Bourdier, 1961). They confirm these ramparts date from Middle Neolithic, though this building is not typical for region.

**Beaume-les-Creancey, Côte d'Or**

Stratigraphic alternation of sand, tufa, peat, under ploughed fields, Beaume-les-Creancey (47° 16' N, 4° 33' E), Côte d'Or. Coll 1965 by M Puissegur and subm 1969 by J Joly, Dir Antiquités Préhist Bourgogne, Dijon, Côte d'Or.

**Gif-1595. Beaume-les-Creancey, I** **1950 ± 110**  
**0**

Charcoal, 1.20m deep. *Comment:* agrees with archaeological artifacts.

**Gif-1596. Beaume-les-Creancey, 2** **4450 ± 140**  
**2500 BC**

Peat, 2.30m deep.

*General Comment:* confirms chronologic sequence established by malacology.

**Gif-1842. Thoraise, Doubs** **2180 ± 70**  
**230 BC**

Charcoal from potter's kiln within settlement site, Thoraise (47° 11' N, 5° 53' E), Doubs. Coll and subm 1970 by P Petrequin, Fac Lettres, Besançon. *Comment:* assoc with La Tène I ceramics. Usually, La Tène I-La Tène II transition is ca 350 BC. Perhaps transition was later in province of Franche-Comté.

**Gif-1843. Florange, F I, Moselle** **2500 ± 70**  
**550 BC**

Charcoal from potter's kiln of Middle Hallstatt age, Florange (49° 19' N, 6° 10' E), Moselle. Coll and subm 1970 by P Petrequin. *Comment:* fits well with archaeological date.

**Grotte de la Tuilerie series, Gondenans-les-Montby, Doubs**

Charcoal from hearths in Grotte de la Tuilerie (47° 25' N, 6° 26' E), Gondenans-les-Montby, Doubs, with 5 well defined Neolithic levels. Coll and subm 1969 by P Petrequin.

**Gif-1387. Grotte de la Tuilerie, Level VII** **4000 ± 120**  
**2050 BC**

**Gif-1388. Grotte de la Tuilerie, Level VIII** **4500 ± 120**  
**2550 BC**

**Gif-1561. Grotte de la Tuilerie, Level IX** **5950 ± 140**  
**4000 BC**

*General Comment:* establishes precise stratigraphy of Neolithic age in province of Franche-Comté.

**Gif-1414. Izernore, Ain** **1580 ± 100**  
**AD 370**

Wood from beam with longitudinal groove filled by earth containing Gallo-Roman potsherds, found while laying foundation for a building at Izernore (46° 13' N, 5° 33' E), Ain. Coll 1967 and subm 1969 by R Chevallier, Antony, Hauts-de-Seine. *Comment:* ovoid vases, from same place, were archaeologically dated from 2nd third of 2nd century and 1st half of 3rd century. Date is ca. 150 yr older, but correct, piece of wood was a big beam, possibly from an old tree.

**Gif-1597. Sermoyer-les-Charmes, Ain** **8150 ± 190**  
**6200 BC**

Carbonized nuts, 1.50m deep, from open-air Mesolithic site, Sermoyer-les-Charmes (46° 29' N, 4° 58' E), Ain. Coll by J P Thevenot and subm 1969 by J Joly. *Comment*: agrees well with archaeology.

**Gif-1926. Antre de Veuve-Noire, Divonne, Jura** **670 ± 90**  
**AD 1280**

Charcoal in filling of entrance of cavity cleared away by spelaeologists, Antre de Veuve-Noire, at Divonne (46° 21' N, 6° 08' E), Jura. Coll and subm 1971 by J Didelot, Grand Saconnex, Switzerland. *Comment*: flint and potsherds in filling, but substantial important reworking of material caused age of charcoal to be completely erroneous.

**Clairvaux series, Jura**

Habitat beside lake and lacustrine habitat, called "La Motte aux Moynins", Clairvaux (46° 34' N, 5° 45' E), Jura. Coll and subm 1970-1971 by P Petrequin.

**Gif-1844. Clairvaux 105-106 I** **3800 ± 110**  
**1850 BC**

*Comment*: presence of ceramics and bone industry of Middle and Late phases of Late Bronze and of a curious clay pearl similar to "plaque of Kakovatos" known ca 1650-1600 BC from a sepulture at Mycenae. Date and assoc furniture fit very well.

**Gif-2297. Clairvaux, CZ 64** **3660 ± 110**  
**1710 BC**

Lake coring. Hearth with potsherds of Late Neolithic.

**Gif-2299. Clairvaux, Station 3** **3880 ± 110**  
**1930 BC**

Pile 4 from a littoral sta. Late Neolithic hut with Luscherz-type ceramics.

**Gif-2298. Clairvaux, Point 68** **4740 ± 110**  
**2790 BC**

Pile hole from littoral sta from a 4-angled hut, without archaeological context. *Comment*: seems a little too old for Late Neolithic industry assoc.

**Gif-2300. Clairvaux, 96 to 100** **1620 ± 90**  
**AD 330**

Late Bronze age hearth in peat, assoc with lozenge awl. *Comment*: disagrees with industry; evidently polluted either by humic acid or by intrusion of a recent hearth in this level, 30cm under present surface.

## 5. N France

**Gif-1986. “Chambre des Fées”, Coigny-en-Tardenois, Aisne** **5210 ± 120**  
**3260 BC**

Charcoal from Neolithic site, with “Tardenoisian” industry, “Chambre des Fées”, Coigny-en-Tardenois (49° 38' N, 3° 23' E), Aisne. Coll and subm 1971 by J Hinout, Château-Thierry, Aisne to confirm controversial age given in 1966 for same site: Gif-133-134: 5040 ± 500 BP (R, 1966, v 8, p 82). *Comment*: new date confirms previous one.

**Gif-2126. Notre-Dame du Lys, Dammarie-les-Lys, Seine et Marne** **≤100**

Bones from sepulture in Cistercian Abbey of Notre-Dame du Lys, Dammarie-les-Lys (48° 30' N, 2° 40' E), Seine et Marne. Coll and subm 1971 by R H Delabrouille, Dammarie-les-Lys, Seine et Marne. *Comment*: abbey was founded in 1244 and abandoned in 1794. Date cannot be related to occupation of Abbey.

**Vanault-le-Châtel series, Marne**

Charcoal with glass pieces, ceramics, potsherds, bones, tiles and construction debris from Feudal moat, Vanault-le-Châtel (48° 52' N, 4° 43' E), Marne. Coll and subm 1970 by M Bur, Fac Lettres, Reims, Marne. Castle foundations were found in moat.

**Gif-1571. Vanault-le-Châtel** **750 ± 100**  
**AD 1200**

**Gif-1911. Vanault-le-Châtel, L 7** **720 ± 80**  
**AD 1230**

**Gif-1912. Vanault-le-Châtel, K5-K6** **600 ± 80**  
**AD 1350**

*General Comment*: dates occupation and destruction of castle.

**Gif-1623. Jonquières, Oise** **1600 ± 300**  
**AD 350**

Charcoal from Neolithic habitat at Jonquières (49° 23' N, 2° 45' E), Oise. Coll and subm 1970 by J C Blanchet, Longueil-Annel, Oise. *Comment*: evident contamination of site.

**Etaples series, Pas de Calais**

Charcoal in humic level from settlement site on dune, Etaples (50° 31' N, 1° 38' E), Pas de Calais. Coll and subm 1969 by H Mariette. Brick works for salt exploitation found in same levels.

**Gif-1602. Etaples 5** **2430 ± 105**  
**480 BC**

Halstattian level.

**Gif-1603. Etaples 6** **3200 ± 110**  
**1250 BC**  
Bronze age level.

*General Comment:* agrees well with expected ages.

**Gif-1712. Hallines, Pas de Calais** **16,000 ± 300**  
**14,050 BC**  
Vertebra of *Elephas primegenius* from open-air site of Upper Paleolithic, at Hallines (50° 42' N, 2° 12' E), in terrace of Aa Valley, Pas de Calais. Coll 1968 and subm 1970 by A Tuffreau, Douai, Pas de Calais. Site was used for flint-chipping and a hunters' encampment. *Comment:* fits lithic industry.

*B. Africa*

**Gif-1724. Djorf Torba, S Oran, Algeria** **Modern**  
Charcoal from pre-Islamic Barrow 71, Djorf Torba (31° 31' N, 2° 45' W), S Oran. Coll 1966 and subm 1970 by H Lhote, Mus de l'Homme, Paris. *Comment:* disagrees with expected age.

**Gif-1696. Aït Raouna, Algeria** **800 ± 90**  
**AD 1150**  
Charcoal from base of dolmen at Aït Raouna (36° 54' N, 4° 18' E), Algeria. Coll 1969 by Musso and subm 1970 by D Raymond, Fac Sci, Paris. *Comment:* presence of Campanian ceramics; obviously it is a late intrusion of charcoal, probably due to persistence of ritual practices in this monument.

**Gif-1671. Medracen, Ain Yagout, Batna, Algeria** **2270 ± 110**  
**320 BC**  
Carbonized wood from burnt cedar trunks from gallery roof of Mausoleum of a Numidian king, before Roman domination, at Medracen (35° 42' N, 6° 25' E), Ain Yagout, Batna. Coll and subm 1970 by G Camps, Univ Provence, Aix-en-Provence, Bouches du Rhône. *Comment:* date 2170 ± 155 yr (ALG-21) was obtained on the same sample by Rahmouni *et al* (R, 1970, v 12, p 356).

**Khanguet Si Mohamed Tahar series, Bou Ahmar, Aurès, Algeria**

Charcoal from stratified Neolithic site in Cave, Khanguet Si Mohamed Tahar (35° 26' N, 6° 28' E), Aurès. Coll by C Roubet and subm 1969 by G Camps. Archaeologic layer is 3.20m thick.

**Gif-1385. K S M T 144** **5380 ± 140**  
**3430 BC**  
Neolithic industry.

**Gif-1384. K S M T 141** **5400 ± 140**  
**3450 BC**  
Neolithic industry.

**Gif-1383. K S M T 140bis** **5740 ± 140**  
**3790 BC**  
Neolithic industry of Capsian tradition.

**Gif-1386. K S M T 145** **5900 ± 150**  
**3950 BC**  
Neolithic industry of Capsian tradition.

*General Comment:* agrees well with industry in each level.

#### **Djebel El Outed site series, Algeria**

Charcoal, in ashy and sandy soil, from open-air site, "escargotière" (snail-midden) Djebel El Outed (34° 45' N, 8° 05' E), Bir El Ater, Bône. Coll and subm 1969 by G Camps.

**Gif-1591. Djebel El Outed, DE 01** **7850 ± 170**  
**5900 BC**  
Typical Capsian.

**Gif-1590. Djebel El Outed, DE 02** **7850 ± 170**  
**5900 BC**  
Typical Capsian.

**Gif-1592. Djebel El Outed, DE 03** **7400 ± 170**  
**5450 BC**  
Typical Capsian.

**Gif-1593. Djebel El Outed, DE 04** **6700 ± 150**  
**4750 BC**  
Typical Capsian.

*General Comment:* confirms rather old dates already obtained for typical Capsian, eg, at Rabah.

#### **Rabah series, Ouled-Djellal, Batna, Algeria**

Open-air site at Rabah (34° 26' N, 5° 08' E), Ouled-Djellal, Batna. Coll and subm 1969 by G Camps.

**Gif-1379. Rabah, RAB 10** **7850 ± 170**  
**5900 BC**

Shells (*Helix*) from ashy sand layer. *Comment:* upper Capsian industry. From same level, *Helix* shells were dated 5975 BC: MC-281 (unpub).

**Gif-1381. Rabah, RAB 13** **6540 ± 300**  
**4590 BC**

Burnt bones from ashy sand layer. *Comment:* diluted for measurement. Upper Capsian with Meridional facies.

**Gif-1382. Rabah, RAB 14** **6300 ± 150**  
**4350 BC**

Burnt bones. *Comment:* upper Capsian with Mediterranean facies. Same level as Gif-1381.

*General Comment:* agrees well with archaeological data.

**Gif-1380. Adrar Tioueiine, Oasis** **5320 ± 130**  
**3370 BC**

Charcoal from open-air site, Adrar Tioueiine (22° 55' N, 4° 18' E), Oasis. Coll and subm 1969 by G Camps. *Comment*: assoc with Neolithic ceramics, seeds of *Celtis integrifolia* and fish bones. Corresponds to a late facies of Sahara-Sudanese Neolithic.

**Gif-2222. Iheren, Tassili, Sahara** **4850 ± 110**  
**2900 BC**

Charcoal from rock shelter with paintings of Bovidian period at Iheren, 200km S of Fort-Polignac (24° 42' N, 8° 34' E), Tassili. Coll and subm 1971 by H Lhote. *Comment*: dated younger than classic period of Bovidian art as expected.

**Relilāi series, Cheria, Bône, Algeria**

Relilāi site, under shelter (35° 02' N, 7° 42' E), Bône. Coll by D Grebenart and subm 1969-1970 by G Camps. Classic site of Capsian civilization with continuous stratigraphy from typical Capsian to Upper Capsian.

**Gif-1899. Relilāi, REL 9** **7300 ± 140**  
**5350 BC**

End of Upper Capsian.

**Gif-1900. Relilāi, REL 10** **7800 ± 140**  
**5850 BC**

Beginning of Upper Capsian.

**Gif-1714. Relilāi, REL I** **7760 ± 180**  
**5810 BC**

Typical Capsian.

**Gif-1896. Relilāi, REL 6** **7850 ± 150**  
**5900 BC**

Typical Capsian, Phase IV.

**Gif-1898. Relilāi, REL 8** **7950 ± 150**  
**6000 BC**

Middle of typical Capsian, Phase IV.

**Gif-2119. Relilāi, REL 3** **7700 ± 150**  
**5750 BC**

**Gif-1901. Relilāi, REL II** **8100 ± 150**  
**6150 BC**

End of typical Capsian, Phase IV.

**Gif-1715. Relilāi, REL 2** **8180 ± 180**  
**6230 BC**

Typical Capsian, Phase III.

**Gif-1902. Relilāi, REL 12** **8350 ± 150**  
**6400 BC**

End of typical Capsian, Phase III.

**Gif-1897. Relilaï, REL 7** **8380 ± 150**  
**6430 BC**  
End of typical Capsian, Phase III.

**Gif-2120. Relilaï, REL 4** **8180 ± 150**  
**6230 BC**  
Typical Capsian, Phase II.

**Gif-2121. Relilaï, REL 5** **8840 ± 160**  
**6890 BC**  
Typical Capsian, Phase I.

*General Comment:* for this site, passage from typical Capsian to Upper Capsian is very rapid: between 5850 and 5800 BP Gif-2121 is oldest date obtained as yet for a typical Capsian level.

#### **Grotte de la Madeleine series, Taza, Sétif, Algeria**

Charcoal from hearths in prehistoric site, in grotte de la Madeleine (36° 42' N, 5° 32' E), Taza, Sétif. Coll by Brahim and subm 1971 by G Camps.

**Gif-2110. TAZA 4** **11,340 ± 220**  
**9390 BC**

**Gif-2111. TAZA 5** **12,700 ± 220**  
**10,750 BC**

*General Comment:* agrees well with expected ages. Industry assoc corresponds to a Middle Ibero-maurusian.

**Gif-1655. Izimane, E Erg, Sahara** **3600 ± 100**  
**1650 BC**

Ostrich-egg shell from open-air Neolithic site, in base of sebkhra, at Izimane (28° 44' N, 6° 54' E). Coll 1964 and subm 1970 by J Mateu, Fac Sci, Paris. *Comment* (JM): recent Saharian Neolithic as deduced from detailed typologic analysis (Roubet and Mateu, 1970).

#### **Zmeilet Barka series, Saoura, Sahara**

Large Neolithic site, on a mound, Zmeilet Barka (29° 07' N, 2° 02' W), Saoura, Sahara. Coll 1964 and subm 1970 by J Mateu.

**Gif-1656. Zmeilet Barka** **7700 ± 180**  
**5750 BC**  
Charcoal.

**Gif-1702. Zmeilet Barka, 2** **7200 ± 180**  
**5250 BC**  
Ostrich-egg shell.

*General Comment:* agrees well with dates obtained from ostrich eggs and charcoal.

**Gif-1821. El Beïada, W Bel-Guebour, Sahara** **7100 ± 180**  
**5150 BC**

Ostrich-egg shell, from Neolithic surface site, El Beïada (28° 44' N, 6° 54' E), NO Sahara. Coll 1965 and subm 1970 by J Mateu.

**Gif-1931. El Bayed, Sahara** **7250 ± 100**  
**5300 BC**

Ostrich-egg shell from Neolithic surface site (28° 30' N, 5° 58' E), Sahara. Coll 1965 and subm 1971 by J Mateu. *Comment:* confirms age already obtained for site: 7300 BP: MC-152 (R, 1969, v 11, p 126). Very similar results were obtained for the 3 Early Neolithic sites, El Bayed, El Beïda, and Zmeilet Barka.

**Gif-2221. Sebkhet en Noual, Tunisia** **6750 ± 130**  
**4800 BC**

Snail shells from ash midden on terrace above Sebkhet en Noual (34° 24' N, 9° 52' E), Tunisia. Coll and subm 1971 by J L Ballais, Fac Lettres, Caen. *Comment:* corresponds to evolved Capsian. Shows Upper Capsian may be contemporary with Neolithic in same region.

**Ancient mines of Morocco series**

Various samples from ancient mines of Morocco. Coll and subm 1969 to 1971 by M Saadi Moussa, Service des Mines, Rabat, Maroc.

**Gif-1453. Vein of Signal, Jbel Aouam, 1** **700 ± 90**  
**AD 1250**

Wood from mine timber, in load argentiferous lead, Vein of Signal (33° 09' N, 5° 38' W), alt: 1220m, Jbel Aouam.

**Gif-1894. Vein of Signal, Jbel Aouam, 2** **770 ± 90**  
**AD 1180**

Wood from same mine, as Gif-1453.

**Gif-2200. S Vein, Boujad, Jbel Aouam** **1020 ± 90**  
**AD 930**

Wood of S Vein, Boujad (ca 32° 48' N, 6° 26' W). *Comment:* shows S Vein was worked well before Vein of Signal.

**Gif-2199. Mine of Zgounder, Tizi n-test** **1250 ± 90**  
**AD 700**

Wood from winch, silver mine of Zgounder, Tizi n-test (ca 30° 40' N, 8° W), Haut-Atlas.

**Gif-2201. Ifriniaden, Tizi n-test** **520 ± 75**  
**AD 1430**

Basket remains from copper mine of Ifriniaden (30° 51' N, 8° 18' W), Haut-Atlas.

*General Comment:* dates working period in these ancient mines.

**Gif-1482. Diakhité, Thiès, Senegal** **2350 ± 100**  
**400 BC**

Charcoal from sandhole of Diakhité (14° 49' N, 16° 54' W), 100cm below surface. Thiès, Senegal. Coll 1969 by C Descamps and subm by L Balout, Inst Paléont Humaine, Paris. Assoc with Neolithic material (geometric microliths and K micrograver: in silex, basalt axes, sherds).

*Comment:* dates, for the 1st time, microlithic Neolithic of Senegal lying *in situ* in dune.

**Arlit series, Aïr, Niger**

Neolithic site of Arlit (18° 44' N, 7° 23' E), Aïr, Niger, > 100m long and 60m wide. Abundant ashes, animal bones, ceramics, and human skeletons in archaeological layer, 1.50m thick.

**Gif-1797. Arlit, Somair 2** **2640 ± 100**  
**690 BC**

Fauna bones, 0.30m deep. Coll by J Petit and subm 1970 by A Gangloff, CEA, Fontenay-aux-Roses.

**Gif-1798. Arlit, Somair 4** **4030 ± 110**  
**2080 BC**

Charcoal, 1m deep. Coll by J Petit and subm 1970 by A Gangloff.

**Gif-2289. Arlit** **4530 ± 110**  
**2580 BC**

Charcoal from level with skeletons, 1.50 to 2m deep, along barrow overlooking site. Coll and subm 1971 by J Petit, Arlit.

**Gif-1725. Arlit, 2** **5200 ± 140**  
**3250 BC**

Charcoal. Coll and subm 1970 by H Lhote.

**Gif-2159. Arlit, 4** **5030 ± 140**  
**3080 BC**

Charcoal, 1.20m deep. Coll and subm 1971 by H Lhote.

*General Comment:* if date, 2640 BP, for animal bones is representative of Neolithic settlement, occupation of site lasted ca 2000 yr. Despite uniformity in ceramics all along the archaeological sequence, this figure is consistent with a late continuation of Neolithic in Sahara.

**Gif-1727. Taferjit, Niger** **4080 ± 110**  
**2130 BC**

Shell of fresh-water mussel from fishing site, assoc with remains of hippopotamus and wart hogs at Taferjit (16° 03' N, 6° 10' E), Niger. Coll and subm 1970 by H Lhote. *Comment:* dates a damp period in Sahara with presence of rather deep ground water.

**Gif-1728. Tamaya Mellet, Niger** **9350 ± 170**  
**7400 BC**

Bones from Neolithic site of Tamaya Mellet (17° 45' N, 5° 22' E), Niger. Coll and subm 1970 by H Lhote. *Comment:* too old date, not yet explained.

**Gif-2156. Azelik, Agadez, Niger** **800 ± 100**  
**AD 1150**

Charcoal in hearth from ruins of Medieval village of Azelik, near Agadez (17° 00' N, 7° 56' E), Niger. Coll and subm 1971 by H Lhote.

**Gif-2160. Jackal den, near Arlit, Niger** **5100 ± 140**  
**3150 BC**

Charcoal in archaeological layer, 20cm deep, Jackal den, 10km off Arlit (18° 44' N, 7° 23' E), Niger. Coll and subm 1971 by H Lhote. *Comment:* same period of occupation as at Arlit.

**Marandet series, Agadez, Niger**

Charcoal in refuse heaps containing 30,000 crucibles in encampment of goldsmiths from W Africa, at Marandet (16° 23' N, 7° 25' E), on road from Gao to Egypt. Coll and subm 1971 by H Lhote.

**Gif-1726. Marandet, 1** **1050 ± 95**  
**AD 900**

**Gif-2157. Marandet, 2** **1310 ± 100**  
**AD 640**  
1m deep.

**Gif-2158. Marandet, 3** **1400 ± 100**  
**AD 550**  
0.20m deep.

*General Comment:* according to Arabian authors, industrial prosperity was 9th to 12th centuries. The 2 last dates indicate an earlier occupation of site.

**Bouar series, République Centrafricaine**

Charcoal from hearths, from Megalithic monuments, on barrow, around Bouar, République Centrafricaine. Megaliths are at border of Chad and Congo Basins, mostly at source of little waterways (de Bayle des Hermens, 1967). Coll by P Vidal and subm 1970 by R de Bayle des Hermens, Inst Paleont, Paris.

**Gif-1636. Beforo I, Tajunu** **7440 ± 170**  
**5490 BC**  
(5° 57' N, 15° 35' E).

**Gif-1637. Tia I, Tajunu** **1920 ± 100**  
**AD 30**  
(5° 55' N, 15° 36' E).

**Gif-1887. Tajunu Be Yole, I** **2560 ± 110**  
**610 BC**  
(5° 58' N, 15° 33' E). 70cm depth.

**Gif-1888. Tajunu Be Yole, 2** **2200 ± 110**  
**250 BC**  
90 to 100cm depth. *Comment:* probably slightly contaminated; younger than upper level.

**Gif-1889. Tajunu Zupaya, 3** **2400 ± 110**  
**450 BC**  
(5° 58' N, 15° 34' E). 60cm depth.

**Gif-1890. Tajunu Zupaya, 4** **6700 ± 140**  
**4750 BC**  
70 to 80cm depth.

*General Comment:* great antiquity of these monuments was unexpected. Recent ages of upper levels coherent with presence of iron artifacts indicate re-use of monuments 4000 yr after 1st occupation.

**Kamoa series, Katanga, Zaïre**

Charcoal from archaeological site of Kamoa (10° 24' S, 25° 09' E), Katanga, Zaïre. Coll and subm 1971 by D Cahen, Mus Royal Afrique Centrale, Tervuren, Belgium.

**Gif-2223. Kamoa, K 70, C 14-15** **1850 ± 100**  
**AD 100**  
Depth, 65cm. *Comment:* assoc microlithic industry of Late Stone age.

**Gif-2224. Kamoa, K 70, C 14-12** **1850 ± 100**  
**AD 100**  
Depth, 70cm. *Comment:* similar to Gif-2223.

**Gif-2225. Kamoa, K 70, C 14-14** **3840 ± 110**  
**1890 BC**  
Depth, 125cm. Just under Gif-2224. *Comment:* belongs to Late Stone age.

*General Comment (DC):* industry already dated twice at Kamoa: 1840 ± 35 BP, 65 to 70cm (GrN-6112) and 2705 ± 35 BP, 90 to 100cm (GrN-6113.) These very coherent dates indicate different occupation phases of site, corresponding to theories about life style of nomadic Pygmies and proto-Bushmen. Thus, recent dates for Late Stone age in these regions of Africa are not surprising.

**Gif-2294. Ruzizi, Burundi, Congo, Level 5** **≤ 100**  
Charcoal from late occupation of Iron age site, in sandy mound 1.40 to 1.75m high on bank of Ruzizi R, Burundi (3° 00' S, 20° 10' E), Congo. Coll by Starosvietsky and subm 1971 by D Cahen.

**Gif-2295. Cyirima Rujugira, Gaseke, Congo** **250 ± 90**  
**AD 1700**  
Human bones from sepulture of King Rwanda, Cyirima Rujugira, Gaseke (1° 40' S, 29° 50' E), Congo. Coll and subm 1970 by F Van Noten, Mus Royal Afrique Centrale, Tervuren, Belgium. *Comment:* King Rwanda died between 1708 and 1768 according to oral tradition. Agrees well with these dates. Another object from sepulture was dated 375 ± 50 BP GrN-6111 (Van Noten, 1972).

**Grotte Biala series, Congo**

"Ossuary", 1.50m deep, without artifacts, covered by stalagmitic formations, in Grotte Biala (3° 52' S, 13° 15' E), Congo. Coll and subm 1970 by J P Emphoux, ORSTOM, Brazzaville.

**Gif-1688. Grotte Biala 1** **1310 ± 100**  
**AD 640**

Human skull. *Comment:* corresponds rather well to 2nd Bantu migration through great forest of Congo. Only site available in region for anthropologic study, because of exceptional conservation of bones.

**Gif-1698. Grotte Biala 2**  $\delta^{14}\text{C} = -299\%$

Concretion in direct contact with bones Gif-1688. *Comment:* if calcite deposit occurred just after inhumation, fraction of organic carbon, which contributed to stalagmitic formation, is 81%: rather high but possible.

**Gif-1914. Moussanda, 3 C, Congo** **6600 ± 130**  
**4650 BC**

Charcoal from hearth in middle Tshitolian archaeological layer under 70cm silty deposits, from open-air site on side of a swamp being drained, 4m above water, Moussanda (4° 01' S, 13° 56' E), Congo. Coll and subm 1970 by J P Emphoux. *Comment:* dates damper climatic phase than at present.

*C. America*

**Diana I series, Diana Bay, Nouveau Québec**

Site Diana I is in Diana Bay (60° 56' N, 69° 57' W), Nouveau Québec. Coll and subm 1969-1970 by P Plumet, Centre d'Etudes Nordiques, Univ Laval, Québec, Canada. Remains of Dorset tradition were found in semi-subterranean circular houses that belong to site (Plumet, 1969).

**Gif-1956. Diana, DIA, I B 70, 23** **920 ± 90**  
**AD 1030**

Burned wood under a paving stone in a semi-subterranean circular house, House B, 1m from House E.

**Gif-1954. Diana, DIA, I B 70, 19** **1090 ± 90**  
**AD 860**

Charcoal from floor of House B. *Comment:* together with Gif-1956, corresponds to Dorset occupation in region.

**Gif-1352. Diana, DIA, I E 68** **1450 ± 90**  
**AD 500**

Charcoal from hearth in floor, inside a "long house with 2 hemicycles".

**Gif-1957. Diana, DIA, I B 70, 24** **1860 ± 90**  
**AD 90**

Charcoal from burnt black soil under bank of Houses A and B.

**Gif-1955. Diana, DIA, I B 70, 22** **2080 ± 90**  
**130 BC**

Charred fat in black layer under bank of House B. *Comment:* together with Gif-1957, confirms theory of an occupation of the site prior to building of Houses A and B.

**UNG series, Ungava Bay, Nouveau Québec**

As Diana site, UNG site (60° 43' N, 69° 36' W), Ungava Bay, delivered abundant Dorset tools. Dated samples come from "long houses with 2 hemicycles". Coll and subm 1969-1970 by P Plumet.

**Gif-1949. UNG II D 70, II** **430 ± 80**  
**AD 1520**  
Charcoal from House D.

**Gif-1953. UNG II, D 70, 17** **530 ± 80**  
**AD 1420**  
Charcoal from House D, 10cm deep, between large stone flags.

**Gif-1950. UNG II, D 70, 13** **680 ± 90**  
**AD 1270**  
Charcoal in square, sunken box, bottom and side of which were protected by stones in House D: this type of box is typical of interior arrangement of the "long houses". *Comment:* sample is very probably contemporary with occupation of House D.

**Gif-1948. UNG II, D 70, 10** **750 ± 90**  
**AD 1200**  
Charcoal in the floor of House D. *Comment:* these 4 1st dates suggest late occupation, after desertion of site, possibly by Eskimos of Thule tradition.

**Gif-1951. UNG II, D 70, 14** **1420 ± 90**  
**AD 530**  
Charred fat adhering to a paving stone, in House D.

**Gif-1952. UNG II, D 70, 16** **1380 ± 90**  
**AD 570**  
Charred fat adhering to another paving stone, in House D. *Comment:* dates 1st occupation of site, as Gif-1951.

**Gif-1947. UNG II, B 70, 4** **1540 ± 90**  
**AD 410**  
Charred fat adhering to paving stone in House B. *Comment:* dates 1st occupation of site.

**Gif-1946. UNG II, B 70, 3 b** **1680 ± 90**  
**AD 270**  
Charred fat under paving stone, in House B. *Comment:* dates 1st occupation of House B.

**Gif-1945. UNG II, C 70, 2** **1470 ± 90**  
**AD 480**  
Charred fat mixed with sand, 10cm deep in Structure C, a dwelling demarcated by erected flat stones.

**Gif-1944. UNG II, A 70, I****1130 ± 90****AD 820**

Charred fat with charcoal, 10cm deep in Structure A, similar to C. *General Comment for Ungava samples:* dates may be classified in 3 groups: 1) AD 410 to 780, corresponding to 1st period of occupation of site, with building of "long houses with 2 hemicycles", 2) AD 820 to 1270 which should correspond to transition between Dorset and Thule culture, 3) AD 1420 to 1520, which is surely occupation by Thule Eskimos.

**Gif-1567. Poste-de-la-Balaine, Baie d'Hudson****3300 ± 110****1350 BC**

Charcoal, 10cm deep, from a circular stone structure, on moraine of E coast of Hudson Bay, NE of Poste-de-la-Balaine (Great Whale) (55° 17' N, 77° 46' W). Site is on a 30m high terrace, uplifted by glacio-isostasy. Coll and subm 1969 by P Plumet. *Comment:* date fits well with pre-Dorset tools on site.

**Gif-1520. La Bernardina, T I 10, Azuero, Panama****1100 ± 95****AD 850**

Charcoal and ashes from circular structure on site of La Bernardina (7° 22' N, 80° 26' W), Azuera Peninsula, Panama. Coll and subm 1969 by A Ichon, Mission Archéolog Française au Panama. *Comment:* assoc with ritual ceramics typical of Phase IV connected with "classic" period of Veraguas and of Chiriqui. Date fits well and is comparable to a date for site of Guaniquito with a similar structure: AD 995 ± 120 (Ichon, pers commun).

**Gif-1642. Site El Indio, Panama****1500 ± 100****AD 450**

Bivalve shell from habitation site El Indio (7° 25' N, 81° 21' W), 10km E Tonosi, Panama. Coll and subm 1970 by A Ichon. *Comment:* dates beginning of site occupation corresponding to Phase II of chronologic sequence of Tonosi.

**Gif-1641. Site El Cafetal, Panama****1560 ± 100****AD 390**

Bivalve shell from habitation site El Cafetal (7° 25' N, 80° 21' W), 11km E Tonosi, Panama. Coll and subm 1970 by A Ichon. *Comment:* should correspond to transition from Phase II to III. Hence, duration of Phase II is 200 yr, at most.

**Gif-1643. Site La India, Panama****1930 ± 110****AD 20**

Charcoal from habitation site La India (7° 23' N, 80° 25' W), 3km SE Tonosi, Panama. Coll and subm 1970 by A Ichon. *Comment:* dates beginning of occupation of this type of site in region. Corresponds to Phase I.

*General Comment for Panama samples:* they verify chronologic sequence established by comparison of ceramics with those of N region (Veraguas, Coclé).

**Utcubamba Valley series, Amazonas, N Peru**

Funereal collective dwellings in open-air under rock shelter cliffs Utcubamba Valley, above Chachapoyas (ca 6° 20' N, 77° 50' W), alt 2800m, Amazonas. Coll 1964 and subm 1969 by H Reichlen, CNRS, Paris. Dwellings are of stone, clay, and wood.

**750 ± 90**

**Gif-1415. Revash 1, Utcubamba Valley, 00140 AD 1200**  
Wood from a roof beam.

**900 ± 90**

**Gif-1416. Revash 1, Utcubamba Valley, 00142 AD 1050**  
Charcoal in clay mortar from wall.

**630 ± 90**

**Gif-1533. Puente-Utcubamba, Utcubamba Valley, 00130 AD 1320**  
Charcoal under 1m thick spoil.

*General Comment:* date local recent cultural set of Revash phase (Gif-1415 and Gif-1416) and Chipurik phase (Gif-1533). Agree with estimated age (Reichlen and Reichlen, 1950).

**Gif-1534. Kuelape, Utcubamba Valley, Amazonas, Modern N Peru, 49-251**

Charcoal from bottom of a circular dwelling inside Kuelape fortress on left bank of Utcubamba R (ca 6° 20' S, 77° 50' W), alt 3000m; under 50cm pottery and kitchen remains. Coll 1949 and subm 1969 by H Reichlen. *Comment:* was expected to date Kuelape phase of this local culture AD 1000-1200.

**3850 ± 110**

**Gif-1536. Cerro Santa Apolonia, Bellavista, Jaen Prov, N Peru, 0012 1900 BC**

Charcoal from hearth in archaeologic level, 1m thick, from left bank of Rio Marañon, at border of present village of Bellavista (5° 43' S, 78° 48' W). Coll 1964 and subm 1969 by H Reichlen. *Comment:* assoc with a rough lithic industry (choppers, chopping tools) and a ceramic type close to "Valdivia corrugated" from coast of Ecuador. Earliest date for a ceramic site in N Peru.

**Cave of Pumurco series, Cerro Callajloma, Cajamarca, Peru**

Charcoal from Cave of Pumurco, older and only site of Cajamarca hunters (7° 11' N, 78° 27' W), Cajamarca Valley. Coll 1965 and subm 1969 by H Reichlen.

**Modern**

**Gif-1531. Cave of Pumurco, 00606**

Level III, 30 to 40cm thick, with Cajamarca III ceramics assoc. *Comment:* expected age ca AD 1000. Probably contamination by modern hearth.

**Gif-1530. Cave of Pumurco, 00664** **7400 ± 170**  
**5450 BC**

Hearth on rock, under Level III. *Comment:* pre-ceramic lithic industry assoc with scrapers related to those of Lauricocha II, Central Andes, dated 5000 BC.

**Gif-1532. Chondorco I, Cajamarca Valley, N Peru** **1200 ± 100**  
**AD 750**  
**49-172**

Fragment from wooden object, at Chondorco (7° 11' S, 78° 28' W), part of town on hill. Coll 1949, inside sepulture, close to ceramics and human bones, under cover of stones, and subm 1969 by H Reichlen. *Comment:* dates arrival in N Peru of Tiahuanaco civilization, from Bolivia (Reichlen and Reichlen, 1950).

**Gif-2482. Castillo de Chankillo, Casma Valley,** **2070 ± 100**  
**120 BC**  
**N Peru 00702**

Wood (*Prosopis*) piece above entrance of stone fortress, Castillo de Chankillo, left bank of R Mojeke (9° 34' S, 78° 14' W), Casma Valley. Coll 1965 and subm 1969 by H Reichlen. *Comment:* date one of most important and curious series of monuments of N Peruvian Coast.

#### **Nasca series, S Peru**

Shells, charcoal, and lithic industry in marine terrace, 1m deep, Nasca (15° 15' N, 75° 14' W), San Nicolas Bay, S coast of Pacific, Peru. Coll 1950-1965 and subm 1969 by H Reichlen.

**Gif-1418. San Nicolas I, 00-45** **400 ± 90**  
**AD 1550**

Charcoal in shell mound on actual shore.

**Gif-1535. San Nicolas, 50-062** **3700 ± 100**  
**1750 BC**

Wood stem in low marine terrace.

*General Comment:* extreme dates of San Nicolas Bay site occupation, from Late preceramic period till beginning of Spanish occupation.

**Gif-1417. Site Ocoña 3, Ocoña Valley, S Peru,** **7700 ± 180**  
**5750 BC**  
**00515**

Charcoal with shell and lithic tools, 1m deep in a low terrace of R de Ocoña, on S coast of Pacific (16° 28' N, 73° 07' W). Coll 1965 and subm 1969 by H Reichlen. *Comment:* dates a preceramic lithic industry (chopping tools, thick blades and basalt points) not described till now.

#### **Caleta Abtao series, Peninsula de Mejillones, Antofagosta, Chile**

Shells (*Concholepas concholepas*) from Caleta Abtao site (23° 02' S, 70° 31' W), Peninsula de Mejillones, Antofagosta, Chile. Site belongs to Anzuelo de Concha (shell hook), culture known in other parts of Chile coast. Coll 1969 and subm 1970 by G Boisse and A Lagostero, Univ Norte, Antofagosta.

- Gif-1657. Caleta Abtao, No. 2** **4950 ± 110**  
**3000 BC**  
Site 1, NE angle. Depth 1.30m.
- Gif-1661. Caleta Abtao, No. 12** **4700 ± 110**  
**2750 BC**  
Site 1, E wall. Depth 0.70m.
- Gif-1658. Caleta Abtao, No. 3** **3550 ± 100**  
**1600 BC**  
Site 1, E wall. Depth 0.85m.
- Gif-1660. Caleta Abtao, No. 10** **4550 ± 110**  
**2600 BC**  
Site 1, E wall. Depth 1m.
- Gif-1659. Caleta Abtao, No. 5** **5350 ± 120**  
**3400 BC**  
Site 1, E wall. Depth 2.10m. First cultural level.
- General Comment:* whole site presumably belonged to Anzuelo de Concha culture, in fact, only the deepest level is concerned. Site occupation lasted from 3500 to 5300 BP, but given levels do not seem to correspond to a very well established stratigraphy.
- Gif-1254. Guipe, Bahia, Salvador, Brazil, Cut A** **200 ± 90**  
**AD 1750**  
Charcoal from dwelling and cemetery site, of Aratu phase, near Guipe R (12° 50' S, 38° 31' W), Bahia, Salvador. Coll and subm 1968 by V Calderon, Inst Ciencias Sociais, Univ Bahia, Brazil. *Comment:* for unknown reasons, 200 yr younger than indigenous occupation of site and 400 yr too young for culture to which site belongs.
- Gif-1628. Caverna do Caboclo, Pernambuco, Brazil** **250 ± 90**  
**AD 1700**  
Charcoal from Caverna do Caboclo, Pernambuco (7° 47' S, 35° 35' W). Coll and subm 1970 by V Calderon. *Comment:* does not exactly correspond to expectation but archaeological data are missing in area.
- Gif-1440. São Desiderio, Bahia, Brazil** **1050 ± 250**  
**AD 900**  
Bones from large funerary urns of Aratu phase in terrace parallel to São Desiderio R, tributary of Grande R (12° 55' S, 45° 00' W), Bahia. Coll and subm 1968 by V Calderon. *Comment:* fits well with expected age for this archaeological base.
- Gif-1627. Caverna da Pedra Acai, Pernambuco, Brazil** **1880 ± 100**  
**AD 70**  
Charcoal from Caverna da Pedra Acai, Pernambuco (8° 07' S, 37° 41' W). Coll and subm 1970 by V Calderon. *Comment:* abundant remains of human occupation, lithic, and shell artifacts. Date as expected.

**Gif-1255. Grutu do Padre, Pernambuco, Salvador, 2200 ± 110  
Brazil 250 BC**

Charcoal from Grutu do Padre, Level 25-35, Pernambuco (9° 01' S, 38° 40' W), Salvador. Coll and subm 1968 by V Calderon. *Comment:* fits chronologic sequence of cave; oldest level, 1.20m deep, was dated 5630 ± 400 BP (SI-644, unpub).

*D. Miscellaneous Countries*

**Grotte d'Ojo Guarena series, Burgos Prov, Spain**

Paleolithic grotte d'Ojo Guarena, with rupestral paintings, La Palomera (43° 02' N, 0° 01' W), Burgos Prov, Spain. Coll by spelaeologic Serv Burgos, and subm 1970 by A Leroi-Gourhan, Collège France, Paris.

**Gif-1720. Grotte d'Ojo Guarena, 1 2100 ± 70  
150 BC**

Charcoal at foot of wall covered with paintings, in Painted Room.

**Gif-1721. Grotte d'Ojo Guarena, 2 15,600 ± 230  
13,650 BC**

Charcoal from torch on soil with human footprints, at bottom of gallery, in Print Room.

**Gif-1971. Grotte d'Ojo Guarena, 3 3430 ± 100  
1480 BC**

Charcoal scattered on soil and covered with stalagmitic floor, ca 1cm thick.

**Gif-1972. Grotte d'Ojo Guarena, 4  $\delta^{14}\text{C} = -450\%$**

Calcite from lower part of stalagmitic floor, in contact with charcoal, Gif-1971. If concretion is contemporary with charcoal, contribution of modern carbon to calcite formation was 85%, which is possible. *General Comment:* obviously, cave was visited at different times, but oldest date is good for a Paleolithic cave.

**Dikili Tash series, E Macedonia, Greece**

Charcoal from archaeological site, on mound, 14m alt, at Dikili Tash (41° 00' N, 24° 15' E), in Macedonia, Greece, cultivated till 1961. Site raises difficult chronologic problems, in Balkan countries, especially in correlating Dikili Tash civilization with those of Anatolia and Greece. Coll 1967-1969 and subm 1969-1970 by J Deshayes, Inst Art et Archeol Paris.

**Gif-1425. Dikili Tash, 10 5750 ± 140  
3800 BC**

Thick destruction level of Late Neolithic, of purely Danubian civilization.

**Gif-1423. Dikili Tash, 5 5650 ± 140  
3700 BC**

From same destruction level.

<b>Gif-1424. Dikili Tash, 6</b>	<b>5750 ± 140</b> <b>3800 BC</b>
From same destruction level.	
<b>Gif-1738. Dikili Tash, 9</b>	<b>5600 ± 150</b> <b>3650 BC</b>
Burning layer from same destruction level.	
<b>Gif-1736. Dikili Tash, G, Soil 12</b>	<b>5850 ± 160</b> <b>3990 BC</b>
First level of Late Neolithic.	
<b>Gif-1737. Dikili Tash, G, under Soil 12</b>	<b>6400 ± 160</b> <b>4450 BC</b>
Destruction level of Middle Neolithic.	
<b>Gif-1740. Dikili Tash, H, top burnt zone</b>	<b>6450 ± 160</b> <b>4500 BC</b>
Destruction level of Middle Neolithic marking a total rupture in civilization between Late and Middle Neolithic.	
<b>Gif-1735. Dikili Tash, G, Soil 13</b>	<b>6170 ± 160</b> <b>4220 BC</b>
In pit of Soil 13. Late level of Middle Neolithic.	
<b>Gif-1426. Dikili Tash, II</b>	<b>6800 ± 160</b> <b>4850 BC</b>
Middle Neolithic. <i>Comment:</i> evokes both corresponding periods in Beograd and Early Middle Neolithic in Central Greece.	
<b>Grotte de Kitsos series, Laurion, Greece</b>	
Neolithic Grotte de Kitsos (37° 44' N, 21° 41' E), Laurion, Greece. Coll and subm 1968-1971 by N Lambert, CNRS, Athens.	
<b>Gif-1283. Kitsos 730, Layer 1b</b>	<b>1900 ± 140</b> <b>AD 50</b>
Charcoal and ash from sepulchral cave near surface. <i>Comment:</i> layer reworked by introduction of late ritual hearths, of 5th to 4th centuries BC.	
<b>Gif-1280. Kitsos 335, Layer 3a, Sounding I</b>	<b>5470 ± 150</b> <b>3520 BC</b>
Charcoal in dwelling level, with seashell, burnt bones (goat, hare), Early Neolithic.	
<b>Gif-1610. Kitsos 1610, Layer 3, Sounding 2</b>	<b>5350 ± 200</b> <b>3400 BC</b>
Charcoal from hearth in homogeneous ashy layer corresponding to a dwelling level with assoc Neolithic potsherds.	
<b>Gif-1832. Kitsos 2/540 Layer 4</b>	<b>5650 ± 130</b> <b>3700 BC</b>
Charcoal from fireplace with human and animal bones, potsherds, stone and bony tools.	

**Gif-1670. Kitsos 1830-31 Layer 4, Hearth  $\Phi$  3** **5550  $\pm$  150**  
**3600 BC**  
 Charcoal from rich dwelling level with Neolithic potsherds, burnt bones (goat, hare, wild boar, hart), and tools in stone, bone, and antler.

**Gif-1729. Kitsos 1826 Layer 4, Sounding 2** **5750  $\pm$  130**  
**3800 BC**  
 Charcoal.

**Gif-1612. Kitsos 1733, Layer 4, Sounding 2,** **5700  $\pm$  140**  
**Hearth  $\Phi$  2** **3750 BC**  
 Charcoal from hearth in dwelling level.

**Gif-2125. Kitsos SE O11 exterior, Layer 2** **6800  $\pm$  170**  
**4850 BC**  
 Broken and burnt bones (deer, horse, wolf, lynx) in open pit outside cave, in consolidated levels well before Neolithic period, 0.40 to 1.20m from surface. *Comment:* incorrect result obtained on total carbon from bone, collagen being insufficient. Discordance between fauna and date indicates important pollution.

*General Comment:* a Neolithic site very rich in industry, particularly in bone and obsidian industries (Lambert, 1971).

#### **Antre Corycien series, Greece**

Archaeologic levels from cave called Antre Corycien, in Parnassos Mts N Delphi (38° 29' N, 22° 30' E), Greece. Cave was dedicated to Pan and to Nymphs since 6th century BC, at least. Epigraphic evidence only goes back to 3rd century BC but various findings date from Archaic up to Roman period. First layer of cave contains offerings of clay figurines and vases, bronze rings and coins, several astragalae, fragments of marble statues, and dedicatory inscriptions. Most important frequentation of sanctuary was from 6th to 3rd centuries BC.

A Neolithic occupation is confirmed by a considerable amount of different types of pottery specially mat painted and fine gray of recent period, and by clay idols.

An excavation to explore central filling of cave, reached 4m and revealed several deep layers with black lenticular formations. Charcoal coll here shows a very ancient passage of man in this cave but no tools have been found yet. Coll and subm 1971 by N Lambert.

**Gif-2122. Antre Corycien, 70/02 Layer 2** **5230  $\pm$  290**  
**3280 BC**  
 Charcoal.

**Gif-2123. Antre Corycien, 70/01, Layer 3** **6250  $\pm$  90**  
**4300 BC**  
 Charcoal. *Comment:* no archaeological clues.

**Gif-2124. Antre Corycien, 71/03, Layer 3 b** **6380 ± 90**  
**4430 BC**  
 Charcoal. Neolithic black and painted potsherds, remains of polished stone tools and fauna (goat, sheep) assoc.

**Gif-2339. Antre Corycien, 71/19, Layer 4 a** **7370 ± 170**  
**5420 BC**  
 Charcoal.

**Gif-2340. Antre Corycien, 71/35, Layer 5 a** **≥40,000**  
 Unidentified broken and burnt animal bones without archaeological clues in consolidated layer. *Comment*: total thickness of Layer 5 is 60cm. Layers 4 and 5 clearly show discontinuity in stratigraphy at this spot, but study of this site is just beginning.

#### **Porsuk-Ulukisla series, Turkey**

Charcoal from destruction level at Porsuk-Ulukisla (37° 31' N, 34° 35' E), Turkey. Coll and subm 1970 by O Pelon, Fac Lettres, Lyon.

**Gif-1672. Porsuk-Ulukisla, 01** **2000 ± 100**  
**50 BC**  
 Quarry III, 1.50m deep.

**Gif-1673. Porsuk-Ulukisla, 02** **1900 ± 100**  
**AD 50**  
 Quarry II, 2m deep.

**Gif-1674. Porsuk-Ulukisla, 03** **2020 ± 100**  
**70 BC**  
 Quarry II, 2.85m deep.

**Gif-1510. Desert of Lut, Iran** **≥40,000**  
 Ostrich egg shells, on surface, at foot of enormous dune, in Desert of Lut (29° 06' N, 59° 03' E), on border of Iran and Baluchistan. Coll and subm 1969 by J. Dresch, Inst Géog, Paris. *Comment*: only remains of life found in that immense azoic region. This also proves that nearby dunes are very stable and older than supposed.

**Gif-1845. Zvartnots, Armenia**  **$\delta^{14}\text{C} = -583\%$**   
 Mortar from Basilica of Zvartnots (40° 15' N, 44° 30' E), Armenia, USSR. Coll and subm 1970 by J Labeyrie. *Comment*: basilica was built from AD 628 to 643: valid date is not obtainable with this mortar, which very probably contains calcareous sand.

**Gif-1997. Ben-Do, Vietnam** **3040 ± 140**  
**1090 BC**  
 Organic remains in black ceramics from Neolithic site at Bèn-Do (10° 58' N, 106° 50' E), Vietnam. Coll and subm 1971 by H Fontaine, Serv Géol, Saigon. *Comment*: within expected age range.

**Xnâm-Loc series, Vietnam**

Important fields with jars of Iron age, at Xnâm-Lõc, Vietnam. Coll and subm 1971 by H Fontaine.

**Gif-1996. Xnâm-Loc, I** **2400 ± 140**  
**450 BC**

Charcoal from Jars 11 and 13.

**Gif-1999. Xnâm-Loc, 2** **2590 ± 290**  
**640 BC**

Carbon deposit on Jar 8. *Comment:* diluted for measurement.

*General Comment:* validates ages of carbon soot deposit on ceramics. Agrees well with archaeology.

**Maré I series, Iles Loyauté, New Caledonia**

Consummated marine shells, proves ancient human occupation of uplifted atoll Maré (21° 31' N, 167° 59' E), Iles Loyauté, New Caledonia. Coll and subm 1969 by M J Dubois, Ecole Pratique Hautes Etudes, Paris.

**Gif-1427. Maré I, B** **500 ± 90**  
**AD 1450**

From center of island, Peu region, constituted by uplifted bottom of ancient lagoon. *Comment:* dates end of permanent occupation of Peu population in region.

**Gif-1428. Maré I, C** **1370 ± 100**  
**AD 580**

From a wall of building of lithic set of Hna-Kudo-tit, an important war refuge closely linked by tradition with similar and nearby fortifications which are largest buildings in S Pacific. *Comment:* dates time of large population with a strange social organization now extinct.

## II. GEOLOGIC SAMPLES

## A. France

## 1. Palynologic and climatic problems

**La Fère-en-Tardenois series, Aisne**

Peat bog from La Fère-en-Tardenois (49° 12' N, 3° 32' E), Aisne, studied to aid in difficult palynologic interpretation of region. Coll 1968 and subm 1969 by M Deneffe, Inst Géog, Paris.

**Gif-1524. Fère-en-Tardenois, C I** **500 ± 90**  
**AD 1450**  
Depth 5cm.

**Gif-1525. Fère-en-Tardenois, C 5** **4150 ± 120**  
**2200 BC**  
Depth 25cm.

**Gif-1526. Fère-en-Tardenois, C 9** **7350 ± 160**  
**5400 BC**  
Depth 45cm.

*General Comment:* 2 first dates fit palynologic analysis, but flora was Sub-Boreal at 3rd level. Discrepancy not yet explained.

**Gif-1839. Aber-Ildut, Finistère** **7950 ± 190**  
**6000 BC**

Peat from Aber-Ildut, -22m related to msl (48° 29' N, 4° 44' W). Coll and subm 1970 by M T Morzadec. Agrees well with pollen analysis, indicating Boreal age (Zone VI<sub>c</sub>).

**Gif-2191. Saint-Servan, Ille-et-Vilaine** **6900 ± 140**  
**4950 BC**

Peat from foreshore, at lowest sea level in Rance estuary, Saint-Servan (48° 38' N, 2° 00' W), Ille-et-Vilaine. Coll and subm 1971 by M T Morzadec. *Comment:* confirms pollen analysis: Early Atlantic VIIa.

**Gif-2190. Redon, Ille-et-Vilaine** **3600 ± 105**  
**1650 BC**

Peat from core 17.5m deep, in modern sediments of Vilaine Valley, 5km S Redon (47° 39' N, 2° 05' W, Ille-et-Vilaine. Coll 1961 and subm 1971 by M T Morzadec. *Comment:* corresponds to transition zone between Sub-Boreal and Sub-Atlantic, Transition VIIb-VIII.

**Gif-1861. Gizeux, Indre-et-Loire** **6850 ± 170**  
**4900 BC**

Black peat, 70cm deep, from peat bog, at Gizeux (47° 23' N, 2° 09' W), Indre-et-Loire. Coll 1966 and subm 1970 by N Planchais. *Comment:* end of Boreal pollen zone.

**Gif-1860. Mazerolles, Loire Atlantique** **6900 ± 170**  
**4950 BC**

Clayey black silt, from bottom of peat bog 754 to 760cm deep, at Mazerolles (47° 21' N, 3° 50' W), Loire Atlantique. Coll 1966 and subm 1970 by N Planchais. *Comment:* beginning of Atlantic pollen zone (Planchais, 1971).

**Gif-1800. Marais Poitevin, Vendée** **2200 ± 110**  
**250 BC**

Oyster from shelly littoral bar which hugs ancient calcareous islet of Champagné-les-Marais and Puyravault (46° 23' N, 1° 07' W), Vendée. Coll and subm 1970 by F Verger, Ecole Pratique Hautes Etudes, Paris. *Comment:* dates a filling stage of Marais Poitevin.

**Gif-1813. Core 202, Loire Estuary** **600 ± 100**  
**AD 1350**

Wood debris, 15.15m below msl, from Core 202 in Fairway of Bonne Anse, W Saint-Nazaire (47° 15' N, 2° 14' W), Loire Estuary. Depth of core surface 12.10m. Subm 1970 by F Ottman.

**Gif-1815. Core 407, Loire Estuary** **2650 ± 110**  
**700 BC**

Oyster shell from 17.30m below msl in Core 407 from Fairway of Bonne Anse, W Saint-Nazaire (47° 15' N, 2° 14' W), Loire Estuary, depth of core surface: 14.60m. Subm 1970 by F Ottman.

**Gif-1816. Core 410, Loire Estuary** **3850 ± 130**  
**1900 BC**

Oyster shell from 17.70m below msl in Core 410 from Fairway of Bonne Anse, W Saint-Nazaire (47° 15' N, 2° 14' W), depth of core surface 13.80m. Coll and subm 1970 by F Ottman. *Comment:* probably same oyster bed as Gif-1815.

**Core II series, Loire Estuary**

Peat from Core II, 41.50m long (47° 16' N, 22° 11' W), Loire Estuary. Depth of core below surface: 11m. Core contains 36m sedimentary filling, typically estuarine. Subm 1970 by F Ottman.

**Gif-1810. Core II, 35.90m below msl** **6210 ± 160**  
**4260 BC**

**Gif-1811. Core II, 45m below msl** **6270 ± 160**  
**4320 BC**

*General Comment:* core is in axis of paleovalley of Loire, where periods of sedimentation probably alternated with periods of erosion.

**Gif-1814. Core 302, Loire Estuary** **7800 ± 180**  
**5850 BC**

Branch debris from levels 20.60m and 21.20m below msl, in Core 302, from Fairway of Bonne Anse, W Saint-Nazaire (47° 15' N, 2° 14' W), Loire Estuary. Depth of core surface 14.70m. Subm 1970 by F Ottman.

**Gif-1812. Core X, Loire Estuary** **13,000 ± 180**  
**11,050 BC**

Shells from level 39 to 40m below msl in Core X, in Loire Estuary, E Saint-Nazaire (47° 15' N, 2° 14' W), depth of core surface 0. Subm by F Ottman. *Comment:* situated in border of paleovalley of Loire where more ancient remains have been preserved.

*General Comment for cores of Loire Estuary:* study shows steps in sedimentary filling of Loire Estuary during Flandrian transgression.

**Gif-1786. Col d'Auxières, Aude** **650 ± 100**  
**AD 1300**

Peaty clay, 1.00 to 1.10m from low level of peat bog of Col d'Auxières (42° 43' N, 2° 20' E), alt 1040m, Aude. Coll and subm 1970 by G Jalut, Fac Sci, Toulouse, Haute-Garonne. *Comment:* rapid peat formation.

**Gif-1785. La Clauze, Pyrénées Orientales** **≤100**

Peaty sandy sediment, 0.70 to 0.80m from a marsh, at La Clauze (42° 41' N, 2° 21' E), alt 1090m, Pyrénées Orientales. Coll and subm 1970 by G Jalut. *Comment:* very rapid peat formation.

**Gif-1784. Salvanère, Aude** **Modern**

Clayey sandy sediment from base of peat bog, 1.70 to 1.80m at Salvanère (42° 42' N, 2° 19' E), alt 1390m, Aude. Coll and subm 1970 by G Jalut. *Comment:* pollen analysis indicates too recent formation of peat bog. But modern age is surprising because it is formed by clayey sediment 0.60m thick overlain by peat, 1.20m thick.

**Pla de Salinas, Cerdagne series, Pyrénées Orientales**

Peat bog, alt 2200m, at Cerdagne (42° 21' N, 2° 40' E), E Pyrénées. Coll and subm 1970 by G Jalut.

**1150 ± 100**

**Gif-1885. Cerdagne, 29** **AD 800**  
0.20m deep.

**1950 ± 100**

**Gif-1886. Cerdagne, 30** **0**  
0.70m deep.

*General Comment:* recent formation of peat bog due to solifluction earth dam.

**Le Bousquet series, Aude**

Peat bog, W of Col de Jau, at Le Bousquet (42° 44' N, 2° 10' E), alt 1050m, Aude. Coll and subm 1970 by G Jalut.

**450 ± 100**

**Gif-1783. Le Bousquet, 21** **AD 1500**  
0.65 to 0.75m. *Comment:* abundant cereal pollens.

**1130 ± 100**

**Gif-1782. Le Bousquet, 22** **AD 820**  
1.30 to 1.40m.

**4300 ± 180**

**Gif-1781. Le Bousquet, 23** **2350 BC**  
2.00 to 2.10m. *Comment:* Sub-Boreal.

*General Comment:* entire profile shows strong human influence on vegetation with intense and frequent deforestations.

**La Moulinasse, I, Col de Jau series, Aude**

Peat bog of Col de Jau, 1.5km W Col de Jau, on right bank of Aiguette R (42° 41' N, 2° 41' E), alt 1380m, Aude. Coll and subm 1970 by G Jalut.

- 1620 ± 110**  
**AD 330**
- Gif-1780. Col de Jau, 15**  
1.40 to 1.50m deep. *Comment:* level marked by important human influence.
- 2000 ± 100**  
**50 BC**
- Gif-1779. Col de Jau, 16**  
1.75 to 1.85m deep. *Comment:* human influence.
- 2500 ± 110**  
**550 BC**
- Gif-1778. Col de Jau, 17**  
2.10 to 2.20m deep. *Comment:* beginning of human influence; these 3 dates indicate rapid peat formation during Sub-Atlantic.
- 3350 ± 120**  
**1400 BC**
- Gif-1777. Col de Jau, 18**  
2.45 to 2.55m deep. *Comment:* belongs to Sub-Boreal.
- 9150 ± 210**  
**7200 BC**
- Gif-1776. Col de Jau, 19**  
2.95 to 3.05m deep. *Comment:* belongs to Pre-Boreal.
- 13,600 ± 350**  
**11,650 BC**
- Gif-1775. Col de Jau, 20**  
3.25 to 3.35m deep. *Comment:* belongs to end of Early Dryas.  
*General Comment:* oldest peat bog studied till now in Pyrénées.
- 1240 ± 120**  
**AD 710**
- Gif-257. “Plan du Carrelet”, La Bérarde, Isère**  
Wood (*Pinus uncinata* Ramon), ca 0.50m diam found after a flood over junction of Vénéon R and Chardon torrent, at 1900m alt, at “Plan du Carrelet”, La Bérarde (44° 55' N, 1° 38' E), Isère. Coll 1958 and subm 1963 by H Huchon, Admin Eaux et Forêts, Grenoble. *Comment:* date indicates “Plan du Carrelet” was covered by big trees in AD 1240, whereas 50 yr ago it was completely denuded. It is now being reforested.
- 6800 ± 140**  
**4850 BC**
- Gif-1792. Isère R alluvium**  
Wood from big Oak trunks under 5m deep gravel in alluvium of Isère R, on right bank, near Barreaux (45° 26' N, 6° 00' E). Coll and subm 1970 by E Baccard, Grenoble. *Comment:* trees probably come from large forest of Coise, frontier between Savoy and Dauphiné.
- Alluvial plain of Durance R series**  
Wood (*Pinus silvestris*) from tree trunks still rooted *in situ* from alluvial plain of middle Durance R. Trees are exhumed by recent gully erosion of “Badlands” on slope of glacis (Archambault, 1969). Coll and subm 1971 by M Archambault, CNRS, Paris.

**Gif-2217. Les Rois, 3** **8260 ± 190**  
**6310 BC**  
From top of steep bank of a tributary of Buech R (44° 19' N, 5° 46' E).

**Gif-2215. Le Tronquet, I** **8500 ± 190**  
**6550 BC**  
From top of steep bank of a sub-tributary of Durance R (44° 19' N, 5° 53' E).

**Gif-2216. Le Mardaric, 2** **10,750 ± 250**  
**8300 BC**  
From bottom of bank of a sub-tributary of Durance R, Le Mardaric (44° 19' N, 5° 53' E).

*General Comment:* 2 first dates added to published results (R, 1972, v 14, p 308) for these fossil trees, show synchronism whatever the precise geographic location may be. Difference of ages between top and bottom of bank indicates duration of backfilling.

#### **Alluvial plain of Garonne R series**

Wood from whole trunks in alluvial filling of the low plain of Middle Garonne R, between Golfech and Valence d'Agen (44° 07' N, 0° 54' E), Tarn-et-Garonne. Coll and subm 1970-1971 by L Rieucou, Inst Géog, Paris.

**Gif-1841. Alluvial plain of Garonne R, 1** **9170 ± 110**  
**7220 BC**

**Gif-2338. Alluvial plain of Garonne R, 2** **8900 ± 160**  
**6950 BC**

*General Comment:* dates period of abundant inundations and important alluviation, same age as for middle Durance R, in French Alps (R, 1972, v 14, p 308, and this list; Rieucou, 1971).

**Gif-2218. Les Condamines, Drôme Valley** **11,150 ± 250**  
**9200 BC**

Wood fragment in colluvium, from lowest horizon in hillside at Combe de Vercheny, Drôme Valley (44° 42' N, 5° 17' E). Coll 1970 and subm 1971 by M Archambault. *Comment:* corresponds to hillside horizon dated ca 8500 BP in Durance Valley. Difference is not yet explained.

**Gif-1421. Saint-Pierre-les-Elboeuf, Seine Maritime** **21,000 ± 600**  
**19,050 BC**

Section of a Seine terrace of Saint-Pierre-les-Elboeuf (49° 16' N, 1° 02' W), Seine Maritime, shows 4 old loess horizons separated by paleosols and brown leached soils. Dated level is 1st humic horizon, ca 2.7m deep under ocher oxidized silt and typical calcareous silt (Lautridou and Verron, 1970). Coll by G Verron and subm 1969 by J Dastugue, Antiquités Préhist, Caen. *Comment:* this humic horizon lies between 2 other humic levels which overlie solifluction Level 8 attributed to Early

Würm. Different horizon should logically be placed above dated level in different phases of Würm. Hence, date does not fit but stratigraphy is not yet satisfactory and recent pollution of sample is not absolutely excluded.

**Gif-1840. Montmorency, Val d'Oise** **≥35,000**

Wood of Gymnosperm, 11.50m deep in ancient scree, at Montmorency (48° 59' N, 2° 19' E), Val d'Oise. Coll by L Honorat and subm 1970 by J C Koeniger, Fac Sci, Paris.

**Stalagmite series, Orgnac, Ardèche**

Samples from bottom of stalagmites, Orgnac Cave (44° 18' N, 4° 26' E), dated to find a stalagmite suitable for proposed isotopic study. Coll and subm 1970 by J C Duplessy, Centre Faibles Radioactivités, Gif-sur-Yvette, Essonne.

**Gif-1742. "Sylvie"**  $\delta^{14}\text{C} = -695\text{‰}$

Pure white calcite, length 1.70m.

**Gif-1743. "Claude"**  $\delta^{14}\text{C} = -315\text{‰}$

Pure white calcite, length 2.07m.

**Gif-1744. "Evelyne"**  $\delta^{14}\text{C} = -617\text{‰}$

Pure white calcite, length 1.60m.

**Gif-1805. Red stalagmite**  $\delta^{14}\text{C} = -1000\text{‰}$

Calcite with red clay, length 1.20m.

*General Comment:* these different stalagmites, still growing, were intended for paleoclimatic study of Last Würm. Oldest parts were analyzed to determine time span of each stalagmite. Unfortunately, analyses of Gif-1742 to -1744 yield too young ages when calculated, assuming that 66% of C is of biogenic origin (R, 1969, v 11, p 338). Gif-1805 age is too old for proposed investigation.

2. *Sea-level variations*

**Gif-1548. Port-Lazo, Plouezec, Côtes-du-Nord** **Modern**

Oyster shells from oyster-and-pebble level underlying boulder-clay ("argile a blocs") 3m thick, at high sea level, Port-Lazo, Plouezec (48° 45' N, 2° 59' W) Côtes-du-Nord. Coll and subm 1969 by P R Giot. *Comment:* high sea deposit at present time.

**Gif-1799. "La Houle" Cove, S Cancale, Ile-et-Vilaine** **450 ± 95**  
**AD 1500**

Oyster from layer of oyster shells with small pebbles, 50cm to 1m thick, overlying silt at l'Aurore Cliff, "La Houle" Cove (48° 40' N, 1° 41' W), + 4m high, S Cancale, Ile-et-Vilaine. Coll and subm 1970 by F Verger, Lab Géomorphol, Ecole Pratique Hautes Etudes, Paris. *Comment:* layer reputed to be pre-Würm; date shows shell layer is result of accumulation of oysters by storms at high tide (Verger, 1972).

**Brouage Marsh series, Charente**

Brouage Marsh (45° 51' N, 1° 04' W), Charente, was formerly used as salt marsh, seawater was supplied at high tide by fairways. Samples coll and subm 1971 by R Regrain, Fac Lettres, Amiens, Somme.

**Gif-2129. Brouage Marsh, A** **610 ± 90**  
**AD 1340**  
Wood from a water main, ca 2m above msl.

**Gif-2128. Brouage Marsh, B** **850 ± 90**  
**AD 1100**  
*Cardium*, from high water mark, ca 2.20m above msl.

*General Comment*: dates salt exploitation. Alt and location of samples suggest a sea level slightly higher than present, but information about warping of marsh is insufficient for confirmation (Regrain and Guilcher, 1972).

**Gif-1356. Saint-Firmin, Le Crotoy, Somme** **1730 ± 100**  
**AD 220**  
*Cardium edule* shells from a conchiferous deposit underlying dune 6m high, Le Crotoy (50° 10' N, 1° 37' E), Bay of Somme. Coll and subm 1969 by M Ters, Inst Géog, Paris. *Comment* (M.T.): this deposit, at +2m, also corresponds to highest Flandrian transgression in region (Dunkirquian II) and to storm formation.

**Gif-2244. Maritime Plain of La Charente R** **3380 ± 110**  
**1430 BC**  
Oyster from shelly bed in estuarine sediment (maritime plain of La Charente R), at -2.50m (45° 57' N, 0° 46' W). Coll by coring and subm 1971 by C Gabet, Rochefort-sur-Mer, Charente Maritime. *Comment* (MT): should correspond to a littoral bar-high sea level of the Dunkirquian O. (Cf Gif-1639, from Camiers, Pas-de-Calais).

**Bréhec series, near Plouha, Côtes du Nord**

Samples from littoral at Bréhec (48° 43' N, 2° 17' W). Coll and subm 1969-1971 by M Ters.

**Gif-1355. Bréhec I** **450 ± 90**  
**AD 1500**  
Oyster shells from littoral sediment along cliff at +6.5m. Probably a storm deposit.

**Gif-2526. Bréhec 12 R** **2950 ± 110**  
**1000 BC**  
Black clay, overlying fluvial gravel and underlying brackish gray silt at mouth of river, +5.90m (0.10m beneath present highest-tide level).

**Gif-1358. Bréhec 2** **5300 ± 140**  
**3350 BC**  
Wood from log in freshwater peat, on beach, at -2m.  
*General Comment* (M.T.): peat overlies brackish sand rich in ostracodes

and foraminifers. Peat bog formation was interrupted by a submergence while msl stood near  $-8\text{m}$ , a little before the high sea level of 5000 BP (cf Gif-2108 and 2109).

#### Camiers series, Pas-de-Calais

Shells lying on beach, 300m from cliff, Camiers ( $50^{\circ} 33' \text{ N}$ ,  $1^{\circ} 35' \text{ E}$ ), Pas-de-Calais.

##### Gif-1639. Camiers 2

*Scrobicularia* shells, in sandy clay, overlying peat (Gif-1638), at about present msl. Transgressive deposit culminating at  $-3\text{m}$ . Coll and subm 1969 by M Ters.

**3400  $\pm$  130**  
**1450 BC**

##### Gif-1638. Camiers I

Freshwater peat layer, 12cm thick, overlying lacustrine clay, at msl. Coll and subm 1969 by M Ters.

**3550  $\pm$  130**  
**1600 BC**

##### Gif-1601. Camiers 4

Freshwater peat at  $-1\text{m}$ . Coll and subm 1969 by H Mariette, Samer, Pas-de-Calais.

*General Comment* (M.T.): 2 peat layers were formed at  $-3\text{m}$  to  $-4\text{m}$ , or lower. *Scrobicularia* clay corresponds to transgressive stage of Dunkirkian O.

**5700  $\pm$  135**  
**3750 BC**

#### Brétignolles series, Vendée

Samples from littoral at Brétignolles ( $46^{\circ} 35' \text{ N}$ ,  $1^{\circ} 53' \text{ W}$ ), Vendée. Coll and subm 1969 by M Ters.

##### Gif-1640. Brétignolles I

Top of Sub-Boreal peat (Gif-1992), underlying sand dunes, ca 4m above msl.

**3170  $\pm$  130**  
**1220 BC**

##### Gif-1992. Brétignolles 3

Peat from ca  $+2.50\text{m}$ . Freshwater peat of Sub-Boreal, deposited when sea level was lower.

**3600  $\pm$  110**  
**1650 BC**

##### Gif-2108. Brétignolles 2

*Cardium edule* shells in gray clay at  $-1.5\text{m}$ . Clay is shore deposit very rich in Chenopodiaceae, formed at highest level of transgression, ca 5000 BP. It overlies fluvial silt, and underlies Sub-Boreal peat (Gif-1992).

**4910  $\pm$  120**  
**2960 BC**

##### Gif-2109. Brétignolles 4

Wood in gray clay, same level as Gif-2108.

**4990  $\pm$  120**  
**3040 BC**

**Gif-2525. Brétignolles 14** **5900 ± 140**  
**3950 BC**

Brackish clay, ca 4m under msl, formed very near high-tide level.

*General Comment* (MT): site reveals one msl ca -9m, at ca 5900 BP, and another, transgressive, that attained -5m between 4990 and 4910 BP (beginning of Sub-Boreal period). The Sub-Boreal peat bog was interrupted, a little before 3000 BP, by formation of sand dunes, during a period of relatively low sea level (Halstatt).

**Gif-1357. Coulogne, Pas-de-Calais** **≥35,000**

*Cardium edule* shells from -2 to -5m in shelly sand, underlying Flandrian sandy silt. Coulogne (50° 56' N, 1° 53' E), Pas-de-Calais. Coll and subm 1969 by M Ters. *Comment*: as expected, probably in a Riss-Würm shingle bar.

**Gif-1863. Grève des Courses, Langueux, Côtes-du-Nord** **≥28,000**

Charcoal in silt, 3m beneath yellow loess, alt ca +1m, on Grève des Courses, Langueux (48° 31' N, 2° 43' W), Côtes du Nord. Coll by J L Monnier and subm 1970 by P R Giot. *Comment*: diluted for measurement. No pollen found, probably interstadial.

**Gif-1677. Saint-Pol-de-Leon, Pointe de Cléguer, Finistère** **30,300 ± 900**  
**28,350 BC**

Wood with flints beneath layer of silt with gravel, 2m thick, and silt 1m thick, and overlying beach gravel 2m above high sea level at Saint-Pol-de-Leon, Pointe de Cléguer (48° 42' N, 3° 48' W), Finistère. Coll and subm 1970 by P R Giot.

**Le Havre series, Seine-Maritime**

Digging a new lock in port of Le Havre made possible a study of the Holocene fill in the Seine estuary. Stratigraphy of fill was between alts -23m and +5m (Ters *et al*, 1972).

**Gif-1407. Le Havre, Core F-614** **≥35,000**

*Cardium edule* from marine gravel on which all estuarine sediments lie. Coll and subm 1969 by J Guyader, Port Autonome du Havre.

**Gif-1402. Le Havre, 30, 21.80m** **8470 ± 170**  
**6520 BC**

Peat above white clay overlying marine gravel. Coll and subm 1969 by M Ters.

**Gif-1403. Le Havre VI, -20.50m** **8050 ± 170**  
**6100 BC**

Peat separated from Gif-1402 by peaty clay with some *Foraminifera*. Coll and subm 1969 by M Ters.

**Gif-1406. Le Havre I, 16.50m****7820 ± 170****5870 BC**

Peat, 30cm thick, overlying silty sand with fauna from more or less salted marine environment, deposited from -21.50 to -16.50m during a transgression.

**Gif-1405. Le Havre II, -12m****2250 ± 100****300 BC**

*Cardium* shells from clayey sand, overlying gravel with black flints and shells. Above 12m, succession of brackish and marine sediments. Coll and subm 1969 by M Ters.

**Gif-1245. Pont de la Roque, Manche****1400 ± 100****AD 550**

Sandy alluvium with organic matter (tangué), alt +4m to +5m, at shore, Pont de la Roque (49° 02' N, 1° 31' W), Manche. Coll and subm 1968 by P Giresse, Fac Sci, Caen. *Comment*: Merovingian ceramics assoc. Probably a storm beach.

**Gif-1808. Hauteville, Manche****6500 ± 130****4550 BC**

Marsh peat at shore, at msl, at Hauteville (48° 55' N, 1° 33' W), Manche. Coll and subm 1970 by P Giresse. *Comment*: abundant Chenopodiaceae indicate marine influence. In 6500 BP, peat bog was reached by high tides; allowing for tide amplitude, msl then was ca -6m.

**Avranches series, Manche**

Coring at shore near Avranches (48° 40' N, 1° 24' W), alt +7m, Manche. Coll and subm 1968 by P Giresse.

**Gif-1144. Avranches, 1****1260 ± 100****AD 690**

Muddy calcareous sand, +3.70 to +3.75m.

**Gif-1142. Avranches, 2****6200 ± 100****4250 BC**

Peaty horizon, -1.05m to -1.00m.

**Gif-1143. Avranches, 3****6200 ± 100****4250 BC**

Peaty level bottom, -0.90 to -0.85m.

*General Comment*: pollen study does not show that marsh was brackish. Hence 6200 BP high-tide level (+6m on this coast) did not reach peat bog, and sea level was lower than now.

**Continental shelf series, Bay of Biscay, off La Rochelle**

Gravelly and coarse sand frequently containing shells of pelecypods, from bottom sediments, 50km off La Rochelle, between Island of Ré and a rocky shoal called Plateau de Rochebonne. Faunal assoc is characteristic of shallow-water sediment of offshore bars. Shells coll 1969 by dredging and subm 1970 by J P Barusseau, Centre Recherches Séd Marine, Perpignan.

**Gif-1707. Continental shelf, 57T** **1400 ± 90**  
**AD 550**  
Shells (*Pectunculus*) from depth 65m (46° 12' N, 2° 32' W).

**Gif-1705. Continental shelf, 12T** **2250 ± 100**  
**300 BC**  
Shells (*Chlamys*) from depth 89m (46° 18' N, 2° 34' W).

**Gif-1703. Continental shelf, 3T** **4650 ± 115**  
**2700 BC**  
Shells (*Pectunculus*) from depth 78m (46° 24' N, 2° 31' W).

**Gif-1706. Continental shelf, 45T** **4900 ± 115**  
**2950 BC**  
Shells (*Pectunculus*) from depth 40m (45° 58' N, 1° 39' W).

**Gif-1704. Continental shelf, 8T** **10,700 ± 190**  
**8750 BC**  
Shells (*Dosinia*) from depth 85m (46° 21' N, 2° 32' W).

*General Comment:* dates of sediment do not correlate with variations of sea level at the respective times.

#### **Marine cores series, British Channel**

Marine cores coll 1969 and 1970 by CNEXO expeditions.

**Gif-1614. Core 288D** **8250 ± 300**  
**6300 BC**  
Peat, 18-20.5cm in core. Depth -32m off Cap Gris-Nez (ca 50° 50' N, 1° 45' E). *Comment:* diluted for measurement. Pollen analysis by M T Morzadec, indicates Pre-Boreal-Boreal limit.

**Gif-1615. Core 288F** **12,600 ± 250**  
**10,650 BC**  
Peat from bottom of core, 70cm deep, separated from Gif-1614 by sand. *Comment:* pollen analysis indicates Late Dryas, Zone I. Core 288, from a submarine paleovalley, contains fluvial and lacustrine sediments.

**Gif-1878. Core 796B** **9800 ± 230**  
**7850 BC**  
Peat, 6 to 10cm in Core 796, covered by sand, depth -36m, N Port-en-Bessin (ca 44° 33' N, 0° 45' W), in paleovalley of Seine. *Comment:* pollen analysis indicates Alleröd, Zone II (Morzadec-Kerfourn and Delibrias, 1972).

**Gif-1990. Terebel 1** **9400 ± 200**  
**7450 BC**  
Wood in marine sediment. Coll by coring, depth -50m in Pas de Calais.

**Gif-1991. Terebel 2** **9700 ± 200**  
**7750 BC**

Peat, in marine sediment, depth -50m, in Pas de Calais.

*General Comment:* it is only possible to say that msl was < -50m, 9700 yr ago, since peat is from fresh water marsh.

### 3. Volcanism

#### Saint-Saturnin diatomite series, Puy-de-Dôme

Near Saint-Saturnin, at Dezac (45° 39' N, 3° 03' E), at border of Limagne Plain, a Saint-Saturnin diatomite site crops out in bed of La Monne R. At NW diatomite is in contact with basalt flow of Saint-Saturnin, that issued from Puy de la Vache and Puy de Lassolas. Diatomite is 5m thick; it overlies ash 20cm thick. The diatomite probably developed in a lake created by the flow. A date of 7650 BP: Sa-90 (R, 1964, v 6, p 238) was obtained on soil beneath the flow, near Saint-Saturnin castle. Diatomite study by F Gasse (1972). Coll by R Brousse and G Delibrias and subm 1969-1971 by R Brousse. Zero level is surface of La Monne R.

<b>Gif-1928.</b>	<b>Saint-Saturnin diatomite, Level 0</b>	<b>9070 ± 210</b> <b>7120 BC</b>
<b>Gif-2364.</b>	<b>Saint-Saturnin, wood in diatomite, Level 0</b>	<b>7890 ± 150</b> <b>5940 BC</b>
<b>Gif-1554.</b>	<b>Saint-Saturnin diatomite, Level 1.25m</b>	<b>7500 ± 160</b> <b>5550 BC</b>
<b>Gif-1930.</b>	<b>Saint-Saturnin diatomite, Level 2.50m</b>	<b>6300 ± 160</b> <b>4350 BC</b>
<b>Gif-1929.</b>	<b>Saint-Saturnin diatomite, Level 3m</b>	<b>6400 ± 160</b> <b>4450 BC</b>
<b>Gif-1555.</b>	<b>Saint-Saturnin diatomite, Level 4m</b>	<b>5250 ± 130</b> <b>3300 BC</b>

*General Comment:* rate of diatomite accumulation ca 1.3m/1000 yr is very high compared, eg, to rate in Pavin Lake. Age of base level on wood (Gif-2364) agrees well with date obtained for Saint-Saturnin flow (Sa-90), whereas age of diatomite at same level is too old, for unexplained reason. Except for Gif-2364, all dates obtained from organic matter in diatomite.

#### Brézet II section series, Puy-de-Dôme

Peaty clay, overlying basaltic ejecta, 30cm thick, at Brézet II (45° 47' N, 3° 05' E), near Clermont-Ferrand, Puy-de-Dôme. Coll and subm 1971 by R Brousse.

- 5230 ± 120**  
**3280 BC**
- Gif-2353. Brézet II 2**  
Lower part of peaty clay horizon, in contact with basaltic ejecta. *Comment:* age is minimum for basaltic ejecta, origin of which is unknown in Chaîne des Puys.
- 2570 ± 95**  
**620 BC**
- Gif-2354. Brézet II 3**  
Upper part of peaty clay horizon. *Comment:* agrees with assoc industry of Late Bronze age.
- 2030 ± 95**  
**80 BC**
- Gif-2355. Brézet III section, Puy-de-Dôme**  
Wood in peaty clay overlying black and white ash, at Brézet III, 100m from Brézet II (45° 47' N, 3° 05' E), Puy-de-Dôme. Coll and subm 1971 by R Brousse. Covered by clay horizon containing ash and Gallo-Roman artifacts. *Comment:* source of ash in Chaîne des Puys is unknown. Date agrees with industry in upper horizon.
- Gerzat—La Combaude section series, Puy-de-Dôme**  
Succession of ancient soil and basaltic ejecta, 4m thick, at Gerzat-La Combaude (48° 59' N, 3° 08' E), in Limagne Plain. Coll and subm 1971 by R Brousse.
- 10,600 ± 180**  
**8650 BC**
- Gif-2357. Gerzat 1**  
Organic horizon immediately beneath fine black ash, Level S<sub>1</sub>, 20m thick, 3.37m deep.
- 5350 ± 120**  
**3400 BC**
- Gif-2358. Gerzat 2**  
Peaty horizon 33cm thick, upper Level S<sub>1</sub> and coarse black ash (Level S<sub>2</sub>), 17cm thick, 2.80 deep. *Comment:* date is unacceptable. Either samples are confused or were contaminated on collection.
- 10,300 ± 180**  
**8350 BC**
- Gif-2359. Gerzat 3**  
Peaty horizon, 2cm thick, between Level S<sub>2</sub> and fine black-and-white ash, S<sub>3</sub>, 36cm thick, 2.50m deep.
- 9380 ± 170**  
**7430 BC**
- Gif-2360. Gerzat 4**  
Peaty horizon, 25cm thick, overlying Level S<sub>3</sub> and covered with fine black and white ash Level S<sub>4</sub>, 19cm thick, 2.30m deep. Ashy Level S<sub>4</sub> is overlain by thin white clay, 3cm thick.
- 9900 ± 170**  
**7950 BC**
- Gif-2361. Gerzat 5**  
Thin peaty horizon between 2 white clay layers, 2.04m deep. Upper clay horizon is covered with thick black Level S<sub>5</sub>, 90cm thick, most recent one from this section. Whole sequence is covered with debris, 1m

thick. *Comment*: inversion of last 2 dates suggests contamination of one of these levels.

*General Comment*: despite some discrepancy between ages, stratigraphy shows high frequency of volcanic events ca 10,000 BP.

**Gif-2261. Royat Flow, "La Grotte des Laveuses", 200 ± 200  
Puy-de-Dôme AD 1750**

Soil beneath Royat basalt flow, in "La Grotte des Laveuses" (45° 45' N, 3° 03' E), Puy-de-Dôme. Coll and subm 1971 by R Brousse. *Comment*: diluted for measurement. Recent date, unrelated to age of basalt flow.

**Gif-2113. Beauregard, Puy-de-Dôme 8150 ± 150  
6200 BC**

Carbonized tree underlying trachyte named "Trachytes type Puy Chopine", 1m thick, E Beauregard (41° 50' N, 2° 55' E), Puy-de-Dôme. Coll and subm 1970 by G Camus, Fac Sci, Clermont-Ferrand, Puy-de-Dôme. *Comment*: same age as charcoal in same domite horizon at Puy-de-Lantegy: 8200 BP (Gif-1501, R, 1972, v 14, p 305).

**Gif-2114. Puy de Louchadière, Puy-de-Dôme 8410 ± 150  
6460 BC**

Carbonized wood; S W Puy de Louchadière (45° 50' N, 2° 56' E), Puy-de-Dôme, beneath acid ejecta named "Trachytes type Puy de la Coquille" probably issued from Puy Chopine. Coll and subm 1970 by G Camus.

**Gif-2115. "Les Cézeaux" flow, Clermont-Ferrand, 1040 ± 90  
Puy-de-Dôme AD 910**

Charcoal coll by coring scoria under "Les Cezeaux" flow, Clermont-Ferrand (45° 45' N, 3° 05' E), Puy-de-Dôme. Coll by D Chaillou, and subm 1971 by G Camus. *Comment*: evident pollution by recent hearth, as foreseen.

**Gif-2117. Puy Thiollet, Puy-de-Dôme 13,200 ± 250  
11,250 BC**

Soil beneath 2 basaltic ash layers, on flank of Puy Thiollet (45° 53' N, 3° 05' E), N end of Chaîne des Puys, Puy-de-Dôme. Coll. and subm 1971 by G Camus. *Comment*: probably dates the last eruption of Puy Thiollet.

**Gif-2118. Puy-de-Dôme 8150 ± 150  
6200 BC**

Carbonized wood from S flank of Puy-de-Dôme (45° 45' N, 2° 56' E) overlying ash from that cone and underlying domitic hornblende ejecta, so-called "Trachytes, type Puy Lacroix". Coll and subm 1971 by G Camus. *Comment*: Puy-de-Dôme is thus, older than date.

- 11,070 ± 200**
- Gif-2255. La Tiretaine flow, Royat, Puy-de-Dôme** **9120 BC**  
Soil beneath basalt flow of La Tiretaine, Royat (45° 45' N, 3° 03' E), Puy-de-Dôme. Coll and subm 1971 by G Camus.
- 3890 ± 110**
- Gif-2349. Pond of Fung, La Gardette, Puy-de-Dôme** **1940 BC**  
Carbonized wood between volcanic ash and lacustrine sediments at Fung Pond, near La Gardette (45° 46' N, 2° 52' E), Puy-de-Dôme. Coll by D Baudry and subm 1971 by G Camus.
- 6760 ± 130**
- Gif-2350. South West Pavin Lake, Puy-de-Dôme** **4810 BC**  
Soil underlying ejecta from the small maar "Les Costes", ca 1.5km SW Lake Pavin (45° 29' N, 2° 54' E), Puy-de-Dôme. Coll and subm 1971 by G Camus. *Comment:* conformably overlain by trachytic ejecta from Lake Pavin. Thus, lake should have been formed after 6760 BP which agrees with age of lake sediments.
- 10,000 ± 200**
- Gif-1624. Chamalières, Puy-de-Dôme** **8050 BC**  
Upper part of peaty horizon. 10cm thick, underlying ash, near Chamalières (45° 47' N, 3° 03' E), Puy-de-Dôme. Coll by M Montpeyroux and subm 1970 by R Brousse. *Comment:* agrees with other dates on last main period of volcanism in Chaîne des Puys (this list and R, 1972, v 14, p 304).
- 1920 ± 110**
- Gif-1927. Jussac, Cantal** **AD 30**  
Bone from skeleton of dog in moraine of Jussac (45° 00' N, 2° 21' E), Cantal. Coll and subm 1970 by Vuittenez and R Brousse. *Comment:* is unrelated to glacial phenomena to date.
- ≥25,000**
- Gif-1608. Flow of Ray Pic, near Burzet, Ardèche**  
Alluvium underlying upper lava flow of Ray Pic near Burzet (44° 44' N, 4° 15' E), Ardèche. Coll by E Berger and subm 1970 by R Brousse. *Comment:* diluted for measurement.

### *B. Africa*

#### *1. Samples with climatic implications*

##### **Sebka Mellala series, Algerian Sahara**

Mollusk shells (*Cardium* and *Melania*) in Sebka Mellala deposits, 40km N W Ouargla, Algerian Sahara (32° 30' N, 4° 24' E). Section is 2.75m thick and contains 2 fossiliferous layers, 50cm thick, between evaporites. Coll by M Trecolle and subm 1970 by M Boyé, Centre d'Etudes Géog Tropicale, Talence, Gironde.

- 9550 ± 130**
- Gif-1853. Sebka Mellala, lower layer** **7600 BC**  
Overlying evaporite deposit.

**Gif-1854. Sebka Mellala, upper layer** **7900 ± 110**  
**5950 BC**

Between 2 evaporite deposits.

*General Comment:* dates alternation of dry and moist periods.

**Bahr-El-Ghazal series, Chad Lake**

Samples from lacustrine sediment of Bahr-El-Ghazal. Coll and subm 1969-70 by M Servant, Fac Sci, Paris.

**Gif-1606. Bahr-El-Ghazal, S-2092** **3000 ± 110**  
**1050 BC**

Fluvial mollusk shells (*Etheriides*) from ancient alluvium of Bahr-El-Ghazal, 17m above present base, SW Koro-Toro (15° 58' N, 17° 38' E). *Comment:* shows Bahr-El-Ghazal was at that time an important river probably fed by a lake to S.

**Gif-1587. Bahr-El-Ghazal, S-2035** **8670 ± 220**  
**6720 BC**

Calcareous diatomite from lacustrine sediment overlying sand, 30km N Koro-Toro (16° 18' N, 18° 33' E). *Comment:* dates a transgressive lacustrine episode.

**Gif-1584. Bahr-El-Ghazal, S-2049** **27,000 ± 900**  
**25,050 BC**

Microcrystalline limestone from littoral lacustrine deposit on eolian sand, making calcareous slab, very near to and ca 6m above Gif-1587, 30km N Koro-Toro (16° 18' N, 18° 33' E).

**Gif-1494. Bahr-El-Ghazal, Cutting 2, S-2161** **22,400 ± 600**  
**20,450 BC**

Limestone with diatoms from 1.60m depth in 2.40m lacustrine sediment overlain by sand dune and overlying lacustrine limestone, 15km SSW Koro-Toro (15° 32' N, 18° 22' E).

**Gif-1585. Bahr-El-Ghazal, Cutting 1, S-2156** **25,600 ± 800**  
**23,650 BC**

Limestone with 0.30m diatoms beneath dune sand and above lacustrine limestone, 15km SSW Koro-Toro (15° 32' N, 18° 22' E). Level is stratigraphically between Gif-1494 and Gif-1583.

**Gif-1583. Bahr-El-Ghazal, Cutting 2, S-2159** **28,800 ± 1000**  
**26,850 BC**

Lacustrine fine limestone overlying dune sand and underlying Gif-1494.

**Gif-1586. Bahr-El-Ghazal, Cutting 1, S-2150** **28,800 ± 1000**  
**26,850 BC**

Microcrystalline limestone separated from Gif-1585 by 30cm laminated clay and overlying sand.

*General Comment:* lacustrine expansion began ca 29,000 BP continuing, with fluctuations, after 22,000 BP, because there is 1m more above horizon dated 22,400 BP: Gif-1494.

**Agadem series, Niger**

Charcoal from lacustrine sediments of Agadem (16° 52' N, 13° 19' E), N Chad Lake, E Niger. Coll and subm 1969 by M Servant. Study confirms and completes preliminary results already pub (R, 1971, v 13, p 213).

**Gif-1394. Agadem, A-42** **3550 ± 110**  
**1600 BC**

In clay with diatoms, 1.50m thick beneath 4m sand.

**Gif-1393. Agadem, A-40** **4710 ± 130**  
**2760 BC**

In eolian sand partly indurated, overlying lacustrine sediments.

*Comment:* dates sanding up of Agadem massif after main lacustrine period of 9000 B.P.

**Gif-1395. Agadem, A-102** **5150 ± 130**  
**3200 BC**

In eolian sand intercalated in gray diatomite, all above main lacustrine period of 9000 BP.

*General Comment:* main lacustrine phase of 9000 BP was probably not followed by a dry period but by alternating lacustrine and dried periods indicated by eolian erosion.

**Bilma series, Niger**

Samples from lacustrine sediment of Bilma. Coll and subm 1970-71 by M Servant.

**Gif-1791. Bilma, S-4142** **5070 ± 110**  
**3120 BC**

Calcareous sandy tufa with reeds, Bilma (18° 44' N, 12° 55' E).

*Comment:* dates marshy sedimentation phase in valleys of Bilma Cliff, contemporary with numerous Neolithic sites in region.

**Gif-1789. Bilma, S-4072** **7450 ± 140**  
**5500 BC**

Microcrystalline limestone with Ostracodes, at top of diatomitic horizon, Bilma (18° 43' N, 12° 55' E). *Comment:* dates upper limit for a regressive episode.

**Gif-1790. Bilma, S-4099** **8480 ± 300**  
**6530 BC**

Charcoal remains in sand between 2 diatomitic horizons, Bilma (18° 43' N, 12° 55' E). *Comment:* corresponds to episode of lacustrine retreat. Diluted for measurement.

**Gif-1913. Bilma, S-4061** **8350 ± 100**  
**6400 BC**

Limestone with diatoms from same horizon as Gif-1790, Bilma (18° 43' N, 12° 55' E). *Comment:* confirms Gif-1790.

**33,400 ± 2500**  
**31,450 BC**

**Gif-1788. Bilma, S-4032**

Limestone with reed prints with occasional gypsum efflorescence and manganese deposits, overlying sandstone with Paleolithic industry *in situ*, Bilma (18° 43' N, 12° 55' E). *Comment*: corresponds to moist period, giving an old date for industry that looks technically similar to European transition of Middle and Upper Paleolithic (Roset, pers commun).

**Mayo Wodeo terraces series, Banyo, Cameroun**

On High Plateau of Cameroun, mean alt 1100m. Rivers, particularly Mayo Wodeo R, show important deepening with terraces 8m high. At base of terraces, 2 continuous levels appear which can be related to climatic episodes. Samples coll in Mayo Wodeo terraces, 20 km NE Banyo (6° 50' N, 11° 42' E) and subm 1969 by J Hurault, Inst Géog Nat, Saint-Mandé.

**1600 ± 100**  
**AD 350**

**Gif-1398. Banyo B 1**

Wood from Level B 1, 5 to 10cm thick, composed of wood and vegetal remains, overlain by blue-black clay, overlying pebbles and gravel just above gneiss. *Comment*: wood scattered in clay dated 1870 ± 100 by Isotopes, Inc (I-2618, pers commun).

**18,000 ± 500**  
**16,050 BC**

**Gif-1399. Banyo B 2**

Peat from Level B 2. Level is either at base of terrace or 1m high; it is discontinuous and difficult to locate relative to Level B 1. *Comment*: same horizon was dated 24,550 ± 900 BP by Isotopes, Inc (I-3603, pers commun), but this sample should be more representative. *General Comment*: dated climatic periods may correspond to modification in vegetation, eg, disappearance of forests in favor of savanna, following appreciable decrease of precipitation; vegetational changes led to streaming and gullying. For Level B 1, dated 1600 BP, climatic explanation is difficult to support.

**Afrera Lake series, Afar, Ethiopia**

Afrera Lake (13° 21' N, 41° 02' E), Ethiopia is in fault trough of Afar, alt -100m. It is remains of an ancient, much larger Holocene lake, which left 2 to 5m calcareous diatomitic mounds 10 to 30m above present lake.

**6900 ± 150**  
**4950 BC**

**Gif-1438. West Afrera Lake, 158**

Pisolitic calcareous sediment corresponding to a lake level lower than diatomitic sediment. Coll and and subm 1970 by H Faure.

- Gif-1437. Afrera Lake, Cutting N W, 175** **7300 ± 160**  
**5350 BC**  
 Calcareous diatomite with *Melania*; level ca 20m. Coll and subm 1970 by H Faure.
- Gif-1436. Afrera Lake, Cutting N W, 170** **7000 ± 150**  
**5050 BC**  
 Calcareous diatomite with *Melania*; level ca 19m. Coll and subm 1970 by H Faure.
- Gif-1435. Afrera Lake, Cutting N W, 163** **8750 ± 190**  
**6800 BC**  
 Calcareous diatomite with *Melania*; level ca 18m. Coll and subm 1970 by H Faure.
- Gif-1439. North West Afrera Lake, 159** **9800 ± 190**  
**7850 BC**  
 Calcareous diatomite with *Melania*, base level, ca 10m. Coll and subm 1970 by H Faure.
- Gif-1151. Afrera Lake, T B I** **8230 ± 170**  
**6280 BC**  
 Gasteropods, level ca 30m, 3km W Afrera Lake. Coll and subm 1968 by J Varet and H Tazieff, Fac Sci Orsay, Essonne.  
*General Comment:* highest lake level occurred from 9800 BP until ca 7300 BP. It was followed by a short accident shown by important modifications in flora, a notable increase of water depth and salinity possibly caused by a tectonic phenomenon. The lake then dried up and diatoms disappeared progressively (Gasse, 1971). Studies are continuing.
- Gif-1196. Gurgusson, near Massawa, Ethiopia** **3900 ± 140**  
**1950 BC**  
 Consumed shell (*Arca senilis*) assoc with obsidian industry, on littoral bar, at Gurgusson, near Massawa (15° 37' N, 39° 28' E), Ethiopia. Coll and subm 1968 by H Faure. *Comment:* corresponds to a sea level similar to present.
- Gif-1441. Afar, N K 328** **31,600 ± 2000**  
**29,650 BC**  
 Madrepore from an exonded submarine volcano, NE Afrera Lake, Afar (13° 21' N, 41° 02' E), Ethiopia. Coll 1968 by H Faure and dated to confirm date, I-2771: 31,050  $\begin{matrix} +1400 \\ -1250 \end{matrix}$ ; however, U-Th method gave age ca 100,000 yr BP which is much more suitable; unexplained discrepancy exists between the 2 methods. Sample is last evidence of Red Sea advance into Afar region. A possible interpretation of discrepancy is that very ancient porous calcareous stones collected some modern carbon compounds from atmosphere fallout during long exposure on the ground, producing some <sup>14</sup>C activity.

**Senegal delta series**

Peat from pedologic profile in Senegal delta, in interdunes depression. Coll and subm 1969 by J H Durand, Inst Recherches Agron Tropicales et Cultures Vivrières, Nogent-sur-Marne.

	<b>4750 ± 130</b>
<b>Gif-1450. Senegal delta, VD 31, 40cm</b>	<b>2800 BC</b>
Under fluvial silt, 40cm deep (16° 06' N, 16° 15' W).	
	<b>7050 ± 150</b>
<b>Gif-1451. Senegal delta, VD 31, 80cm</b>	<b>5100 BC</b>
80cm deep (16° 06' N, 16° 15' W).	
	<b>7050 ± 150</b>
<b>Gif-1452. Senegal delta, VD 65, 55cm</b>	<b>5100 BC</b>
55cm deep (16° 03' N, 16° 18' W).	

*General Comment:* describes delta formation.

*2. Sea level variations***Ivory Continental shelf series**

Some corings and dredgings from sediments on the Ivory Continental shelf to study past sea level variations on W Africa coast. Coll and subm 1969-1971 by L Martin, ORSTOM, Abidjan, Ivory Coast.

	<b>10,700 ± 200</b>
<b>Gif-1619. Core C 55</b>	<b>8750 BC</b>
Thin peat, 0.60m deep in core, underlying silt (4° 48' N, 6° 00' W). Depth -61m. <i>Comment:</i> alternating peat and thin sand layers at this level suggests ancient peat bog along seashore; it is not a good indication of sea level.	
	<b>10,800 ± 200</b>
<b>Gif-1616. Core B 29</b>	<b>8850 BC</b>
Peat, 2m underlying sand (4° 56' N, 5° 53' W). Depth -62m. <i>Comment:</i> comes from stable basal zone.	
	<b>11,500 ± 250</b>
<b>Gif-1618. Core C 57</b>	<b>9550 BC</b>
Mangrove peat, 0.60m deep in core, underlying silty sand (4° 50' N, 5° 55' W). Depth -62m. <i>Comment:</i> comes from stable basal zone.	
	<b>11,900 ± 250</b>
<b>Gif-1146. Core A 10-I</b>	<b>9950 BC</b>
Mangrove peat, 2.60m deep in core, overlain by shell and Foraminiferae (5° 07' N, 4° 20' W). Depth -60m. <i>Comment:</i> corresponds to a transgression.	
	<b>23,000 ± 1000</b>
<b>Gif-1147. Core B 5</b>	<b>21,050 BC</b>
Fresh water peat underlying 2m silty sand, overlying a littoral sediment. Depth -60m (5° 08' N, 4° 15' W). <i>Comment:</i> must correspond to a regression.	

- Gif-2146. Core C 39** **11,100 ± 200**  
**9150 BC**  
Small nodules of calcareous algae underlying 0.50m sand (4° 32' N, 6° 40' W). Depth -82m. *Comment:* from stable basal zone.
- Gif-2140. Core C II** **11,500 ± 200**  
**9550 BC**  
Small nodules of calcareous algae underlying 0.20m organic muddy sand (4° 52' N, 3° 10' W). Depth -80m.
- Gif-1509. Dredging DR, 2** **12,900 ± 250**  
**10,950 BC**  
Small nodule of calcareous algae, diam 3cm, from same place. *Comment:* whole nodule used for dating except outer part, removed by acid treatment.
- Gif-1449. Dredging DR, I** **13,000 ± 250**  
**11,050 BC**  
Center of nodule of calcareous algae, diam ca 15cm, dredged on Continental shelf (5° 02' N, 4° 27' W). Depth -100m. *Comment:* from stable part of sedimentary basin.
- Gif-2138. Core C 43** **13,100 ± 250**  
**11,150 BC**  
Small nodules of calcareous algae, 0.20m beneath organic sandy silt (4° 36' N, 6° 30' W). Depth -82m. *Comment:* from stable basal zone.
- Gif-2135. Core C 8** **13,300 ± 250**  
**11,350 BC**  
Nodules of calcareous algae, 1m beneath organic sandy silt and gray silt (5° 03' N, 3° 55' W). Depth -100m. *Comment:* from part of sedimentary basin, may be subsident.
- Gif-2137. Core C 2** **13,900 ± 250**  
**11,950 BC**  
Nodules of calcareous algae, 0.10m beneath organic sandy silt (4° 29' N, 6° 50' W). Depth -89m. *Comment:* from stable basal zone.
- Gif-2139. Core C 48** **14,700 ± 250**  
**12,750 BC**  
Nodules of calcareous algae, 0.20m under organic silty sand (4° 38' N, 6° 20' W). Depth -82m. From stable part of basal zone.
- Gif-2136. Core C I** **15,100 ± 260**  
**13,150 BC**  
Nodules of calcareous algae, 3.50m beneath silt and gray silt (5° 10' N, 4° 02' W). Depth -99m. *Comment:* comes from comparatively stable part of basal zone.

- Gif-2144. Core D 12** **22,840 ± 250**  
**20,890 BC**  
Nodules of calcareous algae, 1.00m beneath silty and sandy organic silt (4° 12' N, 7° 30' W). Depth -80m. *Comment:* from stable part of basal zone.
- Gif-2141. Core C 24** **≥35,000**  
Nodules of calcareous algae, underlying 3.00m gray silt (5° 01' N, 3° 40' W). Depth -80m. *Comment:* probably formed during earlier regression.
- Gif-2145. Core D 17** **≥35,000**  
Nodules of calcareous algae, underlying more or less silty sand (4° 23' N, 7° 15' W). Depth -63m.  
*General Comment:* nodules of calcareous algae indicate sea levels fairly well; although they live between 0 to -30m, they have a greater probability of formation in shallow water. These points fit well with eustatic curve of sea level (Martin and Delibrias, 1972).
- Cape Verde Is series**  
Samples from fossil horizons from coast of volcanic Cape Verde Is. Coll and subm 1970 by J Laborel.
- Gif-2196. Sao Vicente I. Baía das Gatas, 1** **Modern**  
Vermetid limestone (16° 52' N, 23° 00' W), alt ca +0.5m.
- Gif-2197. Boa Vista I., Sal Rei Bay, 3** **700 ± 90**  
**AD 1250**  
Vermetid limestone from a well-defined horizon (16° 11' N, 23° 06' W), alt +1m.
- Gif-2195. Sao Vicente I., Baía das Gatas, 2** **2040 ± 100**  
**90 BC**  
Melobesiees block (16° 52' N, 23° 00' W), on the platform, alt +3m.  
*General Comment:* preliminary results, proving existence on these little volcanic islands of one elevated horizon +3m, similar to that dated for Brazilian coast.
- Gif-2198. Pointe de Bereby, Ivory Coast** **530 ± 90**  
**AD 1420**  
Vermetid limestone, Pointe de Bereby (4° 37' N, 7° 00' W), Ivory Coast, well characterized horizon, alt +1m. Coll and subm 1971 by J Laborel.
- Gif-1675. Paradise beach, W Tema, Ghana, AF-70-1** **1630 ± 90**  
**AD 320**  
Limestone with *Petalocochus* from a well-defined horizon, ca +3m related to msl, on Paradise beach, 3km W Tema (5° 41' N, 0° 00' W), Ghana. Coll and subm 1970 by J Laborel.

**Gif-1676. Paradise beach, W Tema, Ghana, AF 70-2** **2050 ± 90**  
**100 BC**  
 Similar to Gif-1675, but coll and subm 1970 by J Laborel in a drainage digging.

**Gandioli core series, S L 392, Saint-Louis, Senegal**

Core, SL 392, 30m long, in littoral sediments, at Mouit, Gandiol, alt 2.30m (15° 55' N, 16° 25' W), 20km S Saint-Louis, Senegal. Coll and subm 1968 by H Faure, Fac Sci Paris. Depths are from top of core.

**Gif-1249. Gandiol core, 10 to 11m** **2000 ± 100**  
**50 BC**  
 Old shell debris from beach sand horizon.

**Gif-1250. Gandiol core, 12 to 13m** **16,000 ± 400**  
**14,050 BC**  
 Oyster from gray-bridge shell debris horizon, indurated in places, underlying a layer of mud from 11.40 to 12m. *Comment*: reworked material.

**Gif-1251. Gandiol core, 15.10 to 15.80m** **31,300 ± 2500**  
**29,350 BC**  
 Shell (*Cardium*) from sandstone-like beach rock. *Comment*: dates Inchirian in that subsided region of delta of Senegal R.

**Gif-1252. Gandiol core, 21.20 to 23.50m** **34,300 ± 3000**  
**32,350 BC**  
 Oyster from *lumachella* with gray calcareous cement; ancient beach sediment. *Comment*: similar to Gif-1251.

**Pointe Noire series, Congo**

Samples from recent sediments near Pointe Noire. Coll and subm 1971 by P Giresse, Ecole Supérieure Sci, Brazzaville, Congo.

**Gif-2210. Pointe Noire, P G 30** **Modern**  
*Ostrea denticulata* outcrop in 1st sandy offshore bar (4° 48' S, 11° 50' E), alt +2.7m.

**Gif-2212. Pointe Noire, P G 838** **Modern**  
*Arca senilis* outcrop in 2nd sandy offshore bar (4° 48' S, 11° 51' E), alt +13.5m.

**Gif-2211. Pointe Noire, P G 617** **800 ± 90**  
**AD 1150**  
*Ostrea denticulata* outcrop in 2nd sandy offshore bar (4° 55' S, 11° 56' E).

**Gif-2206. Pointe Noire, P G 47** **3860 ± 130**  
**1910 BC**  
 Silty peat, in Core S 5, -16.7 to 16.9m (4° 47' S, 11° 50' E).

- Gif-2209. Pointe Noire, P G 79** **4920 ± 140**  
**2970 BC**  
*Arca* and *ostrea* shells, from Core S 7, -5.55 to 7.75m (4° 47' S, 11° 59' E).
- Gif-2205. Pointe Noire, P G 89** **7200 ± 180**  
**5250 BC**  
 Silty peat, in Core S 8, -18.85 to 19.05m (4° 47' S, 11° 49' E).
- Gif-2207. Pointe Noire, P G 88** **7650 ± 180**  
**5700 BC**  
 Silty peat, in Core S 8, -13.55 to -13.75m (4° 47' S, 11° 49' E).
- Gif-2204. Pointe Noire, PNFI** **7650 ± 180**  
**5700 BC**  
 Silty peat, in core, -21.56 to -21.71m (4° 47' S, 11° 50' E).
- Gif-2208. Pointe Noire, PG 71** **8200 ± 190**  
**6250 BC**  
 Silty peat, in Core S 12, -10.2 to -11.7m (4° 47' S, 11° 50' E).
- Gif-2202. Pointe Noire, PE 874** **8550 ± 200**  
**6600 BC**  
 Wood, in Core S F, -28.1 to 28.9m (4° 47' S, 11° 49' E).
- Gif-2203. Pointe Noire, PG 885** **8920 ± 200**  
**6970 BC**  
 Wood and peat, in Core S C, -24.9m (4° 47' S, 11° 49' E).

*General Comment:* surprisingly young dates for outcrop levels, at a few m alt. Sedimentation rate is very variable from one point to another, off Pointe Noire, and depths are difficult to relate to sea levels.

### *C. Pacific Ocean*

#### *Sea-level variations*

#### **Hao atoll series, Tuamotou archipelago**

Corings in coral-reef, NE of Hao atoll, Tuamotou archipelago. Coll and subm 1970 by J Trichet, Fac Sci, Orléans, Loiret.

- Gif-1667. Core ST 3, 3 B** **3300 ± 100**  
**1350 BC**  
 Top of a hard compact coral formation, 4.50m thick (17° 54' N, 141° 04' W), +1.32m related to msl.
- Gif-1801. Core ST 3, 4 D** **3800 ± 120**  
**1850 BC**  
 Approx msl.
- Gif-1802. Core ST 3, 4 N** **5800 ± 140**  
**3850 BC**  
 -1.20m related to msl.

**Gif-1803. Core ST 3, 4 R** **6150 ± 140**  
**4200 BC**  
-2.10m related to msl.

**Gif-1804. Core ST I, 5** **6100 ± 140**  
**4150 BC**

Bottom of core, top of coral compact formation (17° 55' N, 141° 02' W), ca -6m related to msl.

*General Comment:* agree well with results from Mururoa atoll (Labeyrie *et al*, 1968).

### Tenia core series, New Caledonia

Coral core, in Tenia Islet of coral reef barrier of New Caledonia (22° S, 165° 58' E). Core reached serpentine base at depth 226m. Coral samples from upper part of core coll and subm 1969 by J Coudray, Inst Géol Montpellier, Hérault.

**Gif-1522. Tenia, G C I, 3.70m** **960 ± 90**  
**AD 990**  
0.70m related to msl. From non-consolidated horizon 0 to 11m deep, with sand and coral, calcareous algae, marine organisms.

**Gif-1523. Tenia, G C 2, 5.80m** **920 ± 90**  
**AD 1030**  
-2.80m related to msl. From same horizon as Gif-1522.

**Gif-1629. Tenia, G C 5, 8m** **≥40,000**  
-5m related to msl.

**Gif-1582. Tenia, G C 6, 11m** **≥40,000**  
-8m related to msl. Upper part of consolidated coral horizon, from 11 to 66m.

*General Comment:* cessation of continuous growth of coral, ca. -11m followed a regression. During next transgressive period, coral did not resume growth, but accumulated detritic coral at first from sediment dated ≥ 40,000, then from more recent sediment.

### W Coast of New Caledonia series

Peat with *Rhizophora* from swamps from W Coast of New Caledonia. Coll and subm 1970 by F Baltzer, Fac Sci, Orsay, Essonne. Alt of samples was determined from a survey of plant distribution related to high tide level (Baltzer, 1969).

**Gif-1578. Dumbea delta, NAT 17 E** **5600 ± 150**  
**3650 BC**  
(22° 10' S, 166° E). -0.10m related to msl.

**Gif-1580. Dumbea delta, NAT 18 H** **7300 ± 170**  
**5350 BC**  
(22° 10' S, 166° E). -4.76m related to msl.

- Gif-1577. Marais de Mara, Moindou, MT 24 D** **5750 ± 150**  
**3800 BC**  
 (21° 50' S, 165° 45' E). -0.14m related to msl.
- Gif-1579. Marais de Mara, Moindou, MT 27 E** **6800 ± 165**  
**4850 BC**  
 (21° 50' S, 165° 45' E). -2.96m related to msl.
- General Comment:* dates on these mangrove peat bogs agree with those for reef sediments on same coast (Baltzer, 1970).
- SW Coast of New Caledonia series**  
 Samples from recent marine terraces and from fringing reef of SW coast of New Caledonia. Coll and subm 1969 by J Coudray (1968).
- Gif-1979. Rivière des pirogues, 69-119** **770 ± 90**  
**1180 BC**  
 Oyster from a well-defined oyster horizon, +0.70m above present oyster horizon (22° 18' S, 166° 40' E).
- Gif-1978. Rivière des Pirogues, 69-118** **1140 ± 90**  
**AD 810**  
 Reworked coral consolidated in beachrock, approx msl.
- Gif-1983. Foué I., 69-60** **2250 ± 100**  
**300 BC**  
 Marine shells consumed on shore, alt +2.10m; assoc with archaeol material, at Foué I. (21° 06' S, 164° 49' E). *Comment:* indicates that sea was under this level.
- Gif-1981. Foué I., 69-56** **3040 ± 100**  
**1090 BC**  
 Shells in bedrock, alt +1.50m, Foué I.
- Gif-1982. Le Hedour I., 69-LP5** **3370 ± 105**  
**1420 BC**  
 Oyster from bedrock, +1.10m above present oyster horizon, Le Hedour I. (21° 58' S, 165° 58' E).
- Gif-1976. Touaourou, 69 TOU-15** **3970 ± 110**  
**2020 BC**  
 Coral *in situ*, alt +1.10m, in marine slot in ancient reef Touaourou (22° 11' S, 166° 57' E).
- Gif-1975. Touaourou, 69 TOU-10** **4380 ± 100**  
**2430 BC**  
 Coral *in situ*, alt +0.8m, on marine abrasion horizon in ancient reef.
- Gif-1974. Touho, 69-T<sub>1</sub>** **5400 ± 120**  
**3450 BC**  
 Coral *in situ*, approx msl, Touho (20° 47' S, 165° 13' E).

- Gif-1980. Puen, 69-P<sub>2</sub>** **1800 ± 95**  
**AD 150**  
Giant clam remains in beach rock from reworked terrace, alt +1.5m.
- Gif-1984. Nepoui R., 66-FN** **5960 ± 130**  
**4010 BC**  
Oyster in clay -12m deep from coring, 2.5km inland, near Nepoui R (21° 18' S, 165° E).
- Gif-1985. Nepoui FN<sub>2</sub>b** **6100 ± 130**  
**4150 BC**  
Lamellibranch from same core as Gif-1984, same horizon.
- Gif-1977. Grimault I., 69-G6** **≥35,000**  
Coral *in situ*, alt +4m, Grimault I. (21° 22' S, 165° E).
- Gif-1973. Isie I., 69-ISIE 5-2** **≥35,000**  
Terrestrial gastropods (*Bulimes*) in upper part of paleosol, alt +2.3m, Isi I. (21° 54' S, 165° 51' E).
- Gif-2257. Isi I., 69-ISIE 6-1** **≥35,000**  
Terrestrial gasteropods from lower part of same paleosol as Gif-1973, alt +1.20m, Isie I.
- Gif-2256. Nouméa, Ricandy reef, RIC 2-13a** **≥35,000**  
Lamellibranch, -14m from fringing reef off Nouméa, Ricandy reef (22° 19' S, 166° 27' E).
- General Comment:* 1st 8 measurements agree and retrace recent variations of sea level on SW coast of New Caledonia. They show a level 1 to 1.50m above msl ca 3300 to 4000 BP.
- Gif-1998. Long-Haï, Vietnam** **Modern**  
Shells from top of shore, +2m above msl, at Long-Haï, Vietnam. Coll and subm 1971 by H Fontaine, Service Géol, Saigon.
- Mekong delta series, Vietnam**  
Shells from emerged horizons, remains of ancient shore line in Mekong delta. Coll and subm 1971 by H Fontaine.
- Gif-2220. Ban-Tân-Dinh** **2500 ± 100**  
**550 BC**  
Very large oysters, on bank of a canal at Ban-Tân-Dinh, 20km SE Rach-Gia (9° 53' N, 105° 15' E), Kiên-Giang.
- Gif-2219. Giong-Da** **3430 ± 110**  
**1480 BC**  
Shelly, hard sediment, 30km SE Rach-Gia (9° 53' N, 105° 15' E), ca high tide level, *ie*, ca +2m above msl.
- Gif-2154. Rice plantation Canal** **4870 ± 120**  
**2920 BC**  
Oyster *in situ*, beneath clay, near Nui-Choc (10° 15' N, 105° 12' E), SW Long Xuyèn, 28km from the sea. Ca high tide level.

**Gif-2153. Cho-So** **5570 ± 120**  
**3620 BC**  
Oyster, *in situ*, beneath clay, at Cho-So near Nui-Choc (10° 15' N, 105° 12' E). Ca high tide level.

**Gif-2152. Nui-Choc** **5680 ± 120**  
**3730 BC**  
Oyster *in situ*, beneath clay, at Nui-Choc (10° 15' N, 105° 12' E). Ca high tide level.

*General Comment:* confirms recent high levels in Mekong delta.

#### *D. Miscellaneous Countries*

##### *1. Sea-level variations*

##### **Brazil coast series**

A new set of dates extending our measurements along Brazilian coast in studying recent oscillations of sea level. This completes results in R, 1971, v 13, p 213, coll and subm 1970 by J Laborel, Sta Marine, Tuléar, Madagascar.

**Gif-1935. Enseada do Forno, Cabo Frio** **2400 ± 95**  
**450 BC**  
Vermetids limestone (22° 51' S, 42° 03' W), alt 2.0 ± 0.5m.

**Gif-1933. Salvador, Ilha de Itaparica** **2450 ± 95**  
**500 BC**  
Vermetids limestone (13° S, 38° 38' W), alt 2.0 ± 0.5m.

**Gif-1934. Ponta do Pai Vitorio, Cabo Frio** **3900 ± 110**  
**1950 BC**  
Vermetids limestone (22° 51' S, 42° 03' W), alt 3.0 ± 0.5m.

**Gif-2147. Ilha do Santo Amaro** **4480 ± 140**  
**2530 BC**  
Vermetids limestone (23° 55' S, 46° 14' W), N Guaruga, alt 3.0 ± 0.5m.

**Gif-1932. Vitoria** **5050 ± 115**  
**3100 BC**  
Oysters (20° 19' S, 40° 21' W), alt 1.0 ± 1m. *Comment:* reference to msl is particularly inadequate for oysters.

*General Comment:* confirms recent ages of these elevated vermetid fossil lines usually attributed to Tertiary. Some 4000 yr ago, sea reached a level ca 3m higher than present one on Brazilian coast (Delibrias and Laborel, 1971).

**Gif-1576. Yauca, Peru** **27,400 ± 1500**  
**25,450 BC**

Shells (*Dosinia*, *Anadara*, *Lamellaria*) from a shelly layer, 50cm thick, from uplifted beach, 3.5km from sea-side, 40m above bottom of Yauca Valley, S side (15° 41' N, 74° 32' W), Peru. Coll 1965 and subm

1969 by H Reichlen. *Comment*: dates important recent tectonic movement on S Coast of Peru.

### Chilean Coast series

Marine mollusk shell, coll 1968 and subm 1969 by R Paskoff, Mission Univ Française au Chili, Santiago.

**Gif-1508. La Serena, 9** **3700 ± 120**  
**1750 BC**

From a low terrace, +4m alt, La Serena (29° 54' S, 71° 18' W), in Herradur Bay, S Coquimbo Bay. *Comment*: belongs to Veguin, eg, maximum of Flandrian rise.

**Gif-1476. Los Molles, II** **4400 ± 120**  
**2450 BC**

From terrace of marine abrasion, Los Molles (32° 15' S, 71° 30' W), near Estero Manzana estuary, S Coquimbo bay. *Comment*: same as for Gif-1508.

**Gif-1446. La Serena, 7** **≥35,000**

From terrace of marine abrasion, +10m alt, La Serena, Norte Chico (29° 54' S, 71° 18' W). *Comment* (RP): terrace assigned to Herradurian II, corresponding to Riss-Würm interglacial. Result does not disagree (Paskoff, 1967).

*General Comment*: helps establish chronology of Chilean marine Quaternary. Alt of dated levels show that recent tectonics are not important in this part of Chile.

### Oka hills series, Champlain Sea, Canada

Shells from emerged shorelines at Hoka hills, Champlain Sea, NW Montreal, Canada. Coll and subm 1970 by P Gangloff, Univ Montreal, and A Moign, Univ Brest.

**Gif-2106. Oka hills, + 160m** **10,300 ± 185**  
**8350 BC**

*Mytilus* from littoral sediment, +160m alt, (45° 31' N, 74° 02' W).

**Gif-2107. Oka hills, St Joseph du Lac, + 100m** **9950 ± 185**  
**8000 BC**

*Mya*, in marine sediments, +100m alt (45° 33' N, 74° 02' W).

*General Comment*: agrees with maximum alt of emerged shorelines of Champlain sea, +250m dated 11,400 BP and with minimum alt +30m dated 7500 BP (Pherson and Brown, 1967).

### Puvirnitug series, Hudson sea, Quebec, Canada

Samples from uplift coast, near Puvirnitug, Hudson Bay, Quebec. Coll and subm 1970 by M Bournérias, Centre d'Etudes Nordiques, Univ Laval, Quebec, PQ (Bournérias, 1971).

**Gif-1818. "Crête des Coquilles", W Puvirnitug** **3400 ± 80**  
**1450 BC**  
*Mytilus edulis* from very large shell accumulation, 35m alt, on "Crête des Coquilles" (60° 13' N, 77° 16' E). *Comment*: corresponds to uplift of 1m per century, at least.

**Gif-1819. E Puvirnitug** **500 ± 80**  
**AD 1250**  
 Beluga bones on ancient littoral bar, 10m alt 300m E Puvirnitug (66° 02' N, 77° 12' E). *Comment*: usually Beluga are sliced and partially consumed ashore by Eskimos. Date could indicate a recent uplift of coast of 2m per century.

**Gif-1645. Falasarna, Kriti, Greece** **2050 ± 100**  
**100 BC**  
 Calcareous encrusting with algae and Vermetids from well marked platform, in different region of Kriti, alt +6.5m at Falaso (35° 30' N, 28° 33' E), Kriti. Coll and subm 1970 by B Keraudren, Fac Sci, Paris.

**Gif-1943. "Faraglioni", Aci Trezza, Sicily, Etna 70-2** **5900 ± 120**  
**3950 BC**  
 Oyster remains in calcareous encrusting going up to 8m on "Faraglioni", small islands, some hundred m off Aci Trezza (37° 27' N, 15° 11' E), Sicily. Coll and subm 1971 by G Kieffer, Inst. Géog, Clermont-Ferrand, Puy-de-Dôme.

## 2. Volcanism

### La Soufrière series, Guadeloupe

Organic debris carbonized during last volcanic Pellean-type eruption of La Soufrière in Guadeloupe (16° 03' N, 61° 40' W). Subm 1963 by M Feuillard, Lab Physique Globe, Saint-Claude, Guadeloupe.

**Gif-225. La Soufrière, No. 1** **370 ± 120**  
**AD 1580**  
 On left bank of Galion R, 600m alt.

**Gif-226. La Soufrière, No. 2** **≤ 120**  
 Under volcanic breccia layer, 50cm thick, 1120m alt. *Comment*: supposedly from last reported volcanic event of La Soufrière, on Dec 3 and 4, 1836.

### E. Marine Sedimentation

#### E Mediterranean sea cores

Deep sea sediment coll 1967 around Kriti and Santorini Is during French *OS J Charcot* cruise in E Mediterranean. Sample dates are related to volcanic and ash level studies, undertaken by CFR, CNRS, Gif-sur-Yvette.

**Gif-1904. Core Mo 6, 20 to 30cm** **7400 ± 140**  
**5450 BC**

Sapropelitic sediments overlying ash; 3 ash horizons identified between 200 and 400cm (33° 23' N, 24° 55' E), S Kriti, 320km S Santorini, depth 2140m, length 565cm. *Comment:* dates (one of last) large eruptions of Santorini volcano.

**Core Mo 24 series**

Core Mo 24 (35° 28' N, 26° 38' E), S Kasos I., 225km SE Santorini, depth 2220m, length 170cm, without ash horizons, but with thick sapropelitic layers.

**Gif-1444. Core Mo 24, 17 to 24cm** **4950 ± 130**  
**3000 BC**  
Upper part of sapropelitic horizon.

**Gif-1430. Core Mo 24, 60 to 64cm** **7900 ± 170**  
**5950 BC**  
Lower part of same sapropelitic horizon as Gif-1444.

*General Comment:* shows very rapid accumulation of sapropelitic sediments, ca 15cm/1000 yr, while mean rate of sediment in upper part of core is ca 3.6cm/1000 yr. Sapropelitic horizons indicate last episodes of anoxic conditions near bottom of E Mediterranean.

**Core Mo 36 series**

Core Mo 36 (35° 58' N, 24° 27' E), N Kriti, 100km SW Santorini, depth 780m, length 570cm. Eight ash or pumice layers identified along the core.

**Gif-1468. Core Mo 36, 70 to 80cm** **23,100 ± 1000**  
**21,150 BC**  
Coarse fraction of sediment >50 $\mu$ , overlying tephra layer 80 to 100cm.  
*Comment:* diluted for measurement.

**Gif-1469. Core Mo 36, 100 to 110cm** **27,400 ± 2400**  
**25,450 BC**  
Coarse fraction of sediment, > 50 $\mu$ . *Comment:* diluted for measurement.

*General Comment:* sedimentation rate of 3.5cm/1000 yr can be calculated for upper part of core. Date is ca 25,000 BP for one of major prehistoric eruptions of Santorini.

**Core Mo 44 series**

Core Mo 44 (35° 46' N, 23° 28' E) between Kriti I. and Peloponnesus, 200km SW Santorini, depth 910m, length 340cm. Three ash layers were found: 0 to 20cm, 30 to 40cm and deeper in core, ca 250cm.

**Gif-1506. Core Mo 44, 25 to 31cm** **5800 ± 140**  
**3850 BC**  
Sapropelitic mud, between 2 upper tephra horizons.

**Gif-1826. Core Mo 44, 100 to 120cm** **30,800 ± 1500**  
**28,850 BC**

Sediment, coarse fraction,  $> 50\mu$ , underlying very thick ash. *Comment*: diluted for measurement.

*General Comment*: mean sedimentation rate in upper part of core is: 4.8cm/1000 yr and from surface to 120cm: 3.6cm/1000 yr. This core indicates a very large eruption of Santorini ca 4800 BP.

#### Core Mo 45 series

Core Mo 45 ( $35^{\circ} 53' N$ ,  $22^{\circ} 21' E$ ), in Matapan deep, S Peloponnesus, 250km WSW Santorini, depth 4420m, length 415cm. One tephra layer between 20 to 30cm.

**Gif-1350. Core Mo 45, 0 to 10cm** **3380 ± 110**  
**1430 BC**

Fine fraction  $\leq 50\mu$ .

**Gif-1351. Core Mo 45, 0 to 10cm** **1950 ± 170**  
**0**

Coarse fraction  $> 50\mu$ . *Comment*: difference between coarse and fine fraction confirms impossibility of dating total sediment because of detritic carbon. Diluted for measurement.

**Gif-1495. Core Mo 45, 30 to 40cm**  **$\geq 25,000$**

Coarse fraction  $\leq 50\mu$ . Underlies upper tephra layer. *Comment*: diluted for measurement.

*General Comment*: based on refractive index and stratigraphic sequence, 2 tephra layers can be distinguished in upper part of almost all cores: one before 5000 BP which should correspond to Minoan eruption of Santorini, and another ca 25,000 BP. Results very similar to those obtained by Ninkovich and Heezen (1965) in a similar study.

#### Cap Mele series, Ligurian sea

Calcareous encrustings, on continental shelf, off Cap Mele in Ligurian sea. Coll and subm 1907 by J P Rehault and C Grazzini, Sta Géodynamique sous-marine, Villefranche-sur-Mer, Alpes Maritimes.

**Gif-1562. Cap Mele, FOM, P 22** **22,000 ± 1000**  
**20,250 BC**

Encrusting with *Lithothamniae* and mollusk shells, from bottom of Core P 22, 4.50m long and 135m deep ( $43^{\circ} 50' N$ ,  $8^{\circ} E$ ).

**Gif-1563. Cap Mele, FOM, P 23 B** **10,200 ± 200**  
**8250 BC**

Encrusting with *Lithothamniae*, from bottom of Core P 23, 2m in sediment and 100m deep ( $43^{\circ} 50' N$ ,  $8^{\circ} E$ ).

**Gif-1564. Cap Mele, FOM, P 24** **23,600 ± 1000**  
**21,650 BC**

Encrusting with *Lithothamniae* and mollusk shells from bottom of Core P 24, 1.20m long and 75m deep ( $43^{\circ} 50' N$ ,  $8^{\circ} E$ ).

**24,100 ± 1000**

**Gif-1565. Cap Mele, FOM, P 25 b** **22,150 BC**  
 Encrusting with mollusk shells from bottom of Core P 25, 2m long  
 and 49m deep (43° 50' N, 8° E).

**10,700 ± 200**

**Gif-1566. Cap Mele, FOM, P 87 A** **8750 BC**  
 Encrusting debris from bottom of Core P 87, 1m long and 80m  
 deep (43° 50' N, 8° 03' E).

*General Comment:* 3 last encrustings were obtained from Quaternary  
 rocks to which they were attached, which suggests they were *in situ*  
 and related to a low sea level. The 2 others: Gif-1562 and -1563, on  
 the contrary, may have been reworked.

#### Seamount samples, Atlantic Ocean

Sediment samples from one of Biscay seamounts, the Charcot (45°  
 22' N, 10° 45' W), NW Spain, in Atlantic Ocean. Coll by *OS J Charcot*  
 dredging cruise 1969 and by coring in 1970, by R Chesselet.

#### Dredging samples series

Two distinct kinds of sediments were dredged: on seamount 3500m  
 deep a gray-beige sediment more or less solid with very high concentra-  
 tion of Foraminiferae and a white compact sediment, almost pure CaCO<sub>3</sub>,  
 with Foraminiferae still extant in upper part only. When possible, Fora-  
 miniferae were separated for dating.

**1720 ± 140**

**Gif-671. Charcot G, surface** **AD 230**  
 Foraminiferae from liquid gray ooze, representative of 5cm surface  
 sediment.

**9100 ± 350**

**Gif-646. Charcot D, gray** **7150 BC**  
 Foraminiferae from compact gray sediment, under liquid sediment.

**26,800 ± 2000**

**Gif-648. Charcot D, White I** **24,850 BC**  
 Foraminiferae from white sediment underlying Gif-646.

**28,600 ± 2000**

**Gif-649. Charcot D, White 2** **26,650 BC**  
 Fine fraction without Foraminiferae, from same white sediment as  
 Gif-648. This sediment contains 95% CaCO<sub>3</sub>.

**≥35,000**

**Gif-670. Charcot E<sub>2</sub>**  
 Foraminiferae, 4cm deep in white sediment dredged at Point E<sub>2</sub>.  
*General Comment:* results show difficulty of obtaining valid dates on  
 dredged material. Sediments from Point D were dredged on the sea-

mount but on an abrupt wall; because of very different consistency of gray and white sediments, it is not certain that sedimentation was not perturbed on the slope and that stratigraphy was preserved during dredging. Moreover, numerous cracks in the compact white sediment enabled the fluid recent gray sediment to penetrate and pollute the white sediment. This explains young ages for these sediments; fauna of Foraminiferae and Coccolithophoridae is Tertiary. Only Gif-671 and -670 are valuable.

#### Core C<sub>I</sub> series

Because of previous results, a core 80cm long was coll in flat area on top of Charcot seamount (45° 19' N, 10° 31' W), depth 2665m, but this coring did not penetrate deep enough to reach the white sediment and contains only Quaternary sediments.

<b>Gif-1374. Core C<sub>I</sub>, 0 to 3.5cm</b> Coarse fraction > 80 $\mu$ .	<b>3800 <math>\pm</math> 120</b> <b>1850 BC</b>
<b>Gif-1456. Core C<sub>I</sub>, 6.5 to 9.5cm</b> Coarse fraction > 80 $\mu$ .	<b>5470 <math>\pm</math> 200</b> <b>3520 BC</b>
<b>Gif-1419. Core C<sub>I</sub>, 21 to 24cm</b> Fraction between 80 and 250 $\mu$ .	<b>15,000 <math>\pm</math> 200</b> <b>13,050 BC</b>
<b>Gif-1458. Core C<sub>I</sub>, 30.50 to 33.50cm</b> Fraction between 80 and 250 $\mu$ .	<b>18,800 <math>\pm</math> 500</b> <b>16,850 BC</b>
<b>Gif-1470. Core C, 41.50 to 43.50cm</b> Fraction between 80 and 250 $\mu$ .	<b>26,500 <math>\pm</math> 200</b> <b>24,550 BC</b>
<b>Gif-1373. Core C<sub>I</sub>, 64.50 to 69cm</b> Coarse fraction > 80 $\mu$ .	<b><math>\geq</math>35,000</b>

*General Comment:* presence of turbidite layers ca 25cm and 40cm deep in core made it necessary to eliminate coarse fraction > 250 $\mu$ . Moreover, in 40cm deep turbidite layer, there is 10% gravel > 5mm. It is difficult for such stones to climb a 17% slope and reach top of seamount; so their presence cannot yet be explained unless one admits a very fast rise of this seamount (at least 2000m during last 20,000 yr). Mean sedimentation rate of 1.8cm/yr in upper part of core above turbidite layers was determined from dates Gif-1374 and -1419.

#### CORRECTION

Gif-1090 and Gif-1109 listed in v 14, p 290 were accidentally repeated. They should be listed only for v 13, p 222.

## REFERENCES

- Archambault, M, 1969, Faits et points de vue nouveaux sur les glaciés d'érosion: Assoc Géog française Bull, no 375, p 525-537.
- Bailloud, G, 1969, Fouille d'un habitat néolithique et torréen à Basi (Serra di Ferro, Corse): Soc préhist française Bull, v 66, p 367-384.
- 1972, Datation C<sup>14</sup> pour le site de Basi (Serra di Ferro, Corse): Soc préhist française Bull, v 69, p 71-72.
- Baltzer, F, 1969, Les formations végétales associées au delta de la Dumbea (Nouvelle-Calédonie): Cahiers ORSTOM, ser Géol, v 1, p 59-84.
- 1970, Datation absolue de la transgression holocène sur la côte ouest de Nouvelle-Calédonie sur des échantillons de tourbe à palétuviers. Interprétation néotectonique: Acad sci [Paris] Comptes rendus, v 271, p 2251-2254.
- Bordes, F, 1970, Informations archéologiques; circonscription d'Aquitaine: Gallia Préhistoire, v 13, no 2, p 485-486.
- Bourdier, F, 1961, Le Bassin du Rhône au Quaternaire: CNRS, v 1, p 321.
- Bournérias, M, 1971, Aspects biogéographiques du Nouveau-Québec: Soc biogéog Comptes rendus, v 416, p 3-21.
- Campmajo, P and Guilaîne, J, 1971, Un habitat protohistorique en Cerdagne, l'Avelanosa, Chaos de Targassonne (Pyrénées Orientales): "Atacina 6", Lab Préhist et Paléthnol.
- Champagne, F and Espitalié, R, 1972, Note sur une datation du Sauveterrien de la Grotte des Fieux, à Miers, (Lot): Soc préhist française Bull, v 69, no 2, p 55-58.
- Coudray, J, 1968, Données préliminaires sur la valeur des croûtes calcaires en tant que niveau repère dans la stratigraphie du Quaternaire de Nouvelle-Calédonie; Hypothèses relatives à leur âge: Séances Soc géol de France, Sommaire Comptes rendus, fasc 9, p 307.
- Coursaget, J and Le Run, J, 1966, Gif-sur-Yvette natural radiocarbon measurements I: Radiocarbon, v 8, p 128-141.
- Courtin, J, 1968, Recherches sur le Néolithique Provençal: Cahiers Ligures Préhist Archéol, v 17, p 220-229.
- 1972, Quelques nouvelles datations du Néolithique provençal: Soc préhist française Bull, v 69, CRSM, p 118-120.
- De Bayle des Hermens, R, 1967, Deuxième mission de Recherches préhistoriques en République Centrafricaine: Cahiers Maboké, v 5, fasc 2, p 77-92.
- De Bouard, M, 1971, Chronique des fouilles médiévales en France. I-Constructions et habitats civils; circonscription: Pays de la Loire: Archéol Médiévale, v 1, p 272-274.
- De Lanfranchi, F, 1972, L'abri sous roche n°1 de la station de Curacchiaghiu (Lévie, Corse): Soc préhist française Bull, v 69, p 70-71.
- Delibrias, G, Guillier, M T, and Labeyrie, J, 1966, Gif natural radiocarbon measurements II: Radiocarbon, v 8, p 74-95.
- 1969, Gif natural radiocarbon measurements III: Radiocarbon, v 11, p 327-344.
- 1970, Gif natural radiocarbon measurements V: Radiocarbon, v 12, p 421-443.
- 1971, Gif natural radiocarbon measurements VI: Radiocarbon, v 13, p 213-254.
- 1972, Gif natural radiocarbon measurements VII: Radiocarbon, v 14, p 280-319.
- Delibrias, G and Laborel, J, 1971, Recent variations of the sea-level along the Brazilian coast: Quaternaria, v 14, p 45-49.
- Gallay, A and Gallay, G, 1968, Le Jura et la séquence Néolithique récent, Bronze ancien: Archives Suisses d'anthropol gén, v 33, p 12.
- Gasse, F, 1971, Diatomées des sédiments holocènes du Lac Afrera (Afar septentrional, Ethiopie). Essai de reconstitution de l'évolution du milieu: Hydrobiologia, La Hague, Netherlands, in press.
- 1972, Etude des diatomées du gisement quaternaire de Saint-Saturnin (Puy-de-Dôme): Internat rev gesammt hydrobiol, v 17, fasc 2, p 321-351.
- Giot, P R, 1960, Une Statue-Menhir en Bretagne: Soc préhist française Bull, v 57, p 317-330.
- 1970, Chronique des datations radiocarbones armoricaines: Annales Bretagne, v 77, no 1, p 155-160.

- Giot, P R, 1971, Chronique des datations radiocarbone armoricaines: *Annales Bretagne*, v 78, p 169-172.
- Giot, P R and Briard, J, 1962, Fouille d'un troisième tumulus de l'Age du Bronze à Kervellerin en Cleguer (Morbihan): *Annales Bretagne*, v 69, p 5-17.
- Giot, P R and Lecerf, Y, 1971, Fouille d'un souterrain de l'Age du Fer près de Lamphily en Concarneau (Finistère): *Annales Bretagne*, v 78, p 125-137.
- Giot, P R and Le Roux, C T, 1971, Le souterrain de Keravel en Plouguerneau (Finistère): *Annales Bretagne*, v 78, p 139-147.
- Guillien, Y, 1970, Informations archéologiques; circonscription de Poitou-Charentes: *Gallia Préhistoire*, v 13, no 2, p 365-378.
- Jousseume, R, 1969, Station préhistorique de l'Anse de la République, Saint-Hilaire de Talmont (Vendée): *Rev Bas Poitou et Prov Ouest*, no 3-4, p 1-15.
- Labeyrie, J, Lalou, C, and Delibrias, G, 1968, Etude des transgressions marines sur l'atoll de Mururoa par la datation des différents niveaux de corail: *Cahiers Pacifique*, no 13, p 59-68.
- Lambert, N, 1971, Rapport sur les Travaux de l'Ecole Française en 1970, Grotte de Kitsos (Laurion): *Correspondance Hellénique Bull*, Paris, De Boccard Ed, v 95, no 2, p 703-735.
- Lautridou, J P and Verron, G, 1970, Palcosols et Loess de Saint-Pierre-les-Elboeuf (Seine-Maritime): *Assoc française étude Quaternaire Bull*, no 2-3, p 145-165.
- Lecornec, J, 1970, Le souterrain de l'Age de Fer de Kerméno à Grandchamp (Morbihan): *Annales Bretagne*, v 77, p 57-71.
- Lerman, J C and Raynal, J, 1972, La teneur en isotopes stables du carbone chez les cypracées: sa valeur taxonomique: *Acad sci [Paris] Comptes rendus*, v 275, p 1391-1394.
- LeRoux, C T, 1971, Chronique de Préhistoire et de Protohistoire des Côtes du Nord, une fabrique de haches polies en Bretagne: *Soc. émulation Côtes du Nord, Bull. et Mém*, p 1-12.
- 1971, Une tombe sous dalle à cupules à Saint-Ouarno en Langoëlan (Morbihan): *Annales Bretagne*, v 78, p 37-45.
- 1972, Les sépultures de l'Age du Bronze de Pendreo en Lennon et de Roz-ar-Challez en Pleyben (Finistère): *Annales Bretagne*, v 79, p 73-85.
- Le Roux, C T, Jouve, G, and Lecerf, Y, 1972, Les tombelles de la Besizais en Trébry (Côtes-du-Nord): *Annales Bretagne*, v 79, p 87-98.
- Le Roux, C T and Lecerf, Y, 1971, Fouille d'un souterrain de l'Age du Fer à Kermoysan en Plabennec (Finistère): *Annales Bretagne*, v 78, p 161-167.
- Martin, L and Delibrias, G, 1972, Datation de tourbes et d'algues calcaires quaternaires sur le plateau continental de Côte d'Ivoire: *Acad Sci [Paris] Comptes rendus*, v 274, no 21, p 2848.
- Mohen, J P, 1970, Les Collections Néolithiques de Saintonge récemment acquises par le Musée des Antiquités Nationales: *Antiquités nat Bull*, no 2, p 21-34.
- Montjardin, R, 1970, Le gisement néolithique d'Escanin-les-Baux de Provence: *Soc d'études Sci Sète Bull*, no 2.
- Morzadec-Kerfourn, M T and Delibrias, G, 1972, Analyses polliniques et datations radiocarbone des sédiments quaternaires prélevés en Manche Centrale et Orientale: *Colloque Géol de la Manche, BRGM, Mém*, no 79, p 160-165.
- Ninkovich, D and Heezen, B, 1965, Santorini Tephra: Submarine geology and geophysics, 17th symposium Colson Research Soc Proc, Bristol Univ, London, Whittard, W F and Bradshaw, R (eds), p 413-454.
- Paskoff, R, 1967, Recent state of investigations on Quaternary sea levels along the Chilean coast between lat 30° and 33° S: *Geosci Jour, Osaka Univ, Japan*, v 10, p 107-113.
- Perrot, R, Granier, S, and Gagnière, S, 1972, Contribution à l'étude du Pont Saint-Bénézet: *Acad Vaucluse Extr mém*, Avignon, Aubanel Imp, p 1-29.
- Pherson, M C and Brown, J, 1967, Raised shorelines and drainage evolution in the Montréal Lowland: *Cahiers Géog Québec*, no 23, p 343-360.
- Planchais, N, 1971, Histoire de la végétation post-Würmienne des plaines du Bassin de la Loire, d'après l'analyse pollinique: *Thesis, Univ Sci et Tech du Languedoc, Montpellier*.
- Plumet, P, 1969, Archéologie de l'Ungava: le problème des maisons longues à deux hémicycles et séparations intérieures: *Contr Centre d'études Arctiques et Finno-Scandinaves*, no 7, Paris.

- Rahmouni, O, Roussillot, C, and Armanet, F, 1970, Algiers radiocarbon measurements I: Radiocarbon, v. 12, p 353-357.
- Regrain, R and Guilcher, A, 1972, Deux témoignages d'un niveau marin d'époque historique dans de Marais de Brouage: Acad sci [Paris] Comptes rendus, in press.
- Reichlen, H and Reichlen, P, 1950, Recherches archéologiques dans les Andes du Haut-Utcubamba: Soc Américanistes Jour (Paris), v 39, p 219-246.
- Rieucan, L, 1971, Des arbres fossiles dans la basse plaine de la moyenne Garonne: Séances Soc géol France, Sommaire Comptes rendus, no 10, p 317.
- Rodriguez, G, 1970, Néolithique ancien, Néolithique moyen, Néolithique final, Saint-ponien, Le Verazien: Acte Colloque Narbonne, Carcassonne, Gabelle Imp, p 2-11.
- Roubet, C and Matteu, J, 1970, Izimana, station néolithique de l'Erg oriental, Sahara algérien: Libyca, v 18, p 67-124.
- Sanquer, R, 1971, Chronique d'archéologie antique et médiévale (année 1971): Soc archéol Finistère Bull, v 97, p 19-83.
- Saurin, E, 1931, Le Dolmen de Saint-Marc, près d'Aix-en-Provence (Bouches-du-Rhône): Cong préhistorique France, 10ème sess, 1934, Le Mans, Imp Monnoyer, p 389-396.
- Ters, M *et al*, 1972, Sur le remblaiement holocène dans l'estuaire de la Seine, au Havre (Seine Maritime), France: Quaternaria, v 14, 8th cong INQUA, p 151-174.
- Thommeret, J and Thommeret, Y, 1969, Monaco radiocarbon measurements III: Radiocarbon, v 11, p 118-129.
- Van Noten, F, 1972, Les tombes du roi Cyirima Rujugira et de la reine-mère Nyirayuhi Kanjogera. Description archéologique: Annales Mus Royal Afrique centrale, Tervuren (Belgique).
- Verger, F, 1972, Le gisement coquillier de l'anse de la Houle, près de Cancale est d'âge historique: Acad sci [Paris] Comptes rendus, v 275, p 649-560.
- Vogel, J C and Waterbolk, H T, 1972, Groningen radiocarbon dates X: Radiocarbon, v 14, p 6-110.