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 $^{14}$C: 5568 years and NBS oxalic acid as recent standard.

Since 1970, $\delta^{13}$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, $\delta^{13}$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 $^{14}$C content being variable, although $\delta^{13}$C measurements are usually done in these cases.

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I. ARCHAEOLOGIC SAMPLES

A. France

Gif-1420. Oissel, Ile Coquet, Seine Maritime

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 $^{14}$C was able to date this medieval object.

Gif-1917. Colombiers-sur-Seulles, Calvados

Charcoal from Neolithic barrow, Colombiers-sur-Seulles (49° 16' N, 0° 31' W), Calvados. Coll and subm 1970 by R Caillaud and E Lagnel, Antiquités Préhist Haute et Basse Normandie, Caen. 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

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 Scuvee, Digosville, Manche. Comment: disagrees with ceramics found nearby; the hearth, younger, must be disassociated from archaeologic remains.

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

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

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

320 ± 95
AD 1630
Gif-2182. La Motte 2
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).

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

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 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 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

Gif-1678. La Besizais, Trébry, Côtes du Nord 470 BC

Gif-1865. Sillon de Talbert, Pleubian, Côtes-du-Nord 2210 BC

Plussulien series, Côtes-du-Nord

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.
Gif-1538. Plussulien, N1 SW
Upper level of the main quarry; probable contamination by late crumblings from Gif-1871 area.

Gif-1539. Plussulien, N1 SW
Huge hearth, Late Neolithic quarry.

Gif-1540. Plussulien, N1 SW

Gif-1541. Plussulien, N1 SW

Gif-2328. Plussulien, N1 SE
Hearths in mass of flaking refuse; stratigraphically just under Soil 3 which marks interruption between Middle and Late Neolithic activities.

Gif-1875. Plussulien, N1 SW

Gif-2329. Plussulien, N1 SE
Scattered charcoal, with imported flint tools and some potsherds.

Gif-2330. Plussulien, N1 SE
Hearth; quarry phase closely connected with Gif-1875 and Gif-2329.

Gif-1872. Plussulien, N1 SW

Gif-1873. Plussulien, N1 SW

Gif-1874. Plussulien, N1 SW
Two hearths and scattered charcoal closely connected with 2 large bench-stones resting on Soil 4 (Middle Neolithic floor of quarry).

Gif-1876. Plussulien, 01 NW
Hearth in Soil 4.

Gif-1877. Plussulien, N2 SW
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  
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  
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  
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  
Under soil of ancient mortar.

Gif-1685. Keradennec, Saint-Frégant, SF/I A I  
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  

Gif-2175. Kermoysan, Plabennec, Finistère  
Gif-1682. Toul-Louarn, Guisseny, Finistère


Gif-1969. Keravel, Plouguerneau, Finistère


Gif-1868. Lamphily, Concarneau, Finistère

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. Litiez, La Feuillée, Finistère

Charcoal from bottom of entrance pit to souterrain at Litiez, 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


Gif-1477. Ile Gaignog, Passage IIIc

Lower level. Comment: contaminated by recent carbon.

Gif-1870. Ile Gaignog, Chambre IIIc

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

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

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
AD 1090

Gif-1683. Kerméno, Grandchamp, Morbihan
100 BC

Gif-1681. Le Boccolo, Elven, Morbihan
1700 BC

Gif-1864. Roso en Since, Theix, Morbihan
AD 1050

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
AD 1070
In hearth and food remains.

Gif-1965. Pen-er-Malo, Guidel
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

Gif-1967. Le Cordier, Brandivy, Morbihan
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
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
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

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
Wood from stake of frame.

Gif-1701. Fay-de-Bretagne, H160, 2 b
Wood from another stake.

Gif-1465. Fay-de-Bretagne, H-160
Charcoal layer under ceramics depot.
Gif-1699. Fay-de-Bretagne, H-160, I
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
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

Gif-1589. Anse de la République, St Hilaire-de-Talmont, Vendée
Charcoal from coastal Neolithic site at St Hilaire-de-Talmont (46° 26' N, 1° 39' W), Vendée. Coll by R Jousseaume and subm 1970 by J L’Helgouach. *Comment:* a good date for that level just under a “campaniform” layer dated 3950 to 4050 BP (Jousseaume, 1969).

Grotte des Duffaits series, La Rochette, Charente

Gif-2263. Grotte des Duffaits, hearth
Bottom of gallery.

Gif-2264. Grotte des Duffaits, S
In clay, S part.

Gif-2265. Grotte des Duffaits, entrance room
In clay.

Gif-2266. Grotte des Duffaits, N
In clay, N part.

Gif-2344. Grotte des Duffaits
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, Thaïré, Charente-Maritime**

Charcoal from salt industry site at La Petite Aiguille, Thaïré (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 archaeologic 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**

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

**Gif-1557. La Sauzaie I**

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

**“Chez Reine” series, Sé musiałac, Charente-Maritime**


**Gif-1717. “Chez Reine”, S IX, 3**

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**

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**

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

2. SW France

**Gif-2174. La Marauderie, Montgamé, Vienne**

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 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 archeo logic 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 B1 2300 BC
From 0.85 to 1.65m. Comment: presence of microlithic industry.

Gif-1734. Fontaine de la Demoiselle, Level B2 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 690 BC

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 2700 BC
4650 ± 130

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

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

General Comment: all 3 levels are dated to late Chalcolithic, a period expected only for Level IV.
Gif-1807. Grotte des Fieux, Miers, Lot

Gif-1880. Le Treboulou, Arcambal, Lot

Gif-1881. Cahors, Lot
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
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

Grotte de Saint Eulalie series, Lot

Gif-2193. Grotte de Sainte Eulalie, Layer 1
Bones from fauna, from Level 1, Magdalenian VI, ie, late Magdalenian.

Gif-1697. Grotte de Sainte Eulalie, Layer I
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
From Layer III, Middle Magdalenian, probably Magdalenian II. Comment: dates mural paintings of cave.
Gif-2194. Grotte de Sainte Eulalie, Layer C 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 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 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 7900 BC

Gif-1939. Grotte de Niaux, 2 8150 BC

Gif-1940. Grotte de Niaux, 3 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.
28 G Delibrias, M T Guillier, and J Labeyrie

Gif-1731. Roquefort O 7, Level C

Level C with industry of Matignons, ie, Middle Neolithic II.

Gif-1732. Roquefort O 7, Level C₂

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

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 Lahillehanne, Comm Energie Atomique, Le Barp, Gironde.

Gif-1412. Dayres, Gironde

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

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

Upper gallery.

Gif-1710. Grotte de La Balme de Montbolo

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

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

AD 1220

730 ± 90

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

AD 200

1750 ± 100

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 reutilization of site.

Gif-2112. Site de Mourre, Saint-Thibery, Hérault

AD 200

4410 ± 140


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

4640 ± 140

Gif-1923. Les Serpents, 2 A

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

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 Chasian industry assoc., although date corresponds rather to a later phase.

Gif-1919. Limonesque, BII, Hérault


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

Upper level of stratigraphy.

Gif-1922. Saint-Pierre IV, 4 A

Bottom of stratigraphy. Comment: diluted for measurement.

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

Pont d'Avignon series, Vaucluse


Gif-1622. Pont d'Avignon, I

From Pile 14.

Gif-1668. Pont d'Avignon 2

From Pile 15.

Gif-1669. Pont d'Avignon 3

From Pile 15.

General Comment: important diversity in ages (cf Gif-137: 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

Gif-1793. Grotte d’Unang, Level 3
5840 ± 130
3890 BC

Gif-1794. Grotte d’Unang, Level 6
5900 ± 130
3950 BC

Gif-1795. Grotte d’Unang, C3, Pit 7
5770 ± 130
3820 BC

Gif-1796. Grotte d’Unang, hearth
5950 ± 130
4000 BC

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.

Gif-1855. Courthezon, Vaucluse
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.

Gif-1910. Grotte de Prével, Montclus, Gard

Gif-1909. Grotte du Traves, Montclus, Gard

Escanin series, Les Baux, Bouches du Rhône

Gif-1993. Escanin, Sq III
AD 1190
760 ± 90

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

Gif-1994. Escanin, Sq GH
Intrusion at La Tène period into Chassean level.
Gif-1995.  Escanin, serre  
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  
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 Scî 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  
Late Chalcolithic.

Gif-2101.  Baume Fontbregoua, Layer 11  
Late Chassean.

Gif-2102.  Baume Fontbregoua, Layer 14  
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  
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  
Wood from Roman wreckage, 35m deep in Bon-Porté Bay, 500m off Taillat Cap (13° 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 Filitsa (41° 45’ N, 8° 47’ E), SW Corsica, is a defensive site with abundant archaeologic remains from Torrean to Cardial periods (Bailloud, 1969). Charcoal coll and subm 1970 by G Bailloud, CNRS, Paris.
Gif-1846. Basi, Level IIIa
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.

3350 ± 110
1400 BC

Gif-1847. Basi, Level IIIb
Lower part of Level III. Classic Torrean ceramics, but much lower than in Level IIIa with some obsidian.

3570 ± 110
1620 BC

Gif-1848. Basi, Level 5 b1
Abundant obsidian industry with lamella and ceramic.

5200 ± 120
3250 BC

Gif-1849. Basi, Level 5 e5
Lower part of Level 5 which belongs to original culture of Chalcolithic.

5250 ± 120
3300 BC

Gif-1850. Basi, Level 5 b5
Lower part of Level 5.

5200 ± 120
3250 BC

Gif-1851. Basi, Level 7
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, Lévie, Corsica

2610 ± 110
660 BC

Gif-1958. Curacchiaghiu, Layer 2
Hearth F 1, 0.27m deep. Comment: end of occupation of site. Iron age industry assoc.

3230 ± 130
1280 BC

Gif-1959. Curacchiaghiu, Layer 3
Upper structured hearth, 0.33m deep. Comment: Bronze age ceramics assoc.
**Gif-1960. Curacchiaghiu, Layer 5**
0.70m deep. *Comment:* stabbed ceramics and lithic industry in obsidian assoc Late Neolithic.

**Gif-1961. Curacchiaghiu, Layer 6**
0.74m deep. *Comment:* stabbed ceramics, obsidian industry, and assoc flint correspond to 2 different facies of Early Neolithic.

**Gif-1962. Curacchiaghiu, Layer 6e**
0.94m deep. *Comment:* Cardial ceramics assoc.

**Gif-1963. Curacchiaghiu, Layer 7**
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 Lantfranchi, 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**
*Comment:* corresponds to end of Torrean period, *ie*, Torrean III.

**Gif-2399. Filitosa, Level III**
*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**
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**
Charcoal from hearth, Level VI, base of Torrean levels, in Rock Shelter E A1, inside Torrean complex of Tappa (41° 32' N, 9° 13' E),

4. East and Central France

**Gif-1528. Ouroux-sur-Saône, Saône et Loire**

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**


**Gif-1559. Oppidum of Myard, Layer III**

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**

Charcoal from hearth on base-level of site occupation.

**Gif-2343. Oppidum of Myard, 467**

Charcoal from hearth in settlement level.

**Gif-2341. Oppidum of Myard, 527**

Burnt wood from fortification structure of oppidum.

**Gif-2342. Oppidum of Myard, 490 a**

Burnt wood from another structure of fortifications.

General Comment: the last 3 dates agree well with assoc Cortaillod ceramics. Cortaillod 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-Créancey, Côte d’Or**

Stratigraphic alternation of sand, tufa, peat, under ploughed fields, Beaume-les-Créancey (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**
Charcoal, 1.20m deep. *Comment:* agrees with archaeologic artifacts.

Gif-1596. **Beaume-les-Creancey, 2**
Peat, 2.30m deep.
*General Comment:* confirms chronologic sequence established by malacology.

Gif-1842. **Thoraise, Doubs**
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**
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 archaeologic date.

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

Gif-1387. **Grotte de la Tuilerie, Level VII**

Gif-1388. **Grotte de la Tuilerie, Level VIII**

Gif-1561. **Grotte de la Tuilerie, Level IX**
*General Comment:* establishes precise stratigraphy of Neolithic age in province of Franche-Comté.

Gif-1414. **Izernore, Ain**
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

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

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

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

Lake coring. Hearth with potsherds of Late Neolithic.

Gif-2299. Clairvaux. Station 3

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

Gif-2298. Clairvaux, Point 68

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

Gif-2300. Clairvaux, 96 to 100

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-2126.  Notre-Dame du Lys, Dammarie-les-Lys, Seine et Marne


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


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**

Bronze age level.

*General Comment:* agrees well with expected ages.

Gif-1712. **Hallines, Pas de Calais**

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**


Gif-1696. **Aït Raouna, Algeria**

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**


**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**

Neolithic industry.

Gif-1384. **K S M T 141**

Neolithic industry.
Gif-1383. K S M T 140bis
Neolithic industry of Capsian tradition.

Gif-1386. K S M T 145
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
Typical Capsian.

Gif-1590. Djebel El Outed, DE 02
Typical Capsian.

Gif-1592. Djebel El Outed, DE 03
Typical Capsian.

Gif-1593. Djebel El Outed, DE 04
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
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
Burnt bones from ashy sand layer. Comment: diluted for measurement. Upper Capsian with Meridional facies.

Gif-1382. Rabah, RAB 14
Burnt bones. Comment: upper Capsian with Mediterranean facies. Same level as Gif-1381.

General Comment: agrees well with archaeologic data.
Gif-1380. Adrar Tioueiine, Oasis
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.

4850 ± 110
Gif-2222. Iheren, Tassili, Sahara
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.

Relilaï series, Cheria, Bône, Algeria

Gif-1899. Relilaï, REL 9
End of Upper Capsian.

7300 ± 140
5350 BC
Gif-1900. Relilaï, REL 10
Beginning of Upper Capsian.

7800 ± 140
5850 BC
Gif-1714. Relilaï, REL I
Typical Capsian.

7760 ± 180
5810 BC
Gif-1896. Relilaï, REL 6
Typical Capsian, Phase IV.

7850 ± 150
5900 BC
Gif-1898. Relilaï, REL 8
Middle of typical Capsian, Phase IV.

7950 ± 150
6000 BC
Gif-2119. Relilaï, REL 3
End of typical Capsian, Phase IV.

7700 ± 150
5750 BC
Gif-1901. Relilaï, REL II
End of typical Capsian, Phase IV.

8180 ± 180
6230 BC
Gif-1715. Relilaï, REL 2
Typical Capsian, Phase III.

8350 ± 150
6400 BC
Gif-1902. Relilaï, REL 12
End of typical Capsian, Phase III.
Gif-1897. Relilai, REL 7
End of typical Capsian, Phase III.

Gif-2120. Relilai, REL 4
Typical Capsian, Phase II.

Gif-2121. Relilai, REL 5
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 Brahimi and subm 1971 by G Camps.

Gif-2110. TAZA 4

Gif-2111. TAZA 5

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

Gif-1655. Izimane, E Erg, Sahara

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
Charcoal.

Gif-1702. Zmeilet Barka, 2
Ostrich-egg shell.

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

Gif-1821. El Beïada, W Bel-Guebour, Sahara
Gif-1931. El Bayed, Sahara


Gif-2221. Sebkhet en Noual, Tunisia

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


Gif-1453. Vein of Signal, Jbel Aouam, I

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

Wood from same mine, as Gif-1453.

Gif-2200. S Vein, Boujad, Jbel Aouam

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

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

Gif-2201. Ifriniaden, Tizi n-test

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

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

**Arlit series, Air, Niger**

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

**Gif-1797. Arlit, Somair 2**

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

<table>
<thead>
<tr>
<th>Date</th>
<th>BC</th>
</tr>
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<tbody>
<tr>
<td>2640 ± 100</td>
<td>690 BC</td>
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**Gif-1798. Arlit, Somair 4**


<table>
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<th>Date</th>
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<tr>
<td>4030 ± 110</td>
<td>2080 BC</td>
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**Gif-2289. Arlit**

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

<table>
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<th>Date</th>
<th>BC</th>
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<tbody>
<tr>
<td>4530 ± 110</td>
<td>2580 BC</td>
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**Gif-1725. Arlit, 2**

Charcoal. Coll and subm 1970 by H Lhote.

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<tr>
<td>5200 ± 140</td>
<td>3250 BC</td>
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**Gif-2159. Arlit, 4**

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 archaeologic sequence, this figure is consistent with a late continuation of Neolithic in Sahara.

<table>
<thead>
<tr>
<th>Date</th>
<th>BC</th>
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<tbody>
<tr>
<td>5030 ± 140</td>
<td>3080 BC</td>
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</tbody>
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**Gif-1727. Taferjit, Niger**

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.

<table>
<thead>
<tr>
<th>Date</th>
<th>BC</th>
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<tbody>
<tr>
<td>4080 ± 110</td>
<td>2130 BC</td>
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</table>

**Gif-1728. Tamaya Mellet, Niger**

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.

<table>
<thead>
<tr>
<th>Date</th>
<th>BC</th>
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<tbody>
<tr>
<td>9350 ± 170</td>
<td>7400 BC</td>
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</tbody>
</table>

**Gif-2156. Azelik, Agadez, Niger**

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.

<table>
<thead>
<tr>
<th>Date</th>
<th>AD</th>
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<tbody>
<tr>
<td>800 ± 100</td>
<td>1150 AD</td>
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</table>
Gif-2160. Jackal den, near Arlit, Niger
Charcoal in archaeologic 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

Gif-2157. Marandet, 2
1m deep.

Gif-2158. Marandet, 3
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

Gif-1636. Before I, Tajunu
(5° 57' N, 15° 35' E).

Gif-1637. Tia I, Tajunu
(5° 55' N, 15° 36' E).

Gif-1887. Tajunu Be Yole, I
(5° 58' N, 15° 33' E). 70cm depth.

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

Gif-1889. Tajunu Zupaya, 3
(5° 58' N, 15° 34' E). 60cm depth.
Gif-1890. Tajunu Zupaya, 4
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

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

Gif-2224. Kamoa, K 70, C 14-12
Depth, 70cm. Comment: similar to Gif-2223.

Gif-2225. Kamoa, K 70, C 14-14
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
Charcoal from late occupation of Iron age site, in sandy mound 1.40 to 1.75m high on band 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 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

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

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

Charcoal from hearth in middle Tshitolian archaeologic 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'Études 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

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

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

Gif-1352. Diana, DIA, I E 68

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

Gif-1957. Diana, DIA, I B 70, 24

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

Gif-1955. Diana, DIA, I B 70, 22

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 Plumat.

Gif-1949. UNG II D 70, II
Charcoal from House D.

430 ± 80
AD 1520

Gif-1950. UNG II, D 70, 13
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.

680 ± 90
AD 1270

Gif-1953. UNG II, D 70, 17
Charcoal from House D, 10cm deep, between large stone flags.

530 ± 80
AD 1420

Gif-1948. UNG II, D 70, 10
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.

750 ± 90
AD 1200

Gif-1951. UNG II, D 70, 14
Charred fat adhering to a paving stone, in House D.

1420 ± 90
AD 530

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

1380 ± 90
AD 570

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

1540 ± 90
AD 410

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

1680 ± 90
AD 270

Gif-1945. UNG II, C 70, 2
Charred fat mixed with sand, 10cm deep in Structure C, a dwelling demarcated by erected flat stones.
Gif Natural Radiocarbon Measurements VIII

1130 ± 90

Gif-1944. UNG II, A 70, I
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.

3300 ± 110

Gif-1567. Poste-de-la-Balaine, Baie d’Hudson
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.

1100 ± 95

Gif-1520. La Bernardina, T I 10, Azuero, Panama
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 Francaise au Panama. Comment: assoc with ritual ceramics typical of Phase IV connected with “classic” period of Veraguas and of Chiriquí. Date fits well and is comparable to a date for site of Guaniquito with a similar structure: AD 995 ± 120 (Ichon, pers commun).

1500 ± 100

Gif-1642. Site El Indio, Panama
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.

1560 ± 100

Gif-1641. Site El Cafetal, Panama
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.

1930 ± 110

Gif-1643. Site La India, Panama
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.

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

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

**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.

**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.

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

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 49-172


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

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


Gif-1418. San Nicolas I, 00-45  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 00515 5750 BC

Charcoal with shell and lithic tools, 1m deep in a low terrace of R de Ocona, 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
Site 1, NE angle. Depth 1.30m.

Gif-1661. Caleta Abtao, No. 12
Site 1, E wall. Depth 0.70m.

Gif-1658. Caleta Abtao, No. 3
Site 1, E wall. Depth 0.85m.

Gif-1660. Caleta Abtao, No. 10
Site 1, E wall. Depth 1m.

Gif-1659. Caleta Abtao, No. 5
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 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 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 archaeologic data are missing in area.

Gif-1440. Sao Desiderio, Bahia, Brazil AD 900
Bones from large funerary urns of Aratu phase in terrace parallel to Sao 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 archaeologic base.

Gif-1627. Caverna da Padra Acai, Pernambuco, Brazil AD 70
Gif-1255. Gratu do Padre, Pernambuco, Salvador, Brazil
2200 ± 110
250 bc
Charcoal from Gratu 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 spelealogic 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
δ14C = -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

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.
<table>
<thead>
<tr>
<th>Code</th>
<th>Location</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gif-1424</td>
<td>Dikili Tash, 6</td>
<td>5750 ± 140</td>
<td>3800 BC From same destruction level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5600 ± 150</td>
<td>Buring layer from same destruction level.</td>
</tr>
<tr>
<td>Gif-1736</td>
<td>Dikili Tash, G, Soil 12</td>
<td>5850 ± 160</td>
<td>3990 BC First level of Late Neolithic.</td>
</tr>
<tr>
<td>Gif-1737</td>
<td>Dikili Tash, G, under Soil 12</td>
<td>6400 ± 160</td>
<td>4450 BC Destruction level of Middle Neolithic.</td>
</tr>
<tr>
<td>Gif-1740</td>
<td>Dikili Tash, H, top burnt zone</td>
<td>6450 ± 160</td>
<td>4500 BC Destruction level of Middle Neolithic marking a total rupture in civilization between Late and Middle Neolithic.</td>
</tr>
<tr>
<td>Gif-1735</td>
<td>Dikili Tash, G, Soil 13</td>
<td>6170 ± 160</td>
<td>4220 BC In pit of Soil 13. Late level of Middle Neolithic.</td>
</tr>
<tr>
<td>Gif-1426</td>
<td>Dikili Tash, II</td>
<td>6800 ± 160</td>
<td>4850 BC Middle Neolithic. Comment: evokes both corresponding periods in Beograd and Early Middle Neolithic in Central Greece.</td>
</tr>
</tbody>
</table>

**Grotte de Kitsos series, Laurion, Greece**


<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-1283</td>
<td>Kitsos 730, Layer 1b</td>
<td>1900 ± 140</td>
<td>AD 50 Charcoal and ash from sepulchral cave near surface. Comment: layer reworked by introduction of late ritual hearths, of 5th to 4th centuries BC.</td>
</tr>
<tr>
<td>Gif-1280</td>
<td>Kitsos 335, Layer 3a, Sounding I</td>
<td>5470 ± 150</td>
<td>3520 BC Charcoal in dwelling level, with seashell, burnt bones (goat, hare), Early Neolithic.</td>
</tr>
<tr>
<td>Gif-1610</td>
<td>Kitsos 1610, Layer 3, Sounding 2</td>
<td>5350 ± 200</td>
<td>3400 BC Charcoal from hearth in homogeneous ashy layer corresponding to a dwelling level with assoc Neolithic potsherds.</td>
</tr>
<tr>
<td>Gif-1832</td>
<td>Kitsos 2/540 Layer 4</td>
<td>5650 ± 130</td>
<td>3700 BC Charcoal from fireplace with human and animal bones, potsherds, stone and bony tools.</td>
</tr>
</tbody>
</table>
Gif-1670. Kitsos 1830-31 Layer 4, Hearth φ 3  
5550 ± 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 ± 130 3800 BC  
Charcoal.

Gif-1612. Kitsos 1733, Layer 4, Sounding 2,  
3600 BC  
Hearth φ 2  
Charcoal from hearth in dwelling level.

Gif-2125. Kitsos SE 011 exterior, Layer 2  
6800 ± 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 ± 290 3280 BC  
Charcoal.

Gif-2123. Antre Corycien, 70/01, Layer 3  
6250 ± 90 4300 BC  
Charcoal. Comment: no archaeologic clues.
Gif-2124. Antre Corycien, 71/03, Layer 3 b
Charcoal. Neolithic black and painted potsherds, remains of polished stone tools and fauna (goat, sheep) assoc.

6380 ± 90
4430 BC

Gif-2339. Antre Corycien, 71/19, Layer 4 a
Charcoal.

7370 ± 170
5420 BC

Gif-2340. Antre Corycien, 71/35, Layer 5 a
Unidentified broken and burnt animal bones without archaeologic 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
Quarry III, 1.50m deep.

2000 ± 100
50 BC

Gif-1673. Porsuk-Ulukisla, 02
Quarry II, 2m deep.

1900 ± 100
AD 50

Gif-1674. Porsuk-Ulukisla, 03
Quarry II, 2.85m deep.

2020 ± 100
70 BC

Gif-1510. Desert of Lut, Iran
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

δ¹⁴C = -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
Xnâm-Loc series, Vietnam


Gif-1996. Xnâm-Loc, I
Charcoal from Jars 11 and 13.

\[2400 \pm 140\]

Gif-1999. Xnâm-Loc, 2
Carbon deposit on Jar 8. Comment: diluted for measurement.

\[2590 \pm 290\]

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

Maré I series, Iles Loyauté, New Caledonia


Gif-1427. Maré I, B
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.

\[1370 \pm 100\]

Gif-1428. Maré I, C
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


Gif-1524. Fère-en-Tardenois, C I
AD 1450
Depth 5cm.

\[500 \pm 90\]

Gif-1525. Fère-en-Tardenois, C 5

\[4150 \pm 120\]

Gif-1526. Fère-en-Tardenois, C 9

\[7350 \pm 160\]

\[5400 \pm 160\]
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
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 VIa).

Gif-2191. Saint-Servan, Ille-et-Vilaine

Gif-2190. Redon, Ille-et-Vilaine
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

Gif-1860. Mazerolles, Loire Atlantique

Gif-1800. Marais Poitevin, Vendée

Gif-1813. Core 202, Loire Estuary
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

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

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

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

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

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

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.

Gif-1885. Cerdagne, 29

AD 800

0.20m deep.

Gif-1886. Cerdagne, 30

AD 800

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.

Gif-1783. Le Bousquet, 21

AD 1500

0.65 to 0.75m. Comment: abundant cereal pollens.

Gif-1782. Le Bousquet, 22

AD 820

1.30 to 1.40m.

Gif-1781. Le Bousquet, 23

2350 BC

4300 ± 180

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.
Gif-1780. Col de Jau, 15  
1.40 to 1.50m deep. *Comment*: level marked by important human influence.

Gif-1779. Col de Jau, 16  
1.75 to 1.85m deep. *Comment*: human influence.

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.

Gif-1777. Col de Jau, 18  
2.45 to 2.55m deep. *Comment*: belongs to Sub-Boreal.

Gif-1776. Col de Jau, 19  
2.95 to 3.05m deep. *Comment*: belongs to Pre-Boreal.

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.

Gif-257. “Plan du Carrelet”, La Bérarde, Isère  
AD 710  
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.

Gif-1792. Isère R alluvium  
AD 710  
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**  
Gif-2217. Les Rois, 3
From top of steep bank of a tributary of Buech R (44° 19' N, 5° 46' E).

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

Gif-2216. Le Mardaric, 2
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

Gif-1841. Alluvial plain of Garonne R, 1

Gif-2338. Alluvial plain of Garonne R, 2
General Comment: dates period of abundant inundations and important alluviation, same age as for middle Durance R, in French Alpes (R, 1972, v 14, p 308, and this list; Rieucau, 1971).

Gif-2218. Les Condamines, Drôme Valley

Gif-1421. Saint-Pierre-les-Elboeuf, Seine Maritime
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**


**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”**

δ¹⁴C = -695‰

Pure white calcite, length 1.70m.

**Gif-1743. “Claude”**

δ¹⁴C = -315‰

Pure white calcite, length 2.07m.

**Gif-1744. “Evelyne”**

δ¹⁴C = -617‰

Pure white calcite, length 1.60m.

**Gif-1805. Red stalagmite**

δ¹⁴C = -1000‰

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**


*Comment*: high sea deposit at present time.

**Gif-1799. “La Houle” Cove, S Cancale, Ille-et-Vilaine**

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, Ille-et-Vilaine. Coll and subm 1970 by F Verger, Lab Géomorphol, Ecole Pratique Hautes Études, 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
Wood from a water main, ca 2m above msl. 610 ± 90 AD 1340

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

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-2244. Maritime Plain of La Charente R
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 (M.T.): should correspond to a littoral bar-high sea level of the Dunkirquan II and to storm formation.

Bréhec series, near Plouha, Côtes du Nord


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

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

Gif-1358. Bréhec 2
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 −8m, 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° 33’ N, 1° 35’ E), Pas-de-Calais.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Age (BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gif-1639</td>
<td>Camiers 2</td>
</tr>
<tr>
<td>Scrobicularia shells, in sandy clay, overlying peat (Gif-1638), at about present msl. Transgressive deposit culminating at −3m. Coll and subm 1969 by M Ters.</td>
<td>3400 ± 130 1450 BC</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Sample</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-1638</td>
<td>Camiers I</td>
</tr>
<tr>
<td>Freshwater peat layer, 12cm thick, overlying lacustrine clay, at msl. Coll and subm 1969 by M Ters.</td>
<td>3550 ± 130 1600 BC</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Sample</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-1601</td>
<td>Camiers 4</td>
</tr>
<tr>
<td>Freshwater peat at −1m. Coll and subm 1969 by H Mariette, Samer, Pas-de-Calais.</td>
<td>5700 ± 135 3750 BC</td>
</tr>
</tbody>
</table>

**General Comment (M.T.)**: 2 peat layers were formed at −3m to −4m, or lower. Scrobicularia clay corresponds to transgressive stage of Dunkerquian O.

**Brétignolles series, Vendée**

Samples from littoral at Brétignolles (46° 35’ N, 1° 53’ W), Vendée. Coll and subm 1969 by M Ters.

<table>
<thead>
<tr>
<th>Sample</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-1640</td>
<td>Brétignolles I</td>
</tr>
<tr>
<td>Top of Sub-Boreal peat (Gif-1992), underlying sand dunes, ca 4m above msl.</td>
<td>3170 ± 130 1220 BC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>Age (BP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gif-1992</td>
<td>Brétignolles 3</td>
</tr>
<tr>
<td>Peat from ca +2.50m. Freshwater peat of Sub-Boreal, deposited when sea level was lower.</td>
<td>3600 ± 110 1650 BC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-2108</td>
<td>Brétignolles 2</td>
</tr>
<tr>
<td>Cardium edule shells in gray clay at −1.5m. 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).</td>
<td>4910 ± 120 2960 BC</td>
</tr>
</tbody>
</table>

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<tr>
<th>Sample</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Gif-2109</td>
<td>Brétignolles 4</td>
</tr>
<tr>
<td>Wood in gray clay, same level as Gif-2108.</td>
<td>4990 ± 120 3040 BC</td>
</tr>
</tbody>
</table>
Gif-2525. Brétignolles 14

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


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**
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**
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**
Sandy alluvium with organic matter (tangue), 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**
Marsh peat at shore, at msl, at Hauteville (48° 55' N, 1° 33' W), Manche. Coll and subm 1970 by P Giresse. **Comment:** abundant Cheno-podiaceae 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**
Muddy calcareous sand, +3.70 to +3.75m.

Gif-1142. **Avranches, 2**
Peaty horizon, -1.05m to -1.00m.

Gif-1143. **Avranches, 3**
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.

7820 ± 170
5870 BC

2250 ± 100
300 BC

1400 ± 100
AD 550

6500 ± 130
4550 BC

6200 ± 100
AD 690

6200 ± 100
4250 BC

6200 ± 100
4250 BC
Gif-2525. Brétignolles 14

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).

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*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.

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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 interstadiial.

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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.

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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

*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, 21.30m


Gif-1403. Le Havre VI, −20.50m

Peat separated from Gif-1402 by peaty clay with some *Foraminifera*. Coll and subm 1969 by M Ters.
Gif-1991. **Terebel 2**

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.

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

*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.
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 Chaine des Puys.

Gif-2354. Brézet II 3

Upper part of peaty clay horizon. *Comment:* agrees with industry of Late Bronze age.

Gif-2355. Brézet III section, Puy-de-Dôme

Wood in peaty clay overlying black and white ash, at Brézet III, 100m from Brézet II (41° 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 Chaine 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.

Gif-2357. Gerzat 1

Organic horizon immediately beneath fine black ash, Level S1, 20m thick, 3.37m deep.

Gif-2358. Gerzat 2

Peaty horizon 33cm thick, upper Level S1 and coarse black ash (Level S2), 17cm thick, 2.80 deep. *Comment:* date is unacceptable. Either samples are confused or were contaminated on collection.

Gif-2359. Gerzat 3

Peaty horizon, 2cm thick, between Level S2 and fine black-and-white ash, S3, 36cm thick, 2.50m deep.

Gif-2360. Gerzat 4

Peaty horizon, 25cm thick, overlying Level S3 and covered with fine black and white ash Level S4, 19cm thick, 2.30m deep. Ashy Level S4 is overlain by thin white clay, 3cm thick.

Gif-2361. Gerzat 5

Thin peaty horizon between 2 white clay layers, 2.04m deep. Upper clay horizon is covered with thick black Level S5, 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 yr.


Soil beneath Royat basalt flow, in “La Grotte des Laveuses” (45° 15’ 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. Comment: same age as charcoal in same domite horizon at Puy-de-Lantegy: 8200 yr (Gif-1501, R, 1972, v 14, p 305).

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

Carbonized wood; S W Puy de Loucheadière (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 Cezeaux” flow, Clermont-Ferrand, 1040 ± 90 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.
Gif-2255. La Tiretaine flow, Royat, Puy-de-Dôme 11,070 ± 200
Soil beneath basalt flow of La Tiretaine, Royat (45° 45' N, 3° 03' E), Puy-de-Dôme. Coll and subm 1971 by G Camus.

Gif-2349. Pond of Fung, La Gardette, Puy-de-Dôme 3890 ± 110
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.

Gif-2350. South West Pavin Lake, Puy-de-Dôme 6760 ± 130
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.

Gif-1624. Chamalières, Puy-de-Dôme 10,000 ± 200
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).

Gif-1927. Jussac, Cantal 1920 ± 110
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.

Gif-1608. Flow of Ray Pic, near Burzet, Ardèche 25,000

B. Africa

1. Samples with climatic implications

Sebkha Mellala series, Algerian Sahara
Mollusk shells (Cardium and Melania) in Sebkha 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.

Gif-1853. Sebka Mellala, lower layer 9550 ± 130
Overlying evaporite deposit.
Gif-1854. Sebka Mellala, upper layer
Between 2 evaporite deposits.
*General Comment:* dates alternation of dry and moist periods.

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


**Gif-1606. Bahr-El-Ghazal, S-2092**
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**
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**
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**
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**
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**
Lacustrine fine limestone overlying dune sand and underlying Gif-1494.

**Gif-1586. Bahr-El-Ghazal, Cutting 1, S-2150**
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.

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Agadem series, Niger


Gif-1394. Agadem, A-42
In clay with diatoms, 1.50m thick beneath 4m sand. 3550 ± 110 1600 BC

Gif-1393. Agadem, A-40
In eolian sand partly indurated, overlying lacustrine sediments. Comment: dates sanding up of Agadem massif after main lacustrine period of 9000 B.P. 4710 ± 130 2760 BC

Gif-1395. Agadem, A-102
In eolian sand intercalated in gray diatomite, all above main lacustrine period of 9000 B.P. 5150 ± 130 3200 BC

Bilma series, Niger


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

Gif-1789. Bilma, S-4072
Microcrystalline limestone with Ostracodes, at top of diatomitic horizon, Bilma (18° 43’ N, 12° 55’ E). Comment: dates upper limit for a regressive episode. 7450 ± 140 5500 BC

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

Gif-1913. Bilma, S-4061
Limestone with diatoms from same horizon as Gif-1790, Bilma (18° 43’ N, 12° 55’ E). Comment: confirms Gif-1790. 8350 ± 100 6400 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.

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).

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 gulling. 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.

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
Calcareous diatomite with *Melania*; level ca 20m. Coll and subm 1970 by H Faure.

Gif-1436. Afrera Lake, Cutting N W, 170
Calcareous diatomite with *Melania*; level ca 19m. Coll and subm 1970 by H Faure.

Gif-1435. Afrera Lake, Cutting N W, 163
Calcareous diatomite with *Melania*; level ca 18m. Coll and subm 1970 by H Faure.

Gif-1439. North West Afrera Lake, 159
Calcareous diatomite with *Melania*, base level, ca 10m. Coll and subm 1970 by H Faure.

Gif-1151. Afrera Lake, T B I
Gasteropods, level ca 30m, 3km W Afrera Lake. Coll and subm 1968 by J Varet and H Tazielli, 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
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
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 +1400 -1250 ; 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 ^14C activity.
Senegal delta series


Gif-1450. Senegal delta, VD 31, 40cm
Under fluvialite silt, 40cm deep (16° 06’ N, 16° 15’ W).

Gif-1451. Senegal delta, VD 31, 80cm
80cm deep (16° 06’ N, 16° 15’ W).

Gif-1452. Senegal delta, VD 65, 55cm
55cm deep (16° 03’ N, 16° 18’ W).

General Comment: describes delta formation.

2. Sea level variations

Ivory Continental shelf series


Gif-1619. Core C 55
Thin peat, 0.60m deep in core, underlying silt (4° 48’ N, 6° 00’ W). Dept —61m. Comment: alternating peat and thin sand layers at this level suggests ancient peat bog along seashore; it is not a good indication of sea level.

Gif-1616. Core B 29
Peat, 2m underlying sand (4° 56’ N, 5° 53’ W). Depth —62m. Comment: comes from stable basal zone.

Gif-1618. Core C 57
Mangrove peat, 0.60m deep in core, underlying silty sand (4° 50’ N, 5° 55’ W). Depth —62m. Comment: comes from stable basal zone.

Gif-1146. Core A 10-I
Mangrove peat, 2.60m deep in core, overlain by shell and Foraminiferae (5° 07’ N, 4° 20’ W). Depth —60m. Comment: corresponds to a transgression.

Gif-1147. Core B 5
Fresh water peat underlying 2m silty sand, overlying a littoral sediment. Depth —60m (5° 08’ N, 4° 15’ W). Comment: must correspond to a regression.
78  G Delibrias, M T Guillier, and J Labeyrie

**Gif-2146. Core C 39**
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**
Small nodules of calcareous algae underlying 0.20m organic muddy sand (4° 52' N, 3° 10' W). Depth -80m.

**Gif-1509. Dredging DR, 2**
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, 1**
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**
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**
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**
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**
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**
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.

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Gif-2144. Core D 12
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
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
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. Baia 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 AD 1250
Vermetid limestone from a well-defined horizon (16° 11' N, 23° 06' W), alt +1m.

Gif-2195. Sao Vicente I., Baia das Gatas, 2 90 BC
Melobesia 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 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 AD 320
Limestone with Petaloconchus 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
Similar to Gif-1675, but coll and subm 1970 by J Laborel in a drainage digging.

Gandiol 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
Old shell debris from beach sand horizon.

Gif-1250. Gandiol core, 12 to 13m 16,000 ± 400
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
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
Oyster from lumachella with gray calcareous cement; ancient beach sediment. Comment: similar to Gif-1251.

Pointe Noire series, 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 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
Silty peat, in Core S 5, −16.7 to 16.9m (4° 47' S, 11° 50' E).
Gif-2209. **Pointe Noire, P G 79**  
Arca and ostrea shells, from Core S 7, -5.55 to 7.75m (1° 47’ S, 11° 59’ E).

4920 ± 140  
2970 BC

Gif-2205. **Pointe Noire, P G 89**  
Silty peat, in Core S 8, -18.85 to 19.05m (4° 47’ S, 11° 49’ E).

7200 ± 180  
5250 BC

Gif-2207. **Pointe Noire, P G 88**  
Silty peat, in Core S 8, -13.55 to -13.75m (4° 47’ S, 11° 49’ E).

7650 ± 180  
5700 BC

Gif-2204. **Pointe Noire, PNFI**  
Silty peat, in core, -21.56 to -21.71m (4° 47’ S, 11° 50’ E).

7650 ± 180  
5700 BC

Gif-2208. **Pointe Noire, PG 71**  
Silty peat, in Core S 12, -10.2 to -11.7m (4° 47’ S, 11° 50’ E).

8200 ± 190  
6250 BC

Gif-2202. **Pointe Noire, PE 874**  

8550 ± 200  
6600 BC

Gif-2203. **Pointe Noire, PG 885**  
Wood and peat, in Core S C, -24.9m (4° 47’ S, 11° 49’ E).

8920 ± 200  
6970 BC

**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**


Gif-1667. **Core ST 3, 3 B**  
Top of a hard compact coral formation, 4.50m thick (17° 54’ N, 141° 04’ W), +1.32m related to msl.

3300 ± 100  
1350 BC

Gif-1801. **Core ST 3, 4 D**  
Approx msl.

3800 ± 120  
1850 BC

Gif-1802. **Core ST 3, 4 N**  
-1.20m related to msl.

5800 ± 140  
3850 BC
Gif-1803. Core ST 3, 4 R
-2.10m related to msl.

Gif-1804. Core ST I, 5
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

Gif-1522. Tenia, G C I, 3.70m
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
-2.80m related to msl. From same horizon as Gif-1522.

Gif-1629. Tenia, G C 5, 8m
-5m related to msl.

Gif-1582. Tenia, G C 6, 11m
-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
(22° 10’ S, 166° E). -0.10m related to msl.

Gif-1580. Dumbea delta, NAT 18 H
(22° 10’ S, 166° E). -4.76m related to msl.
Gif-1577. Marais de Mara, Moindou, MT 24 D
(21° 50’ S, 165° 45’ E). —0.14m related to msl.
5750 ± 150
3800 BC

Gif-1579. Marais de Mara, Moindou, MT 27 E
(21° 50’ S, 165° 45’ E). —2.96m related to msl.
6800 ± 165
4850 BC

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).

Oyster from a well-defined oyster horizon, +0.70m above present oyster horizon (22° 18’ S, 166° 40’ E).
770 ± 90
1180 BC

Gif-1978. Rivière des Pirogues, 69-118
Reworked coral consolidated in beachrock, approx msl.
1140 ± 90
AD 810

Gif-1983. Foué I., 69-60
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.
2250 ± 100
300 BC

Gif-1981. Foué I., 69-56
Shells in bedrock, alt +1.50m, Foué I.
3040 ± 100
1090 BC

Gif-1982. Le Hedour I., 69-LP5
Oyster from bedrock, +1.10m above present oyster horizon, Le Hedour I. (21° 58’ S, 165° 58’ E).
3370 ± 105
1420 BC

Gif-1976. Touaourou, 69 TOU-15
Coral in situ, alt +1.10m, in marine slot in ancient reef Touaourou (22° 11’ S, 166° 57’ E).
3970 ± 110
2020 BC

Gif-1975. Touaourou, 69 TOU-10
Coral in situ, alt +0.8m, on marine abrasion horizon in ancient reef.
4380 ± 100
2430 BC

Gif-1974. Touho, 69-T1
Coral in situ, approx msl, Touho (20° 47’ S, 165° 13’ E).
5400 ± 120
3450 BC
Giant clam remains in beach rock from reworked terrace, alt +1.5m.

Oyster in clay—12m deep from coring, 2.5km inland, near Nepoui R (21° 18’ S, 165° E).

Gif-1985. Nepoui FN2b
Lamellibranch from same core as Gif-1984, same horizon.

Coral in situ, alt +4m, Grimault I. (21° 22’ S, 165° E).

Terrestrial gastropods (Bulimes) in upper part of paleosol, alt +2.3m, Isi I. (21° 54’ S, 165° 51’ E).

Gif-2257. Isi L., 69-ISIE 6-1
Terrestrial gasteropods from lower part of same paleosol as Gif-1973, alt +1.20m, Isie I.

Gif-2256. Nouméa, Ricandy reef, RIC 2-13a
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
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
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
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
Oyster in situ, beneath clay, near Nui-Choc (10° 15’ N, 105° 12’ E), SW Long Xuyên, 28km from the sea. Ca high tide level.
Gif-2153. Cho-So

Gif-2152. Nui-Choc
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.

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
Vermetids limestone (22° 51' S, 42° 03' W), alt 2.0 ± 0.5m.

Gif-1933. Salvador, Ilha de Itiparica
Vermetids limestone (13° S, 38° 38' W), alt 2.0 ± 0.5m.

Gif-1934. Punta do Pai Vitorio, Cabo Frio
Vermetids limestone (22° 51' S, 42° 03' W), alt 3.0 ± 0.5m.

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

Gif-1932. Vitoria
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
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**


**Gif-1508. La Serena, 9**

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.

3700 ± 120
1750 BC

**Gif-1476. Los Molles, II**

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.

4400 ± 120
2450 BC

**Gif-1446. La Serena, 7**


*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**

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

10,300 ± 185
8350 BC

**Gif-2107. Oka hills, St Joseph du Lac, + 100m**

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

9950 ± 185
8000 BC

*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).

**Puvinrnituq series, Hudson sea, Quebec, Canada**

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

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Gif-1818. “Crète des Coquilles”, W Puvirniutq

Mytilus edulis from very large shell accumulation, 35m alt, on “Crète des Coquilles” (60° 13’ N, 77° 16’ E). Comment: corresponds to uplift of 1m per century, at least.

Gif-1819. E Puvirniutq

Beluga bones on ancient littoral bar, 10m alt 300m E Puvirniutq (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

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

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. Geog, Clermont-Ferrand, Puy-de-Dôme.

2. Volcanism

La Soufrière series, Guadeloupe


Gif-225. La Soufrière, No. 1

On left bank of Galion R, 600m alt.

Gif-226. La Soufrière, No. 2

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 30 cm
Sapropelic sediments overlying ash; 3 ash horizons identified between 200 and 400 cm (33° 23' N, 24° 55' E), S Kriti, 320 km S Santorini, depth 2140 m, length 565 cm. 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., 225 km SE Santorini, depth 2220 m, length 170 cm, without ash horizons, but with thick sapropelic layers.

Gif-1444. Core Mo 24, 17 to 24 cm
Upper part of sapropelic horizon.

Gif-1430. Core Mo 24, 60 to 64 cm
Lower part of same sapropelic horizon as Gif-1444.
General Comment: shows very rapid accumulation of sapropelic sediments, ca 15 cm/1000 yr, while mean rate of sediment in upper part of core is ca 3.6 cm/1000 yr. Sapropelic 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, 100 km SW Santorini, depth 780 m, length 570 cm. Eight ash or pumice layers identified along the core.

Gif-1468. Core Mo 36, 70 to 80 cm
Coarse fraction of sediment >50 μ, overlying tephra layer 80 to 100 cm. Comment: diluted for measurement.

Gif-1469. Core Mo 36, 100 to 110 cm
Coarse fraction of sediment, > 50 μ. Comment: diluted for measurement.
General Comment: sedimentation rate of 3.5 cm/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 Peloponneseus, 200 km SW Santorini, depth 910 m, length 340 cm. Three ash layers were found: 0 to 20 cm, 30 to 40 cm and deeper in core, ca 250 cm.

Gif-1506. Core Mo 44, 25 to 31 cm
Sapropelic mud, between 2 upper tephra horizons.
Gif-1326. Core Mo 44, 100 to 120cm  
30,800 ± 1500 28,850 BC  
Sediment, coarse fraction, > 50µ, underlying very thick ash. Comment: diluted for measurement.  
*General Comment:* mean sedimentation rate in upper part of core is: 1.8cm/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° 53’ N, 22° 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 ≤ 50µ.

Gif-1351. Core Mo 45, 0 to 10cm  
1950 ± 170 0  
Coarse fraction > 50µ. 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  
>25,000  
Coarse fraction ≤ 50µ. 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**  

Gif-1562. Cap Mele, FOM, P 22  
22,000 ± 1000 20,250 BC  
Encrusting with Lithothamniiaceae and mollusk shells, from bottom of Core P 22, 4.50m long and 135m deep (43° 50’ N, 8° E).

Gif-1563. Cap Mele, FOM, P 23 B  
10,200 ± 200 8250 BC  
Encrusting with Lithothamniiaceae, from bottom of Core P 23, 2m in sediment and 100m deep (43° 50’ N, 8° E).

Gif-1564. Cap Mele, FOM, P 24  
23,600 ± 1000 21,650 BC  
Encrusting with Lithothamniiaceae and mollusk shells from bottom of Core P 24, 1.20m long and 75m deep (43° 50’ N, 8° E).
Gif-1565. Cap Mele, FOM, P 25 b
Encrusting with mollusk shells from bottom of Core P 25, 2m long and 49m deep (43° 50' N, 8° E).

Gif-1566. Cap Mele, FOM, P 87 A
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 concentration of Foraminiferae and a white compact sediment, almost pure CaCO₃, with Foraminiferae still extant in upper part only. When possible, Foraminiferae were separated for dating.

Gif-671. Charcot G, surface
Foraminiferae from liquid gray ooze, representative of 5cm surface sediment.

Gif-646. Charcot D, gray
Foraminiferae from compact gray sediment, under liquid sediment.

Gif-648. Charcot D, White 1
Foraminiferae from white sediment underlying Gif-646.

Gif-649. Charcot D, White 2
Fine fraction without Foraminiferae, from same white sediment as Gif-648. This sediment contains 95% CaCO₃.

Gif-670. Charcot E₂
Foraminiferae, 4cm deep in white sediment dredged at Point E₂.

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 C₁ 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.

- **Gif-1374. Core C₁, 0 to 3.5cm**
  - Coarse fraction > 80µ.
  - 3800 ± 120
  - 1850 BC

- **Gif-1456. Core C₁, 6.5 to 9.5cm**
  - Coarse fraction > 80µ.
  - 5470 ± 200
  - 3520 BC

- **Gif-1419. Core C₁, 21 to 24cm**
  - Fraction between 80 and 250µ.
  - 15,000 ± 200
  - 13,050 BC

- **Gif-1458. Core C₁, 30.50 to 33.50cm**
  - Fraction between 80 and 250µ.
  - 18,800 ± 500
  - 16,850 BC

- **Gif-1470. Core C, 41.50 to 43.50cm**
  - Fraction between 80 and 250µ.
  - 26,500 ± 200
  - 24,550 BC

- **Gif-1373. Core C₁, 64.50 to 69cm**
  - Coarse fraction > 80µ.
  - ≥35,000

*General Comment:* presence of turbidite layers ca 25cm and 40cm deep in core made it necessary to eliminate coarse fraction > 250µ. 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.
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