This list consists mainly of dates obtained from analysis during 1967 and 1968 of archaeologic and geologic samples. The last section deals essentially with climatic, palynologic, and sea level variation problems. All measurements of atmospheric CO₂ made periodically from 1962 until end of 1970 are also published here. In agreement with international convention, all dates have been calculated on the basis of the C¹⁴ half-life of 5568 years and 95% of NBS oxalic acid as the modern reference year.

ACKNOWLEDGMENTS

Thanks are due to Mireille Rousseau for routine sample preparation and regular atmospheric CO₂ collection, and to Jean-Pierre Garnier for his valuable technical assistance.

SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC SAMPLES

A. France

Gif-1117. Kervéo, Plomelin, Finistère


2120 ± 110 170 B.C.

Gif-812. Mesperleuch, Plouhinec, Finistère


2250 ± 100 300 B.C.

Gif-748. Le Hellen, Cleder, Finistère


3250 ± 115 1300 B.C.

Gif-749. Lescongar, Plouhinec, Finistère


3570 ± 115 1620 B.C.
Gif-809. Kerleven, La Forêt-Fouesnant, Finistère 1850 B.C.


Kernonen, Plouvorn series, Finistère

Samples from an Early Bronze age barrow, at Kernonen, Plouvorn (48° 35' N Lat, 4° 03' W Long), Finistère. Coll. and subm. 1967 by J. Briard.

<table>
<thead>
<tr>
<th>Gif-805. Kernonen A</th>
<th>3910 ± 120</th>
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</thead>
<tbody>
<tr>
<td>Wood from chest containing flat axes.</td>
<td>1960 B.C.</td>
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</table>

<table>
<thead>
<tr>
<th>Gif-806. Kernonen B</th>
<th>3200 ± 120</th>
</tr>
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<tbody>
<tr>
<td>Charcoal in clayey material of barrow.</td>
<td>1250 B.C.</td>
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</table>

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<tr>
<th>Gif-807. Kernonen C</th>
<th>3150 ± 120</th>
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</thead>
<tbody>
<tr>
<td>Charcoal in soil under barrow.</td>
<td>1200 B.C.</td>
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</tbody>
</table>

General Comment: dates for Charcoals B and C are statistically consistent but too young, for an unexplained reason; wood from chest is older than expected; possibly, this one-piece chest is from a big tree trunk (Briard, 1970; Giot, 1968, 1969).

Plouzévédié series, Finistère

Charcoal from middle Bronze age barrow of Ar Reunic (48° 35’ N Lat, 4° 15’ W Long). Coll. and subm. 1967 by J. Briard.

<table>
<thead>
<tr>
<th>Gif-1113. Plouzévédié A</th>
<th>3200 ± 120</th>
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<tbody>
<tr>
<td>1.40 m depth in barrow, N and E trenches.</td>
<td>1250 B.C.</td>
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<tr>
<th>Gif-1114. Plouzévédié B</th>
<th>3160 ± 120</th>
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<tbody>
<tr>
<td>1.20 m depth in barrow S trench.</td>
<td>1210 B.C.</td>
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</table>

General Comment: barrow without central tomb and without grave goods, only some potsherds of middle Bronze age. Age usually found for this type of monument (Giot, 1969).

Barnenez, Plouezoch series, Finistère


<table>
<thead>
<tr>
<th>Gif-1116. Barnenez, Dolmen F, passage</th>
<th>5100 ± 140</th>
</tr>
</thead>
<tbody>
<tr>
<td>3150 B.C.</td>
<td></td>
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</table>
Gif-1309. Barnenez, Dolmen G, chamber
5750 ± 150
3800 B.C.

Gif-1310. Barnenez, Dolmen A, chamber
5450 ± 150
3500 B.C.

Gif-1311. Barnenez, Dolmen B, entrance
3200 ± 120
1250 B.C.

Gif-1556. Barnenez, Chamber F, chamber
5550 ± 140
3600 B.C.

General Comment: Gif-1311, as Gsy-30 and Gsy-147 (2200 ± 200 and 2690 ± 105, R., 1966, v. 8, p. 137) indicate that Megalithic site of Barnenez was re-used during Bronze and Iron ages. Gif-1116, -1309, -1310, and -1556 date 1st occupation and agree well with established chronology for construction of the different dolmens (Giot, 1969, 1970).

Gif-767. Prajou menhir, Trebeurden, Finistère
5330 ± 150
3380 B.C.


Gif-804. Le Calais, Saint-Michel-Chef-Chef, Loire Atlantique
800 ± 100
A.D. 1150


Gif-803. Kerlavos, Trégastel, Côtes du Nord
1500 ± 100
A.D. 450


Gif-747. Miniou Bonen, Côtes du Nord
2200 ± 105
250 B.C.


Gif-808. Grohan, Quessoy, Côtes du Nord
2290 ± 100
340 B.C.

Charcoal from Iron age souterrain, Grohan, Quessoy (48° 22' N Lat, 2° 41' W Long), Côtes du Nord (Guyader, 1969). Coll. by Y.

Gif-814. Cre’hn-Quillé, Saint-Quay-Perros, Côtes du Nord, E entrance
3760 ± 120 1810 B.C.


Gif-813. Ile Geignog, Landela, Finistère
4500 ± 120 2550 B.C.


Cap d’Erquy series, Côtes du Nord

Cap d’Erquy (48° 39’ N Lat, 2° 27’ W Long), Côtes du Nord, covered by remains of double entrenched camp of Protohistoric age. Under Fossé Catuélan which blocks way to extreme part of Cap, Neolithic industry was found. Fossé de Plaine-Garenne is 450 m E of this 1st entrenchment (Giot and Briard, 1969). Charcoal coll. and subm. 1967, 1968 by P. R. Giot and J. Briard.

Gif-1118. Fossé Catuélan, Erquy
4560 ± 140 2610 B.C.

Comment: dates Neolithic forest clearance.

Gif-1302. Fossé de Plaine-Garenne, Erquy
2270 ± 110 320 B.C.

Comment: Gif-715 (R., 1970, v. 12, p. 432) dates Fossé Catuélan to late Hallstatt age; Fossé de Plaine Garenne has La Tène fortification, with interlaced timber-work.

Gif-1115. Moustérian, Séné, Morbihan
A.D. 330


Gif-863. Saint-Fiacre, Melrand, Morbihan
3900 ± 135 1950 B.C.

Gif-458. **Le Breuil-sous-Argent, Deux-Sèvres**

Charcoal from moat at Le Breuil-sous-Argent, Deux-Sèvres (46° 59' N Lat, 0° 27' W Long). Coll. and subm. 1965 by M. Berthod, Paris. *Comment:* too old for feudal moat; charcoal probably dates earlier construction, on same site.

Gif-1119. **Jard-sur-Mer, Vendée**


Gif-802. **“Moulin du Fâ”, Barzan, Charente Maritime**

Charcoal from Layer 0 under Gallo-Roman sta. of “Moulin du Fâ”, Barzan (45° 32' N Lat, 0° 53' W Long). Coll. and subm. 1967 by J. P. Mohen, Merignac, Dordogne. *Comment:* important ceramics from La Tène I and Hallstatt epochs assoc. Date corresponds with Hallstatt occupation.

Gif-724. **Cave of Rancogne, Charente**

Charcoal A found in clay deposit on walls of a well in cave of Rancogne (45° 41' N Lat, 0° 24' E Long), Charente. Coll. 1964 and subm. 1966 by C. Burnez, Gensac-La-Pallue, Charente. *Comment:* dates important Urnfield site, Stage II-III.

Gif-725. **La Croix des Sables, Mainxe, Charente**

Charcoal in ditch around settlement site, 1.50 m depth, under refuse deposit with bones, ceramics, and abundant charcoal at La Croix des Sables (45° 38' N Lat, 0° 11' W Long), Charente. Coll. 1963 and subm. 1966 by C. Burnez. *Comment:* dates a La Tène site.

2. **S. W. France**

**Roanne series, Villegouge, Gironde**

Charcoal from Neolithic sta. of Roanne, Villegouge (44° 57' N Lat, 0° 22' W Long), Gironde. Coll. and subm. 1967 by A. Coffyn, Bordeaux.

Gif-782. **Roanne F 3, 1961**

From hearth found in a pit.

Gif-783. **Roanne 1963**

In 5 cm charcoal layer, under 1.70 m stratified levels.
Gif-784. Roanne 1966

From same level.
General Comment: according to assoc. ceramics, belongs to Peu-Richard culture defined in Charente, but lithic industry is slightly different. Some hundred yr younger than other dates from Charente (Gsy-32, -71: R., 1966, v. 8, p. 131-132; Gif-474, -475, -313, and -417: R., 1970, v. 12, p. 435).

Auterive series, Haute Garonne


Gif-757. Auterive II
Upper level.

Gif-756. Auterive I
Deepest level.
General Comment: agrees well with Gif-757; but Gif-756 is several hundred yr older than expected.

Gif-826. Grotte de Puech Ricard, Aveyron


Gif-827. Puech de Mus, Aveyron

Charcoal from carbonized cinders from Iron age rampart of wall of Puech de Mus, Sainte-Eulalie de Cernon (43° 59' N Lat, 3° 08' E Long), Aveyron. Coll. and subm. by A. Soutou, Toulouse. Comment: in good agreement with expected age.

Gif-773. Saint-Pardoux-Le-Neuf, Haute Corrèze


3. S. E., S., and Central France

Gif-759. Roc de Las Caichos, Roquefèrè, Aude

Gif-760. Cave of Chataigniers, Casenove, Vingrau, Mediterranean Pyrénées


Hypogeum of Roaix series, Vaucluse


Gif-857. Roaix, Level 2
Typical Chalcolithic furniture.

Gif-1620. Roaix, Level 5
Basal level.
General Comment: same age for these 2 samples is confirmed by presence of copper pearls in both levels.

Gramari series, Methamis, Vaucluse


Gif-752. Gramari, Level 3 A
Industry assoc. with remains of wild horse.

Gif-753. Gramari, Levels 3 B I and 3 B 2
Underlying level 3 A.

Gif-754. Gramari, Level C 4
Upper level of Layer C.

Gif-755. Gramari, Level C 5
The deepest level, the last one with charcoal.
General Comment (M.C.): do not agree with archaeology: Levels 3 A and 3 B are not within conventional limits of classical Sauveterrian, and Level C 4, which comes from a level above the others, is older. Many questions seem to remain about this site.

Gif-867. Grotte Murée, Gorges du Verdon, Basses Alpes
1967 by J. Courtin. Comment: dates this layer to Middle Neolithic, as expected from archaeology.

Stantare series, Sartène, Corsica

Gif-1397. Stantare, Corsica 5-1968
30 cm depth.

Gif-1396. Stantare, Corsica 4-1968
General Comment: Gif-1396 agrees very well with archaeologic expectation, but Gif-1397 is too young.

Bonifacio series, Corsica
Charcoal from hearths in well-defined levels, from surface to 1.30 m depth, in upper part of filling of Araguina rock shelter, at Bonifacio (41° 22' N Lat, 9° 10' E Long). Coll. and subm. by R. Grosjean.

Gif-776. Bonifacio, Corsica 1, 1966
Level VI a, Area A 6, A 7, B 7.

Gif-777. Bonifacio, Corsica 2, 1966
Level VI d, Area A 6.

Gif-778. Bonifacio, Corsica 3, 1966
Level VI f, Area A 7, B 7, B 8.

Gif-779. Bonifacio, Corsica 4, 1966
Level VI, Hearth F 3.
General Comment: dates last occupation of site and end of importation of obsidian from Sardinia (Gif-778).

Castello d’Araggio series, Lévie, Sartène, Corsica
Charcoal from a Torre monument, Castello d’Araggio (41° 38' N Lat, 9° 15' E Long), San-Gavino di Carbinì, Lévie, Sartène, Corsica. Coll. and subm. 1967 by R. Grosjean.

Gif-898. Castello d’Araggio, C-Ar-2
On Hearth A, N room.

Gif-899. Castello d’Araggio, C-Ar-3
Central Hearth, upper circular E room.
Gif Natural Radiocarbon Measurements VI

Gif-1000. Castello d’Araggio, C-Ar-4

Central Hearth, S guard room. Comment: was supposed to be similar either to Gif-898 or -899.

Gif-1001. Castello d’Araggio, C-Ar-1

Under Hearth A, N room.

General Comment: except for Gif-1000, results agree well with ages already obtained for Torre cult monuments in Corsica.

Curacchiaghiu series, Lévie, Corsica

Charcoal from sepulchral cave, Curacchiaghiu (41° 42’ N Lat, 9° 8’ E Long), Lévie, Corsica. Coll. and subm. 1966 by R. Grosjean.

Gif-796. Curacchiaghiu, Corsica 6

Level 5, 80 cm depth.

Gif-795. Curacchiaghiu, Corsica 5

Level 5, 117 cm depth.

General Comment: dates arrival, maybe from N Africa, of a Neolithic culture with obsidian lithic industry and stamped and dotted ceramics (de Lanfranchi, 1967). Gives early date for apparition of ceramic in W Mediterranean.

Chaume de Montforgeon series, Courcelles-Fremoy, Côte d’Or


Gif-734. Chaume de Montforgeon, No. 1

A.D. 1120

40 to 80 cm depth.

Gif-735. Chaume de Montforgeon, No. 2

A.D. 1280

80 cm to 1 m depth.

General Comment: the 2 samples probably date same level.

Chaume-les-Baigneux series, Côte d’Or

Charcoal, in a barrow, at Chaume-les-Baigneux (47° 38’ N Lat, 4° 34’ E Long), Côte d’Or. Coll. and subm. 1966 by R. Ratel, Fac. Sci., Dijon, Côte d’Or.

Gif-786. Chaume-les-Baigneux 1

A.D. 90 to 80 cm depth.

2710 ± 110

760 B.C.
Gif-1109. Chaume-les-Baigneux 2
Charcoal from incineration.
*General Comment:* no archaeologic clue to date barrow. Belongs to Late Bronze age—Iron age limit.

Gif-789. Minot, Côte d'Or
Carbonized wood from Gallo-Roman villa, Ferme de Busserolles, Minot (47° 39' N Lat, 4° 54' E Long), Côtes d'Or. Coll. by R. Ratel and subm. 1967 by A. Joly, Circonscription des Antiquités Préhistoriques de Dijon. *Comment:* sample very well dated by archaeology at ca. 200 A.D. and used for calibration.

Bressey series, Côte d'Or
Different samples coll. at Bressey (47° 18' N Lat, 5° 11' E Long), Côtes d'Or and subm. 1966, 1967 by R. Ratel.

Gif-727. Sablière de Bressey, 1
Charcoal from refuse pit in Sablière de Bressey. *Comment:* assoc. ceramics typically from Hallstatt age. Too young.

Gif-1090. Ferme de Clair Bois, Bressey
Charcoal from incineration in barrow from Late Hallstatt, Ferme de Clair Bois, Bressey. *Comment:* confirms Gif-727 which dates a refuse pit situated some hundred m from barrow.

Gif-788. Sablière de Bressey, 2
Wood from trunk of *Pinus sylvestris*, 3.50 m in sand, at la Sablière de Bressey. *Comment:* tree from same stratigraphic position as Sablière of Couternon, very close by, dated 9440 b.p. (Gif-341, R., 1966, v. 8, p. 89).

Gif-785. Neuvy-en-Dunois 66, Eure et Loir

Chaussée Tirancourt series, Somme
Charcoal from rehandled part of large gallery grave containing remains of ca. 300 skeletons, La Chaussée Tirancourt (49° 58' N Lat, 2° 10' E Long), Somme. Coll. and subm. 1968 by C. Masset. Sepulcher archaeologically dated from Chalcolithic age. Later on, large blocks of sandstone covering sepulcher were quarried away.

Gif-1289. La Chaussée Tirancourt, No. 1

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<table>
<thead>
<tr>
<th>Gif-1372. La Chaussée Tirancourt, No. 3</th>
<th>3700 ± 120</th>
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<td></td>
<td>1750 B.C.</td>
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<tr>
<th>Gif-1378. La Chaussée Tirancourt, No. 4</th>
<th>3650 ± 120</th>
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<tbody>
<tr>
<td></td>
<td>1700 B.C.</td>
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*General Comment:* this extraction of sandstone began very soon after the sepulcher.

**B. Africa**

<table>
<thead>
<tr>
<th>Gif-840. Tisoukai, Tassili n’Ajjer, Sahara</th>
<th>3650 ± 130</th>
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<tbody>
<tr>
<td></td>
<td>1700 B.C.</td>
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</table>

Charcoal from refuse layer, with Neolithic implements, potsherds and assoc. with paintings of “Bovidian” period, at Tisoukai (9° 30' N Lat, 24° 55’ E Long), Tassili n’Ajjer, Sahara. Coll. and subm. 1967 by H. Lhote, Mus, de l’Homme, Paris. *Comment:* youngest date obtained for “Bovidian” period which lasted a few millennia.

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<tr>
<th>Gif-848. Zegag Oued, S Oran</th>
<th>5320 ± 150</th>
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<tr>
<td></td>
<td>3370 B.C.</td>
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**Hassi Messaoud series, E Sahara**

Neolithic sites on oil field at Hassi-Messaoud (32° 00' N Lat, 5° 51’ E Long) E Sahara. Lithic material was studied by H. Brezillon and N. Chavaillon, palynology by F. Beucher. Subm. 1966 by H. Alimen, C.N.R.S., Bellevue.

<table>
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<tr>
<th>Gif-731. Hassi Messaoud, “La Touffe”, x o</th>
<th>5930 ± 150</th>
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<tr>
<td></td>
<td>3980 B.C.</td>
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Coarse black sand with ash, Level III, 50 cm thick, depth ca. 50 cm. Some gramineae and abundant chenopodiaceae. Presence of fish, batrachia, and fresh-water mollusk indicate proximity of a stretch of water. Neolithic industry and ceramics of Capsian type.

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<tr>
<th>Gif-732. Hassi Messaoud, x 5</th>
<th>6100 ± 160</th>
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<td></td>
<td>4150 B.C.</td>
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Black sand with charcoal and shell fragments, depth: some cm. Same industry as Gif-731.

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<tr>
<th>Gif-733. Hassi Messaoud, o Mn 17</th>
<th>5490 ± 150</th>
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<tr>
<td></td>
<td>3540 B.C.</td>
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Sandy black ground, 50 cm thick under yellow sand, in a large depression with flat bottom, diam. ca. 1 km; probably an ancient marsh. Ceramic and lithic industry is slightly more recent than for Gif-731 and -732.

*General Comment:* may be evidence of evolution from Neolithic of Capsian tradition towards pure Saharian Neolithic.
Cave of Bitorri series, Brazzaville, Congo


Gif-459. Cave of Bitorri, 1

Charcoal from Level 17, under 85 cm humic-rich layer with 20 archaeologic levels.

Gif-460. Cave of Bitorri, 2

Shells of gasteropods (kitchen-middens) from Level 14, 70 cm depth. Comment: as for Gif-459, presence of chipped flint implements. General Comment: dates late “Tshitolian” in Central Africa.

Gif-851. Karkarichinkat, Tilemsi, Mali

Human and animal bones from Neolithic site of Karkarichinkat, in Valley of Tilemsi (16° 52’ N Lat, 0° 12’ E Long), 80 km N Gao, Mali. Coll. 1962 by J. Gaussen and subm. 1967 by R. Mauny, Fac. des Lettres et Sci. Humaines, Paris. Karkarichinkat (Mauny, 1955), stretching on some hectares is a site with abundant Neolithic material: axes, heads of arrows, bone tools, ceramics, fauna, etc. (Gaussen and Gaussen, 1960); nearby are very big flint works. Comment: Neolithic age lasted till Iron age in W Africa; age is correct (Mauny et al., 1968).

C. Peru

Chilca Canyon series, Peru


Gif-864. Chilca Canyon, V. 2474

Willow-wood from pillar in a hut, Village 304 (12° 26’ S Lat, 76° 46’ W Long). Comment: dates one of most ancient villages of coast of Peru.

Gif-1070. Chilca Canyon, V. 2411

Burnt plant remains from Site 12 B-VII, Village 867 (12° 32’ S Lat, 76° 41’ W Long). Comment (F.E.): dates one of large pre-agricultural villages in the “lomas” where food was based on a flora growing from the only atmospheric moisture.

Gif-1071. Chilca Canyon, V. 2417

Vegetal debris in Site 12 B-VII, Level I, Village 868 (12° 31’ S Lat, 76° 41’ W Long). Comment: important village of maize consumers in gorge presently entirely dried up.
Gif-1072. Chilca Canyon, V. 2444
2050 ± 110
100 B.C.
Shells from Site 12 B-VII, Level I, Village 933 (12° 31' S Lat, 76° 38' W Long), village of stony houses in the “lomas”.

Gif-1296. Chilca Canyon, V. 2415
6080 ± 150
4130 B.C.
Carbonized vegetal remains from refuse, ash and shell deposit on Site 12 B-VII, Village 908, Chilca Canyon (12° 28' S Lat, 76° 46' W Long), central coast of Peru.

Gif-1297. Chilca Canyon, V. 2532
1420 ± 100
A.D. 530
Carbonized vegetal remains from Site 12 B-VII, Village 933 (12° 31' S Lat, 76° 46' W Long), Chilca Canyon, central coast of Peru.

Comment (F.E.): sample would help date start of potato culture in the village.

Gif-1299. Chilca Canyon, V. 2665
635 ± 110
A.D. 1315
Wool cloth, Site 12 B-VII-12, village on left side of Chilca Canyon (12° 29' S Lat, 76° 43' W Long). Comment: will help date some villages of “Cuculi” phase.

Gif-1298. Bandurria, V. 2664
470 ± 110
A.D. 1480
Cotton cloth fragment from corpse buried at 1 m depth under refuse deposit, Site 12 B-VII-61, village of Bandurria (12° 30' S Lat, 76° 46' W Long). Coll. and subm. 1967 by F. Engel.

Chavin de Huantar series
Carbonized vegetal remains from Chavin de Huantar complex (9° 35' S Lat, 77° 10' W Long), alt 3200 m, Peru. In this monument, signs of a new culture that arrived ca. 1600 B.C. in Peru, were defined and called “Chavin” culture. Coll. and subm. 1967 by F. Engel.

Gif-1077. Chavin de Huantar, V. 2481
2370 ± 100
420 B.C.
Site 8 D-X-I, Level 3, in stairs leading to Great Temple. Coll. by L. G. Lumbreras.

Gif-1078. Chavin de Huantar, V. 2482
2730 ± 110
780 B.C.

Gif-1079. Chavin de Huantar, V. 2483
2100 ± 100
150 B.C.
Gif-707. Bay of Paracas, V. 2335

Human excrement from refuse deposit in a pit, covered by eolian sand, Site 14 A-VI-96, near Bay of Paracas, 265 km S of Lima (13° 51' S Lat, 76° 15' W Long). Alt. +6 m. Coll. and subm. 1966 by F. Engel. Comment: corresponds to Late Preceramic period with cotton, in middle S coast of Peru.

Gif-708. S of Lima, V. 2336

Human excrement from Site 12 B-VII, Village 613, 58 km S of Lima (12° 25' S Lat, 76° 45' W Long), alt 200 m. Found on ground of a “kiwa”, an oval stony construction, half underground with 2 steps. Coll. and subm. 1966 by F. Engel. Comment: corresponds to last occupation of site during Preceramic period.

Gif-770. Perro Perdido, Supe Valley, V. 1654


Gif-771. Bermejo, V. 1656


Gif-772. Paracas, V. 2450

Feathers found on corpse, in a grave, Site 14 A-VI, Village 96, Paracas Peninsula (13° 51 S Lat, 76° 15' W Long), S coast of Peru. Coll. and subm. 1966 by F. Engel.

Gif-1073. Quallikani, Puno, V. 2458

Straw used to temper raw bricks, in a funeral tower, Site 171-XI-2, Level I, Quallikani, Puno (16° 13' S Lat, 19° 54' W Long), alt 4000 m. Coll. and subm. 1967 by F. Engel.

Gif-1074. Cave of Jankulloni, Puno, V. 2461

Carbonized plants from cave of Jankulloni, Site 18 F-II-I, Level 3 (16° 29' S Lat, 69° 22' W Long), Pisacoma dist., Puno, alt 4000 m. Coll. and subm. 1967 by F. Engel. Comment: deepest level of site; assoc. with lithic industry.

Gif-1076. Kampa, Puno, V. 2466

Burnt plants from Rock-shelter I of Kampa, Site 171-XI-I, Level 2, (16° 45' S Lat, 69° 59' W Long), Pisacoma dist., Puno, alt 4100 m.

D. Miscellaneous Countries

**Gif-1247. Arta, Majorca, Balearic Is., M.A.J. S.P.**  950 B.C.

**Mallia series, Kriti**
Charcoal from Mallia (37° 17' N Lat, 25° 27' E Long, Kriti.

**Gif-447. Mallia 1**
Charcoal 70 cm depth in well-sealed layer between stucco ground and close course of bricks. Coll. and subm. 1966 by J. C. Poursat, Ecole Française d’Athènes.

**Gif-448. Mallia 2**
Carbonized wood, 80 cm depth, in destruction layer. Coll. and subm. 1966 by J. C. Poursat.

**Gif-449. Mallia 3**
Charcoal, 80 cm depth, at surface of thick layer of potsherds. Coll. and subm. 1966 by J. C. Poursat. Comment: date is too young.

**Gif-874. Mallia 4**
Charcoal, 2.80 m depth. Coll. and subm. 1967 by J. C. Poursat.

**Gif-875. Mallia 5**
Carbonized wood from a cypress pillar, 90 cm depth, same house as Mallia 4. Coll. and subm. 1967 by J. C. Poursat.

**Gif-1277. Mallia 7**
Charcoal from destruction layer of the “Petit Palais,” 0.50 to 1 m depth, 1 m thick. Coll. and subm. 1968 by O. Pelon, Ecole Française d’Athènes.

**Gif-1279. Mallia 6**
Charcoal, 1 m depth, under a close course of bricks. Coll. and subm. 1968 by J. G. Poursat.
Gif-1521. Mallia 8
Charcoal, from destruction layer of the “Petit Palais.” Coll. and subm. 1968 by O. Pelon.

Mari series, Moyen Euphrate

Gif-496. Mari 1
Fragment of wood from beams of presargonic palace in Mari.

Gif-497. Mari 2
Similar to Gif-496.

Gif-498. Mari 3
Similar to Gif-496.

Gif-721. Mari 6
Fragment of wood from beams from podium of presargonic palace in Mari.

Gif-722. Mari 4
Carbonized wood in central Jar I, Rm. 219, palace in Mari.

Gif-723. Mari 5
Carbonized wood and corns in central Jar 2, Rm. 219, palace in Mari.

General Comment: chronology places level dated by Gif-496, -498 and Gif-727 between 2700 and 2400 B.C. C¹⁴ dates are at least 400 yr too young. But Gif-722 and -723 come from a palace burnt very probably in 1760 B.C.; C¹⁴ dates are, thus, very coherent with archaeologic data.

II. GEOLOGIC AND PALYNOLOGIC SAMPLES

A. France

1. W. France

Gif-709. Plage de Corréjou, Plouguerneau, Finistère
Peat under sand hill, on beach of Corréjou, Plouguerneau (48° 38′ N Lat, 4° 30′ W Long). Coll. and subm. 1966 by M. T. Morzadec, Lab. Geol. Fac. Sci., Rennes. Comment: disagreement with pollen analysis; contaminated by rootlets of present vegetation; base level of the peat bog, 1 m deeper, was found 4250 yr old (Gif-282, R., 1966, v. 8, p. 78; Morzadec, 1969).
Gif Natural Radiocarbon Measurements VI

**Gif-712. Lampaul-Plouarzel, Finistère**

Salt marsh peat from base level of peat bog under sand hill, Plouarzel (48° 28′ N Lat, 4° 46′ W Long), Finistère, 3.50 m above mean sea level. Coll. and subm. 1966 by M. T. Morzadec. *Comment:* Pollen Zone: VII b–VIII transition. Presence of hystrichospheres, at base level only, indicates site was close to seashore, at that time.

**Gif-713. Le Scluz, Brignogan, Finistère**

Submerged peat bog on strand, Le Scluz, Brignogan (48° 41′ N Lat, 4° 20′ W Long) 2.50 m above mean sea level. Coll. and subm. by M. T. Morzadec. *Comment:* Pollen Zone VII b; certainly contaminated.

**Gif-714. Trezien, Plouarzel, Finistère**

Fresh water peat, on shore, Trezien, Plouarzel (48° 26′ N Lat, 4° 47′ W Long), Finistère. Coll. and subm. 1966 by M. T. Morzadec; 1.50 m above mean sea level. Pollen Zone: VII b.

**Gif-818. Santec, Finistère**

Salty peat, ca. 2 m above m.s.l., on shore of Santec, N part (48° 43′ N Lat, 4° 02′ W Long), Finistère. Coll. and subm. 1967 by M. T. Morzadec. *Comment:* pollen analysis: Sub-Atlantic, Zone VIII.

**Landunvez series, Finistère**


**Gif-815. Landunvez 1**

Ca. m.s.l. *Comment:* pollen analysis: Sub-Boreal–Sub-Atlantic transition, VII b–VIII, or just under.

**Gif-816. Landunvez 2**

0.50 m under m.s.l. Zone VII b.

**Gif-817. Landunvez 3**

4 m above m.s.l. *Comment:* pollen zone: Sub-Atlantic. Zone VIII.

**Ploulec’h series, Côtes du Nord**


**Gif-819. Ploulec’h 1**

*Comment:* 2 swords were dredged at this place which corresponds to an ancient ford.
Gif-820. Ploulec’h 2

Comment: many Roman antiquities are found in this ancient river bed.

General Comment: agree well with archaeologic frequentation of the site. Both Zone VIII, Sub-Atlantic.

**Porsguen series, Plouescat, Finistère**


Gif-710. Porsguen, Plouescat 1

Peaty silt, +2.50 m above m.s.l. Comment: many sherds of Bronze age pottery were found in this level. Transition Zone VIIb-VIII.

Gif-711. Porsguen, Plouescat 2

Wood and charred wood from peaty level, +2.00 m above m.s.l. Comment: presence of hystrichospheres. Zone VIIb.

Gif-891. Pointe de la Torche, Plomeur, Finistère

Shells in sandy layer, with gravel, ca. +2 m above sea level, at Pointe de la Torche, Plomeur (44° 31’ N Lat, 4° 22’ W Long), Finistère. Coll. and subm. 1967 by P. R. Giot and A. Guilcher, Fac. des Lettres, Brest. Comment: a 1st sample from another level at another point was dated in 1963, 580 B.P. (Gif-238, R., 1966, v. 8, p. 77). Both corroborate existence of very recent sea levels at this place, as expected.

Gif-1100. La Torche, Plomeur, Finistère

Debris of shells from a lumachelle, 1 m thick, on strand, at low tide sea level, N La Torche, Baie d’Audierne (47° 32’ N Lat, 4° 22’ W Long). Coll. and subm. 1967 by A. Guilcher and P. R. Giot.

Gif-850. Off S. Pointe de Penmarc’h

Shells (Cyprina Islandica) dredged in place, between 110 and 120 cm depth, in muddy sediments called “La Grande Vasière”, on continental shelf, 45 km off S. Pointe de Penmarc’h (47° 20’ N Lat, 4° 32’ W Long). Coll. and subm. by M. Glemarec, Fac. Sci., Brest. Comment: this shell species, at present, occurs only N of 52° N Lat; its presence confirms cold water, S of Bretagne 10,000 yr ago (Glemarec, 1969).

Gif-849. Off estuary of Loire

Shells (Glycymeris) dredged at 40 m depth, in Atlantic Ocean, off estuary of Loire (47° 00’ N Lat, 2° 40’ W Long). Lying on surface sediment, probably not in situ. Coll. and subm. 1967 by M. Glemarec. Comment:
ment: expected to prove fossil species; different varieties of *Glycymeris*, both fossil and living, were found later on this part of continental shelf.

**Gif-876. Loire estuary**

Wood from a big trunk, 12 to 16 m depth, from bank of Loire, at Nantes (47° 14' N Lat, 1° 35' W Long). Subm. 1967 by F. Ottman, Fac. Sci., Nantes. *Comment*: rate of sedimentation in Loire estuary calculated 3 to 4 mm/yr, coherent with other estimates.

**Gif-839. Saint-Lumine de Coutais, Loire Atlantique 2020 B.C.**

Peat, in a drowned peat bog, 125 to 137 cm depth, at Saint-Lumine de Coutais (47° 04' N Lat, 3° 02' W Long). Coll. 1966 and subm. 1967 by N. Planchas. *Comment*: subm. because of abundance of vine pollen at this level, but systematic pollen analysis in region also indicated important mixing of sediments, probably due to a tide-race which devastated country at end of 6th century.

**Asnelles series, Calvados**

Three borings were made in Quaternary formations, along the coast, at Asnelles, (49° 20' N Lat, 0° 34' W Long), Calvados. The 1st one, on the strand, the 2nd, at the top of the beach, 130 m from the 1st and, the 3rd in the marsh behind shoestring sands, ca. 70 m SE of the preceding one. At the bottom, is sandy gravel, becoming finer and then silty with organic remains; peat overlies silty sand. On the top, in Borings 2 and 3, are either brackish or marine sediments, which are probably eroded in Boring 1. Alt of borings relative to m.s.l. is +0.3 m for Boring 1, +2.65 m for Boring 2, and + 3.20 m for Boring 3. Peat or peaty silt were coll. and subm. 1967, 1968 by C. Larsonneur, Fac. Sci., Caen, Calvados. Palynologic study was done by H. Elhai. Depths are given from top of the core.

**Gif-1009. Asnelles, Boring 1, As 9**


**Gif-1012. Asnelles, Boring 1, As 23**

210 cm depth, base level of peat bog. *Comment*: according to pollen analysis, would correspond to Alleröd.

**Gif-1013. Asnelles, Boring 2, As 34**

83 cm depth.

**Gif-1014. Asnelles, Boring 2, As 36**

105 cm depth.
Gif-1015. Asnelles, Boring 2, As 38
126 cm depth.

Gif-1016. Asnelles, Boring 2, As 39
160 cm depth.

Gif-1017. Asnelles, Boring 2, As 40

Gif-1176. Asnelles, Boring 3, As 51
50 cm depth.

Gif-1177. Asnelles, Boring 3, As 53
70 cm depth.

Gif-1178. Asnelles, Boring 3, As 56
110 cm depth.

Gif-1179. Asnelles, Boring 3, As 58
150 cm depth.

Gif-1180. Asnelles, Boring 3, As 64
200 cm depth.

General Comment: good correlation with pollen analysis for the 3 cores. Peat bog was formed while sea was still very low, hence depths cannot be related to former sea level. It is only during the Sub-Boreal that influence of the sea is seen (presence of Chenopodiaceae); by that time sea level was very near the present.

Peat formation was particularly rapid during the Boreal period (10 cm/100 yr) and from the end of Atlantic to Sub-Boreal period (5700 to 2700 B.P.) (Delibrias et al., 1969).

Cherbourg harbor series, Manche
Submerged peat from borings, off Cherbourg. Subm. 1968 by C. Larsonneur. Depths related to m.s.l.

Gif-1020. Cherbourg, 121 C
In Becquet bay (49° 40’ N Lat, 1° 32’ W Long). Depth: 34.60 m. Comment: very young for such depth.

Gif-1021. Cherbourg, 128 C
In Becquet bay (49° 41’ N Lat, 1° 33’ W Long). Depth: 34.40 m.

Gif-1022. Cherbourg, 215 C
In outer roadstead (49° 40’ N Lat, 1° 37’ W Long). Depth: 29.10 m.
Gif-1023. Cherbourg, 235 C

In outer roadstead (49° 40' N Lat, 1° 37' W Long). Depth: 22.90 m. General Comment: interesting for studying variations of sea level (Delibrias and Guillier, in press).

**Le Havre series, Channel**


- **Gif-744. Core 289**
  26.75 m (49° 30' N Lat, 0° 06' E Long).
  9900 ± 300 7950 b.c.

- **Gif-745. Core 287 bis**
  27.40 m (49° 30' N Lat, 0° 06' E Long).
  9730 ± 300 7780 b.c.

- **Gif-746. Core 284**
  27.70 m (49° 30' N Lat, 0° 06' E Long).
  9340 ± 300 7390 b.c.

- **Gif-1019. Core 9 H**
  19.50 m (49° 28' N Lat, 0° 17' W Long).
  8130 ± 190 6180 b.c.

- **Gif-1238. Core X**
  29 m (49° 28' N Lat, 0° 17' W Long).
  8850 ± 200 6900 b.c.

- **Gif-1401. Core 804**
  21.5 m to 22.7 m (49° 28' N Lat, 0° 17' W Long).
  General Comment: agrees well with pollen analysis (Michel, 1968). Interesting for studying variation of sea level.
  8250 ± 220 6300 b.c.

- **Gif-1067. Saint Sauveur de Pierrepont, Manche**
  Mollusk shells, underlying greensand and pebbles, 16.40 m thick, in boring at Saint Sauveur de Pierrepont (48° 37' N Lat, 1° 36' W Long), Manche. Ca. —6.40 m related to m.s.l. Coll. and subm. 1967 by C. Pareyn, Fac. Sci., Caen. Comment: impossible to interpret shell bed as old beach.
  9650 ± 210 7700 b.c.

- **Gif-1110. Mammoth tooth, Channel**
  Collagen from mammoth tooth from Channel, ca. 60 m depth (50° 27' N Lat, 0° 25' W Long), from site of numerous mammoth remains. Subm. 1967 by C. Larsonneur. Comment: from same site as Sa-342 (8720 ± 300, R., 1966, v. 8, p. 90), of which total carbon (not only collagen) was extracted for dating.
  19,300 ± 700 17,350 b.c.
2. N. and Central France

Marquenterre series, Picardie


Gif-841. Marquenterre, 100 cm
Sandy brown peat. 980 ± 100 A.D. 970

Gif-842. Marquenterre, 440 to 460 cm
Brown peat with vegetal remains. Pollen zone: late appearance of Fagus; Sub-Atlantic. 3060 ± 110 1110 B.C.

Gif-843. Marquenterre, 580 to 600 cm
Brown peat, with lighter zones. Pollen zone: Atlantic-Sub-Boreal transition. 5080 ± 140 3130 B.C.

Gif-844. Marquenterre, 640 to 660 cm
Brown peat with shells of small gastropods. 5520 ± 150 3570 B.C.

Gif-845. Marquenterre, 660 to 670 cm
Brown peat with sandy appearance. Pollen zone: Atlantic period with Quercus, Tilia, Ulmus, and Alnus dominant. 6450 ± 160 4500 B.C.

General Comment: dates stages of formation of coastal plain of Picardie.

Gif-836. Mur de Sologne, Loiret

Rians series, Cher

Peat from bog, Rians (47° 09' N Lat, 0° 15' E Long), Cher. Coll. 1966 and subm. 1967 by N. Planchais.

Gif-837. Rians, 0.70 m depth
Pollen zone: Quercus, Tilia, just before beginning of Fagus. Beginning of Sub-Atlantic. 3970 ± 140 2020 B.C.

Gif-838. Rians, 1.10 to 1.40 m
Pollen zone: Quercus and Ulmus abundant, Tilia at low frequency and Fraxinus at beginning. Indicates Boreal-Atlantic boundary. 6630 ± 170 4680 B.C.
Mont de l’Espinouse series, Cévennes


Gif-1101. La Salverguette

A.D. 1100

75 cm depth, (43° 38’ N Lat, 2° 54’ E Long), alt: 1070 m.

Gif-1102. La Salverguette

A.D. 810

100 cm depth, base level.

Gif-1103. Font-Salesse

A.D. 1600

65 cm depth, base level (43° 36’ N Lat, 2° 58’ E Long), alt: 1060 m.

Gif-1104. Baissescure

4050 B.C.

140 cm depth, base level with silt, (43° 32’ N Lat, 2° 48’ E Long), alt: 1000 m.

General Comment: except for Gif-1104, which is dated from Boreal, ages found are surprising and tend to cast doubt on accepted inferences from pollen analysis in this region. This is probably due to geography of region, subject both to Mediterranean and Atlantic influences. Pollen study by de Beaulieu (1969).

3. S. E. and S. W. France

Gif-1129. La Flachère, Isère

>35,000


Gif-1130. Bruant, Isère

>35,000

Debris of branches in local moraine of Vercors, Bruant (45° 01’ N Lat, 5° 37’ E Long), Isère. Coll. and subm. 1968 by G. Montjuvent. Comment: question was whether this moraine was built recently by local glaciers.

Gif-824. Plateau de la Matheysine, Savoie

7880 B.C.

Submerged peat, from bank of Lac Mort, on Plateau de la Matheysine (45° 02’ N Lat, 5° 47’ E Long), S E Grenoble. Coll. and subm. 1967 by G. Montjuvent. Plateau is a glacial valley, alt: 900 m. During the Würm it was occupied by 2 glacier tongues; the Romanche tongue, at the N, built a series of frontal moraines which now delimit 4 dammed lakes; one is Lac Mort. Age of peat implies that glacier evacuated the valley ca. 10,000 B.P.
**Gif-825. Trièves, Savoie**

Fossil wood in calcareous and marly material transported in a landslide over Würm moraine (44° 47' N Lat, 5° 44' E Long). Coll. and subm. 1967 by G. Montjuvent. *Comment*: corrects geologic map on which these sediments were shown as post-Würm alluvium.

**Lac de Balcère series, Pyrénées Orientales**

Peat from submerged peat bog of Lac de Balcère (42° 35' N Lat, 2° 03' E Long), Pyrénées Orientales; alt: 1764 m. Coll. and subm. 1967 by C. Jalut, Lab. de Botanique, Fac. Sci., Toulouse.

- **Gif-1060. Lac de Balcère, Palyn 6**
  0.50 m to 0.60 m depth. Pollen analysis: Zone VII b of Sub-Boreal period. *Comment*: too young; superficial levels probably slightly contaminated.

- **Gif-791. Lac de Balcère, Palyn 1**
  1.50 m to 1.60 m depth. Pollen analysis: appearance of *Abies*; end of Pre-Boreal period. *Comment*: date in good agreement.

- **Gif-792. Lac de Balcère, Palyn 2**
  2.60 m to 2.70 m depth. Pollen analysis: Zone II of Allerød. *Comment*: in good agreement.

*General Comment*: aids study of evolution of flora from Early Dryas to Sub-Atlantic. Allerød oscillation is shown for 1st time in Pyrénées Orientales (Van Campo and Jalut, 1969).

**Mas de la Borde series, Pyrénées Orientales**

Peat bog, in Valley of Têt, Mas de la Borde (42° 32' N Lat, 2° 05' E Long), alt: 1680 m, Pyrénées Orientales. Coll. and subm. 1967 by G. Jalut.

- **Gif-868. Mas de la Borde, Palyn 3**
  0.70 m to 0.80 m depth; from surface to 0.60 m depth, ploughed soil overlies peat bog with sharp contact. Pollen analysis indicates beginning of cultivation.

- **Gif-869. Mas de la Borde, Palyn 4**
  2.30 m to 2.40 m depth. Pollen analysis: extension of *Abies*. *Comment*: in good agreement.

- **Gif-870. Mas de la Borde, Palyn 5**
  3.50 m to 3.60 m depth.

*General Comment*: *Abies* is dated here at 7500 B.P. whereas it is dated...
at 9250 b.p. at Lac de Balcère; these 2 peat bogs, some km apart, have very different exposures, which can explain age difference.

**Gurp series, Médoc**

**Gif-1032. Gurp, G. U. Paleosol**
Black organic horizon, A<sub>0</sub> A<sub>1</sub>, of a Podzol under a dune, 150 to 170 cm below top of cliff. **Comment:** iron hardpan was without carbon; age similar to other Podzols in region.

**Gif-1105. Gurp, G. U., wood**
Wood from lignite, from foot of cliff, 340 cm depth, just above blue gray silt. **Comment:** too old to be dated by C<sup>14</sup>, as expected.

4. Mediterranean

**Gif-738. Shoal of Méjean**
Polyparies, 3.90 m below surface; in sediment core C.A.P.P. 58, at 430 m depth, 12 km S of Lérins Is. (43° 23' N Lat, 7° 1' E Long) (Pautot, 1967). Coll. and subm. 1966 by G. Pautot, Sta. de Géodynamique sous-marine, Villefranche-sur-Mer, Alpes Maritimes. **Comment:** agrees with known sedimentation rates in W Mediterranean Sea (Labeyrie et al., 1968).

**Gif-829. Little Submarine Canyon of Planier**
*Chlamys septemradiatus*, 24 km off Cap Couronne, 170 m depth in the little Canyon of Planier (43° 34' N Lat, 5° 05' E Long), Mediterranean. Dredged during Mission Calypso 1966 and subm. 1967 by L. Dangeard, Fac. Sci., Caen. **Comment:** *Chlamys septemradiatus* is characteristic of cold water.

**Gif-828. Living Chlamys, Marseille**
δC<sup>14</sup> = +8.4%
Coll. near Marseille, 1967 (43° 05' N Lat, 5° 06' E Long).

**Tchad series**
In low regions of Tchad, between 13th and 17th parallel, 2 lithostratigraphic units may be distinguished: (1) Soulias series forms sandy bars with layers of clay and marl with Ostracods in interdune depression. (2) Labdé series is lacustrine, clayey and diatomaceous, or calcareous, 10 to 15 m thick, in which 2 lacustrine extensions can be distinguished: 1<sub>1</sub> and 1<sub>2</sub> (Servant et al., 1969). Samples coll. and subm. 1966-1968 by M. Servant. Office de la Recherche Sci. des Territoires d’Outre Mer (O.R.S.T.O.M.), Fort-Lamy, Tchad.

**Gif-799. Amakha, Tchad, S-805**
Mollusk shells, 1 km S of well of Amakha (13° 51' N Lat, 15° 28' E Long), Tchad, in sandy silt with calcareous concretions, 5 m above
Bahr-el-Ghazal. Comment: top of recent alluvium of base of Bahr-el-Ghazal.

**Gif-1096. Nedeley, Tchad, S-1106**
A.D. 1810

*Pila* shells in sandstone at top alluvium of floor of Bahr-el-Ghazal, 1 km E of Nedeley well (15° 36' N Lat, 18° 09' E Long), Tchad. *Comment:* base at Bahr-el-Ghazal was marshy at very recent period; assoc. with elephant and hippopotamus.

**Gif-1099. Kosomanga, Tchad, S-1426**
A.D. 200

*Bulinus* shells in interdune depression at Kosomanga (14° 02' N Lat, 16° 03' E Long), Tchad. *Comment:* confirms existence of moist pulsation in Tchad ca. 1800 B.P. Sequence I₂ of Labdé.

**Gif-798. Well of Salal, Tchad, S-731**
A.D. 190

Peaty silt in a well of Salal (14° 50' N Lat, 17° 13' E Long), 11.60 m depth at base of lacustrine silt. *Comment:* base of alluvium of Bahr-el-Ghazal.

**Gif-797. Ebeta, Tchad, S-485**
500 B.C.

Tufa with Phragmites from upper part of lacustrine sediment, 1 m thick, in 1 unterdune depression, Ebeta (13° 48' N Lat, 15° 42' E Long). *Comment:* dates end of a wet period, 2nd sequence of lacustrine Labdé series, I₂.

**Gif-1230. Largeau, S Sahara, Tchad, K-339**
550 B.C.

*Valvata* shells at base of thin calcareous diatomic layer, on landing field at Largeau (17° 56' N Lat, 18° 07' E Long).

**Gif-1234. Kichi-Kichi, Tchad, K-289**
1430 B.C.

*Valvata* shells at base of calcareous silt with diatoms, 48 km S E of well of Kichi-Kichi (17° 19' N Lat, 17° 47' E Long). *Comment:* agrees well with stratigraphy.

**Gif-1229. Well of Kelba, Tchad, S-1639**
1550 B.C.

Organic remains in sand, 4.75 m depth, in well of Kelba (13° 45' N Lat, 16° 31' E Long). *Comment:* inserted in lacustrine series of Labdé (Sequence I₂); to be related to a regressive phase.

**Gif-1264. Angamma, Tchad, K-32**
4100 B.C.

Nodule of calcareous sandstone, atop a deltaic body at Angamma, 32 km E of Kichi-Kichi, Tibesti (17° 34' N Lat, 17° 38' E Long). *Comment:* 2 dates for base of this body: 9260 ± 140 (T-731) and 10,160 ± 160 (T-732) (Servant et al., 1969) show that deltaic series is entirely Holocene, when rivers were flowing and this area was in a pluvial zone.
Gif-1231. Largeau, Tchad, K-354
Diatomaceous limestone, at base of minor diatomaceous sequence, in outcrop 5 km ENE landing field at Largeau (17° 57’ N Lat, 19° 11’ E Long).

Gif-1227. Well of Tjéri, Tchad, S-1608
Organic remains in clayey layer with diatoms, depth 7 m, in well of Tjéri (13° 44’ N Lat, 16° 30’ E Long). Comment: belongs to 2nd lacustrine cycle of Labdé series.

Gif-1226. Well of Tjéri, Tchad, S-1604
Organic remains in clayey layer with diatoms, depth 7.75 m, in well of Tjéri. Comment: same layer as Gif-1227, slightly deeper.

Gif-1095. Koro-Toro, Tchad, S-1165
Melania shell in outcrop of marly layer above sand, at top of cliff, NNE Koro-Toro (16° 05’ N Lat, 18° 29’ E Long), Bahr-el-Ghazal, Tchad. Comment: base of diatomaceous Sequence 12.

Gif-801. Kamala, Tchad, S-826
Melania shells, in marly layer, 0.10 m thick in basal lacustrine unit, 10.50 m thick, in wall of a well, Kamala (13° 02’ N Lat, 16° 15’ E Long). Comment: dates transgression of ancient lake and belongs to lower part of Sequence 12.

Gif-1094. Nedeley, Tchad, S-1116
Vegetal debris in silt under remains of Holocene diatomites in outcrop, 2 km S of well at Nedeley (15° 35’ N Lat, 18° 10’ E Long), Bahr-el-Ghazal, Tchad. Comment: base of diatomaceous Sequence 12.

Gif-1097. Nedeley, Tchad, S-1121

Gif-1233. Kichi-kichi, Tchad, K-294
Lacustrine shells in sand intercalated between lacustrine sediment with gravel, 48 km SE of Kichi-Kichi well (17° 19’ N Lat, 17° 47’ E Long). Comment: belongs in Sequence 12.

Gif-847. Djazena, Tchad, S-1055
Biomphalaria and Bulinus shells in marly layer at base of lacustrine
sequence, 8.85 m depth in well at Djazena (13° 48' N Lat, 17° 36' E Long), Tchad. Comment: dates end of Sequence 1c.

Gif-1228. Well of Kelba, Tchad, S-1633

Sandy, silty limestone with ostracods between 2 eolian-sand deposits, depth 12.30 m in Kelba well. Comment: dates lacustrine unit in Soulias series.

Gif-800. Well of Kamala, Tchad, S-819

Fine limestone from thin calcareous layer in lacustrine sequence between 2 periods of sand reworking; 15.35 m in well of Kamala. Comment: upper part of lacustrine unit of Soulias series. General Comment: 2 lacustrine transgressions were dated in Labdé series; the last one, which corresponds to Sequence 1c, is the longest, characterized by 2 regressive episodes ca. 8500 to 7000 B.P. and 4000 to 3500 B.P. During the 2 last millennia, the lowest regions of Tchad, N of the 16th parallel, connected with Lake Tchad, until 150 B.P.

Gif-1028. Chari River, S Lake Tchad, Ref. 23


Gif-1029. Lake Tchad, Ref. 663

Hardened silt with organic remains, 40 to 50 cm depth in sediments, between lacustrine layers, 2.90 m below surface of Lake Tchad (13° 27' N Lat, 14° 30' E Long). Coll. and subm. 1967 by B. Dupont. Comment: marks regression of lake; helps to calculate sedimentation rate of 1m/yr (Dupont and Delibrias, 1970).

Sebkha de N'Dramcha series, Mauritania

Shells from coastal Sebkha de N'Dramcha, N of Nouakchott, Mauritania. Stratigraphy of upper Quaternary in region shows 2 marine transgressions separated by a dry period with dune accumulation; last marine episode was followed by evaporation, indicated by a silty-gypsiferous layer. Coll. and subm. 1967 by C. Fontes, Fac. Sci., Paris.

Gif-852. Sebkha de N'Dramcha, N. K-171

Cardium edule, ca. 2 m depth in silty-gypsiferous layer (18° 36' N Lat, 15° 46' W Long). Comment: dates beginning of evaporation series, following closing of gulf.

Gif-853. Sebkha de N'Dramcha, N. K-172

Shells (Venus sp.) of various forms, 90 cm below N.K-171, in quartzose sediment, partly terrigenous (18° 36' N Lat, 15° 46' W Long). Comment: dates maximum of Nouakchottian transgression.

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Gif-856. Sebkha de N’Dramcha, N. K-193  
Cardium edule, 25 cm below a sandy crust (18° 50’ N Lat, 15° 29’ W Long). Comment: occupies a central position related to supposed outlines of Nouakchottian gulf; expected to be much older.

Gif-854. Sebkha de N’Dramcha, N. K-191  
Arca senilis from lumachelle cropping out from recent formation, NW of Sebkha (18° 55’ N Lat, 15° 23’ W Long). Comment: belongs to shelf-rich shore of Upper Inchirian.

Gif-855. Sebkha de N’Dramcha, N. K-192  
Arca senilis, 30 cm below surface (18° 52’ N Lat, 15° 28’ W Long). General Comment: dates determine shorelines corresponding to Nouakchottian and Inchirian extensions of gulf.

Delta of Ogooué series, Gabon
Algae and mollusk shells from calcareous submarine layer, off delta of Ogooué, on continental shelf of Gabon. Coll. by dredging and subm. 1965 by P. Giresse, Fac. Sci., Caen.

Gif-456. Delta of Ogooué, G-600-50  
50 to 60 cm depth (0° 23’ S Lat, 8° 55’ E Long).  
590 ± 95  A.D. 1360

Gif-457. Delta of Ogooué, G-300-15  
10 to 20 m depth (0° 31’ S Lat, 8° 56’ E Long).  
1540 ± 100  A.D. 410

General Comment: expected to date an ancient shoreline; but obviously dredged material was not in situ.

Gif-871. Terrace of Benoué, N Cameroon

C. South America

Brazil coast series

Gif-1059. Sitio Forte, Ila Grande, J.L. Br-67-1  
Vermets limestone (23° S Lat, 45° W Long), +2.60 m.  
3420 ± 110  1470 B.C.

Gif-1060. Sitio Forte, Ila Grande, J.L. Br-67-2  
Vermets and Balanes limestone (23° S Lat, 45° W Long), +1.70 m.  
1670 ± 100  A.D. 280
Gif-1061.  **Sitio Forte, Ilha Grande,**
**J.L. Br-67-3**  
380 ± 90  
A.D. 1570  
Vermets limestone (23° S Lat, 45° W Long), ca. +0.50 m.

Gif-1062.  **Reef of Rio Doce, Olinda,**  
**Pernambuco, J.L. Br-67-4**  
3100 ± 120  
1150 B.C.  
Madrepora (Montastrea cavernosa) (8° S Lat, 37° 10’ W Long), +3 m.

Gif-1063.  **Reef of Rio Doce, Olinda,**  
**Pernambuco, J.L. Br-67-5**  
1830 ± 110  
A.D. 120  
Madrepora (Siderastrea stellata), (8° S Lat, 37° 10’ W Long), ca. present sea level.

Gif-1064.  **Reef of Rio Doce, Olinda,**  
**Pernambuco, J.L. Br-67-8**  
1390 ± 90  
A.D. 1560  
Melobesies limestone (8° S Lat, 37° 10’ W Long), ca. +50 cm.

Gif-1065.  **Lagoa de Itahype, Ilheus,**  
**Bahia, J.L. Br-67-6**  
4070 ± 140  
2120 B.C.  
Madrepora (Mussismilia braziliensis), (14° 30’ S Lat, 39° W Long), ca. present sea level. *Comment*: species not now living in region.

Gif-1066.  **Ilha de Caieira, Vitoria Bay,**  
**Espirito Santo, J.L. Br-67-7**  
5520 ± 150  
3570 B.C.  
*Mussismilia hartii* (20° 10’ S Lat, 40° 15’ W Long). *Comment*: species not now living in this lat.

**General Comment**: good correlation between dates and levels for these coastal regions of Brazil, 2000 km apart. Confirms existence in Brazil of recent variations of sea level as indicated by Van Andel and Laborel (1964) and studied by Bigarella (1965). Gif-1064 and -1065 date a climatic optimum because of disappearance of species from region.

**Sambaqui da Pedra Oca series, Brazil**

Shells from Sambaqui da Pedra Oca, Bahia de Todos (12° 51’ S Lat, 38° 31’ W Long), Santos, Brazil (Calderon, 1964). Coll. and subm. 1969 by J. Labeyrie.

Gif-1067.  **Sambaqui da Pedra Oca 1**  
2180 ± 110  
230 B.C.  
Taken from beach rock under sambaqui, ca. +1 m of present sea level.

Gif-1068.  **Sambaqui da Pedra Oca 2**  
2630 ± 110  
680 B.C.  
Shell from basal horizon of sambaqui, above beach rock.  
*General Comment*: dates construction of Sambaqui, just after a slight marine transgression.

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**Rio de la Plata series, Argentina**


**Gif-736. Rio de la Plata 1**

Shells dredged from black silt under sediment, S Arquimedes bank, (35° 12' N Lat, 56° 17' W Long) in lagoon formation, attributed to a slightly regressive episode.

**Gif-737. Rio de la Plata 2**

Shells from beach ridge farthest inland, a few m above present sea level, Rio de la Plata.

*General Comment:* no precise indication of alt of samples but in this very flat country, slight variation of sea level can explain penetration of sea a few km inland; Gif-737 may date maximum of a transgression.

**D. Miscellaneous Countries**

**Gif-835. Neutraubling, Bavaria**

Bone, 1.60 m depth in layer of Danube alluvium, 10 m thick, Neutraubling, SE of Regensburg (48° 59' N Lat, 12° 11' E Long), Bavaria. Coll. 1962 and subm. 1967 by M. Léger, Inst. de Géog., Paris. *Comment:* date shows upper part of layer belongs to older Dryas and not to end of Würm, as supposed (Léger, 1965). Collagen not extracted for measurement.

**Gif-780. Aalter, Belgium**

B2h horizon of Podzol beneath eolian sand 75 cm thick, Aalter, 20 km NW Gand (50° 50' N Lat, 3° 29' E Long), Belgium. Coll. and subm. 1966 by C. Sys, Ruks Univ., Ghent. *Comment:* Roman ceramics overlie the Podzol.

**Gif-781. Anzegem, Belgium**

B2h horizon beneath eolian sands 70 cm thick, Anzegem, 30 km SW Ghent (51° 07' N Lat, 3° 28' E Long), Belgium. Coll. and subm. 1966 by C. Sys. *Comment:* like Gif-780, dates overlying sand of sandy region of Flanders.

**Gif-897. Xivares, Asturias, Spain**

Shells (*Purpura hoemastoma*), from Xivares beach (43° 34' N Lat, 2° 02' W Long), Cabo Penas, Asturias, Spain. Alt +3 m. Coll. and subm. 1967 by G. Mary, Fac. Sci., Univ. Caen. *Comment:* in this region recent crustal movement is not excluded.
Gif-730.  S W Madeira Island

Mollusk shells and calcareous algae from shell rocks, 1900 m depth, 15 km off Funchal, SW Madeira (32° 33' N Lat, 16° 56' W Long). Coll. 1966 with bucket of Bathyscaphe by C. Pareyn; subm. 1967 by C. Pareyn and L. Dangeard. *Comment:* considered to be of littoral origin. Possibility of rapid subsidence in this volcanic region is not excluded.

Ile Maré series, New Caledonia


**Gif-1024. Maré, M.A.-64**

From reef knoll in lagoon. *Comment:* date is infinite, as expected.

**Gif-1025. Maré, M.A.-83**

From side of La Rocheknoll, on the ring. *Comment:* age expected: Pleistocene.

**Gif-1026. Maré, M.A.-133**

From Terrace 13, alt +4 m related to highest sea level. *Comment:* Holocene expected.

**Gif-1027. Maré, M.A.-172**

From Terrace 14, alt +2 m related to highest sea level. *Comment:* Holocene expected.

*General Comment:* Maré atoll seems to be recently uplifted ancient atoll, because most dated Pacific atolls have surface ages of 3000 to 5000 yr.

Gif-892. Motu Manu, Atoll de Mapelia, French Polynesia, No. 505

Calcareous coral, at Motu Manu, Atoll de Mapelia (16° 47' S Lat, 153° 59' W Long), alt +1 m. Coll. and subm. 1967 by A. Guilcher. *Comment:* confirms existence of higher recent sea level, in Pacific, as shown at Mururoa atoll by the authors (R., 1969, v. 11, p. 337-338) and by Thurber *et al.* (1965).

Gif-893. Motu Mote, Bora-Bora, French Polynesia, No. 581


Gif-823. Tapao, Phum Chhuk, Wompong Cham, Cambodia

Peaty sample from core at 80 m depth, in alluvium of Mekong, at Tapao, Phum Chhuk (12° 09' N Lat, 105° 44' E Long), Kompong Cham, Cambodia. Coll. and subm. by J. P. Carbonnel, C.N.R.S., Paris. *Com-
ment: corresponds to ancient phase filling of Mekong valley; too old to be precisely placed in history of aggradation.

**Mannavanur series, Madras, Madurai dist., India**

Peaty sediments from marsh in a swale at Mannavanur (10° 13' N Lat, 77° 20' W Long), alt 2100 m, Madras State, Madurai dist., India. Coll. and subm. 1967 by F. Blasco, Inst. Fr., Pondichery, India.

Gif-1136. Mannavanur, I.F.P. A.D. 1170
40 to 50 cm depth, black silty mud with 30% organic matter.

Gif-1137. Mannavanur, I.F.P. A.D. 1050
110 cm depth, sand with 2.8% organic matter.

*General Comment:* recent increase of sedimentation in this depression due to erosion related to destruction of vegetation by man. Rapid sedimentation rate explains why there is no change in pollen composition throughout the profile.

Gif-775. Christmas Harbour, Kerguelen A.D. 1770
Organic remains, 1.20 m depth, in “peatbog”, on a hillside, Bay of Christmas (48° 40' S Lat, 69° 10' E Long), Kerguelen. Bog, 1.50 m thick, lies on gravel bed. Coll. 1965 and subm. 1966 by N. Bellair, Fac. Sci., Paris. “Peatbog” on this island designates thick spongy soil containing abundant organic remains. *Comment:* pollen analysis indicates 2 cold periods: one at base of peat bog, and a 2nd one from 40 to 80 cm depth (Bellair and Delibrias, 1967).

**III. GROUND WATER SAMPLES**

No systematic program for dating ground waters of aquifers exists at the laboratory. Nevertheless, we undertook a short study of aquifers of Saudi Arabia and some preliminary measurements for aquifers of the Paris Basin, now being studied by other laboratories. In Saudi Arabia, water was sampled from aquifers of Wasi-Biyadh and of Minjur and from their respective outcrops; subm. 1967-1968 by Soc. Grenobloise d’Etudes et d’Applications Hydrauliques (SOGREAH) to determine if these aquifers are currently being supplied. Some dates were already obtained by Thatcher *et al.* (1961).

For aquifers of the Paris Basin, samples were subm. by Vuillaume, B.R.G.M., Orléans. Measurements are reported as % of modern, without correction for limestone dilution.

**Wisia-Biyadh Aquifer, Saudi Arabia**

Gif-905. Wadi Nisah, S-9

150 m below water table, middle Wadi Nisah (24° 10' N Lat, 46° 42' E Long).

\[ \delta^{14}C \]

(% of modern) 36.2 ± 0.8
Gif-906. Bijidiyan-Khardj, S-426  
(24° 14' N Lat, 47° 33' E Long).

Gif-908. Khurais, K.S.W.W.J.  
50 m depth from top of the aquifer, at Khurais (25° 03' N Lat, 47° 56' E Long).

Gif-907. Layla, S-892  
(22° 21' N Lat, 46° 49' E Long).

Minjur Aquifer, Saudi Arabia

Gif-910. M., Minjur outcrop, S-1524  
16.5 ± 0.7
Middle part of lower Minjur formation (24° 30' N Lat, 45° 48' E Long).

Gif-909. Shaqra, S-1090  
7.2 ± 0.6
Upper part of the lower Minjur formation (25° 15' N Lat, 45° 15' E Long).

Gif-901. Hayr, S-7  
4.7 ± 0.6
46 m below water table, upper part of upper Minjur formation (24° 26' N Lat, 46° 47' E Long).

Gif-912. Majma'ah, S-999  
4.0 ± 0.6
168 m below water table, middle part of upper Minjur formation (25° 53' N Lat, 45° 21' E Long).

Gif-913. W. Bu'ayja, S-8  
1.75 ± 0.4
(24° 19' N Lat, 46° 50' E Long).

Gif-902. Jiza, S-105  
≤1.2
117 m below water table, middle part of upper Minjur formation (24° 34' N Lat, 46° 45' E Long).

Gif-900. Riyadh Shumeyssi, S-46  
≤1.2
197 m below water table, lower part of the upper Minjur formation (24° 39' N Lat, 46° 43' E Long).

Gif-904. Dirab, S-431  
≤1.2
103 m below water table, middle part of upper Minjur formation (24° 25' N Lat, 46° 30' E Long).

Gif-914. Drumah, S-429  
≤0.5
(24° 38' N Lat, 46° 09' E Long).

General Comment: measurements, accompanied by a classic hydrodynamic study, lead to conclusion that recharge for both aquifers is now
very inferior to discharge; hence, these formations are being depleted naturally, without exploitation.

**Albian Aquifer of Paris Basin, France**

**Gif-600. Radio House, Paris**
Well (48° 52' N Lat, 2° 20' E Long).

**Gif-604. Issy-les-Moulineaux, Seine**
Well (48° 49' N Lat, 2° 17' E Long).

**Gif-605. Fleury-la-Vallée, Yonne, FvH**
Outcrop (47° 53' N Lat, 3° 26' E Long).

**Gif-606. Chichery-la-Ville, Yonne, ch.v.J**
Outcrop (47° 55' N Lat, 3° 31' E Long).

**Gif-607. Viry-Châtillon, Essonne, V.c.A**
Artesian well (48° 40' N Lat, 2° 23' E Long).

**Gif-601. Dige, Yonne, K. K**
Outcrop (47° 43' N Lat, 3° 22' E Long).

Outcrop (47° 46' N Lat, 3° 16' E Long).

**Gif-603. Mantes, Yvelines**
Well (48° 59' N Lat, 1° 43' E Long).

**IV. ATMOSPHERIC SAMPLES**

All atmospheric CO₂ samples coll. to determine increase of C₁⁴/C₁² ratio due to explosion of nuclear devices, and measured between publication of our first results (R., 1964, v. 6, p. 248-249) and end of 1970, reported here.

Technique for CO₂ collection is the same as used previously, i.e., by bubbling air through solutions of NaOH. Flow-rate is chosen to obtain a quasi-total collection of CO₂.

Recently, δC₁³ measurements have become available for filling gases; corrections are now applied to δC₁⁴, taking these values in consideration. For all other measurements, value of −11‰ corresponding to average of measured δC₁³, was assumed.

**Val Joyeux series, France**

Scientific sta., Val Joyeux, Univ. of Paris, 10 km from Versailles, in the countryside, until now situated away from large roads (48° 49' N Lat, 2° 01' E Long). Mostly level atmosphere comes from W and, therefore, is not contaminated with CO₂ coming from industrial area of Paris which extends 20 km to 70 km E of Val Joyeux. All coll. samples are reported here. In Fig. 1, ΔC₁⁴ for samples coll. before 1963 (R., 1964, v. 6, p. 248-249) have been recalculated with δC₁³ value equal to −11‰.
Fig. 1. Per mill C\textsuperscript{14} excess over natural concentration at Val Joyeux in France at Iles Kerguelen (Indian Ocean) and in Terre Adélie (Antarctica). Statistical errors are given in the legend. Parts of curves with dotted lines correspond to some periods when samplings were not done. All other values have been included.
<table>
<thead>
<tr>
<th>Date no.</th>
<th>Sample no.</th>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>$\delta^{14}C%_{oo}$</th>
<th>$\delta^{13}C%_{oo}$</th>
<th>$\Delta%_{oo}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Apr.</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gif-2004</td>
<td>64-II-A</td>
<td>May</td>
<td>6</td>
<td>1964</td>
<td>970</td>
<td>-11</td>
<td>915 ± 14</td>
</tr>
<tr>
<td>Gif-2006</td>
<td>64-IV-A</td>
<td>Oct.</td>
<td>28</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Nov.</td>
<td>7</td>
<td>1964</td>
<td>740</td>
<td>-11</td>
<td>691 ± 13</td>
</tr>
<tr>
<td>Gif-2008</td>
<td>65-II-A</td>
<td>Apr.</td>
<td>14-22</td>
<td>1965</td>
<td>850</td>
<td>-11</td>
<td>798 ± 14</td>
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<tr>
<td>Gif-2009</td>
<td>65-III-A</td>
<td>July</td>
<td>1-7</td>
<td>1965</td>
<td>820</td>
<td>-11</td>
<td>769 ± 14</td>
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<tr>
<td>Gif-2010</td>
<td>65-IV-A</td>
<td>Nov.</td>
<td>10-20</td>
<td>1965</td>
<td>710</td>
<td>-11</td>
<td>662 ± 13</td>
</tr>
<tr>
<td>Gif-2012</td>
<td>66-II-A</td>
<td>Apr.</td>
<td>18-25</td>
<td>1966</td>
<td>760</td>
<td>-11</td>
<td>711 ± 13</td>
</tr>
<tr>
<td>Gif-2014</td>
<td>66-IV-A</td>
<td>Oct.</td>
<td>11-17</td>
<td>1966</td>
<td>760</td>
<td>-11</td>
<td>711 ± 13</td>
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<tr>
<td>Gif-2016</td>
<td>67-II-A</td>
<td>Apr.</td>
<td>10-14</td>
<td>1967</td>
<td>660</td>
<td>-11</td>
<td>614 ± 13</td>
</tr>
<tr>
<td>Gif-2017</td>
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<td>July</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Aug.</td>
<td>7</td>
<td>1967</td>
<td>640</td>
<td>-11</td>
<td>594 ± 13</td>
</tr>
<tr>
<td>Gif-2020</td>
<td>68-II-A</td>
<td>Apr.</td>
<td>4-10</td>
<td>1968</td>
<td>577</td>
<td>-11</td>
<td>533 ± 13</td>
</tr>
<tr>
<td>Gif-2021</td>
<td>68-III-A</td>
<td>July</td>
<td>3-9</td>
<td>1968</td>
<td>580</td>
<td>-11</td>
<td>536 ± 13</td>
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<tr>
<td>Gif-2027</td>
<td>70-I-A</td>
<td>Jan.</td>
<td>15-26</td>
<td>1970</td>
<td>577</td>
<td>-10.2</td>
<td>530 ± 13</td>
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<td>3-8</td>
<td>1970</td>
<td>515</td>
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<td>Gif-2029</td>
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<td>July</td>
<td>1-6</td>
<td>1970</td>
<td>556</td>
<td>-10.24</td>
<td>515 ± 13</td>
</tr>
</tbody>
</table>

* $\delta^{13}C_{oo}$ assumed

**General Comment:** variations are similar to those already pub. by many laboratories: rapid increase of $\Delta C_{14}$ in 1963, followed by a progressive decrease pulsed by a yearly injection ("Spring injection") which grows less important and disappears completely after 1966.

**Iles Kerguelen series**

Atmospheric CO₂ coll. at scientific sta. Port aux Français, Iles Kerguelen (49° 21' N Lat, 70° 13' E Long) begun in 1965 by technicians of Terres Australes and Antarctiques Françaises. Small building shelter-
ing sampling apparatus, away from main sta., was accidentally destroyed in 1968, leaving no samples for April, July, and October 1968. Every year, in January, bottles with NaOH solution are brought back from Kerguelen to Gif with equipment of expedition.

<table>
<thead>
<tr>
<th>Date no.</th>
<th>Sample no.</th>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>(\delta^{13}C)</th>
<th>(\delta^{14}C)</th>
<th>(\Delta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gif-2066</td>
<td>K-II-65</td>
<td>Apr.</td>
<td>3-7</td>
<td>1965</td>
<td>660</td>
<td>(-11)</td>
<td>614 ± 13</td>
</tr>
<tr>
<td>Gif-2067</td>
<td>K-III-65</td>
<td>July</td>
<td>5-9</td>
<td>1965</td>
<td>620</td>
<td>(-11)</td>
<td>575 ± 13</td>
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<tr>
<td>Gif-2068</td>
<td>K-IV-65</td>
<td>Oct.</td>
<td>4-9</td>
<td>1965</td>
<td>640</td>
<td>(-11)</td>
<td>594 ± 13</td>
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<tr>
<td>Gif-2070</td>
<td>K-II-66</td>
<td>Apr.</td>
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<td>1966</td>
<td>697</td>
<td>(-11)</td>
<td>647 ± 13</td>
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<tr>
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<td>K-III-66</td>
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<td>4-8</td>
<td>1966</td>
<td>730</td>
<td>(-11)</td>
<td>682 ± 14</td>
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<td>5-10</td>
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<td>594 ± 13</td>
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<td>8-11</td>
<td>1967</td>
<td>674</td>
<td>-10.3</td>
<td>625 ± 13</td>
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<td>Gif-2075</td>
<td>K-III-67</td>
<td>July</td>
<td>1-7</td>
<td>1967</td>
<td>643</td>
<td>-12.0</td>
<td>600 ± 13</td>
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<tr>
<td>Gif-2076</td>
<td>K-IV-67</td>
<td>Oct.</td>
<td>2-7</td>
<td>1967</td>
<td>608</td>
<td>-12.5</td>
<td>568 ± 13</td>
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<td>Gif-2077</td>
<td>K-I-68</td>
<td>Jan.</td>
<td>4-8</td>
<td>1968</td>
<td>608</td>
<td>-11.5</td>
<td>565 ± 13</td>
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<tr>
<td>Gif-2079</td>
<td>K-II-69</td>
<td>Apr.</td>
<td>20-25</td>
<td>1969</td>
<td>582</td>
<td>-10.6</td>
<td>537 ± 13</td>
</tr>
</tbody>
</table>

* \(\delta^{13}C\) assumed

**Terre Adélie, Antarctica series**

Atmospheric \(CO_2\) coll. at sta. Dumont Durville in Terre Adélie (66°40' S Lat, 140° E Long). Coll. made by Expeditions Polaires Françaises, Paris. Sampling began in 1960 and continued till now, except for 1964, when equipment was lost in Papeete Harbour. As in Kerguelen, samples are brought back every year.

<table>
<thead>
<tr>
<th>Date no.</th>
<th>Sample no.</th>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>(\delta^{14}C)</th>
<th>(\delta^{13}C)</th>
<th>(\Delta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gif-2030</td>
<td>TA-I-60</td>
<td>May</td>
<td>16-18</td>
<td>1960</td>
<td>290</td>
<td>(-11)</td>
<td>254 ± 11</td>
</tr>
<tr>
<td>Gif-2031</td>
<td>TA-II-60</td>
<td>Nov.</td>
<td>10-15</td>
<td>1960</td>
<td>390</td>
<td>(-11)</td>
<td>351 ± 11</td>
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<tr>
<td>Gif-2033</td>
<td>TA-II-61</td>
<td>June</td>
<td>1-5</td>
<td>1961</td>
<td>260</td>
<td>(-11)</td>
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<tr>
<td>Gif-2034</td>
<td>TA-III-61</td>
<td>Aug.</td>
<td>9-14</td>
<td>1961</td>
<td>190</td>
<td>(-11)</td>
<td>157 ± 11</td>
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<tr>
<td>Gif-2035</td>
<td>TA-IV-61</td>
<td>Oct.</td>
<td>11-15</td>
<td>1961</td>
<td>305</td>
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<tr>
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<td>TA-I-62</td>
<td>Jan.</td>
<td>7-9</td>
<td>1962</td>
<td>257</td>
<td>(-11)</td>
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<tr>
<td>Gif-2037</td>
<td>TA-II-62</td>
<td>Feb.</td>
<td>24 to</td>
<td>1962</td>
<td>240</td>
<td>(-11)</td>
<td>205 ± 11</td>
</tr>
<tr>
<td>Date no.</td>
<td>Sample no.</td>
<td>Month</td>
<td>Day</td>
<td>Year</td>
<td>δC^{14}‰</td>
<td>δC^{13}‰</td>
<td>Δ‰</td>
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<td>Gif-2039</td>
<td>TA-IV-62</td>
<td>Nov.</td>
<td>9-24</td>
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<td>320</td>
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<td>Gif-2040</td>
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<td>Dec.</td>
<td>1-5</td>
<td>1962</td>
<td>300</td>
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<td>12</td>
<td>1963</td>
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<td>302 ± 11</td>
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<tr>
<td>Gif-2042</td>
<td>TA-II-63</td>
<td>Sept.</td>
<td>4</td>
<td>1963</td>
<td>430</td>
<td>(-11)</td>
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<tr>
<td>Gif-2044</td>
<td>TA-I-64</td>
<td>Oct.</td>
<td>25-30</td>
<td>1964</td>
<td>620</td>
<td>(-11)</td>
<td>575 ± 12</td>
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<tr>
<td>Gif-2045</td>
<td>TA-II-64</td>
<td>Dec.</td>
<td>2-5</td>
<td>1964</td>
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<td>575 ± 12</td>
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<tr>
<td>Gif-2047</td>
<td>TA-II-65</td>
<td>July</td>
<td>1-6</td>
<td>1965</td>
<td>660</td>
<td>(-11)</td>
<td>615 ± 13</td>
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<td>Gif-2048</td>
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<td>Oct.</td>
<td>1-6</td>
<td>1965</td>
<td>675</td>
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<tr>
<td>Gif-2049</td>
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<td>1966</td>
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<tr>
<td>Gif-2050</td>
<td>TA-II-66</td>
<td>Apr.</td>
<td>4-10</td>
<td>1966</td>
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<td>667 ± 13</td>
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<td>1-5</td>
<td>1966</td>
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<td>(-11)</td>
<td>623 ± 13</td>
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<tr>
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<td>1-5</td>
<td>1967</td>
<td>710</td>
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<tr>
<td>Gif-2057</td>
<td>TA-I-68</td>
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<td>Gif-2058</td>
<td>TA-II-68</td>
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<td>4-8</td>
<td>1968</td>
<td>617</td>
<td>(-11)</td>
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<tr>
<td>Gif-2059</td>
<td>TA-III-68</td>
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<td>3-7</td>
<td>1968</td>
<td>614</td>
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<td>Oct.</td>
<td>3-7</td>
<td>1968</td>
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<td>(-11)</td>
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</tr>
<tr>
<td>Gif-2061</td>
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<td>1969</td>
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<td>TA-II-69</td>
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<td>11-15</td>
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<td>9-13</td>
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<td>537</td>
<td>-12.9</td>
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</table>

* δC^{13} assumed

**General Comment:** curves of artificial C^{14} values vs. time obtained in Terre Adélie and in Kerguelen are not as smooth as might be expected if transfer from N to S hemispheres is the sole process. Observed variations seem to indicate stratospheric injections not far from these lats. There is no significant difference between artificial C^{14} values for Terre Adélie and Kerguelen, these curves are very similar to those obtained, e.g., at Makara, New Zealand (41° 18' S Lat, 74° 14' E Long) (Rafter and O'Brien, 1970). Values in 1967 and 1968 are higher in Terre Adélie than in France. Coincidence of Antarctica values with those in N hemisphere appears approximately at end of 1967. Hence it may be estimated that entire troposphere reached fairly uniform C^{14} concentration ca. 5 yr after cessation of main (N hemisphere) nuclear atmospheric tests.
**Spitsbergen series**

Atmospheric CO₂ samples obtained by G. Lambert, Centre des Faibles Radioactivités, Gif-sur-Yvette, who participated in C.N.R.S. expedition in 1966 at Ny-Alesund, in Spitsbergen (78° 55' N Lat, 12° 00' E Long).

<table>
<thead>
<tr>
<th>Date no.</th>
<th>Sample no.</th>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>δC¹⁴‰</th>
<th>δC¹³‰</th>
<th>Δ‰</th>
</tr>
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<tbody>
<tr>
<td>Gif-2082</td>
<td>SP₁</td>
<td>July</td>
<td>7-8</td>
<td>1966</td>
<td>871</td>
<td>(−11)*</td>
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<td>Gif-2083</td>
<td>SP₂</td>
<td>July</td>
<td>28-29</td>
<td>1966</td>
<td>832</td>
<td>(−11)</td>
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<td>Gif-2084</td>
<td>SP₃</td>
<td>Aug.</td>
<td>4-5</td>
<td>1966</td>
<td>846</td>
<td>(−11)</td>
<td>795 ± 14</td>
</tr>
<tr>
<td>Gif-2085</td>
<td>SP₄</td>
<td>Aug.</td>
<td>17-18</td>
<td>1966</td>
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<td>775 ± 14</td>
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<tr>
<td>Gif-2086</td>
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<td>26-27</td>
<td>1966</td>
<td>878</td>
<td>(−11)</td>
<td>824 ± 14</td>
</tr>
</tbody>
</table>

* δC¹³ assumed

*Comment*: these Spitsbergen values are ca. 10% higher than those of I. Olsson (R., 1970, v. 12, p. 283) during same period. Discrepancy has not yet been explained.

**References**


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Delibrias, G. and Guillier, M. T., The sea level on the Atlantic coast and the Channel for the last 10,000 years by the C¹° method: Quaternaria, in press.


Le Provost, F. M. and Giot, P. R., 1966, La céramique d'un site de surface au Minion en Bonen (Côtes du Nord): Annales Bretagne, v. 73, p. 43-49.


