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GIF NATURAL RADIOCARBON MEASUREMENTS XI

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This list is part of a program of publishing our large backlog of unpublished dates. The dates listed here, from 1974 to 1979, include archaeologic samples from various cultures and countries and geologic samples related to sea-level variations, volcanism, and especially the history of paleolakes in Africa.

Ages are calculated according to the Libby half-life of 5570 ± 30 years. The recent standard is 95% of the ^{14}C activity of oxalic acid, referring to 1950. All ages are given in years before present (AD 1950). Corrections for isotopic fractionations are made only when $\delta^{13}C$ values are given.

The marine shells in our present and previous lists are corrected for reservoir effect of ca 400 yr, since there is no systematic isotopic correction. For lascustrine shells and carbonate formations corrections are more complex, and were performed when $\delta^{13}C$ values were available.

Some dates were calibrated using the correction table of Klein *et al* (1982) and are reported as "cal" ages.

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ARCHAEOLOGIC SAMPLES

France

Les Sablins series, Etaples, Pas de Calais

Charcoal from fill of pits from flint chipping workshop (50′ 31′ N, 1° 39′ E). Coll by J Hurtrelle and subm 1975–1977 by J F Piningre. Abundant assoc lithic industry is attributed to Neolithic of "Cerny" type.

Gif-3701. Les Sablins, D II, b 1 **5660 ± 120**

Gif-4024. Les Sablins, B IV, c 1 **5690 ± 120**

General Comment: dates Cerny culture and beginning of "Neolithization" in N France (Hurtrelle & Piningre, 1978).

Gif-3227. Labuissière, Pas de Calais **1720 ± 90**

Charcoal from Gallo-Roman potter's workshop (50° 30′ N, 2° 34′ E). Coll and subm 1973 by G Vion, Soc Recherche Hist, Bruay-en-Artois. *Comment:* date agrees with expectation.

Gif-3611. Houdain-les-Bavay, Nord **920 ± 90**

Charcoal from cave-refuge (50° 18′ N, 3° 48′ E). Coll and subm 1975 by F Ozeel, Maroilles, Nord. *Comment:* date confirms expected age of ceramics.

Gif-3551. Loos-lez-Lille, Nord **1930 ± 100**

Charcoal from refuse ditch, assoc with atypical ceramics (56° 28′ N, 3° 15′ E). Coll and subm 1975 by G Leman, Dir Antiquités Hist, Lille. *Comment:* date agrees with expected La Tène age.

Neuville-sur-Escaut series, Nord

Charcoal samples, at base of pits, in terrace of Escaut R (58° 18′ N, 3° 24′ E). Coll in La Cimenterie quarry and subm 1975 by G Hantute, Circonscription Antiquités Préhist Nord-Picardie, Valenciennes, Nord. Assoc with some metal pieces and crude ceramics.

Gif-3625. Neuville-sur-Escaut, point A **2310 ± 120**

Gif-3626. Neuville-sur-Escaut, point B **2430 ± 110**

Gif-3627. Neuville-sur-Escaut, point C **2420 ± 110**

Gif-3728. Neuville-sur-Escaut, point E **2500 ± 130**

Comment: undersized sample.

General Comment: dates correspond to boundary between Hallstatt and La Tène ages.

Vers-sur-Selle series, Somme

Samples from collective tomb in passage grave (49° 51′ N, 2° 14′ E). Coll and subm 1975–1982 by J F Piningre, Dir Antiquités Préhist, Villeneuve d'Ascq, Nord.

Gif-3698. Vers-sur-Selle, F 3-4 IV **3070 ± 110**

Charcoal from destruction level of monument.

Gif-3699. Vers-sur-Selle, F a-1-1 **4060 ± 120**

Charcoal in fill of pit.

Gif-3700. Vers-sur-Selle, F a-XII b **4240 ± 120**

Charcoal in fill of circular ditch, assoc with Neolithic ceramics of SOM type.

Gif-5740. Vers-sur-Selle, X b **4240 ± 100**

Human bones from tomb.

General Comment: Gif-3700 and -5740 agree well with expected age from assoc industry and type of monument (Piningre & Bréart, 1976).

Jonquières series, Oise

Bovidae bones from open air site (49° 24′ N, 2° 44′ E). Coll and subm 1972 by J C Blanchet, Centre Recherche Archéol, Compiègne, Oise.

Gif-2918. Jonquières, XVII Ba 3 **2340 ± 100**

Depth 0.80 m.

Gif-2919. Jonquières XIV So 2 **5120 ± 130**

From fill of Chassean ditch. *Comment:* agrees with Ly-2970: 5300 ± 140 obtained for bones (R, 1985, v 27, p 432) and with assoc industry.

Chartrettes series, Seine et Marne

Charcoal from deep pits in Hallstatt site, in alluvium of Seine R (48° 29′ N, 2° 41′ E). Coll by J Tarrête and subm 1975 by M Brézillon, Mus Homme, Paris. Assoc with ceramics of Hallstatt period.

Gif-2952. Chartrettes **2750 ± 100**

From detritus pit.

Gif-3677. Chartrettes, pit I, B-C **2450 ± 100**

Gif-3678. Chartrettes, pit II, G **2450 ± 100**

General Comment: dates agree well with assoc ceramics.

Pincevent series, Seine et Marne

Pincevent, famous open-air Late Magdalenian encampment, is situated on left bank of Seine R (48° 23′ N, 2° 53′ E). Series of occupations were found on sands and gravels of Seine R, interspersed with flood loams. Abundance of reindeer bones suggest that inhabitants were mainly hunters. Samples, except for Gif-3480, coll and subm 1981–1983 by M Julien, Coll France and CNRS, Paris.

Gif-3480. Pincevent, 74, IV 2 **9460 ± 170**

Ashes from hearth in Level IV 2, coll 1976 by A Leroi-Gourhan, Coll France, Paris.

Gif-6283. Pincevent, IV 2 **12,120 ± 130**

Carbonaceous material from hearth in Level IV 2, coll 1982.

Gif-6284. Pincevent, IV 26 **11,800 ± 130**

Carbonaceous material from hearth in Level IV 26, coll 1981.

Gif-6310. Pincevent IV 30 **12,100 ± 130**

Carbonaceous material from hearth in Level IV 30, coll 1983.

Gif-5971. Pincevent, IV 40 **12,100 ± 120**

Charcoal Level IV 40, coll 1982.

General Comment: these dates, except for Gif-3480 which is aberrant, with Gif-358: 12,300 ± 400 (R, 1970, v 12, p 430) indicate that Pincevent was occupied ca 12,000 BP but probably only during short periods; this supports homogeneity of finds in different occupation levels.

Gif-3750. Argenteuil, Val d'Oise **870 ± 90**

Wood from pirogue, in sediment of Oise R (48° 57′ N, 2° 15′ E). Coll and subm 1975 by L Lherault, Soc Hist & Archaeol, Argenteuil.

Gif-3329. Guiry-en-Vexin, Val d'Oise **3640 ± 100**

Human bones from collective sepulcher of "SOM" Neolithic type, at Bois Couturier (47° 49′ N, 1° 45′ E). Coll and subm 1974 by M Brezillon. *Comment:* date is slightly younger than "SOM" Neolithic age expected from ceramics.

Gif-3330. Courcelles-sur-Viosne, Val d'Oise **4060 ± 110**

Charcoal from pit, of Middle Neolithic site (49° 05′ N, 2° 00′ E). Coll by J Degros and J Tarrête and subm 1974 by M Brezillon. *Comment:* date is younger than expected.

Gif-3000. Palaiseau, Essonne **1320 ± 90**

Human bones from burial found in archaeol level under sacristy of St Martin of Palaiseau Church (48° 43′ N, 2° 14′ E). Coll and subm 1974 by J M Bartholi, Palaiseau. *Comment:* date confirms existence of Gallo-Roman level (Bartholi, 1975).

Gif-3287. Buthiers, Essonne, FA-060 **4760 ± 110**

Charcoal from Tardenoisian shelter of Chateaubriand (48° 18′ N, 2° 26′ E). Coll and subm 1974 by J Hinout, Château-Thierry, Aisne.

Gif-3557. Sonchamp, Yvelines **4940 ± 120**

Charcoal from Neolithic site of "Augy-Sainte-Pallaye" type (48° 35′ N, 1° 53′ E). Coll and subm 1974 by J Tarrête, Dir Antiquités Préhist région parisienne, Paris. *Comment:* date agrees perfectly with age expected from ceramics.

Montigny series, Loiret

Charcoal from collective tomb (48° 07′ N, 02° 08′ E). Coll and subm 1975 by C Masset, Paris.

Gif-3759. Montigny, D 3-D 2 III **4310 ± 130**

Gif-3760. Montigny, B 3 III **4490 ± 130**

General Comment: dates agree with expected age for this kind of monument.

Gif-2825. Saint-Georges du Bois, Sarthe **2220 ± 100**

Charcoal and ashes from iron foundry settlement (47° 58′ N, 2° 15′ W). Coll and subm 1973 by A Pioger, Le Mans. *Comment:* this foundry activity is dated cal 545-20 BC.

Plelauff series, Kerivoelen, Côtes du Nord

Charcoal from megalithic tomb (48° 13′ N, 3° 11′ W). Coll and subm 1975 by C T Le Roux, CNRS, Rennes.

Gif-3586. Plelauff, 1 **3680 ± 110**

Under pavement.

Gif-3587. Plelauff, 2 **3640 ± 110**

From funeral room.

General Comment: dates indicate Chalcolithic period, in spite of assoc Late Neolithic ceramics of "SOM" type.

Liscuis en Laniscat series, Côtes du Nord

Charcoal from group of three megalithic tombs of passage-grave type on sandy moor (48° 13′ N, 3° 08′ W). Coll and subm 1974–1976 by C T Le Roux.

Gif-3943. Laniscat, 75-1 **2250 ± 90**

Comment: indicates re-use of monument.

Gif-4075. Laniscat, 76-1 **3680 ± 110**

From hearth near tomb, at basal mound around tomb. *Comment:* date suggests re-use of monument during Bronze Age.

Gif-3585. Laniscat, 74-3 **4170 ± 110**

From funeral room of outlying building.

Gif-4076. Laniscat, 76-2 **4200 ± 110**

Comment: dates building of monument.

Gif-3944. Laniscat, 75-2 **4450 ± 110**

Comment: dates building of monument.

General Comment: dates agree well with other dates obtained for these tombs (R, 1986, v 28, no. 1, p 11) and establish chronology of construction of these passage graves.

Gif-3748. Trans, Ille-et-Vilaine **210 ± 80**

Charcoal from pottery kiln (48° 30′ N, 1° 35′ W). Coll and subm 1975 by L Langouët, Univ Rennes. *Comment*: younger than expected.

Gif-3746. Saint-Malo, Ille-et-Vilaine **1050 ± 90**

Charcoal from kiln of bronze foundry inside Alet cathedral (48° 38′ N, 2° 02′ W). Coll and subm 1975 by L Langouët. *Comment*: agrees with expected age from chronology of monument building.

Gif-3747. Erdeven, Morbihan **4800 ± 110**

Charcoal from hearth of flint chipping workshop (47° 38′ N, 3° 12′ W). Coll and subm 1975 by C T Le Roux. *Comment*: site is dated to Neolithic period as expected.

L'Epinette series, Préfailles, Loire Atlantique

Samples from Camp des Fougerais (47° 08′ N, 2° 15′ W) assoc with "augets" pottery salt pans. Coll by M Tessier and subm by J L'Helgouach, Dir Antiquité Préhist, Nantes.

Gif-821. L'Epinette, I **1930 ± 130**

Charcoal, coll 1967.

Gif-3765. L'Epinette, II **1870 ± 100**

Marine shells.

General Comment: both dates disagree with Hallstatt age attributed to ceramics.

La Fougerais B series, Saint-Michel-Chef-Chef, Loire Atlantique

Charcoal from enclosure ditch of promontory Camp (47° 09′ N, 2° 08′ W). Coll by M Tessier and subm 1975 by J L'Helgouach. Assoc with abundant ceramics and remains of pottery kilns.

Gif-3533. Les Fougerais, B I **1890 ± 90**

Comment: dates Late Iron Age ceramics (Tessier, 1983).

Gif-3534. Les Fougerais, B III **2300 ± 100**

Gif-3535. Les Fougerais, B 5 **2300 ± 100**

General Comment: Gif-3534-3435 confirm first settlement of site at 4th century BC, as expected from ceramics (Tessier, 1983).

La Pierre Couvretière series, Ancenis, Loire Atlantique

Human bones found in Neolithic dolmen (47° 22′ N, 1° 18′ W). Coll by D Prigent and subm 1974–1975 by J L'Helgouach.

Gif-3415. La Pierre Couvretière, I **2990 ± 110**

Gif-3763. La Pierre Couvretière, II **2880 ± 100**

General Comment: dates indicate re-use of monument, confirmed by presence of protohistoric potsherds.

Gif-3536. Hêle, Donges, Loire Atlantique **4230 ± 110**

Wood, at foot of menhir (47° 22′ N, 2° 05′ W), overlying blue clay and underlying peat, 0.50m deep. Coll by D Prigent and subm 1974 by J L'Helgouach. *Comment*: date agrees with expected age of monument, but disagrees with presence of Subatlantic pollens in clay.

Gif-3532. Fossé de Gatineau, Saint-Michel-Chef-Chef, Loire Atlantique **4900 ± 110**

Charcoal from ditch of Neolithic camp (47° 10′ N, 2° 08′ W). Coll by M Tessier and subm 1975 by J L'Helgouach. *Comment*: archaeol material corresponds to Late Neolithic. Date suggests earlier occupation.

Gif-3531. Pointe Saint-Gildas, Préfailles, Loire Atlantique **7520 ± 140**

Shells from refuse pit of Mesolithic site (47° 08′ N, 2° 15′ W). Coll by M Tessier and subm 1975 by J L'Helgouach. Assoc with microliths. *Comment:* very good date for typical archaeol material of Middle Tardenoisian.

Melleran series, Sauzé-Vaussais, Deux-Sèvres

Charcoal from artificial souterrain (46° 07′ N, 0° 00′ W). Coll and subm 1975 by R Proust, Soc Hist Deux-Sèvres. These souterrains, numerous in region, are probably ancient refuges.

Gif-3457. Melleran, no. 1 **780 ± 90**

From entrance passage.

Gif-3669. Melleran, no. 2 **1320 ± 90**

From Pit A.

General Comment: dates correspond to two different occupations of souterrain.

Camp Allaric series, Aslonnes, Vienne

Charcoal samples from boring VI in open-air site (46° 28′ N, 0° 22′ E). Coll and subm 1973 by J Pautreau.

Gif-3008. Camp Allaric, Boring VI-190 **2560 ± 140**

At basal level of Hallstatian rampart, assoc with Late Bronze III ceramics.

Gif-3009. Camp Allaric, Boring VI-280 **4260 ± 140**

Assoc with potsherds of Artenac type.

Gif-3010. Camp Allaric, Boring VI-310 **4280 ± 140**

Assoc with Chalcolithic artifacts.

General Comment: Gif-3009 and -3010 date Artenac culture which corresponds to main Chalcolithic occupation in W central France (Pautreau, 1975).

Martizay series, Indre

Wood from ancient pilings of bridge at bottom of Claise R (46° 49′ N, 1° 03′ E). Coll and subm 1974 by M Hours, Lab Mus France, Palais Louvre, Paris.

Gif-3067. Martizay, 3 **200 ± 90**

Gif-3068. Martizay, 2 **560 ± 90**

General Comment: results do not date bridge, which is Gallo-Roman, but restoration periods.

Gif-3256. Saint-Martial de Mirambeau, Charente Maritime **1570 ± 90**

Charcoal from protohistoric ditch discovered by aerial photography at "La Champagne de Font Tertaud" (45° 21′ N, 0° 37′ W). Subm 1974 by J Dassié, Versailles.

Gif-3422. La Prevalerie de Dirac, Charente **2700 ± 110**

Peat in Aurochs cranium, 1.4m deep in peat bog (45° 35′ N, 0° 13′ W). Coll and subm 1974 by J Massaud, Angoulême. Whole skeleton was found nearby. *Comment* (TM): agrees with assoc post-Neolithic industry. Aurochs disappeared from France ca AD 13th century.

Gif-3609. Roc de Sers, Charente **19,230 ± 300**

Bones from Early Solutrean level of prehistoric station with rupestral art (45° 36′ N, 0° 42′ W). Coll and subm 1975 by G Henri Martin, CNRS, Paris. *Comment*: date agrees well with assoc Early Solutrean lithics.

Saline de Dousseille series, Guérande, Vendée

Samples from various archaeol sites, along littoral, near Guérande (47° 19′ N, 2° 28′ W).

Gif-3764. Saline de Dousseille, I **1750 ± 100**

Charcoal from habitation site with "augets" pottery salt pans. Coll by D Prigent and subm 1975 by J L'Helgouach. *Comment*: in expected range of date.

Gif-4120. Saline de Dousseille, II **610 ± 90**

Human bones from necropolis. Coll by J Y Gallais and subm 1976 by J L'Helgouach. *Comment*: dates recent occupation of site.

Gif-3417. Les Aspies, Nieul-sur-l'Autize, Vendée **4040 ± 130**

Fragment of human cranium assoc with Campaniforme Chalcolithic industry, from dolmen under tumuli (46° 27′ N, 0° 41′ E). Coll by R Joussaume and subm 1973 by J L'Helgouach. *Comment* (J L'H): very good date for Atlantic Campaniform occupation.

Gif-3761. PetitRocher, Brétignolles, Vendée **4290 ± 130**

Charcoal from coastal Chalcolithic habitat in sandy dune (46° 37′ N, 1° 53′ W). Coll by R Joussaume and subm 1975 by J L'Helgouach. Assoc with rich Chalcolithic industry, ceramics and gold jewelry. *Comment*: date is exactly as expected.

Pierre Virante II series, Xanton Chassenon, Vendée

Human bones from typical megalithic monument (46° 28′ N, 0° 41′ E). Coll by R Joussaume and subm 1974–1975 by J L'Helgouach.

Gif-3416. Pierre Virante, I **4870 ± 140**

Gif-3762. Pierre Virante, II **4040 ± 130**

General Comment: date for 2nd sample, Gif-3762, is exactly as expected, whereas Gif-3416 is much too old and difficult to explain.

Gif-3675. Nieul sur l'Autize, Vendée **4110 ± 130**

Charcoal from Neolithic camp with triple surrounding walls (46° 25′ N, 0° 39′ W). Coll and subm 1975 by R Joussaume, Les Sables d'Olonne, Vendée. *Comment*: in expected age range.

Gif-3676. Les Cous, Bazoges-en-Pareds, Venolée **4680 ± 130**

Charcoal from passage grave (46° 39′ N, 3° 16′ E). Coll and subm 1975 by R Joussaume. *Comment:* in expected age range.

Gif 3649. La Faurélie II, Dordogne **11,780 ± 180**

Carbonized bones from hearth of Magdalenian V Level of La Faurélie rock shelter (44° 56′ N, 1° 02′ E). Coll 1966 and subm 1975 by J Tixier, CNRS, Meudon-Bellevue. *Comment:* date is rather young for assoc Magdalenian V industry assoc. Bones were probably slightly contaminated.

Crozo Bastido series, Pinsac, Lot

Charcoal from cavern (44° 51′ N, 1° 30′ E). coll and subm 1974 by M Lorblanchet, CNRS, Paris.

Gif-3279. Crozo Bastido, Upper Level II **2230 ± 110**

Gif-3280. Crozo Bastido, Level III **2710 ± 110**

General Comment: date of Level II agrees with Iron Age date of ceramics, but date of Level III disagrees with expected Middle Bronze Age date probably due to numerous observed disturbances of site.

Cuzoul series, Vers, Lot

Cuzoul Rock Shelter (44° 27′ N, 1° 32′ E), offers very interesting stratigraphy, 3m thick with 50 levels of successive temporary occupations during Early Magdalenian (Clottes & Giraud, 1985). Samples coll and subm 1982–83 by J Clottes, Dir Antiquités Préhist Midi-Pyrénées, Foix.

Gif-6372. Cuzoul, Level 3, a-b **14,560 ± 130**

Bone splinters.

Gif-6638. Cuzoul, Level 5 c **15,980 ± 150**

Bone splinters, mainly reindeer. Corresponds to Magdalenian II level.

Gif-6371. Cuzoul, Level 13 **16,800 ± 170**

Bone splinters from Middle Classic Magdalenian I level.

Gif-6797. Cuzoul, Level 20 **17,050 ± 170**

Bone splinters from base of Magdalenian I level.

Gif-6370. Cuzoul, Level 23 **18,300 ± 200**

Bone splinters from Magdalenian O level.

Gif-6798. Cuzoul, Level 24 **18,400 ± 200**

Bones from very early Magdalenian O level.

Gif-6699. Cuzoul, Level 30 **19,400 ± 210**

Bone splinters from basal level with typical Solutrean tools.

General Comment: due to thickness of sequence, high-precision dating of Early Magdalenian might be performed.

Grotte des Escabasses series, Thémines, Lot

Charcoal from occupation levels (44° 45′ N, 1° 48′ E). Coll and subm 1974 by M Lorblanchet.

Gif-3276. Grotte des Escabasses, Upper Level III **2710 ± 110**

Late Bronze-Early Iron Age occupation level.

Gif-3277. Grotte des Escabasses, Base Level III **2470 ± 110**

Late Bronze-Early Iron Age occupation.

Gif-3278. Grotte des Escabasses, Level VIc **4120 ± 120**

Late Neolithic occupation.

General Comment: dates fit well with expected ages. Gif-3276 and -3277 seem inverted, yet are almost in statistical range of each other.

Abri du Mas Viel series, Saint-Simon, Lot

Bone splinters from famous Mousterian shelter, Mas Viel (44° 42′ N, 1° 50′ N). Coll and subm 1974 by M Lorblanchet.

Gif-3281. Mas Viel, Upper Level C **26,770 ± 800**

Gif-3559. Mas Viel, Level E **>40,000**

General Comment: lithics were studied by F Bordes after excavation in 1954. He attributed them to peculiar Late Mousterian though date of Level C is too young.

Sargel Cave series, Saint-Rome de Cernon, Aveyron

Charcoal from different levels of Sargel Cave (44° 01′ N, 2° 59′ W). Coll 1967 and subm 1973 by G Costantini, Millau, Aveyron.

Gif-3005. Sargel Cave, Level V **3800 ± 130**

Level attributed to Chalcolithic period.

Gif-3006. Sargel Cave, Level IX **3620 ± 130**

Level attributed to Chalcolithic period.

Gif-3007. Sargel Cave, Level XIII **4650 ± 150**

Level attributed to Early Chassean period.

General Comment: dates are slightly younger than expected.

Gif-3502. Tumulus de Lardicou, Cancalières, Tarn **2140 ± 90**

Charcoal from hearth of stone tumulus (43° 31′ N, 2° 19′ E). Coll and subm 1975 by M Labrousse, Antiquités Hist Midi-Pyrénées. Assoc with potsherds of Gallo-Roman appearance. *Comment*: site older than presumed age.

La Poujade series, Millau, Aveyron

Charcoal from rock shelter (44° 07′ N, 3° 10′ E). Coll and subm 1974–75 by G B Arnal, CNRS, Montpellier.

Gif-3418. La Poujade, Level 10 C **8710 ± 190**

Gif-3631. La Poujade, Level I D **8990 ± 190**

General Comment: assoc lithic material seems Mesolithic and agrees well with date, but presence of potsherds in levels so old suggests disturbance.

Gif-3419. Grotte du Bourrut, Sumène, Gard **8790 ± 190**

Charcoal from Chassean level (43° 50′ N, 3° 40′ E). Coll and subm by G B Arnal. *Comment*: date is 3000 yr older than industry and remains unexplained.

Gif-3322. Prades, Lozère **4010 ± 120**

Carbonized wheat in "Fontbouisse" Chalcolithic level, from Aven des Corneilles (44° 18′ N, 3° 27′ E). Coll and subm 1974 by G Fages, CNRS, Thémines, Lot. *Comment*: dates beginning of "Fontbouisse" culture in "Grandes Causses," Massif Central.

Gif-3648. Memer, Vailhoules, Aveyron **1280 ± 90**

Bones of "Man of Memer" (44° 20′ N, 1° 53′ E) found in 1948 and subm 1975 by M Delhon-Bujard, Toulouse. *Comment*: dates skeleton of man, antiquity of whom has been much debated.

Gif-3704. Château de Montaner, Hautes Pyrénées **820 ± 90**

Wood from stake in well filling (43° 20′ N, 0° 00′). Subm 1976 by D Bardin.

Gif-3701. Germs-sur-L'Oussouet, Hautes Pyrénées **2480 ± 100**

Wood from timbers of argentiferous galena workings (43° 03′ N, 0° 03′ E). Coll and subm 1976 by D Bardin, ELF Aquitaine Soc, Pau.

Saint-Jean-de-Verges series, Ariège

Faunal bones from unsheltered site near little cave (43° 01′ N, 1° 36′ E). Coll 1964 by J Vezian and subm 1973 by J Bouchud, Mus d'Hist Nat, Paris.

Gif-2942. Saint-Jean-de-Verges, 1973-1 **21,500 ± 400**

From Perigordian V Level.

Gif-2941. Saint-Jean-de-Verges, 1973-2 **24,200 ± 600**

From Aurignacian I Level separated from Perigordian V level by red clayey layer, 0.10 to 0.20m thick.

General Comment: Gif-2942 agrees well with expected age of Perigordian V, whereas Gif-2941 is much too young for assoc Aurignacian I industry, probably because of recent contamination of bones.

Gif-2943. Grottes du Portel, Ariège **12,760 ± 170**

Bone fragments in Magdalenian IV hearth, underlying sterile red clay and stalagmitic deposits (43° 01′ N, 1° 36′ E). Coll 1972 by J Vezian and subm 1973 by J Bouchud. *Comment:* data is a little too young but does not disagree with range of expected ages from industry.

Gif-2950. La Cauna, Belvis, Aude **12,270 ± 280**

Bones from Level 3 (42° 55′ N, 2° 23′ E). Coll and subm 1973 by D Sacchi, Lab Préhist CNRS, Caracassonne. *Comment:* date agrees perfectly with assoc Magdalenian VI industry.

Gif-2981. Lassac, Sallèles-Cabardès, Aude **16,750 ± 250**

Faunal bone fragments from Level IIb of open air site (43° 18′ N, 2° 23′ E). Coll and subm 1973 by D Sacchi. *Comment:* (DS) date agrees perfectly for Early Magdalenian site, first open-air Magdalenian site known in S France and probably most noteworthy one found *in situ* for this period (Sacchi, 1973).

Grotte d'Enlène series, Montesquieu-Avantès, Ariège

Grotte d'Enlène (43° 02′ N, 1° 13′ E) is cave in famous group of caverns of Volp R (Clottes, 1985). Samples were subm 1976–1984 by J Clottes.

Gif-5319. Grotte d'Enlène 0-9 **890 ± 80**

Charcoal from superficial hearth in base of cave. *Comment:* dates recent occupation of cave.

Gif-4122. Grotte d'Enlène, Level 1-b **2200 ± 120**

Charcoal from little hearth lying on stalagmitic floor. Coll 1976. *Comment:* dates recent occupation of cave.

Gif-4123. Grotte d'Enlène, Level 3-1 **10,080 ± 230**

Charcoal from top of Level 3, from Salle des Morts. Coll 1976. *Comment:* date disagrees with expected Middle Magdalenian age. Undersized sample.

Gif-4124. Grotte d'Enlène, Level 3-2 **13,940 ± 250**

Charcoal from thick hearth at base of Level 3, in Salle des Morts. Coll 1976. Assoc with Magdalenian assegais of Lussac-Angles type. *Comment:* date agrees well with expected age.

Gif-6030. Grotte d'Enlène, 82-416 **13,900 ± 120**

Carbonized bones from an other hearth of Level 3, in Salle des Morts, in same part of cave as Gif-4124.

Gif-5320. Grotte d'Enlène, Level 1-2 **9630 ± 170**

Burned bones from Level 1, lying on stalagmitic floor, from Salle du Fond. Coll 1980.

Gif-5321. Grotte d'Enlène, Level 3-e **12,800 ± 140**

Burned bones, separated from upper Level 1-2 by thick stalagmitic layer, in Salle du Fond. Coll 1980. *Comment:* very famous engraved "Plaquette of Enlène" was discovered in this cave 50 yr ago (Begouen *et al,* 1984). Additional pieces of same plaquette were assoc with bones at base of Level 3-e.

Gif-5770. Grotte d'Enlène, Level 3-f **13,400 ± 120**

Bones from Level 3-f of Middle Magdalenian IV in Salle du Fond. Coll 1982. *Comment:* industry is a little more recent than that from Salle des Morts. Difference between dates is compatible with observed difference between artifacts.

Gif-6655. Grotte d'Enlène, Level 4 **21,000 ± 250**

Bones from Level 4, near entrance of cave. Coll 1984. *Comment:* date corresponds to Late Perigordian.

Gif-6656. Grotte d'Enlène, Level 5 **24,600 ± 350**

Bones from Level 5, near entrance of cave. Coll 1984. Assoc with typical Perigordian V industry. *Comment:* date is within ages generally accepted for Late Perigordian.

General Comment: upper levels seem disturbed and ages are too early; dates of lower levels agree well with archaeol attribution.

Gif-3484. Serralongue, Pyrénées Orientales **Modern**

Human bones from necropolis of Late Bronze-Hallstatt transition (43° 23′ N, 2° 20′ E). Coll and subm 1974 by H Baills. *Comment:* dates recent inhumation.

Can-Pey series, Montferrer, Pyrénées Orientales

Samples from Late Neolithic level of Can-Pey site (42° 53′ N, 1° 46′ E). Coll and subm 1974–1977 by H Baills, Centre Catalan Etudes Préhist, Cabestany.

Gif-3282. Can-Pey, Level N 3-1 **4420 ± 120**

Human bones from sepulcher.

Gif-4045. Can-Pey, Level N 3-2 **4060 ± 200**

Charcoal from habitation level. *Comment:* undersized sample.

Gif-4280. Can-Pey, Level N 3, 18 H 8 **2680 ± 100**

Charcoal from habitation level N 3.

General Comment: Gif-3282 and -4045 agree with archaeol estimate, but Gif-4280 is much too young, which may be explained by intrusion of charcoal from upper level of Late Bronze III A age.

Gif-3787. En Gorner, Villefranche de Conflent, Pyrénées Orientales **4610 ± 110**

Charcoal from cave, (42° 35′ N, 2° 22′ E). Coll and subm 1975 by H Baills. *Comment:* dates Middle Neolithic of "Groupe de Montbolo" type.

Gif-3346. Vingrau, Pyrénées Orientales **5300 ± 110**

Charcoal in hearth from site in cave (42° 51′ N, 2° 48′ E), depth: 0.25m. Coll and subm 1974 by P Campmajo, Cabestany, Pyrénées Orientales. Assoc with Late Magdalenian VI lithic industry. *Comment:* aberrant date proves contamination of this level which is too superficial.

Gif-3753. "Las Conques," Vingrau, Pyrénées Orientales, D 27-C 3 **8780 ± 120**

Bones from Level 3 from Magdalenian level of prehistoric cave (42° 57′ N, 2° 47′ E). Coll and subm 1975 by D Sacchi. *Comment:* date strongly disagrees with expected age, probably because of contamination of bones.

Gif-3571. Pereiras, Pouzols, Aude **4690 ± 110**

Bones from burial in Chassean ditch (43° 17′ N, 2° 51′ E). Coll 1959 and subm 1975 by G Camps, LAPEMO, Aix-en-Provence. *Comment:* good date for Late Chassean site.

Gif-3573. Saint-Jean-de-Cas, Mailhac, Aude **3730 ± 110**

Charcoal from Bronze Age site, type Verazian (43° 19′ N, 2° 49′ E). Coll by P Ambert and coll 1975 by G Camps. *Comment:* very good date for Verazian culture.

Shelter Jean Cros series, Labastide-en-Val, Aude

Samples from shelter from Early Neolithic-Mesolithic transition (43° 05′ N, 2° 28′ E). Coll and subm 1975 by J Guilaine, CNRS, Carcassonne. Assoc with printed ceramics.

Gif-3575. Shelter Jean Cros, Level 2 b-c **6600 ± 130**

Charcoal from Sq IX-6 and X-6.

Gif-3576. Shelter Jean Cros, Level 2 a-b-c **7160 ± 130**

Shells (*Helix nemoralis*) from Sq VI-4. *Comment:* may be slightly contaminated by old carbonate.

General Comment: dates confirm previous date for Level 2: 6500 ± 300, Gif-218 (R, 1966, v 8, p 85) and agree well with archaeol estimate (Guilaine, 1979).

Gif-3448. Grotte de Canecaude I, Villardonnel, Aude **12,300 ± 600**

Coprolites from Level C (43° 19′ N, 2° 19′ E). Coll and subm 1975 by D Sacchi. *Comment* (DS): stratigraphic position of Level C, between Aurignacian Level III: 22,980 ± 330 (Gif-2709) and Aurignacian Level IV: 25,510 (Gif-2710) (R, 1982, v 24, p 323), is unquestionable (Sacchi, 1973). Date strongly disagrees with expected age and remains unexplained.

Gif-3572. Fournes 2, Siran, Hérault **3140 ± 110**

Bones from upper Level B, assoc with Campaniform potsherds, in dolmen (43° 20′ N, 2° 40′ E). Coll by P Ambert and coll 1975 by G Camps. *Comment:* date is too young, but grave goods suggest that levels were disturbed.

Gif-3570. Parignoles, La Livinière, Hérault **3600 ± 110**

Bones from classic Early Bronze site, type Verazian (43° 18′ N, 2° 38′ E). Coll by P Ambert and subm 1975 by G Camps. *Comment:* date agrees with expected age.

Grotte de Camprafaud series, Ferrière-Poussarou, Hérault

Charcoal samples from different levels of Grotte de Camprafaud (43° 26′ N, 2° 54′ E). Coll and subm 1974–1975 by G Rodriguez, Saint Chinian, Pardaillon, and 1976 by J L Roudil, Montpellier.

Gif-3073. Grotte de Camprafaud, Level 2 **3980 ± 100**

From Level 2, assoc with Chalcolithic industry from "Early Bronze-Campaniforme" type.

Gif-3074. Grotte de Camprafaud, Level 3 **4060 ± 100**

From Level 3, assoc with Chalcolithic industry of "Verazian" type.

Gif-3075. Grotte de Camprafaud, Level 4 **2070 ± 90**

From Level 4, assoc with Chalcolithic industry of "Verazian" type. *Comment:* date indicates important recent contamination, explained by presence of burrows. *Cf* Gif-3782.

Gif-3782. Grotte de Camprafaud, Level 4b **3980 ± 110**

From Level 4, similar to Gif-3075. *Comment:* date agrees well with assoc Chalcolithic industry.

Gif-3076. Grotte de Camprafaud, Level 7 **4380 ± 110**

From Level 7, assoc with Late Neolithic industry of "Tardo-Saintponian" type.

Gif-3469. Grotte de Camprafaud, Level 10 **4950 ± 110**

From hearth in upper part of Level 10, assoc with Late Neolithic industry of "Saintponian" type.

Gif-3470. Grotte de Camprafaud, Level 10 **4920 ± 110**

From same Level as Gif-3469.

Gif-3078. Grotte de Camprafaud, Level 19 **6480 ± 130**

From Level 19, assoc with Early Neolithic of "Languedocian" type.

Gif-3077. Grotte de Camprafaud, Level 20 **7900 ± 150**

From Level 20, assoc with Early Neolithic industry. *Comment:* date is probably oldest for Early Neolithic.

General Comment: dates agree well with assoc archaeol industry. With previously pub dates (R, 1972, v 14, p 285), they confirm long use of cave: 4500 yr of continuous settlement with 20 very well-stratified levels (Rodriguez, 1976, 1983).

Gif-2868. Abri de la Madeleine, Bedoin, Vaucluse **3020 ± 100**

Human bones from burial chamber of Chalcolithic dolmen (44° 07′ N, 5° 10′ E). Coll and subm 1973 by G Sauzade, Dir Antiquités Préhist Provence, Avignon. *Comment:* younger than expected, but assoc industry is not typical enough for good archaeol date.

Gif-2869. Dolmen de Prignon, Saint-Cézaire Alpes Maritimes **4040 ± 110**

Human bones from basal level (43° 38′ N, 6° 48′ E). Coll and subm 1973 by G Sauzade. *Comment:* agrees with assoc industry and expected age for that monument.

Capula station series, Levie, Corse

Charcoal from Rockshelter 1 from important site of Capula (41° 42′ N, 9° 07′ E). Coll and subm 1975 by F de Lanfranchi, Inst Etudes Corses Préhist, Ajaccio.

Gif-3529. Capula 1 **2960 ± 100**

Level VI b, Iron Age.

Gif-3530. Capula 2 **3410 ± 100**

Level VII, Hearth F 1, Late Bronze Age.

Gif-4033. Capula 3 **3400 ± 110**

Level VIII, Bronze Age.

General Comment: dates are in expected range.

Gif-3337. Massiac, Cantal **220 ± 90**

Wood in gallery of ancient silver mine (50° 16′ N, 3° 14′ E). Coll and subm 1974 by M Lasserre, Fac Sci, Clermont-Ferrand, Puy de Dôme. *Comment:* dates recent working.

Gif-3045. Aulnat, Gandaillat, Puy de Dôme **2150 ± 100**

Charcoal at bottom of Pit B 29, at Aulnat (45° 47′ N, 3° 05′ E). Coll and subm 1973 by H Pelletier, Univ Clermont-Ferrand. Assoc with Early La Tène I industry. *Comment:* date agrees with expected age.

Champsemard series, Tournus, Saône et Loire

Charcoal from La Tène II levels of Celtic site (45° 33′ N, 4° 55′ E). Coll and subm 1974 by M Perrin, Tournus.

Gif-3554. Champsemard, Level 7 **2150 ± 90**

Gif-3555. Champsemard, Level 4 **2190 ± 90**

General Comment: dates agree with archaeol data.

Camp de Myard series, Vitteaux, Côte d'Or

Charcoal from fortified Neolithic oppidum (47° 23′ N, 4° 31′ E). Coll and subm 1974 by J P Nicolardot, CNRS, Saint Germain-en-Laye.

Gif-3380. Camp de Myard, 1378 **4500 ± 130**

From habitation structure.

Gif-3381. Camp de Myard, 1377 **4990 ± 130**

From Neolithic rampart.

Gif-3670. Camp de Myard, 1522 **4770 ± 140**

From habitation structure.

General Comment: dates agree well with previous dates for other structures at same site (R, 1974, v 16, p 35) (Delattre & Nicolardot, 1976).

Mont Avrollot series, Saint-Florentin, Yonne

Charcoal samples from Level 9 c in La Tène oppidum (48° 0′ N, 3° 41′ E). Coll and subm 1974 by A Duval, Mus Antiquités Nat, Saint Germain-en-Laye.

Gif-3356. Mont Avrollot, E 3 **2290 ± 110**

Gif-3357. Mont Avrollot, E 4 **2410 ± 110**

Gif-3354. Chichery, Yonne **5600 ± 120**

Human bones from Neolithic sepulcher (47° 55′ N, 3° 31′ E). Coll and subm 1974 by J Rigaud, Appoigny, Yonne. *Comment:* agrees with assoc grave goods.

Gif-3783. Hallignicourt, Haute-Marne **810 ± 90**

Human bones from burial ditch 3 (48° 39′ N, 4° 52′ E). Coll and subm 1975 by L Lepaje, Saint-Dizier. No artifacts were assoc, but in nearby grave, ceramics of Bronze-Hallstatt transition were found. *Comment:* date indicates re-use of burial, as suspected.

Gif-3784. Laneuville au Pont, Haute-Marne **2240 ± 100**

Charcoal in refuse pit of habitat (48° 38′ N, 4° 51′ E). Coll and subm 1975 by L Lepaje. Assoc with Early Hallstatt ceramics. *Comment:* date is younger than expected.

Gif-3785. Nijon-La Mottote, Haute-Marne **2020 ± 100**

Charcoal from hearth at base of barrow (48° 12′ N, 5° 36′ E). Coll and subm 1975 by L Lepaje. *Comment:* younger than Middle Hallstatt expected.

Gif-3716. Moncey, Doubs **610 ± 90**

Wood from whole dug-out canoe, 5m long, in bed of Ogon R (47° 17′ N, 6° 07′). Coll and subm 1975 by P Petrequin, Antiquités Préhist Franche-Comté, Besançon.

Gigot series, Bretonvilliers, Doubs

Charcoal in hearths from habitat at foot cliff (47°13′N, 6°41′E). Coll and subm 1974 by D Vuillat, Circonscription Antiquités Préhist Franche-Comté, Besançon.

Gif-3342. Gigot, K 6-F 1 **4100 ± 110**

From pit of Early Bronze Age occupation.

Gif-3343. Gigot, L 6-F 2 **5080 ± 100**

From Late Tardenoisian Mesolithic–Early Neolithic occupation.

General Comment: both samples come from same level: dates indicate that hearth Gif-3342 is intrusive in Tardenoisian level.

Gif-3328. Juniville, Ardennes **2400 ± 180**

Carbonized plant remains from La Tene I site (49° 24′ N, 4° 21′ E). Coll and subm 1974 by J L Flouest, Saint Dizier, Haute Marne. *Comment:* agrees well with ceramics.

Gif-3577. Nanteuil-sur-Aisne, Ardennes **2820 ± 90**

Charcoal from protohist ditch (49° 31′ N, 4° 17′ E). Coll and subm 1975 by B Lambot, Compiègne. *Comment:* date agrees with Late Bronze-Early Halstatt period, as expected.

Africa

Algeria

Protohistoric Megalithic monuments series

Human bones from megalithic monuments in N Algeria. Coll and subm 1973 by M C Chamla.

Gif-2841. Djebel Mistiri, Ain Chabro **2490 ± 110**

From one of many tumuli of Djebel Mistiri (35° 25′ N, 8° E).

Gif-2842. Bou Nouara, Djebel Mazela **1700 ± 110**

From largest necropolis of N Africa, Djebel Mazela (36° 10′ N, 6° 50′ E).

Gif-2843. Sil **1290 ± 110**

From burial cave, Sila (36° 10′ N, 6° 45′ E).

Gif-2844. Tiddis **2200 ± 100**

From Berber tomb of Tiddis (36° 35′ N, 6° 35′ E).

Gif-2845. Gastel **1090 ± 100**

Under dolmen of necropolis (35° 40′ N, 8° 10′ E).

Gif-2846. Beni Messous **2100 ± 100**

Under dolmen of large necropolis (300 dolmens), (36° 45′ N, 3° 1′ E).

General Comment: confirm expected range of ages for these cemeteries.

Brezina series, S Algeria

Charcoal from Neolithic sites near Brezina (33° 06′ N, 1° 15′ E) Saharian Atlas. Coll and subm 1972 by L Balout, Inst Paléont Humaine, Paris.

Gif-3011. Grotte de l'Equidé, Grottes d'El Aouī **3600 ± 130**

Superficial sample, 0.40m depth.

Gif-3012. Station du Méandre, M 1 **5350 ± 130**

From hearth in lowest Level M 1. *Comment:* date may be compared to Gif-883: 5850 ± 150 (R, 1972, v 14, p 291) from same site, at foot of wall with rupestral paintings. Site settlement was probably very short.

General Comment: dates indicate that these two sites, although near each other, were not occupied at same time.

Niger

Gif-3547. Djaba **760 ± 80**

Wood from beam of ancient building, at Djaba (21° N, 12° 30′ E). Coll and subm 1975 by W Savy, Paris. *Comment:* dates remains of important town.

Djado series

Wood from ruins of Djado (21° N, 12° 20′ E). Coll and subm 1977 by W Savy. Djado, like Djaba, is important ancient town in desert region of Ténéré.

Gif-4130. Djado, 1 **90 ± 90**

From lintel in wall from interior of town.

Gif-4131. Djado, 4 **270 ± 90**

Ténéré series

Samples from open air sites, in Ténéré. Coll 1972 and subm 1975 by J P Roset, ORSTOM, Fort-Lamy.

Gif-3639. Ténéré, No. 7 **3180 ± 100**

Human bones from burial, at depth 1.50m, under stone blocks (18° 29′ N, 10° 03′ E).

Gif-3640. Ténéré, No. 8 **Modern**

Charcoal from hearth, at depth 0.20m (18° 33′ N, 9° 46′ E). *Comment:* dates recent hearth in archaeol site.

Sudan

Saï Island series

Saï I., one of largest islands of Nile R (20° 40′ N, 30° 20′ E), is in important strategic position. Site was occupied from earliest antiquity until now. Samples coll 1974 by B Gratien and J Vercoutter and subm 1975 by J Vercoutter, Univ Lille.

Gif-3581. Saï, SKC 3-T 37 **3810 ± 110**

Leather from burial of Late Kerme culture. *Comment:* cal 2620–1975 BC agrees well with expected age.

Gif-3582. Saï, SACJ-T 21 **4010 ± 120**

Charcoal from cemetery of New Egyptian Empire, cal ca 1580–1200 BC. *Comment:* cal 2885–2310 BC might correspond to Middle Empire: cemetery was re-used in New Empire.

Gif-3583. Saï, SAFJ-C 14 **3880 ± 120**

Carbonized wood from burial of Middle Empire. *Comment:* cal 2650–2130 BC, agrees well with archaeol data (Gratien, 1974; Vercoutter, 1974).

Ethiopia

Matara series

Samples from Matara site (14° 4′ N, 39° 4′ E) attributed to "Axum" period. Coll and subm 1975 by F Anfray, Inst Ethiopien Archéol, Addis Ababa.

Gif-3316. Matara, 1 **1460 ± 90**

Charcoal.

Gif-3320. Matara, 5 **1250 ± 90**

Carbonized barley grains.

General Comment: agrees well with archaeol data.

Ethiopian Christian monuments series

Wood from ancient churches in Ethiopia, some of which were discovered during French expedition 1971–1973. Samples coll and subm 1973 by C Lepage, CNRS, Paris.

Gif-2922. Abraha Asbeha, 1 **1290 ± 90**

Monument A.

Gif-2923. Zarema, 2 **1560 ± 90**

From wood piece engraved on one side, Monument B.

Gif-2924. Agobo, 3bis **860 ± 80**

Gif-2925. Agobo, 3 **800 ± 90**

Monument C.

Gif-2926. Mikael Amba 4 **700 ± 90**

From wood piece engraved on one side.

General Comment: dates precise period of building of ancient churches (>200) and of use of typical architectural elements.

Yeha series

Charcoal from archaeol site of Yeha (14° 04′ N, 39° 4′ E) attributed to "pre-Axum" period. Coll and subm 1975 by F Anfray.

Gif-3317. Yeha, 2 **2260 ± 100**

Gif-3318. Yeha, 3 **2100 ± 100**

Gif-3319. Yeha, 4 **2150 ± 100**

General Comment: agrees well with archaeol estimate.

Harrar megalithic monuments

Charcoal from megalithic monuments of Harrar region. Two types of monuments, dolmen cists and tumuli are distinguished, according to struc-

ture. Coll and subm 1973–1974 by R Joussaume, Lab Anthropol, Univ Rennes.

Gif-3040. Ganda Hassan-Abdi II **3200 ± 100**

Under dolmen cist II, depth 0.60m (9° 25′ N, 41° 38′ E).

Gif-3039. Ganda Hassan-Abdi I **3450 ± 100**

Under dolmen cist II, depth 0.80m.

Gif-3041. Ganda Hassan-Abdi III **1170 ± 90**

From refuse pit at base of thick walls of old town.

Gif-3042. Ganda Hassan-Abdi V **1030 ± 90**

From bone deposit, 100m from refuse pit. *Comment:* both Gif-3041 and -3042 confirm Medieval age of these monuments.

Gif-3288. Sourre-Kabanawa, Tchelenko, 1 **940 ± 90**

Cist 6 (9° 35′ N, 41° 40′ E).

Gif-3289. Sourre-Kabanawa, 2 **940 ± 90**

From room of monument with circular chamber.

Gif-3290. Sourre-Kabanawa, 3 **1000 ± 90**

In polypod vase, in same monument as Gif-3288.

Gif-3291. Sourre-Kabanawa, 5 **1150 ± 90**

Beside two crania, at base of same monument, as Gif-3288.

Gif-3292. Sourre-Kabanawa, 6 **1170 ± 90**

From tumulus.

General Comment: dates indicate that these monuments, difficult to date by archaeol assoc belong either to Neolithic or Medieval times.

Congo

Grotte of Ntadi Yomba series, Niari

Samples from rock shelter (ca 4° 19′ S, 13° 47′ E). Coll by R Lanfranchi and subm 1976–78 by R de Bayle des Hermens. Assoc with Neolithic industry of Tshitolian type.

Gif-4219. Grotte of Ntadi, 1-76-NY **370 ± 80**

Charcoal from upper level, depth 20 to 25cm.

Gif-4220. Grotte of Ntadi, 2-76-NY **270 ± 80**

Charcoal from upper level, depth 50 to 55 cm.

Gif-4221. Grotte of Ntadi, 3-76-NY **300 ± 80**

Charcoal from upper level, depth 60 to 65 cm.

Gif-4391. Grotte of Ntadi, 1-77-NY **1990 ± 90**

Charcoal from Level A.

Gif-4614. Grotte of Ntadi, 2-78-NY **690 ± 200**

Charcoal from Level A. *Comment:* undersized sample. Probably contaminated with charcoal from upper levels.

Gif-4392. Grotte of Ntadi, 2-77-NY **7090 ± 140**

Charcoal from base of Level B from Early Tshitolian age.

Gif-4613. Grotte of Ntadi, 1-78-NY **6890 ± 160**

Akatina shells from Level B, depth 98 to 100cm, from Early Tshitolian age.

General Comment: dates from lower levels agree well with Early Tshitolian industry found in cave (De Maret, 1982).

Gif-4223. Pointe Noire, 1-77 PN **1240 ± 90**

Charcoal in Late Neolithic habitat in sandy dune (4° 46′ S, 11° 53′ E). Coll by R Lanfranchi and subm 1977 by R de Bayle des Hermens, Inst Paléont Humaine, Paris. *Comment:* in expected age range.

Madagascar

Andranosoa series

Charcoal from archaeol sites in N part of Androy region (24° 35′ S, 45° 21′ E). Coll and subm 1978 by J P Emphoux and J A Rakotoarisoa, Mus Art & Archaeol, Antananarivo.

Gif-4496. Beropitika **750 ± 90**

From deepest occupation level.

Gif-4570. Andranosoa, 1 **730 ± 90**

Assoc with abundant ceramics.

Gif-4751. Andranosoa, 2 **920 ± 90**

From refuse pit of same site as Gif-4570.

General Comment: after calibrations, first settlement of Androy region is dated between X and XIV centuries.

Gif-5154. Ambohitrikanlaka **380 ± 90**

Charcoal in Level 3 from Site 1, 13km E Antananarivo (18° 52′ S, 47° 30′ E). Subm 1980 by J P Domenichini, Mus Art & Archaeol, Antananarivo. *Comment:* dates first settlement of this region.

Fanongoavano series

Charcoal from ancient political site (19° 03′ S, 47° 50′ E). Coll and subm 1981 by D Rasamuel, Univ Madagascar, Antananarivo.

Gif-5472. Fanongoavana, F 5 b **Modern**

Gif-5471. Fanongoavana, E 5 m **450 ± 100**

General Comment: Gif-5471 dates first settlement in region of "Hauts Plateaux" in Madagascar.

Gif-3403. Befotaka Bay **300 ± 90**

Wood from stem post of boat found in Befotaka Bay (13° 11′ S, 48° 56′ E). Coll by H Bruelle and subm 1974 by G Pain, Tananarive.

Other African Countries

Morocco

Kef el Baroud series, Ben Slimane

Charcoal from site with burial (33° 40′ N, 7° 1′ W). Coll and subm 1974 by A de Wailly, Casablanca.

Gif-2888. Kel el Baroud, K B G **5160 ± 110**

From hearth from gray level, around human skeleton.

Gif-2889. Kef el Baroud, K B B **4750 ± 110**

From white level underlying Gif-2888. *Comment:* slightly too young if compared to Gif-2888, but samples contained abundant rootlets.

Mauritania

Gif-3001. Tumulus Mauny, Massif R'Kiz **480 ± 90**

Human bones from grave in Mauny tumulus (17° 25′ N, 10° 25′ W), assoc with iron and bronze artifacts. Coll and subm 1973 by C Richir, Bordeaux. *Comment:* date does not confirm expected pre-Islamic age.

Zaïre

Gif-4158. Kinshasa **1710 ± 90**

Charcoal from site near Kinshasa (4° 21′ S, 15° 32′ E). Coll and subm 1974 by D Cahen. Assoc with Iron Age potsherds. *Comment:* dates beginning of metallurgy in this part of Africa.

Gabon

Gif-4157. Ovendo **5040 ± 130**

Charcoal assoc with Late Stone Age microlithic industry (0° 20′ S, 9° 28′ E). Coll and subm 1978 by D Cahen, Mus Royal Afrique Centrale, Tervuren, Belgium. *Comment* (DC): agrees with dates previously reported for other Late Tshitolian assemblages in Congo: Gif-459–460: 4030 ± 200 and 3930 ± 200 BP (R, 1971, v 13, p 224) and in Zaïre: Lv-162: 5750 ± 110.

Egypt

Gif-3355. Luxor, no. 1255 **3080 ± 90**

Carbonized wood from tomb of Touy Queen, Valley of Queens (25° 41′ N, 32° 24′ E). Coll and subm 1974 by S Delbourgo, Palais Louvre, Paris. *Comment:* Touy Queen belongs to XIXth dynasty, cal 1320–1200 BC agrees with this data.

Djibouti Republic

Gif-3321. Balho **2830 ±130**

Human bones from "Galla" sepulcher of pre-Islamic and pre-Afar period, Bahlo region (ca 12° N, 42° 10′ E). Coll and subm 1974 by R Ferry, Djibouti Republic.

TABLE 1
Canadian Arctic series

Sample	Site	Geog coordinates	Date	Material	Culture	Age
Gif-2967	Site Cordeau DIA-1. House A	(60° 51′ N, 69° 52′ W)	1973	Charred fat	Dorset	1170 ± 100
-2968	Site Cordeau DIA-1. House F	(60° 51′ N, 69° 52′ W)	1973	Charred fat	Dorset	1350 ± 100
-3002	Site DIA-4 House A	(60° 55′ N, 69° 57′ W)	1973	Charcoal	Dorset	470 ± 90
-3003	Site DIA-4 Refuse pit	(60° 55′ N, 69° 57′ W)	1973	Charcoal	Dorset	1080 ± 100
-3004	Site DIA-4 House with passage	(60° 55′ N, 69° 57′ W)	1973	Charred fat	Dorset	990 ± 90
-2970	Site DIA-4 House 4 F	(60° 55′ N, 69° 57′ W)	1973	Charred fat	Dorset	930 ± 90
-2969	Site DIA-25 Amittuq		1973	Charred fat		1900 ± 110
-4207	Ariane Anse du Talon Site Je EL-2	(69° 49′ N, 69° 52′ W)	1976	Charcoal	Dorset	700 ± 80
-4208	Site DIA-4 Uplifted beach	(60° 56′ N, 69° 58′ W)	1976	Charcoal	Dorset	620 ± 80
-4209	Site DIA 10-D Illutialuk Ile aux Iglous	(60° 51′ N, 69° 52′ W)	1976	Charcoal	Thule	810 ± 80
-4210	Site DIA-1 Ile du Diana	(60° 56′ N, 69° 57′ W)	1976	Organic matter	Dorset	540 ± 80
-4211	Site DIA-1	(60° 56′ N, 69° 57′ W)	1976	Soil	Dorset	Modern
-4212	Site DIA-10 Illutialuk Ile aux Iglous	(60° 51′ N, 69° 52′ W)	1976	Peat		2090 ± 100
-4213	Site DIA-10 Illutialuk	(60° 51′ N, 69° 52′ W)	1976	Soil		Modern
-3500	Heel Cove VHC 475–480	(60° 47′ N, 69° 51′ W)	1973	Lacustrine sediment		6460 ± 160

North America

Canada

Canadian Arctic series

Samples mainly from Dorset houses around Diana Bay and on Diana I., New Quebec were coll and subm by P Plumet, Univ Quebec, Montreal. These new results (see Table 1) complete data already pub (R, 1974, v 16, p 47) for same region.

General Comment: settlement of Ungava Bay by Paleo-Eskimos occurred late, at Dorset period, which lasted until end of 15th century AD, although Thule people had already arrived in the area (Plumet, 1977, 1982). Paleo-Eskimos settlement on Diana I. occurred after Thule people had occupied region for one century: 1480 ± 90 BP (Gif-3002).

Mesoamerica

Guatemala

Pueblo Viejo Chichaj series

Samples from Pueblo Viejo Chichaj site (15° 07′ N, 90° 49′ W). Coll 1974 by A Ichon and subm by H Lehmann, CNRS, Paris.

Gif-3895. Pyramid GP-2 **100**

Carbonized wood from fallen roof of temple.

Gif-3896. Pyramid GP-I **110 ± 90**

Similar to Gif-3895.

Gif-3897. Structure C-1 **100**

Bones, from funeral urn.

General Comment (AI): site attributed to 15th century and assumed deserted since Spanish conquest; dates disagree with this assumption.

Los Cimientos Chustum series

Charcoal from Los Cimientos Chustum site (15° 13′ N, 90° 52′ W). Coll 1974 by A Ichon and subm by H Lehmann.

Gif-3601. Los Cimientos I, Terrace B **790 ± 90**

From Sepulture 2 of important chief.

Gif-3894. Los Cimientos 2, Terrace B **Modern**

From fill of water vat, in Structure 12.

Gif-3602. Los Cimientos 1, Terrace T **840 ± 90**

From hearth, in Structure 4.

General Comment: Gif-3601 and -3602 date first occupation of site very well, at beginning of Postclassic period, but Gif-3894 disagrees with expected age.

Los Cerritos Chijoj Canilla Quiche series

Charcoal from ceremonial structures at Los Cerritos Chijoj site (15° 10′ N, 90° 50′ W). Coll by A Ichon and subm 1974–1975 by H Lehmann.

Gif-3242. Los Cerritos, Structure 1, Excavation T 3, Level 100 **1630 ± 70**

Gif-3243. Los Cerritos, Structure 1, tomb **1640 ± 70**

Gif-3244. Los Cerritos, Structure 1, Excavation T 3, Level 250 **1620 ± 70**

Gif-3607. Los Cerritos, Group A, Structure 1 **1360 ± 100**

Gif-3603. Los Cerritos, Group A, Structure 10 **1480 ± 90**

Comment: cal AD 345–645 does not agree well with polychrome potsherds of assoc Late Classic period (cal ca AD 600–900).

Gif-3604. Los Cerritos, Group A, Structure 8 **1400 ± 100**

Gif-3605. Los Cerritos, Group A, Structure 10 **1540 ± 100**

From Tomb 1. *Comment:* dates re-use of Tomb 1 at Late Postclassic period.

Gif-3606. Los Cerritos, Group A, Structure 7 **1650 ± 100**

Charcoal from center of platform.

Gif-3246. Los Cerritos, Group A, Structure 3, Level 20 **1590 ± 70**

Gif-3248. Los Cerritos, Group A, Structure 4, Level 40 **1590 ± 70**

Gif-3250. Los Cerritos, Group A, Structure 4, Level 50 **1370 ± 70**

Gif-3251. Los Cerritos, Group A, Structure 4, Level 0 **950 ± 80**

Comment: dates end of occupation of site.

Gif-3892. Los Cerritos, Group A, Structure 5 **1340 ± 100**

Gif-3239. Chijoj, Mound 1 **1400 ± 70**

Gif-3247. Chijoj, Mound 1, base Level 120 **1830 ± 80**

General Comment: site was occupied at different times. Protoclassic occupation, cal AD 100–300, was not very important; main occupation was during Late Classic period, with building of Group A and polychrome ceramics, cal AD 600–900. Some structures were re-used at Epiclassic, cal AD 900–100, and probably at Postclassic periods.

Mexico

Tonina series, Chiapas

Charcoal from Classic Maya City (16° 50′ N, 92° W). Coll and subm 1971–1980 by P Becquelin, Mus Homme, Paris.

Gif-3252. Tonina, 128 **1160 ± 60**

Assoc with potsherds attributed to Late Classic period. *Comment:* agrees well with expected age.

Gif-3253. Tonina, 619 **1340 ± 60**

From building level of group of habitations.

Gif-3254. Tonina, 659 **1350 ± 60**

From tomb assoc with group of habitations dated by Gif-3253.

Gif-3255. Tonina, 831 **1380 ± 60**

From occupation level. *Comment:* agrees well with expected age.

Gif-5056. Tonina, 928–942 **260 ± 60**

From hearth in group of habitations. *Comment:* corresponds to recent occupation of site.

Gif-5057. Tonina, 1132 **980 ± 80**

From depth 1.73m in occupation level of group of habitations; F 3 attributed to beginning of Late Classic period. *Comment:* date is a little younger than expected.

Gif-5058. Tonina, 1509 **1300 ± 60**

Piece of wood from frame inside stucco block.

Gif-5059. Tonina, 1253 **1310 ± 60**

From depth 1.90m in occupation level, S E part.

Gif-5060. Tonina, 1388 **1950 ± 60**

From depth 1.00 to 1.20m, in ashy soil. *Comment:* dates early occupation of site.

Gif-5359. Tonina, 1845 **910 ± 80**

From level attributed to Early Postclassic period. *Comment:* date agrees with expected age.

Gif-5360. Chix, Tonina, 1663 **2070 ± 120**

From occupation level attributed to Late Preclassic period, from site near Tonina.

Gif-5362. Chix, Tonina, 1666 **1720 ± 100**

From same occupation level as Gif-5360.

Gif-5361. Chix, Tonina, 1664 **1840 ± 90**

From same occupation level as Gif-5360.

Gif-5364. Rancho de Santa Rosa, Tonina 1964 **1930 ± 120**

From occupation level from Late Preclassic site, near Tonina.

General Comment: dates establish chronology of occupation from Preclassic to Postclassic periods for that region.

Bahia de Kino series

Charcoal from human settlements on littoral sandbar of Holocene transgression (28° 50′ N, 114° E). Coll and subm 1975 by N Petit-Maire, CNRS, Marseille.

Gif-3683. Bahia de Kino, K IV, −5cm **270 ± 90**

Gif-3685. Bahia de Kino, K XI, −10cm **1290 ± 90**

Gif-3687. Bahia de Kino, K IX, −15cm **300 ± 90**

Gif-3690. Bahia de Kino, K IX, −60cm **310 ± 90**

Gif-4055. Playa San Bartolo, Sonora **7630 ± 460**

Bones of large mammals (*Camelidae*) in paleolacustrine deposit (29° N, 114° S). Coll and subm 1976 by N Petit-Maire. *Comment:* date proves late existence of camel in Mexico (Petit-Marie & Casta, 1977).

South America

Peru

Gif-3564. Huazmey Valley, Peru, HN 1 **3750 ± 110**

Carbonized wood from preceramic open-air site (10° 03′ S, 78° 10′ W). Depth, 1.50m. Coll by D Bonavia and subm 1975 by C Chauchat. *Comment:* dates Late Peruvian preceramic site.

Paijan complex series, Pampa de Cupisnique

"Paijan" complex is 50km from Paijan in Moche Valley, S side of Pampa de Cupisnique. Site is very large and complex group of lithic surface scatters in desert. Twofold division is distinguished between numerous discovered sites (Chauchat, 1976, 1982). Samples coll by S Uceda and C Chauchat and subm 1974, 1976, 1981 by C Chauchat, Univ Bordeaux (see Table 2).

General Comment (CC): ages of shells seem systematically younger than ages of charcoal at this site. If statistical margin for charcoal is doubled for each date, Paijanian lasted from 10,720 to 7940 BP, which means 3000 yr, at Cupisnique. These results may be compared to other dates obtained for Paijanian, for Quirihuac rock shelter, in Moche Valley; oldest one is 12,795 ± 350 (Gx-2021) and for Cerro Chivateros: 10,430 ± 160 (UCLA-683). Dated bones (Gif-4116) are ribs from whole skeleton of *Mylodontide, Scelidodon* sp (id by R Hoffstetter). Date corresponds either to Late Paijanian period and proves existence of this fauna at that time or to contamination of bones (Chauchat, 1982). Gif-3565 is not significant: sample is too superficial.

TABLE 2
Pampa de Cupisnique

Sample	Loc	Geog coordinates	Ref	Material	Age
Gif-3565	Camp	(7° 34′ S, 79° 20′ W)	12-U 7-C	Charcoal	5490 ± 140
-4165	Camp	(7° 34′ S, 79° 20′ W)	12-U7-S	Snail shells	8810 ± 160
-4161	Camp	(7° 34′ S, 79° 20′ W)	13-UI-C	Charcoal	9810 ± 180
-4163	Camp	(7° 34′ S, 79° 20′ W)	13-U I-S	Snail shells	7740 ± 150
-3781	Tomb T 2	(7° 34′ S, 79° 20′ W)	13-U2-T2	Charcoal	10,200 ± 180
-4914	Quarry	(7° 34′ S, 79° 20′ W)	13-U II	Charcoal	9490 ± 170
-4915	Camp	(7° 34′ S, 79° 20′ W)	13-U29	Charcoal	9300 ± 170
-4162	Camp	(7° 33′ S, 79° 19′ W)	27-U I	Charcoal	8260 ± 170
-5159	Camp	(7° 33′ S, 79° 19′ W)	14-U2-BH	Charcoal	8730 ± 160
-5160	Camp	(7° 33′ S, 79° 19′ W)	14-U2-BD	Charcoal	10,380 ± 170
-5161	Camp	(7° 33′ S, 79° 19′ W)	14-U2-BG	Charcoal	9360 ± 170
-5162	Camp	(7° 33′ S, 79° 19′ W)	14-U2-BI	Charcoal	9600 ± 170
-4116	Paleontol site	(7° 32′ S, 79° 19′ W)		Scelidodon	8910 ± 200
-4912	Camp, refuse pit	(7° 39′ S, 79° 05′ W)	5-U4-C	Charcoal	9670 ± 170
-4913	Camp, refuse pit	(7° 39′ S, 79° 05′ W)	5-U4-S	Snail shells	9510 ± 170
-4164	Camp	(7° 39′ S, 79° 05′ W)	12-U3	Snail shells	7220 ± 140

Brazil

Gif-5365. Aldeia Tuatuari, Mato Grosso **680 ± 60**

Charcoal from site (12° 15′ S, 53° 20′ W) attributed to Ipavu phase. Coll and subm 1980 by P Becquelin, Mus Homme, Paris. *Comment:* date agrees with expected range of dating.

Gif-3307. Lagoa das Onças, Haut Xingu **600 ± 80**

Carbonized wood from site near lake where, according to Amazonian cultural traditions, many ritual objects were dropped (12° 07′ S, 53° 24′ W). Coll and subm 1973 by P Becquelin. *Comment:* date agrees well with expected age.

Argentina

Las Lomas series, Santiago del Estero

Charcoal from Sunchituyoj site and Averias tradition (ca 29° 30′ S, 61° 30′ W). Coll and subm 1974 by A M Lorandi, Fac Ciencias Nat y Mus, La Plata, Argentina.

Gif-3365. Las Lomas, B 5, Sec 1, Level 3 **690 ± 90**

Gif-3366. Las Lomas, B 4, 1, 40–60cm **720 ± 90**

Gif-3367. Las Lomas, C 5, 1, 40–60cm **950 ± 90**

Other Countries

Gif-3394. Vastogirardi, Molise, Abruzzi, Italy **2050 ± 90**

Charcoal from habitation site (41° 45′ N, 14° 15′ E), alt 1150m. Coll and subm 1974 by J P Morel and M Hano, Ecole Française de Rome. *Comment:* data agrees with age expected from assoc ceramics.

Tureng Tepe series, Iran

Samples from tell at Tureng Tepe (36° 55′ N, 54° 35′ E). Coll and subm 1974 by J Deshayes, Univ Paris I.

Gif-3340. Tureng Tepe, TTC 73-5 **1370 ± 90**

Carbonized wood from destruction of Sassamide fortress.

Gif-3341. Tureng Tepe, TTC 73-1 **1400 ± 90**

Carbonized wood from 1st Islamic occupation level.

Gif-3338. Tureng Tepe, TTC 69-2 **3750 ± 230**

Carbonized wood from transition level between III C 1 and III C 2 periods.

Gif-3339. Tureng Tepe, TTC 73-6 **4000 ± 110**

Piece of carbonized beam from terrace without archaeol assoc. *Comment:* dates largest structure at Tureng Tepe.

General Comment: Gif-3340 agrees with Sassanid Empire history, but Gif-3341 seems too early relative to Gif-3340. Gif-3338 and -3339 confirm dates previously obtained for that site (R, 1970, v 12, p 441).

Rondane series, Norway

Charcoal and wood from typical rounded pits used by reindeer hunters. Coll and subm 1973 by E K Barth, Oslo Univ.

Gif-2801. Lille Ula, P 3 c-72 **370 ± 80**

(61° 51′ N, 9° 40′ E).

Gif-2802. Verkelsdalen, P 7-71 **430 ± 80**

(61° 56′ N, 9° 41′ E).

Iles de la Société series, French Polynesia

Charcoal from archaeol sites from Iles de la Société. Coll by B Gérard and subm 1973 by J Garanger, ORSTOM, Paris.

Gif-2830. Raiatea, R M 9-1-72 **220 ± 80**

From site with lithic industry (16° 46′ S, 151° 25′ W).

Gif-2831. Tahiti, T M 4 2-71 **170 ± 80**

From surface site (17° 30′ S, 149° 30′ W). *Comment:* agrees with date: AD 1695 ± 95 (Gx-1271) obtained for similar site in Tahiti.

General Comment: dates confirm that human settlement in Iles de la Société is recent.

Gif-3541. Ngando Beach, Ile des Pins, New Caledonia **1980 ± 90**

Shells in beach rock with gray coral stones, perodotite river pebbles and encrusted iron oxide stones, on Ngando Beach (22° 38′ S, 167° 33′ E). Coll and subm 1975 by M J Dubois, CNRS, Paris. *Comment* (MJD): Ile des Pins is coralliferous Pleistocene fms, consequently, stones and pebbles scattered on beach 300m long and encrusted in beach rock were brought by man. They look like projectile points fallen during fighting. This proves island was inhabited 1980 yr ago.

GEOLOGIC SAMPLES

Sea Level Variations

Gif-2667. Knockagoneen Cliff, D, Ireland **3210 ± 110**

Oyster and *Littorina* shell bed, +5 ± 1m above msl (51° 16′ N, 9° 03′ W). Coll by R Keary, Dept Geol, Univ College, Galway, Ireland and subm 1972 by J Labeyrie, CFR, Gif-sur-Yvette.

Gif-2668. Sea Weed Point, Galway Bay, F, Ireland **2560 ± 110**

Oyster shells from large oyster bed, +15m above msl (51° 15′ N, 9° 02′ W). Coll by R Keary and subm 1972 by J Labeyrie. *Comment:* unexpected date for sea level +15m above msl.

Gif-2806. Culleenamore Strandhill, Slico Bay, Ireland **3730 ± 130**

Oyster shells from very large oyster shell reef, 1.5 to 2m thick, covered by blown sand +2m above msl (54° 15′ N, 8° 30′ W). Coll and subm 1973 by R Keary.

Gif-2807. Doona, Bally Croy, Mayo, B, Ireland **5490 ± 140**

Wood from tree trunk in peat bog, on shore, −2m below msl (54° 02′ N, 9° 49′ W). Coll and subm by R Keary.

General Comment: samples date variations of Holocene sea level.

Gif-2903. Mont-Saint-Michel, France **3440 ± 110**

Wood from timber, from fishing equipment remains, removed by sea from sand, in Mont-Saint-Michel bay (48° 38′ N, 1° 30′ W). Coll and subm 1973 by A L Homer, BRGM, Orléans. *Comment:* indicates that sea level was higher than today.

Spanish Mediterranean coast series

Samples from ancient shorelines, from +2m to +7m above msl, along Alboran and W Mediterranean Seas, S Spain. Most of these fossil marine

fms belong to last Thyrrenian transgression and have been dated by U/Th method between 114,000 and 125,000 yr BP. Others were expected to be Holocene and were dated by ^{14}C. Coll and subm 1973–75 by M Gigout, Lab Geol, Univ Orléans, as part of general study of neotectonic in Mediterranean area.

Gif-3730. Campo de Dalias, W Almeria, JFC 62-62 4520 ± 130

Shells (*Cardium, Pectunculus* sp) (36° 50′ N, 2° 26′ W), alt +2m above msl. *Comment:* corresponds to Holocene sea level.

Gif-3087. Cabo de Gata, Torre Garcia, GIG 3200 >35,000

Shells (*Strombus bubonius, Pectunculus* sp) (36° 45′ N, 2° 15′ W), alt +6.5–7m above msl.

Gif-3088. Cabo de Huertas, Alicante, GIG 2006 10,590 ± 190

Shells (*Strombus bubonius* sp) in sandstone (38° 21′ N, 0° 29′ W). *Comment:* presence of *Strombus* characterizes Thyrrenian transgression. Date is aberrant because of important recent contamination of shells, in spite of numerous mechanical and chemical treatments to eliminate calcareous encrusting.

Gif-3728. Cala Judios, Alicante, GIG 3700 >35,000

Shells (38° 21′ N, 0° 29′ W).

Gif-3729. Cala Judios, Alicante, GIG 3701 >35,000

Shells, from another outcrop than Gif-3728.

Gif-3473. Adra region, Andalusia, JFB 12-2 860 ± 90

Shells (*Glycymeris* sp) (36° 45′ N, 3° 01′ W). *Comment:* dated level is not Flandrian as expected, but results of very recent shelly deposit.

Gif-3491. Adra, Andalusia, JFB 233 >35,000

Shells (*Thaïs, Sponclyle, Natica, Columbella* sp) in littoral conglomerate, Adra, alt +2m msl.

Gif-3089. Torre Calahouda, Malaga, KDG 14 390 ± 80

Shells (marine *Lamellibranchia, Gasteropoda* sp) (36° 29′ N, 1° 01′ W), alt +2m msl. *Comment:* dated level is not Flandrian as expected, but results of very recent shelly deposit.

General Comment: characterization by alt, fauna, and dating of ancient littorals allows identification of same levels along coasts as well as tectonic deformations. Data from shore neotectonic indicate that deformations are more important in E Mediterranean than in W Mediterranean. Uplifts and lowerings were found to be slight and localized (Angelier *et al,* 1976).

Gif-2902. Ifni, Morocco >35,000

Mussel shells from marine terrace, +2m alt (29° 39′, 10° W). Coll 1973 by P Oliva and subm by G Baudet, Univ P Valery, Montpellier. *Comment:* shelly level corresponds to ancient high sea level, probably ca 120,000 BP.

Gif-4542. Moulay Bou Selham lagoon, Kenitra, Morocco 3490 ± 100

Shelly level, 0.60 to 0.67m deep, in core 7800. Coll and subm 1978 by J Moyes, Univ Bordeaux I. *Comment:* dates lagoon closing that probably results from sea regression.

Côte d'Ivoire series, Africa

Carbonate samples coll and subm 1975 by R Pomel, Univ Clermont-Ferrand, to date recent variation of sea level of Ivory Coast. Alts are related to msl.

General Comment: these dates (Table 3) demonstrate, with previous Gif measurements (R, 1982, v 24, p 306), minor marine fluctuations since 4000 BP, with max transgression +2m, ca 2000 BP, on Ivory Coast (Pomel, 1979).

Gif-2914. Lopez Cape, Gabon 1230 ± 90

Shells from recent littoral sand bar (0° 39′ S, 8° 42′ E). Coll and subm 1973 by J Le Fournier, Elf Soc, Boussens. *Comment:* dated in order to study recent evolution of sea shore and of sedimentation on that coast.

Gif-3270. Goubbhat, Djibouti Republic, 802 5980 ± 120

Lamellibranch shells from conglomerate, +4m above present msl, SE Goubbhat (11° 35′ N, 42° 44′ E). Coll and subm 1974 by H Faure, CNRS, Marseille. *Comment:* dates max Holocene sea level.

Gif-3271. Sanda, Djibouti Republic, 818 4630 ± 110

Lamellibranch shells from shelly sandy level, +4m above present msl, N Sanda (11° 37′ N, 42° 44′ E). Coll and subm 1974 by H Faure. *Comment:* dates max Holocene sea level.

Gif-3272. Obock-Alayla, Djibouti Republic, 851 >35,000

Shell (*Tridacna* sp) from coral terrace, +5m above present msl, E Obock (12° N, 43° 18′ E). Coll and subm 1974 by H Faure. *Comment:* corresponds to high sea level preceding Holocene high level.

TABLE 3
Cote d'Ivoire

Sample	Site	Geog coordinates	Alt (m)	Material	Age (yr)BP
Gif-3633	Cap of Bereby	(4° 38′ N, 6° 54′ W)	+3	Concretion	Modern
-3673	Falaise, Bassa	(4° 37′ N, 6° 56′ W)	+0.25	Vermetidae	Modern
-3674	N'Gaty	(5° 19′ N, 4° 21′ W)	+1.50	Falun	1310 ± 80
-3672	Cap Est-Niega	(4° 53′ N, 6° 11′ W)	−1	Conglomerate	1480 ± 90
-3632	Grand-Bereby	(4° 38′ N, 6° 55′ W)	+2	Shell	1670 ± 100
−3671	Bassa	(4° 37′ N, 6° 55′ W)	−0.50	Conglomerate	3790 ± 110

La Plata-Magdalena series, Argentina

Shell from coastal region near La Plata-Magdalena, prov Buenos Aires. Coll and subm 1975 by C R Cortelezzi, Fac Sci Nat, La Plata. Alt is given in m above msl.

Gif-3717. Paso de Piedra, Magdalena **>35,000**
(34° 50′ S, 57° 50′ W), alt 3.1m.

Gif-3719. Canta Landa, Magdalena **>35,000**
(35° 02′ S, 57° 44′ W), alt 4.3m.

Gif-3722. Luis Chico, Magdalena **>35,000**
(35° 20′ S, 57° 08′ W), alt 6m.

Gif-3721. Punta Piedras, Magdalena **>35,000**
(35° 22′ S, 58° 07′ W), alt 6.5m.

Gif-3718. Arroyo El Pescado, La Plata **5140 ± 140**
(34° 50′ S, 57° 50′ W), alt 3.1m.

Gif-3720. Calle 105 y 126, La Plata **6160 ± 150**
(34° 50′ S, 57° 50′ W), alt 3.0m.

General Comment: dates distinguish Holocene from Tyrrhenian levels.

Sao Paulo coastal plain series, Brazil

Holocene sea-level fluctuations along State of Sao Paulo coast have been retraced by studying position and age of Sambaquis and of geol fms. Samples (Table 4) were coll and subm 1974–1976 by L Martin, ORSTOM, Observatorio Nac, Rio de Janeiro, Brazil.

General Comment: uncontestable geol records indicating Holocene sea levels were higher than at present are observed along State of Sao Paulo coastal plain. During past 6000 yr, relative sea level was subjected to 2 max ca 5000 and 3300 yr BP and to a min ca 3800 yr BP. Comparison between curves of sea-level variations established for several parts along this coastal plain showed that max have different amplitudes. Vertical deformation of geoïd surface furnishes best explanation of amplitude differences (Martin *et al,* 1979–1980).

Maroni estuary series, French Guyana

Organic sediments from level with tree trunks and leaf remains, overlain by blue marine clay, 1.10m thick on bank of Maroni estuary (ca 5° 30′ N, 54° 30′ W). Coll and subm 1975 by G R Sieffermann, ORSTOM, Paris.

Gif-3695. Maroni estuary, BSP 54 **4260 ± 120**

100 to 120cm under present soil at top of organic level, in contact with clay.

TABLE 4
Sao Paulo State Coastal Plain

Sample	Loc	Geog coordinates	Material	Former sea level (m)	Ref	Age (yr BP)
			Samples from Sambaquis			
Gif-3435	Cananeia I.	(25° 01′ S, 48° 03′ W)	Oyster shell	Above present level	A 3	4340 ± 100
-3436	Comprida I.	(24° 59′ S, 47° 53′ W)	Oyster shell	Below +2m	A 16	4120 ± 100
-3437	Ararapiza Channel	(25° 08′ S, 48° 02′ W)	Oyster shell	About present level	A 29	3790 ± 110
-3641	Sao Paulo	(24° 30′ S, 47° 27′ W)	Oyster shell	Near max	A 121	4750 ± 100
-3646	Sao Paulo	(24° 27′ S, 47° 13′ W)	Oyster shell	Above present level	A 175	4560 ± 110
-3643	Sao Paulo	(25° 01′ S, 48° 02′ W)	Shell	Below +0.5m	A 81	1850 ± 100
-3645	Sao Paulo	(24° 58′ S, 47° 51′ W)	Oyster shell	After max	A 149	3090 ± 110
			Geologic formations of Sao Paulo coast			
-3438	Comprida I.	(25° 01′ S, 47° 55′ W)	Wood	0 ± 0.3m	A 23	680 ± 90
-3430	Iguape I.	(24° 51′ E, 47° 28′ W)	Plant debris	0.6 ± 0.3m	A 37	3370 ± 100
-3439	Ararapiza channel	(25° 09′ S, 48° 02′ W)	Wood	1.5 ± 0.3m	A 28	4400 ± 110
-3644	Sao Paulo	(25° 00′ S, 47° 54′ W)	Oyster shell	1.4 ± 0.4m	A 89	5410 ± 120
-3848	Pernambuco, Santo	(23° 58′ S, 46° 11′ W)	Vermets	+1.4 ± 0.4m	A 249	790 ± 90
-3847	Bertigas Santos	(23° 57′ S, 46° 26′ W)	Wood	Ca 0m	A 239	4100 ± 100
-3850	Bertigas Santos	(23° 50′ S, 46° 08′ W)	Wood	+0.8 ± 0.4m	A 256	6020 ± 130
-3846	Bertigas Santos	(23° 57′ S, 46° 26′ W)	Wood	+0.8 ± 0.3m	A 238	6280 ± 130
-3845	Santos	(24° 00′ S, 46° 23′ W)	Wood	Below ± 1.5m	A 234	6250 ± 130
-3844	Santos	(23° 57′ S, 46° 24′ W)	Wood	+3.5 ± 0.5m	A 225	≥35,000
-3431	Caraguatatuba Plain	(23° 39′ S, 45° 29′ W)	Organic matter	+1.5 ± 0.75m	SP02	3320 ± 100
-3433	Caraguatatuba Plain	(23° 39′ S, 45° 29′ W)	Wood	−12.5 ± 1m	SP-5	7950 ± 220
-3434	Caraguatatuba bay	(23° 39′ S, 45° 29′ W)	Organic matter	−16.2 ± 1.9m	SP05	8030 ± 150
-3647	Ilha Grande bay	(23° 00′ S, 45° 00′ W)	Shell *in situ*	+1.5 ± 0.5m	A 178	2390 ± 100

Gif-3697. Maroni estuary, BSP 4 **4340 ± 120**

110 to 130cm under present soil.

Gif-3696. Maroni estuary, BSP 55 **4500 ± 130**

80 to 200cm under present soil.

General Comment: dates rapid marine transgression which reached ca 0.80m above present msl, 4200 BP.

Mer de Champlain series, Quebec, Canada

Shells from uplift levels in Mer de Champlain. Coll and subm 1975–1976 by J M Dubois, Univ Sherbrooke. Alts are related to present msl.

Gif-3769. Mer de Champlain, Rochemonteix **7670 ± 140**
(50° 17′ N, 65° 40′ W), alt +42.5m

Gif-3768. Mer de Champlain, Pointe Saint-Charle **8890 ± 160**
(50° 17′ N, 65° 50′ W), alt +22.7m.

Gif-3770. Mer de Champlain, Estuary de la Chaloupe R, 1 **10,230 ± 180**
(50° 11′ N, 65° 01′ W), alt ca +3m.

Gif-4017. Mer de Champlain, Estuary de la Chaloupe R, 2 **9630 ± 200**
(50° 17′ N, 65° 07′ W), alt +3m. *Comment:* confirms age of level +3m dated by Gif-3770, and dates beginning of estuarian sedimentation phase.

General Comment: set of very coherent dates for rapid uplift of coast after ice-cap retreat in this region.

Taiaro atoll series, Tuamotu, Polynesia

Coral from lagoon of Taiaro, one of smallest atolls from Tuamotu Is., diam 5km (15° 44′ S, 144° 10′ W). Coll and subm 1973 by J P Chevallier, Inst Paleont, Mus Hist Nat, Paris. Lagoon is presently closed and water level at 0.60m under high sea level. Samples from ancient "hoa" which was passage of oceanic water.

Gif-2920. Taiaro, TAI 8 **1120 ± 80**
From 1m above present lagoon water level.

Gif-2921. Taiaro, TAI 28 a **1090 ± 80**
From reef, ca 0.70m above present lagoon water level.

General Comment: dates closing of lagoon, probably due to uplift of atoll at AD 660 to 1160.

Volcanism

Gif-2960. Tartaret, Chambon Lake, France **2970 ± 110**

Paleosol underlying basalt flow, Tartaret (45° 33′ N, 2° 54′ E). Coll and subm 1974 by R Brousse, Fac Sci, Orsay.

Gif-3425. Las Lajas, Tenerife I, Canary Is. **8760 ± 160**

Charcoal from humic level at base of andosol formed on volcanic ash overlying tropical brown soil (28° 15′ N, 16° 35′ W). Coll and subm 1974 by P Quantin, ORSTOM, Bondy. *Comment:* gives min age for ash.

Gif-3085. Mangoum-Foumbo, Cameroun **1290 ± 80**

Charcoal in humic level under basaltic scorias, 140cm thick Babileke Plateau (5° 39′ N, 10° 45′ E), alt 1500m. Coll by P Muller and subm 1974 by F Paris and G Sieffermann. *Comment:* dates one of last volcanic events in this region.

Gif-3487. Kasbeghi, Caucasus **6290 ± 90**

Wood fragments under lava flow in Terek valley. Coll and subm 1971 by G Montjuvent. *Comment:* dates last lava flow of Kasbek volcano.

Mexico

S E Mexico series

Samples dated to establish chronology of volcanism of SE Mexico. Geol study by C Robin (1981).

Pico de Orizaba series

Charcoal from Pico de Orizaba Volcano, coll 1979–1980 by P Vincent, C Robin, and J Cantagrel, Inst Geog, Clermont-Ferrand, France.

Gif-4952. Coscomatepec valley, PU 110 **7020 ± 130**

Carbonized tree trunk in *nuée ardente* deposit of Saint-Vincent type (18° 58′ N, 97° 05′ W). Coll and subm by P Vincent.

Gif-4953. Hidalgo, PU 107 **≥38,000**

Carbonized wood in gray pumice underlying volcanic debris 10m thick.

Gif-5188. Loma Grande, PU 127, Mexico **6200 ± 120**

Charcoal in lowest pyroclastic flow deposit of Saint-Vincent type (18° 55′ N, 97° 14′ W). Alt 2630m.

Gif-5189. Texmalaca Orizaba valley, PU 132 **3400 ± 110**

Charcoal in upper pyroclastic flow deposit of Saint-Vincent type (18° 58′ N, 97° 06′ W). Alt 1630m.

Gif-5190. El Paso, Hidalgo Coscomatepec, PU 139 **4060 ± 120**

Charcoal in ocher pumice deposit (19° 12′ N, 97° 12′ W). Alt 3580m.

Gif-5191. Hidalgo Coscomatepec road, PU 141 **10,600 ± 190**

Charcoal in *nuée ardente* deposit of Saint-Vincent type (19° 12′ N, 77° 12′ W). Alt 3450m.

Gif-5192. Quarries of Chocaman, PU 143 **12,900 ± 150**

Charcoal in pyroclastic flow deposit (19° 01′ N, 96° 56′ W).

Gif-5193. Teteltzingo, PU 146 **9400 ± 170**

Popocatepetl series

Samples from Popocatepetl volcano, coll in *nuée ardente* deposit of Saint-Vincent type and subm 1982 by J Cantagrel, Inst Geog, Clermont-Ferrand.

Gif-5594. Paso de Cortes sec, PO 60 **4980 ± 50**

Carbonized wood at base of *nuée ardente* deposit, (19° 05′ N, 98° 36′ W). Alt 3250m.

Gif-5595. Quarry of Bavanco Seca, Canado, PO 61 **4320 ± 70**

Carbonized wood in lower *nuée ardente* deposit with dacitic pumice, Quarry of Bavanco Seca Huiloclatengo, E side of volcano (19° 05′ N, 98° 36′ W). Alt 3600m.

Gif-5596. Quarry of Bavanco Seca, Canado, PU 74 **9640 ± 440**

Carbonized wood in lowest tephra deposit, alternately gray and ocher ash; in same quarry as Gif-5595.

Gif-5597. San Pedro Benito Juarez, PO 65 **1220 ± 60**

Carbonized wood at base of *nuée ardente* deposit of Saint-Vincent type, (18° 57′ N, 98° 33′ W). Alt 2060 m.

Gif-5598. Tlaltzopia, PO 72 **880 ± 80**

Carbonized wood in lowest *nuée ardente* deposit of Saint-Vincent type with large blocks, W Santiago Xalizintla (19° 04′ N, 98° 32′ W). Alt 3850m.

General Comment: dates indicate very recent pyroclastic activity previously unknown.

Gif-4954. Quarry of Rio Frio, RF 1 **≥38,000**

Carbonized wood at base of pyroclastic flow deposit of pumice and ash Coll by P Vincent.

Nevado de Toluca series

Samples from Nevado de Toluca volcano. Coll and subm 1979–1980 by P Vincent and C Robin.

Gif-4955. Barranca de Jahal, NE 12 **≥38,000**

Paleosol.

Gif-5187. Rio Grande Valley, Barranca de Tlamisco, NE 30 **11,200 ± 200**

Charcoal in lower Pelean *nuée ardente* deposit (19° 02′ N, 99° 39′).

Mauritania

Tiriersoum series

Samples of calcareous lacustrine sediment from ancient lake in Tiriersoum region (21° 15′ N, 16° 22′ W). Coll and subm 1971 by G Delibrias.

Gif-2501. Tiriersoum, 0–5cm **3000 ± 100**

Gif-2502. Tiriersoum, 35–40cm **4290 ± 110**

Gif-2503. Tiriersoum, 75–85cm **4560 ± 110**

Gif-2504. Tiriersoum, 125–130cm **7690 ± 140**

General Comment: dates Holocene lacustrine episode in W Africa. After diatoms study (F Gasse) deepest lake occurred 4290 BP. Surface sediment, very poor in diatoms, corresponds to time when lake dried up.

Azefal series

Lacustrine sediment, depth 50cm, at Graref Agourega (19° 50′ N, 16° 10′ W). Coll and subm by L Hebrard, IFAN, Dakar.

Gif-2500. Azefal, 1 Carbonate fraction **4550 ± 110** $\delta^{13}C = -4.3‰$

Gif-2500 bis. Azefal, 2 Organic fraction **4490 ± 110** $\delta^{13}C = -17.5‰$

General Comment: both fractions give same age within statistical margin of dates.

Gif-2506. Goud Anagoum **4560 ± 110** $\delta^{13}C = +0.6‰$

Gasteropods from lacustrine deposit between sand dunes of Akchar and Agueitir (19° 19′ N, 16° 08′ W). Coll and subm 1972 by L Hebrard. *Comment:* corresponds to Holocene lacustrine episode.

Gif-2549. MAU 72-8 **2250 ± 100**

Gasteropod shells from dried lagoon behind range of dunes (17° 28′ N, 15° 58′ W). Coll and subm 1972 by J P Carbonnel. *Comment:* confirms dates already pub for end of last moist period in W Africa (Delibrias, Guillier & Labeyrie, 1982).

Gif-2505. Tintane **6070 ± 130** $\delta^{13}C = -5.2‰$

Plant roots calcified in sand from Neolithic site, Tintane (20° 55′ N, 16° 40′ W). Coll and subm 1971 by J P Carbonnel. *Comment:* confirms existence of moist period 6000 yr ago in Mauritania. Data agree very well with Holocene lacustrine extension of Aouker Lake (below).

Aouker Lake series

Samples dated to precise extension of Aouker Lake (Hugot, 1977) in late Quaternary time. Coll around Tichitt (18° 28′ N, 9° 28′ W) and near Akhreijit (18° 20′ N, 9° 10′ W) and subm 1971–1972–1973 by H J Hugot, Inst Paleontol Humaine, Paris.

Gif-2878. Tichitt, TIC 18/72 **8180 ± 170**

Organic level in sand overlying diatomite.

Gif-2879. Tichitt, TIC 71/10–5 **8570 ± 170**

Calcareous diatomite level.

Gif-2883. Tichitt, TICH 235 **6990 ± 150**

Calcareous diatomite deposit with faluns, behind sand-hill.

Gif-2885. Tichitt, TICH 247/4 **7120 ± 150**

Calcareous diatomite lying on paleozoic substratum.

Gif-2876. Tichitt, TIC 2/72 **4570 ± 130**

Calcareous diatomite from base of lake.

Gif-2887. Tichitt, T, HAF 71/1 **4670 ± 130**

Calcareous diatomite with faluns.

Gif-3405. Akhreijit, Monodville, 24 **5030 ± 110**

Hippopotamus bones, under lacustrine deposit.

Gif-3406. Akhreijit, Monodville, sup B **730 ± 90**

Bones in ashy level.

Gif-4110. Tichitt, TIC 70 **2610 ± 110**

Fish bones, from hearth, in Neolithic site on border of lake. *Comment:* dates limit for drying of lake.

Gif-4111. Tichitt, TIC 75 **1930 ± 110**

Human bones from necropole of Tichitt village. *Comment:* dates last settlement in village.

Gif-4112. Tichitt, TIC 75 **2290 ± 110**

Hippopotamus bones from Neolithic site on lacustrine deposit. *Comment:* dates end of pachyderma fauna.

General Comment: date beginning and extension of Aoukert Lake, at Holocene time and its drying ca 2500 BP.

Ethiopia

Ziway-Shala Lake basin, S Ethiopia

Bulbula R, B 20 series

Samples from Sec 10 C in Bulbula lacustrine fm, between Ziway and Abiyata Lakes (7° 48′ N, 38° 41′ E). Coll and subm 1975 by A Street-Perrot, Univ Oxford, England.

Gif-3984. Sec 10 C, no. 1 **8520 ± 200**

Organic matter from paleosol underlying calcareous silt deposit.

Gif-3985. Sec 10 C, no. 2 **12,200 ± 200**

Carbonate fraction from diatomaceous marl deposit overlying paleosol. *Comment:* corresponds to high stand of lake, called Bulbula III.

Gif-3986. Sec 10 C, no. 3 **10,450 ± 180**

Organic matter from soil underlying Gif-3985. *Comment:* from same level, charcoal was dated at 11,870 ± 300 by G Gillespie; this discrepancy is unexplained.

Gif-3987. Sec 10 C, no. 4 **22,050 ± 650**

Carbonate fraction from calcareous silt overlying pebbly pumice sand.

Gif-3988. Sec 10 C, no. 5 **24,000 ± 750**

Carbonate fraction from base level from same deposit as Gif-3987. *Comment:* date corresponds to high stand of lake, called Bulbula II.

Gif-4011. Shala Lake, Sec 39B **2510 ± 100**

Charcoal from top of colluvial loams deposit around Shala Lake. Coll and subm 1977 by A Street-Perrott. *Comment:* corresponds to arid phase of lake.

Bulbula Wadi series, Sec GO series

Shells from Bulbula lacustrine deposit, between Ziway and Abiyata Lakes (8° N, 39° E). Coll by J Gèze and subm 1973 by P Rognon.

Gif-2817. Bulbula, G O 1 **4960 ± 140**

Shelly level overlying diatomite deposit.

Gif-2818. Bulbula, G O 4 **9360 ± 210**

Shelly level under diatomite level.

Gif-4010. Bulbula R, Sec B 26 **28,200 ± 1000**

Shells (*Corbicula* sp) from section very close to exit from Ziway Lake (7° 47′ N, 38° 44′ E), under fine sand with pumice pebbles, 1.5m thick. Coll and subm 1977 by A Street-Perrott. *Comment:* corresponds to lowstand of lake.

Bulbula R, Sec B 3 series

Shelly horizon underlying silty sand deposit with surface soil at top, overlying Pleistocene diatomite sequence (7° 47′ N, 38° 45′ E). Different species of shells were separated and dated. Coll and subm 1977 by A Street-Perrott.

Gif-4012. Sec B 3, A **5450 ± 120**

Shells (*Bellamya unicolor*).

Gif-4013. Sec B 3, B **5550 ± 120**

Shells (*Melanoïdes tuberculata*).

Gif-4014. Sec B 3, C **5300 ± 120**

Shells (*Bulinus truncatus*). *Comment:* dates highstand of Holocene lake as expected; there is no difference between ages of different species.

General Comment: for Ziway-Shala Lake Basin, chronological study of lacustrine sequences in this basin establishes precise dates and confirms magnitude and abruptness of lake-level fluctuations in N intertropical Africa during Late Quaternary time (Gillespie, Street-Perrot & Switsur, 1983).

Ghana

Bosumtwi Lake series

Bosumtwi Lake (6° 30′ N, 1° 25′ W) lies within steep-sided crater that was produced by meteoric impact. Lake level is, thus, largely dependent upon rainfall over the crater. Consequently, study of changing lake levels is a particularly valuable paleoclimatic tool to reconstruct atmospheric conditions over W Africa during Late Quaternary (Talbot, 1980). Present max water depth is 80m. Overflow channel is ca 45m above present lake level (apll). Samples (Table 5) coll and subm 1976–1979 by M R Talbot, Univ Bergen, Norway.

Shell and algal carbonate dates were corrected for isotopic fractionation, according to $\delta^{13}C$ values measured, from 0.6‰ to 2.7‰.

Gif-4605. Bosumtwi BO 78:2 **$\Delta^{14}C = +272 \pm 5‰$**
$\delta^{13}C = -13.8‰$

Living shells (*Bulinus* sp) coll at Banso in Abiriw stream, in 1978. *Comment:* ^{14}C content of these mollusk shells is in approx equilibrium with atmospheric ^{14}C and is evidence of very low "hard effect" and reliability of shell and carbonate dating in vicinity of lake.

General Comment: during Pleistocene, Lake Bosumtwi suffered major regression and probably remained low for some time. Just after 13,000 BP, lake rose again and thereafter crater was generally characterized by lake significantly higher than at present. These periods of high water level were interrupted by short, but intense regression ca 10,500–8000, 4500–4000 and just after 1000 BP (Talbot & Delibrias, 1977, 1980; Talbot *et al,* 1984).

TABLE 5
Bosumtwi Lake, Ghana

Sample	Loc	Material	Estimated water depth (m)	Age (BP) yr	Comment
Gif-3650	Banso 1	Charcoal	≫10	9880 ± 220	Lake very high
-3651	Abonu	*M tuberculata*	<5	2950 ± 200	Lake moderately high
-3652	Abonu	*M tuberculata*	<5	370 ± 300	Lake moderately high
-3991	Banso 1	Charcoal	>40?	10,000 ± 230	Lake very high
-3992	Banso 1	Carbonized root	0	3620 ± 110	Root of plant killed by rising lake
-3993	Ejeman	Algal carbonate	0.5	2350 ± 100	Probably reworked
-3994	Ejeman	Algal carbonate	0.5	1910 ± 100	Probably reworked
-3995	Old Konkoma	*M tuberculata*	<2	1130 ± 90	Lake moderately high
-3996	Old Konkoma	Charcoal	0.5	3020 ± 110	Marks transgression
-3997	Ejeman	Algal carbonate	0.5	2250 ± 100	Probably reworked
-3998	Pipie	*M tuberculata*	<2	2080 ± 100	Lake moderately high
-4306	Pepiakuma	Charcoal	>40?	5000 ± 120	Lake very high
-4307	Amakon	Algal carbonate	1	610 ± 90	?Contaminated
-4308	Amakon	Algal carbonate	1	2200 ± 100	Lake moderately high
-4309	Amakon	Algal carbonate	1	2210 ± 100	Lake moderately high
-4310	Ejeman	Algal carbonate	0.5	2020 ± 100	Lake moderately high
-4311	Ejeman	*M tuberculata*	<2	1850 ± 100	Lake moderately high
-4312	Old Brodekwano	Algal carbonate	1	2180 ± 100	Lake moderately high
-4606	Banso 1	Charcoal	>10	9330 ± 170	Lake high
-4607	Banso 2	Charcoal	0.5	12,690 ± 230	Marks transgression
-4609	Piple	Charcoal	5	10,460 ± 180	Lake falling
-4610	Ejeman	Charcoal	<5	2150 ± 100	Lake moderately high
-4814	Banso 2	Humus	0	8000 ± 180	Sample probably contaminated
-4815	Obo 2	Charcoal	0	7800 ± 180	Stream flooded by rising lake
-4816	Obo 2	Humus	0	13,400 ± 150	Soil caps fluviatile sequence
-4817	Obo 3	Charcoal	>10	9190 ± 110	Lake high
-4818	Obo 1	Charcoal	40+	12,060 ± 130	Lake high
-4909	Banso 1	Charcoal	>10	9250 ± 170	Lake high

Niger

Gif-3892. Dogomboulo, Fachi, Niger, C **12,080 ± 220**

Organic matter from base level of Holocene lacustrine sequence, 2m depth (18° 06′ N, 11° 34′ E). Coll and subm 1976 by J Maley.

Chad

Mouskorbé series, E Tibesti

Samples from lacustrine depression, Mouskorbé Mts (21° 11′ N, 18° 25′ E). Alt +2700m. Coll 1968 by B Messerli and subm 1974 by J Maley, ORSTOM, Montpellier.

Gif-3228. Mouskorbé, 3 **6600 ± 140**

Plant remains in marshy paleosol with diatoms.

Gif-4182. Mouskorbé, X **6700 ± 140**

Calcareous encrusting deposited on border of depression.

General Comment: dates beginning of arid phase, at that alt, in E Tibesti.

Kouka series

Samples from test pit in lacustrine sediments, Kouka (13° 06′ N, 15° 38′ E), 20km from E Chad Lake. Alt +283m. Subm 1975 by J Maley.

Gif-3682. Kouka, 2 **110 ± 90**

Shells (*Unio* sp) in silty level under 0.65m black clay level.

Gif-3681. Kouka, 1 **360 ± 90**

Shells (*Unio* sp) in silty level, 1.20 to 1.45m depth.

Gif-4232. Kouka, 3 **≤90**

Shells from base level from silty level.

Gif-3548. Kouka, 3 **9690 ± 210**

Organic sediment, 5.90m depth, overlying clayey sand and overlain by lacustrine silty clayey deposit. *Comment:* dates beginning of important transgressive period.

General Comment: Gif-3682, -3681, and -4232 date recent and probably very short lower level of Chad. These young ages, mainly Gif-4232, ≤90 yr, show no "hard effect" and indicate validity of ^{14}C dates for lacustrine shells in Chad region.

Gif-3549. Ngouri **260 ± 120**

Shells (*Limicolaria* sp) 0.50m depth in gray silt in ancient course of Bahr el Ghazal (13° 39′ N, 15° 23′ E). Coll and subm 1975 by J Maley. *Comment:* very recent age of shells show very little "hard effect" in Chad region.

Gif-3610. Tjeri, 1588 **12,500 ± 220**

Organic matter from base level of lacustrine sequence, 12.20m depth (13° 45′ N, 16° 30′ E). Coll by M Servant and subm 1975 by J Maley.

Gif-4125. Mandi **10,000 ± 170**

Organic matter from regressive sediment level, 4m depth in core H9 (13° 27′ N, 14° 40′ E). Coll by B Dupont and subm 1977 by J Maley.

Gif-4233. Dilindri **2400 ± 100**

Shells coll and subm 1977 by J Maley.

General Comment: for Chad samples: dated lacustrine deposits belong to two transgressive lacustrine periods 12,500–9600 BP and ca 6000 BP. Present Chad Lake is remains of Paleochad which extended to area similar to that of Caspian Sea, between 6000–5000 BP.

Central Afar

Central Afar, now desert, is in Ethiopia and Djibouti Republic, at E end of Sahelian African zone. Its numerous tectonic depressions have been filled up by large lakes during Upper Quaternary humid periods. Lake level fluctuations are deduced from parallel analysis of numerous geol secs, and of one core, on border of Abhe Lake. Chronology of main stages of lacustrine evolution was established. Paleo-environments were also reconstructed from sedimentary facies and diatom flora (Gasse, 1975). Samples from Afar were coll and subm 1971–72–73–74 by F Gasse and P Rognon, CNRS, Paris, and samples from Ethiopia were coll and subm 1975 by A Street-Perrott.

Gif-2715. Assaita plain, A 100 **8000 ± 170**

Shells (mainly *Unio* sp) in conglomerate overlying silty diatomite (11° 39′ N, 41° 29′ E).

Gif-2571. Assaita plain, M 161 **13,130 ± 170**

Calcareous level with plant remains, at top of diatomite A 80 bis, overlain by silty diatomite without shells (11° 38′ N, 41° 53′ E).

Gif-2716. Assaita plain, A 80 bis **23,600 ± 740**

Shells (mainly *Melania* sp) in diatomite (11° 39′ N, 41° 29′ E).

Gif-2572. Assaita plain, NW Barawle volcano **8330 ± 180**

Shells (*Unio* and *Melania* sp) from beach deposit left at time of extension of lakes of Awash low valley (11° 30′ N, 41° 20′ E).

Erole II series, S Magenta

Samples from Erole II sec (11° 19′ N, 40° 20′ E), in Awash valley.

Gif-2727. Erole II, A 59 **$31{,}000^{+2200}_{-1700}$**

Shells (*Melania* sp) from shelly level at base of pure diatomite deposit, 5m thick, underlying Gif-2718.

Gif-2894. Erole II, A 45 **$30{,}600^{+2200}_{-1700}$**

Calcareous diatomite overlying Gif-2727.

Gif-2718. Erole II, A 60 **16,800 ± 310**

Carbonate from indurated calcareous slab, interstratified in diatomite Gif-2894. *Comment:* date strongly disagrees with stratigraphy and is unexplained.

Asal Lake series

Samples from ancient sediment of Asal Lake (11° 45′ N, 42° 25′ E).

Gif-2719. W Asal L, A 167 **5300 ± 130**

Lamellibranch shells from base level of gypseous sediments of Asal Lake.

Gif-2720. W Asal L, A 166 **8540 ± 180**

Shells (*Melania* sp) from silty level separated from A 167 by calcareous deposit, 1.5m thick.

Gif-3063. N Asal L, B 183 **≥40,000**

Shells from base of diatomite.

E Magenta Plateau series

Samples from different secs of E border Magenta plateau (11° 00′ N, 41° 20′ E).

Gif-2810. E Magenta A 25 **8650 ± 160**

Shells (*Unio, Melania* sp).

Gif-2811. E Magenta A 26 **8450 ± 190**

Shells (*Melania* sp) from silty level, superimposed on A 25.

Gif-2816. E Magenta, A 22 **8770 ± 190**

Shells.

Gif-2812. E Magenta, A 30 **7460 ± 180**

Shells from silty level.

Gif-2814. E Magenta, A 32 **6020 ± 160**

Shells overlying silty level.

General Comment: date extension of lower Holocene lacustrine phase, between 8000 and 9000 BP.

Gif-2813. Dubti, A 6 **8530 ± 190**

Shells in calcareous encrusting (11° 44′ N, 41° 04′ E).

Gif-2815. Dit-Bahari, A 11 **8450 ± 190**

Shells (*Unio, Melania* sp) (11° 35′ N, 41° 10′ E).

As Ela sec series, Gobaad plain

Shells from calcareous diatomite deposit, 1m thick (11° 00′ N, 42° 07′ E).

Gif-2854. As Ela, A 643 **4120 ± 110**

At top level of diatomite.

Gif-2855. As Ela, A 645 **7610 ± 140**

At base level of diatomite.

General Comment: date transgression of Abhe Lake at Middle Holocene.

Gif-3402. Modahtou, B 87 **7150 ± 100**

Shells in clayey level, near Abhe Lake (10° 59′ N, 41° 49′ E).

Gif-3093. As Ela, B 108 **26,000 ± 700**

Shells in calcareous deposit (10° 59′ N, 42° 08′ E).

Barogali Wadi series, Gobaad plain

Shells from superimposed levels corresponding to 2 different periods of lacustrine extension (11° 06′ N, 42° 04′ E).

Gif-3064. Barogali W, B 428 **7450 ± 100**

Melanoïdes sp, from shelly level. *Comment:* dates max extension of Abhe Lake at Middle Holocene.

Gif-3065. Barogali W, B 427 **20,800 ± 400**

Calcareous diatomite deposit. *Comment:* dates beginning of regression of Abhe Lake at Lower Pleistocene.

Gif-3066. Gramari Lake, B 132 **24,800 ± 650**

Shells in brown silt, S E present residual Gramari Lake in low valley of Awash (11° 29′ N, 41° 42′ E). *Comment:* dates max of late transgression of Abhe Lake at Lower Pleistocene.

Gif-2859. Sankal-Godaad, A 648 **5930 ± 130**

Shells (*Unio* sp) from shelly beach, in Godaad plain (11° 00′ N, 42° 30′ E).

Hanle series

Shells from sec in shelly lacustrine deposit (11° 21′ N, 42° 10′ E).

Gif-2857. Hanle, A 527 b **5250 ± 120**

From top of calcareous level. *Comment:* corresponds to Holocene episode.

Gif-3061. Hanle, B 277 **≥35,000**

From basal level. *Comment:* corresponds to 2nd lacustrine episode of Upper Pleistocene.

Unda-Dobi series

Samples from Unda-Gobi graben (11° 42′ N, 41° 51′ E).

Gif-2858. Unda-Gobi, A 569 **6570 ± 130**

Shells from top of calcareous diatomite deposit, 3m thick. *Comment:* corresponds to lacustrine optimum.

Gif-3092. Unda-Gobi, B 293 **23,600 ± 650**

Calcareous ashy diatomite. *Comment:* dates N extension of lakes during Upper Pleistocene.

Gif-3062. Sankal Wadi, B 36 **>40,000**

Shells (*Unio* sp) in silt, from lacustrine beach on right side of Sankal W (11° 00′ N, 42° 10′ E).

Sediment core series, Abhe Lake, Djibouti Republic

Samples from sediment core, 50m depth, on border of present Abhe Lake (11° 08′ N, 41° 53′ E). Subm 1973 by F Gasse. Present Abhe Lake, alt +240m, is remains of very large lake which spread through low valley of Awash R, mainly at low Holocene (Table 6).

TABLE 6
Lake Abhe core

Sample	Depth (m)	Sediment nature	Dated material	C content (%)	$\delta^{13}C$ (‰)	Age (yr BP)
Gif-3387	6.30–6.37	Calcareous clay	Carbonate	4		5830 ± 90
-3386	7.00–7.05	Calcareous clay	Carbonate	8.5		6660 ± 100
		Calcareous clay	Organic matter	3.5		7000 ± 140
-3385	8.25–8.50	Calcareous clay	Organic matter	2.4		7250 ± 140
-3662	8.90–9.10	Calcareous clay	Organic matter	1.5		16,500 ± 400
-3095	9.84–10.04	Calcareous clay	Organic matter	0.16		16,100 ± 800
-3560	10.60–11.00	Calcareous clay	Organic matter	0.13		16,900 ± 500
-3091	13.70–13.82	Calcareous silt	Carbonate	0.4		17,100 ± 400
-3388	17.17–17.22	Calcareous clay	Carbonate	1.4		23,900 ± 700
-3084	18.98–19.28	Clayed calcareous diatomite	Carbonate	5.8	−1.5	25,100 ± 700
-3660	19.75–20.08	Clayed calcareous diatomite	Organic matter	1.7	−24.3	25,600 ± 700
-3659	20.80–21.08	Clayed calcareous diatomite	Organic matter	2.6		39,000 ± 4000
-3955	25.60–25.77	Calcareous clay	Carbonate	1.9		7830 ± 140
-3485	25.77–26.35	Calcareous clay	Organic matter	0.7	−2.5	9000 ± 180
-3364	26.85–27.19	Calcareous clay	Organic matter	1.8	−24.7	7830 ± 140
-3562	27.67–27.77	Calcareous clay	Carbonate	3.6		≥41,000
-3563	29.53–29.63	Calcareous clay	Carbonate	7	−0.2	≥41,000

General Comment: dates help reconstruct successive phases of lacustrine evolution (Gasse, 1977). Large and persistent lakes extended in Afar and Main Rift from 40,000 and 20,000 yr with slight regression ca 30,000;

highest levels in Pleistocene are dated ca 25,000–23,000. After arid phase, all lakes transgress ca 9000 BP and reach high level between 9100–6000 BP. From 4000 BP onwards, climatic deterioration progressively incurred present situation. Diatomite studies indicate Late Pleistocene and Holocene environmental changes in subdesert E African zone. This study completes and verifies data on climatic evolution in Intertropical Africa, (Gasse & Delibrias. 1976).

Climatic samples

France

Gif-3229. Grangues, Calvados, 907 **3640 ± 100**

Silty peat from peat bog (49° 15′ N, 0° 03′ W). Coll and subm 1974 by E Helluin, Centre Géomorphol, Caen. *Comment:* date does not confirm Atlantic period deduced from pollen analysis.

Saint-André de Cubzac series, Dordogne

Peaty clayey sediment from marsh in Dordogne Valley (44° 59′ N, 0° 27′ W). Coll and subm 1973 by J F Vidalie, Lab Central Ponts et Chaussées, Paris.

Gif-3445. Saint-André de Cubzac, A 02 **5510 ± 120**

Peaty level, depth 2.62m, overlying mud, 4m thick.

Gif-3446. Saint-André de Cubzac, A 09 **5430 ± 120**

Peaty clayey level, depth 7m, underlying mud.

General Comment: both dates are within statistical limits of measurements; mud was deposited suddenly. Samples were dated for study of mechanical characteristics of compressible soils.

Gif-3486. La Rivière, Isère **10,600 ± 140**

Peaty gray clay at top of low terrace of glacial depression of Moirans (45° 20′ N, 5° 34′ E). Coll and subm 1975 by G Montjuvent, Inst Dolomieu, Grenoble. *Comment:* dates retreat of glaciers in Isère Valley.

Gif-2561. Plain of Ariège R, Haute Garonne **3410 ± 110**

Wood from fossil tree in gravel pit, low alluvial plain of Ariège R (43° 17′ N, 2° 23′ E). Coll and subm 1972 by L Rieucau, Univ Paris IV.

Gif-3384. Bordeaux, GA 28145, France **4190 ± 110**

Wood from alluvial fm, at Bordeaux (44° 50′ N, 0° 34′ W), depth 6m. Coll and subm 1974 by J Alvinerie, Inst Geol Bassin d'Aquitaine, Talence, Bordeaux.

Spain

Tenerife Island series, Canary Islands

Calcareous crusts interbedded with brown soils, developed on basalt substratum, Tenerife I. Coll and subm 1975 by P Quantin, ORSTOM, Bondy. Measured to date this type of soil formation.

Gif-3776. Los Olivos, T 5-1 **22,000 ± 600**

(28° 06′ N, 13° 02′ W), depth 70 to 85cm.

Gif-3777. Los Olivos, T 5-2 **≥31,000**

(28° 06′ N, 13° 02′ W), depth 125 to 135, same sec as T 5-1. *Comment:* due to contamination problems for this type of sample, only lower limit of age is given.

Gif-3779. Bajamar, T 6 **24,500 ± 700**

(28° 35′ N, 12° 40′ W) depth 70 to 85cm.

Gif-3780. Fasnia, T 7-3 **19,100 ± 400**

(28° 13′ N, 12° 44′ W), depth 395 to 410cm.

Area Longa series, Asturias

Peat from peat beds interstratified in solifluction flow, Area Longa beach (43° 36′ N, 7° 25′ W). Coll and subm 1974–1975 by G Mary, Fac Sci, Le Mans.

Gif-3490. Area Longa, 2 **16,780 ± 400**

From peaty level 2, 30cm thick, overlying solifluction flow, 3m above beach level.

Gif-3489. Area Longa, 1, upper part **15,950 ± 500**

From upper part of peaty level 1, ca 1m thick, underlying solifluction flow.

Gif-3488. Area Longa, 1, lower part **≥35,000**

From lower part of level 1.

General Comment: dates point out existence of solifluction period at 16,000 BP.

La Franca series, Asturias

Organic horizons interstratified in head which forms cliff on La Franca beach (43° 23′ N, 4° 23′ W). Samples coll and subm 1974–1975 by G Mary (Mary, Medus & Delibrias, 1977).

Gif-3051. La Franca, 3 **20,300 ± 500**

Peaty soil. *Comment:* date corresponds to Early Würm III, as expected from palynology.

Gif-3501. La Franca, 7 **32,900 ± 1600**

Paleosol, from level under Gif-3051. *Comment:* because of very low content of organic matter in paleosol, date must be taken as age limit rather than true age.

Gif-3052. La Franca, 1 **≥35,000**

Peat from peaty basal level.

Africa

Morocco

Imsouane, El Majni series

Samples from sec in alluvial silty terrace, (31° 50′ N, 9° 40′ W). Coll and subm 1975 by P Rognon.

Gif-3616. Imsouane, 34-3 b **880 ± 80**

Charcoal from kitchen midden.

Gif-3617. Imsouane, 34-3 b **570 ± 100**

Shells assoc with charcoal from same level as Gif-3616.

Gif-3621. Imsouane, 34-2 b **13,900 ± 250**

Shells (*Helix* sp) from sandstone level overlying typical rose-colored silty deposit.

Gif-3620. Imsouane, 34-2 a **27,700 ± 1100**

Shells (*Helix* sp) from bottom of rose-colored silty deposit.

General Comment: Gif-3621 dates important development of littoral dunes after episode of rose-colored silt deposit, at end of Soltanian Pluvial (Delibrias, Rognon & Weisrock, 1976).

Tissouirine, Ksob Wadi series

Samples from terrace of Ksob Wadi (31° 30′ N, 9° 45′ E). Coll and subm 1975–1981 by P Rognon.

Gif-3619. Ksob wadi, S **250 ± 80**

Charcoal from organic level in upper part of terrace under aeolian sand.

Gif-6000. Ksob wadi, AG 66 **1380 ± 60**

Shells (*Helix* sp) from shelly level at top of brown silt deposit, on sandy hill, in wadi estuary, near Essarouira.

Gif-3618. Ksob wadi, 50 **4950 ± 120**

Shells (*Helix* sp) from shelly level, in brown silt deposit, 1m under Gif-6000.

Gif-4053. Ksob wadi, 45 **5700 ± 120**

Shells (*Helix* sp) in human settlement on dune, near Ksob wadi.

General Comment: Gif-4053 dates end of arid period of sand accumulation.

Gif-6000 and -3618 date wadi overflows during Holocene (Weisrock *et al,* 1985).

Gif-3615. Koudiat el Aouija **≥40,000**

Lacustrine mussels from bottom of rose-colored silt deposit at upper part of low alluvial terrace of wadi Tensif (31° 40′ N, 8° 45′ W). Coll and subm by P Rognon.

Gif-4542. Moulay Bou Selham lagoon, Kenitra **3490 ± 100**

Shelly level from 0.60-0.67m depth in core 78001 (34° 58′ N, 6° 18′ W). Coll and subm 1978 by J Moyes, Univ Bordeaux 1. *Comment:* dates closing of lagoon.

Other Countries

Kafubu series, Shaba, Zaire

Samples from bank of river at Kafubu (12° 53′ S, 27° 46′ E). Alt 1120m. Coll by A Lequarré and subm 1975 by P de Maret, Mus Royal Afrique Centrale, Tervuren, Belgium.

Gif-3454. Kafubu, 16/29-6 **170 ± 100**

Charcoal assoc with ceramics, depth 1.50–2.00m.

Gif-3455. Kafubu, 3/29-6 **1140 ± 90**

Wood assoc with remains of cob-work, depth 5m.

Gif-3456. Kafubu, 19/29-6 **2030 ± 100**

Wood, depth 5m.

General Comment: dates indicate high fluviatile sedimentation rate.

Delta of Chari R series, Chad

Organic sediments from borings in delta of Chari (ca 12° 50′ N, 14° 30′ E). Coll and subm 1975 by M Mathieu, ORSTOM, N'Djamena, Chad.

Gif-3458. Boring V-18 **270 ± 90**

Depth 4.10m.

Gif-3459. Boring XV-11 **Modern**

Depth 1.15m.

Gif-3460. Sec XVI-2 **510 ± 90**

Depth 2.70m, in sec in river bank.

General Comment: dates are much younger than expected, which suggests very high sedimentation rate.

Gif-3424. Koren Mogodaye, Yagoua, N Cameroon **4010 ± 110**

Charcoal coated with iron-clay deposit in B horizon of pedogenic profile at top of red-sand dune (10° 17′ N, 15° 4′ E). Coll and subm 1975 by M

Gavaud, ORSTOM, Yaounde, Cameroon. *Comment:* dates fm of this type of ferrigeneous soil.

Badoudi series, Garoua region, Cameroon

Samples from Profile BEG 182 in ancient terrace of Benoué R, at Badoudi (9° 15′ N, 13° 23′ E). Alt 8m. Profile shows succession of differentiated and leached soils, which are result from recent pedogenesis. Coll and subm 1975 by M Gavaud.

Gif-3359. Badoudi, BEG 182-11 b **10,950 ± 220**

Calcareous nodules, 1 to 5mm diam, 4.40m depth in fossil vertisol.

Gif-3081. Badoudi, BEG 182-12 **8920 ± 160**

Gastropod shells, 4.70m depth, at base level of fossil vertisol with nodules dated by Gif-3359.

General Comment: Gif-3359 and -3081 are in inverted order but date of Gif-3359 obtained for nodules is probably less reliable than Gif-3081. Nevertheless dates agree with Gif-871: 10,160 ± 200 (R, 1971, v 13, p 241) age of organic matter from vertisol in same strat position, ca 20km from Badoudi. This episode of pedogenesis, in W Cameroon, corresponds to humid period well dated in Africa.

Badda Mountain series, Ethiopia

Peat samples from cores in peat bog on E side of Badda Mt (8° 00′ N, 39° 45′ E). Alt +4043m. Coll 1975 by A Street and D Lauder and subm 1976 by F Gasse.

Gif-3889. Badda Mt, S 1, Bog 3, 40–50cm **770 ± 110**

Comment: undersized sample.

Gif-3890. Badda Mt, Bog 3, 140–150 cm **2520 ± 100**

Gif-3891. Badda Mt, Bog 3, 290–300cm **11,500 ± 200**

Gif-4684. Badda Mt, Bog 1, 40–50cm **790 ± 80**

Gif-4685. Badda Mt, Bog 1, 90–100cm **1700 ± 90**

Gif-4109. Badda Mt, Bog 1, 183–200cm **3430 ± 120**

Comment: undersized sample.

Gif-4108. Badda Mt, Bog 1, 232–250cm **7490 ± 140**

Gif-2915. Antanetibe plain, Hauts-Plateaux, AHR 35, Madagascar **360 ± 80**

Organic horizon, 2.10m depth underlying clayey soil (18° 30′ S, 47° 30′ E). Coll and subm 1974 by C Ratsimbazafy, ORSTOM, Tananarive.

Gif-2916. Antanetibe plain, Hauts-Plateaux, AHR 64, Madagascar **Modern**

Organic horizon, 1.50m depth underlying hydromorphic soil in alluvial Antanetibe plain (18° 22′ S, 47° 33′ E). Coll and subm 1973 by C Ratsimbazafy. *Comment:* Gif-2916 and -2915 indicate very recent fossilization and rapid sedimentation rate in that region (Bourgeat & Ratsimbazafy, 1975).

Gif-2958. Iazafo plain, ZAR 1007, Madagascar **8110 ± 170**

Organic horizon underlying alluvial deposit, 3m thick (17° 25′ S, 49° 16′ E). Coll and subm 1973 by C Ratsimbazafy.

Gif-2959. Iazafo plain, ZAR 334, Madagascar **17,700 ± 420**

Black organic horizon underlying clayey alluvial deposit, in low terrace, 2.80m thick (17° 25′ S, 49° 17′ E). Coll and subm 1973 by C Ratsimbazafy. *Comment:* Gif-2958 and 2959 indicate that weathering and concomitant low terrace fm occurred between 25,000 and 8000 BP (Bourgeat & Ratsimbazafy, 1975).

Southern Indian Ocean

Kerguelen Island series

Peat samples subm 1974 by N Bellair, CNRS, Paris.

Gif-3543. Betsy Cove 1 **1620 ± 90**

(49° 10′ S, 70° 12′ E), depth 0.95 to 1.05m.

Gif-3544. Betsy Cove 2 **3340 ± 100**

Depth 1.10 to 1.25m.

Gif-3545. Betsy Cove 3 **4260 ± 110**

Depth 1.85 to 2.00m.

Gif-3546. Betsy Cove 4 **3840 ± 110**

Depth 2.15 to 2.25m.

Gif-3542. Dante Plain **5790 ± 120**

(49° 38′ S, 69° 34′ E), depth 2.25 to 2.35m.

Possession Island series, Crozet Archipelago

Peat samples subm 1972–73 by N Bellair.

Gif-2602. Branloirs Valley, 2 **840 ± 90**

(46° 24′ S, 51° 45′ E), depth 0.95 to 1.30m.

Gif-2460. Branloirs Valley, 1 **4570 ± 130**

Depth 3.50 to 3.75m.

Gif-4501. American Bay **580 ± 80**

(46° 23′ S, 51° 48′ E), depth 2.10 to 2.50m.

General Comment: for Kerguelen and Possession I series: because of relatively high sedimentation rate, studied secs do not represent long period of time and only climatic variations of Little Ice Age were indicated by pollen analysis (Roche-Bellair, 1973).

South America

Los Llanos Centrales series, Venezuela

In central plains of Venezuela, +100m above msl, dune fms extend over large area from 6° to 9° 15′ N and 64° to 70° W. These fossil dunes, 10 to 15m high, presently fixed by grass, contain some paleosol levels. Samples from these organic horizons were coll by boring and subm 1974 by P R Morales, Fac Ciencas, Univ Central Venezuela, Caracas.

Gif-3331. Llanos Centrales, M-27 A **2290 ± 90**

Black sandy level with vegetal debris, depth 2.05m (7° 33′ N, 69° 15′ W).

Gif-3332. Llanos Centrales, M-33 B **3700 ± 110**

Black sandy level with vegetal debris, depth 1.60m (7° 34′ N, 69° 16′ W).

Gif-3333. Llanos Centrales, M-35 C **4130 ± 240**

Brown sandy level with vegetal debris, depth 1.20m (7° 29′ N, 69° 15′ W).

Gif-3335. Llanos Centrales, M-32 B **5860 ± 270**

Silty level with vegetal and charcoal debris, depth 2m (8° 32′ N, 67° 32′ W).

Gif-3336. Llanos Centrales, M-19-1-aP **11,000 ± 450**

Silty level with vegetal remains, depth 4.20m (8° 32′ N, 67° 33′ W).

General Comment (PRM): dates succession of arid periods with sand accumulation and moist periods with soil development since 11,000 BP. Dunes imply existence of vast desert in that region during last glaciation.

North America

Owl River series, Baffin Island, Canada

Peat from 3m river-cut exposure of Owl R, Pangnirtung Pass (66° 45′ N, 64° 42′ W). Coll by G H Miller and subm 1974 by J T Andrews, Univ Colorado, Boulder.

Gif-3493. Owl River, 155–160cm **1870 ± 90**

Gif-3494. Owl River, 289–294cm **2660 ± 100**

Comment (JTA): peat underlying 1.5m of niveo-aeolian sand that reflects increased aridity in N sec Pangnirtung Pass since 2660 BP.

Gif-4044. Prudhoe Bay, N Alaska **6480 ± 130**

Peat from underlying blue clay exposed in coastal bluff, Prudhoe Bay (70° 18′ N, 148° 23′ W), alt ca 0.2m above msl. Peat is covered by 20cm dead vegetal matter, 20cm alternating dark and light colored silts and 40cm dark brownish-black organic-rich clay. Coll and subm 1974 by J T Andrews. *Comment* (JTA): strat suggests marine transgression or clay solifluction when sea was lower than at present. Pollen analysis shows Cyperaceae dominates, but *Betula, Alnus* and *Picea* are present in significant amounts.

Kuparuk River series, Alaska

Peat from river-bank exposure of Kuparuk R (70° 19′ N, 148° 57′ W), ca 6m above msl. Coll and subm 1974 by J T Andrews.

Gif-3667. Kuparuk R, 74cm **2300 ± 110**

Gif-3666. Kuparuk R, 195-205cm **3470 ± 100**

General Comment (JTA): river gravels were overlain by overbank silts and clays and succeeded by peats and sands after 3500 BP. Shortly after 2300 BP, site was dominated by eolian sediments. Pollen analysis shows Cyperaceae, Gramineae, and *Alnus, Betula, Pinus, Picea.*

Gif-3668. Putuligayuk River, Alaska **3270 ± 100**

Peaty clay sample from base of river-bank exposure along Putuligayuk R (70° 14′ N, 148° 44′ W), ca 4m above msl. Coll and subm 1974 by J T Andrews.

Sagavanirktok River series, Alaska

Peat samples from slumped block of E facing slope of Sagavanirktok R (70° 13′ N, 148° 22′ W). Coll and subm 1974 by J T Andrews.

Gif-3665. Sagavanirktok R **190 ± 100**

Near surface.

Gif-3664. Sagavanirktok R **1210 ± 110**

Depth 1.35m.

Marine Samples

Large manganese nodules series

Carbonate inclusions in fluorapatite core of large manganese nodules from Pacific Ocean (16° 28′ S, 146° 34′ W), 1000m depth. Samples subm 1973 by C Lalou, CFR-CNRS, Gif sur Yvette, in connection with Mn nod-

ules growth rate and Mn chemistry in sea studies (Lalou *et al,* 1973; Lalou, Brichet & Bonté, 1976).

Gif-2314. Nodule D IV A **15,700 ± 400**
$\delta^{13}C = +1.2‰$

Weight 16.5kg.

Gif-2751. Nodule DO 23 F **25,800 ± 800**
$\delta^{13}C = +2.3‰$

Weight 9.5kg.

General Comment: these values cannot be considered true ages. Presence of ^{14}C indicates either continual exchange of C with sea water or exchange during abrupt recrystallization of core. Undersized samples.

Mn deposit series

Coral samples dredged from Mid-Atlantic ridge (36° 46′ N, 35° 15′ W), between 2850 and 2500m, near hydrothermal field, by R Hekinian, COB-CNEXO. Subm 1975 by C Lalou.

Gif-3440. CH 31 n° 4 **3730 ± 230**

Inside part of coral branch (*Isis* sp) which shows Mn annular ring, 6μm thick, between two growth phases. *Comment:* x-ray analysis shows 100% calcite.

Gif-3441. CH 31 n° 2 **3550 ± 230**

Coral from same branch as Gif-3440, outside Mn ring. *Comment:* x-ray analysis shows 100% calcite. Dates of Gif-3440 and -3441, within statistical margin, show Mn was deposited very quickly.

Gif-3958. CH 31, DR 5 B **6760 ± 160**

Coral branch (*Desmophyllum* sp) with external Mn deposit 6μm thick. *Comment:* x-ray analysis shows 10% calcite.

General Comment: undersized samples.

Gif-3636. Coral branch, DO 11 (1), Pacific Ocean **≥28,000**

Internal part of coral branch, diam 5mm, underlying manganese deposit, from Pacific Ocean, near Tuomatu I. Coll by CNEXO and subm 1975 by C Lalou (17° 13′ S, 145° 44′ W) 1140m depth. *Comment:* undersized sample.

Gif-3731. Mid-Atlantic Ridge **≥28,000**

Travertine inside Mn-Fe-carbonate geode, coll 1974 during FAMOUS expedition by CYANA submersible on surface sediment of Mid-Atlantic Ridge, depth 3000m, 8m from hydrothermal vents (36° 56′ N, 33° 04′ W). Subm 1975 by C Lalou.

La Romanche Trench series, Atlantic Ocean

Organic fraction of sediment from marine core 71-08, 770cm long (0° 14′ S, 18° 37′ W), depth 7500m. Subm 1974 by C Lalou.

Gif-3404. Core 71-08, 0–1cm 2250^{+450}_{-1000}

Undersized sample.

Gif-3426. Core 71-08, 71–75cm **3220 ± 360**

Gif-3442. Core 71-08, 403–407cm **8600 ± 360**

Gif-4247. Core 71-08, 664–674cm **15,700 ± 400**

General Comment: dates help to calculate very high sedimentation rate, ca 50cm/1000 yr, which is due to funnel shape of trench (Bonté *et al,* 1982). Undersized samples.

Atlantic abyssal plain series

Marine sediments were coll by box cores, in 1974 during MIDLANTE expedition in Atlantic abyssal plain. Samples subm 1975 by A Monaco, Centre Univ, Perpignan. Carbonate fraction $\geq 40\mu$ was dated.

Gif-3754. Atlantic abyssal plain, KR 02, 1 **2740 ± 200**

(18° 24′ N, 24° 34′ W), depth 3794m, surface sediment, 0 to 1cm.

Gif-3790. Atlantic abyssal plain, KR 02, 3 **3040 ± 200**

2 to 3cm depth.

Gif-3791. Atlantic abyssal plain, KR 03, 1 **2660 ± 200**

(19° 36′ N, 27° 26′ W), depth 4791m, surface sediment, 0 to 1cm.

General Comment: high sedimentation rate deduced from Gif-3754 and -3790 is probably due to turbidite currents, indicated by sedimentologic and mineralogic studies.

Blanc du Four series, W Atlantic

Carbonate fraction of sediment cores in organogenic calcareous sand bank (hydraulic sand dunes). Samples subm 1975 by J P Le Gorgeu, CNEXO, Brest.

Gif-3679. Blanc du Four, 35 F 1 **5300 ± 130**

From 1st m of core 35 F (48° 38′ N, 4° 54′ W), depth 43m.

Gif-3497. Blanc du Four, 35 F 10 **4100 ± 110**

From 10th m of core 35 F.

Gif-3680. Blanc du Four, 41 F 1 **4860 ± 130**

From 1st m of core 41 F (48° 31′ N, 4° 53′ W), depth 60m.

Gif-3498. Blanc du Four, 41 F 9 **2970 ± 100**

From 9th m of core 41 F.

General Comment: dated to estimate sand accumulation rate in order to exploit dunes, but ages are not significant; sediments were probably reworked by fm process of hydraulic dunes.

Miscellaneous Samples

Soil series

Study of evolution rate of organic matter in two types of Mediterranean soils, on calcareous substratum, was made at Massif de la Gardiole (43° 29′ N, 3° 44′ E), alt 210m (calcic-ferrasiallitic soil A), and at Bois Doscare (43° 37′ N, 3° 57′ E), alt 55m (non-calcic-ferrasiallitic soil B), Hérault (Bottner, 1972). Samples (Table 7) were coll 1973 and chemical preparation made by P Bottner, Centre d'Etudes Phytosociolog écolog, Montpellier, France. Different separated fractions result from successive hydrolysis, (F II and F IV), and from alkaline extractions (F III).

General Comment: different components of O M in surface horizons of both soils are young which means that turnover of O M is rapid in these soils. Presence of bomb ^{14}C makes it possible to establish residence time of C in A horizons at most 15 yr and is shorter in B Cryptomull than in A Calcic mull, as expected.

TABLE 7
Massif de la Gardiole and Bois Doscare

Sample	Fraction	^{14}C activity (△‰)	Age (yr BP)	Horizon
Soil A: Calcic mull				
Gif-3234	Total OM	+142 ± 10		A1 2–10cm
-3235	F II	+137 ± 10		
-3236	F III	+191 ± 10		
-3237	F IV	+139 ± 10		
-3552	Total OM		210 ± 80	A3 10–35cm
-3553	Total OM		1940 ± 100	B 70–120cm
Soil B: Cryptomull				
Gif-3238	Total OM	+366 ± 10		A1 3–12cm
-3239	F II	+224 ± 10		
-3240	F III	+256 ± 10		
-3241	F IV	+153 ± 10		

Fossil hydrocarbon in marine organism series

Measurements of ^{14}C activity of shells and algae living in estuary of Rance R (48° 60′ N, 2° W), in estuary of Loire R (47° 17′ N, 2° 12′ W) and in Aber Benoit (48° 33′ N, 3° 27′ W) were studied to distinguish between fossil organic carbon due to petroleum and modern organic carbon, in living marine organisms (Table 8). Samples were coll and subm 1975 and 1978 by P Renault and J C Roussel, Inst Français Pétrole, Rueil-Malmaison. Extraction and identification of different dated fractions were done by IFP.

General Comment: results indicate importance of carbon of fossil origin in marine organisms. Gif-4832 shows that totality of hydrocarbon is fossil in

TABLE 8
Fossil hydrocarbon in marine organisms

Sample	Material	$\delta^{14}C$ (‰)	$\delta^{13}C$ (‰)	$\Delta^{14}C$ (‰)	Fossil carbon (%)
Gif-3771	Rance estuary, *Algua,* ref 1975	+194	−16.1	+172.8 ± 10	
-3749	Rance estuary, *Zostera,* cellulose ref 1975	+186	(−16)	+164 ± 10	
-3887	Rance estuary, *Laminaria,* cellulose ref 1975	+195	(−16)	+173 ± 10	
-3751	Rance estuary, *Laminaria,* lipid fraction	+196	(−16)	+174 ± 22	0
-4009	Rance estuary, *Laminaria,* hydrocarbon in hexane, 1	−282	(−16)	−295 ± 25	40
−4041	Rance estuary, *Laminaria,* hydrocarbon in benzene	−233	(−16)	−233 ± 30	36
-4537	Rance estuary, *Laminaria,* hydrocarbon in hexane, 2	−58.5	(−16)	−75 ± 10	21
-4432	Loire estuary, mussel shells, ref 1978	+151	(ca 0)	+93 ± 7	
-4591	Loire estuary, mussel flesh, hydrocarbon	+46	−27.6	+51.5	4
-4590	Loire estuary, 0 M in marine sediments, hydrocarbon	−612	−23.9	−611 ± 7	
-4829	Aber Benoit, oyster shells, ref 1978	+161	(0)	+103 ± 5	
-4830	Aber Benoit, oyster flesh, hydrocarbon in hexane	−212	−218	−217 ± 25	29
-4831	Aber Benoit, oyster flesh, hydrocarbon in methanol	+74	−21.3	+66 ± 24	4
-4832	Aber Benoit, 0 M in marine sed hydrocarbon in hexane		−32.7	>−980	>98

organic matter of sediments of Aber Benoit. Moreover, ^{14}C measurements help calculate fossil carbon percentage in different separated fractions and improve chemical extraction of hydrocarbon.

Cuenca del Lago de Valencia series, San Joaquim-El Ereigue, Venezuela

Organic sediments from Lago de Valencia (ca 10° N, 68° W), alt +1000m. Subm 1977 by G R Sieffermann.

Gif-4353. Lago de Valencia, depth 4.5m **980 ± 100**

Gif-4354. Lago de Valencia, depth 7.5m **5900 ± 100**

General Comment: dates help evalute erosion rate in basin.

Gif-4355. Rio Guarapiche, Chiguata, Venezuela **2700 ± 150**

Organic level in recent terrace of R Guarapiche (ca 9° N, 64° W), 115 to 117cm under surface. Subm 1977 by G R Sieffermann, ORSTOM, Paris.

Gif-2890. Bansbari, Kathmandu, Nepal **≥44,000**

Lignite, 3m thick, in sand pit underlying gray and yellow silty sand, 6m thick. Coll and subm 1973 by J Hubschman, Inst Geog, Univ Toulouse. *Comment:* date is min for fill of this lacustrine depression.

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