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RADIOCARBON

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INSTRUCTIONS TO CONTRIBUTORS

Manuscripts of radiocarbon papers should follow the recommendations in *Suggestions to Authors,* 5th ed.* All copy (including the bibliography) must be typewritten in *double space.* Manuscripts for vol 16, no. 2 must be submitted in *duplicate* before October 1, 1973; for vol 16, no. 3 before February 1, 1974.

Descriptions of samples, in date lists, should follow as closely as possible the style shown in this volume. Each separate entry (date or series) in a date list should be considered an *abstract,* prepared in such a way that descriptive material is distinguished from geologic or archaeologic interpretation, but description and interpretation must be both brief and informative, emphasis placed on significant comments. Date lists should therefore not be preceded by abstracts, but abstracts of the more usual form should accompany all papers (eg, geochemical contributions) that are directed to specific problems.

Each description should include the following data, if possible in the order given:

1. Laboratory number, descriptive name (ordinarily that of the locality of collection), and the date expressed in years BP (before present, ie, before AD 1950) and, for finite dates, in years AD/BC. The standard error following the date should express, within limits of $\pm$ 1σ, the laboratory's estimate of the accuracy of the radiocarbon measurement, *as judged on physicochemical (not geologic or archaeologic) grounds.*
2. Substance of which the sample is composed; if a plant or animal fossil, the scientific name if possible; otherwise the popular name; but not both. Also, where pertinent, the name of the person identifying the specimen.
3. Precise geographic location, *including latitude-longitude coordinates.*
4. Occurrence and stratigraphic position in precise terms; use of metric system exclusively. Stratigraphic sequences should *not* be included. However, references that contain them can be cited.
5. Reference to relevant publications. Citations within a description should be to author and year, with specific pages wherever appropriate. References to published date lists should cite the sample no., journal (R for Radiocarbon), years, vol, and specific page (eg, M-1832, R, 1968, v 10, p 97). Full bibliographic references are listed alphabetically at the end of the manuscript, in the form recommended in *Suggestions to Authors.*
6. Date to collection and name of collector.
7. Name of person submitting the sample to the laboratory, and name and address of institution or organization with which submitter is affiliated.
8. Comment, usually comparing the date with other relevant dates, for each of which sample numbers and references must be quoted, as prescribed above. Interpretive material, summarizing the significance and implicity showing that the radiocarbon measurement was worth making, belongs here, as do technical matters, *eg,* chemical pretreatment, special laboratory difficulties, etc.

Illustrations should not be included unless absolutely essential. They should be original drawings, although photographic reproductions of line drawings are sometimes acceptable, and should accompany the manuscript in any case, if the originals exceed 9 to 12 inches in size.

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* Suggestions to authors of the reports of the United States Geological Survey, 5th ed, Washington, DC, 1958 (Government Printing Office, $1.75).

NOTICE TO READERS

Half life of ^{14}C. In accordance with the decision of the Fifth Radiocarbon Dating Conference, Cambridge, 1962, **all dates published in this volume (as in previous volumes) are based on the Libby value, 5570 ± 30 yr,** for the half life. This decision was reaffirmed at the 8th International Conference on Radiocarbon Dating, Wellington, New Zealand, 1972. Because of various uncertainties, when ^{14}C measurements are expressed as dates in years BP the accuracy of the dates is limited, and refinements that take some but not all uncertainties into account may be misleading. The mean of three recent determinations of the half life, 5730 ± 40 yr, (**Nature,** v 195, no. 4845, p 984, 1962), is regarded as the best value presently available. Published dates in years BP, can be converted to this basis by multiplying them by 1.03.

AD/BC dates. As agreed at the Cambridge Conference in 1962, AD 1950 is accepted as the standard year of reference for all dates, whether BP or in the AD/BC system.

Meaning of $\delta^{14}C$. In Volume 3, 1961, we indorsed the notation Δ (Lamont VIII, 1961) for geochemical measurements of ^{14}C activity, corrected for isotopic fractionation in samples and in the NBS oxalic-acid standard. The value of $\delta^{14}C$ that entered the calculation of Δ was defined by reference to Lamont VI, 1959, and **was corrected for age.** This fact has been lost sight of, by the editors as well as by authors, and recent papers have used $\delta^{14}C$ as the **observed** deviation from the standard. At the New Zealand Radiocarbon Dating Conference it was recommended to use $\delta^{14}C$ only for age-corrected samples. Without an age correction, the value should then be reported as percent of modern relative to 0.95 NBS oxalic acid. (Proceedings 8th Conference on Radiocarbon Dating, Wellington, New Zealand.)

In several fields, however, age corrections are not possible. $\delta^{14}C$ and Δ, uncorrected for age, have been used extensively in oceanography, and are an integral part of models and theories. For the present therefore we continue the editorial policy of using $\delta^{14}C$ notations for samples not corrected for age.

Radiocarbon Measurements: Comprehensive Index, 1950-1965. This index, covering all published ^{14}C measurements through Volume 7 of RADIOCARBON, and incorporating revisions made by all laboratories, has been published. It is available to all subscribers to RADIOCARBON at ten dollars US per copy.

Publication schedule. Beginning with Volume 15, RADIOCARBON is published in three numbers: Winter, Spring, and Summer. The next deadline is February 1, 1974. Contributors who meet our deadlines will be given priority but not guaranteed publication in the following issue.

List of laboratories. The comprehensive list of laboratories at the end of each volume now appears in the third number of each volume.

Index. All dates appear in index form at the end of the third number of each volume.

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Vol. 16, No. 1 Radiocarbon 1974

CONTENTS

[RADIOCARBON, VOL. 16, No 1, 1974, P. 1-5]

Radiocarbon

1974

CAIRO NATURAL RADIOCARBON MEASUREMENTS I

SHAWKI M NAKHLA and FERIAL M MOHAMMED

Carbon-14 Dating Laboratory, Center of Research and Conservation of Antiquities, Organisation of Egyptian Antiquities, Cairo

INTRODUCTION

The Organisation of Egyptian Antiquities believes that Egypt should play an important role in current international research in the field of radiocarbon dating of archaeologic samples. Thus, such a laboratory was established within the Center of Research and Conservation of Antiquities, CRCA, Cairo.

Electronics and much of the glass equipment were contributed by the French government for applied archaeologic research in Egypt.

The laboratory began operating in 1971 using the carbon dioxide proportional counter technique. Our proportional gas counter was made at the Centre des Faibles Radioactivités, France, with an effective volume of 1.2 L. The counter is surrounded by 40 Geiger counters L cd-8 in 2 alternative layers and arranged in anticoincidence. The counters are within an iron shield 30cm thick. The iron used was completely free from radioactive contamination. The pulses are counted by a transistor apparatus made by Intertechnique, France. The background is 3.1cpm and the counting rate of oxalic acid standard from NBS is 10.12cpm at normal counting pressures. The sample is introduced into the counter as purified carbon dioxide at a pressure of 1 atmosphere.

The sample, after being cleaned mechanically, is generally treated with hot 2% NaOH, followed by hot 10% HCl and then washed with hot, distilled water several times until the resulting solution is neutral to an acid indicator, then dried at 80°C. The sample is then burnt in a stream of oxygen and the CO_2 formed is purified by passing it over hot CuO (600°C), 0.1N $AgNO_3$ and $H_2SO_4 \cdot CrO_3$ solutions successively to remove halides, nitrogen, and sulphur oxides. The CO_2 is generally stored for 3 weeks to allow for complete decay of radon. It is then submitted to a process of fractional distillation using liquid nitrogen and a cooling mixture at −80°C. The gas is then trapped over alumina to eliminate electronegative impurities, dried by passing it over P_2O_5, and the proportional counter is filled at 1 atmosphere. The sample is generally counted for 2 successive nights. All dates are calculated both in years before 1950 and in the AD/BC scale. The applied ^{14}C half-life is 5570 yr. The NBS recent standard is 95% of the ^{14}C activity in the oxalic acid.

CRCA-9. Soil 90 to 110cm **1220 ± 120 AD 730**

Organic fraction from a dark continuous archaeologic layer that probably was inhabited before as it contains traces of bricks, pottery, glass, and other artifacts.

ACKNOWLEDGMENTS

The authors wish to thank Gamal Moukhtar, Chairman, Organisation of Egyptian Antiquities, Zaky Iskander, Dir Gen, for the help offered during the construction of the laboratory. They wish also to express their deep gratitude to Jacques Labeyrie, chief, Centre des Faibles Radioactivités, France, and Georgette Delibrias, chief, Gif Radiocarbon Dating Laboratory for advice and help in establishing the laboratory.

SAMPLE DESCRIPTIONS

Karnak series

The Karnak temples at Thebes (25° 43′ N, 32° 39′ E), the most famous temples in Ancient Egypt, were built over a long period of time. The oldest part was constructed ca 2000 BC and the temples continued in use until early Christian times.

Varied samples from different dynasties were coll 1971 by one of us (S Nakhla) with the staff of the Franco-Egyptian Center for the Study and Restoration of the Karnak temples. Five soil samples were taken from different depths in front of the W wing of the 1st pylon, ca 60m from the Nile R. The samples described here are the 1st part of this group.

CRCA-4. **2254 ± 100**
304 BC

Carbonized wood from a piece of furniture found during the Franco-Egyptian excavations near the W side of the 1st pylon built by Nectanebo I of the XXXth Dynasty (378 to 360 BC).

CRCA-6. **2943 ± 120**
993 BC

A wooden dove-tail wedge found between blocks of E part of the Sanctuary of the temple of Harpré. The temple is in N part of the Karnak temples and supposedly was built during the XXIst dynasty, 1080 to 950 BC (Jacquet, pers commun).

CRCA-5. **2162 ± 100**
212 BC

A wooden dove-tail wedge found between sandstone blocks of IXth pylon, built during the reign of Horemheb, the last king of the XIXth dynasty, 1340 to 1320 BC. *Comment*: date indicates that the pylon may have been reconstructed or restored during the Greaco-Roman period.

CRCA-8. Soil 8 to 18cm $\delta^{14}C = 12\%$

Organic fraction from soil 8cm from surface. Land was cultivated a few years ago and is now covered with wild grasses. Recent vegetation is responsible for presence of atomic bomb effect in this layer.

CRCA-33. **3500 ± 100**
1550 BC

Reeds found as sheets between mudstraw bricks of arcades facing tomb of Mentu-em-hat (26th dynasty) Assasif (25° 40′ N, 32° 30′ E), Thebes. *Comment*: date indicates reeds are much older than tomb of

1220 ± 120

CRCA-9. Soil 90 to 110cm **AD 730**

Organic fraction from a dark continuous archaeologic layer that probably was inhabited before as it contains traces of bricks, pottery, glass, and other artifacts.

1582 ± 120

CRCA-10. Soil 170 to 190cm **AD 368**

Organic fraction from a dark mud layer.

1440 ± 120

CRCA-11. Soil 270 to 290cm **AD 510**

Organic fraction from a brownish mud layer.

1504 ± 120

CRCA-12. Soil 360 to 380cm **AD 446**

Organic fraction from a yellowish sandy layer. *Comment*: port of Karnak was reconstructed during Roman occupation, which may explain relatively young ages obtained for layers 170 to 380cm. Presence of artifacts in layer 90 to 110cm indicates that level may have been inhabited some 1220 yr ago. Date corresponds to Christian epoch in Egypt and the beginning of Arabic period.

3433 ± 100

CRCA-32. **1483 BC**

Pieces of *cedrus libani* from tomb of Tutankhamon (18th dynasty), valley of the Kings (25° 40′ N, 32° 30′ E) Thebes, Egypt. Coll 1971 by SM Nakhla and M Saleh from excavation colln at Qurna.

3284 ± 100

CRCA-65. **1334 BC**

Pieces of *cedrus libani* from funerary furniture of Tutankhamon, valley of the Kings, Thebes. Colln of A Lucas, Center of Research and Conservation of Antiquities, Cairo. *Comment*: tomb of Tutankhamon was discovered by Howard Carter in 1922 (Carter, 1933). Historical date of reign of Tutankhamon is 1352 to 1343 BC.

3274 ± 120

CRCA-44. **1324 BC**

Wood from Serdab behind burial chamber of Seti I (19th dynasty), valley of the Kings (25° 40′ N, 32° 30′ E), Thebes. Coll 1971 and subm by Z Iskander. *Comment*: Seti I was the son of Ramsis I, the founder of the 19th dynasty. He reigned from 1327 to 1306 B.C.

3886 ± 150

CRCA-38. **1936 BC**

Trunk found embedded in soil during German excavations at Assasif (52° 40′ N, 32° 30′ E), Thebes. Coll 1971 and subm by A Arnolds. *Comment*: trunk is dated archaeologically at time of Mentuhotep II from XIth dynasty (2050 to 2010 BC).

3500 ± 100
CRCA-33. **1550 BC**

Reeds found as sheets between mudstraw bricks of arcades facing tomb of Mentu-em-hat (26th dynasty) Assasif (25° 40′ N, 32° 30′ E), Thebes. *Comment*: date indicates reeds are much older than tomb of Mentu-em-hat, dated archaeologically at 600 BC. Thus arcades may have been built or reconstructed during the 18th dynasty.

4387 ± 150
CRCA-22. **2437 BC**

Reeds from tomb of Khenamon, Assasif (25° 40′ N, 32° 30′ E), Thebes. Coll 1971 and subm by M Saleh. *Comment*: tomb of Khenamon was discovered in 1961 by M Saleh and is dated from Old Kingdom (3200 to 2280 BC).

2370 ± 120
CRCA-35. **420 BC**

Plant debris from one of tombs excavated by Antiquities Dept Egypt in region of Abo-Bello (30° 26′ N, 30° 48′ E), Egypt. Coll 1971 and subm by S El Bakry. *Comment*: region of Abo-Bello includes tombs from Graeco-Roman period and early Christian times.

1890 ± 120
CRCA-37. **AD 60**

Human bones from one of tombs discovered during excavation by Ministry of Industry in 1971 at Helwan dist. Coll 1971 and subm by A Nassef. *Comment*: tombs are part of ancient public cemetery and are dated archaeologically from Roman and early Christian times (M Basta, pers commun).

2520 ± 100
CRCA-46. **570 BC**

Carbonized wood from W furnaces on road of ram-headed sphinxes leading from Luxor temple to Karnak temples (25° 43′ N, 32° 39′ E), Thebes. Coll 1971 and subm by S El Bakry.

10,580 ± 200
CRCA-36. **8630 BC**

Carbonized wood, 55 to 60m from surface in region of Tala Betous (30° 40′ N, 30° 57′ E), Menoufiia, Egypt, during excavation by Dept Chem Egypt for geochemical study of Nile Delta. Coll 1971 and subm by M Abd El Aziz.

2254 ± 100
CRCA-57. **304 BC**

Carbonized wood found during Polish excavations, 10m from surface at Kom El Dikka (31° 40′ N, 29° 55′ E) Alexandria, Egypt. Region of Kom El Dikka is archaeologically dated from Graeco-Roman times and includes the famous Roman theater.

4750 ± 200

CRCA-43. **2800 BC**

Carbonized wood from one of furnaces in ancient village discovered by Univ Cairo in region of pyramids (29° 58′ N, 31° 7′ E) Giza, Egypt. Coll 1971 and subm by A Saleh. *Comment*: pyramids belong to Kings from IVth dynasty (2680 to 2563 BC).

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[RADIOCARBON, VOL. 16, NO. 1, 1974, P. 6-9]

DUBLIN RADIOCARBON DATES II

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INTRODUCTION

The Dublin radiocarbon dating laboratory was operational in 1958 to 1960 and the scintillation counter system used at that time has previously been described (Delaney and McAulay, 1959). The system is now operational again and has been modified to date samples after conversion to benzene. The electronic equipment differs from that previously used only insofar as more compact and drift-free transistorized units are now employed. With these modifications, considerable improvements in sensitivity and accuracy are obtained. 5ml benzene, diluted with a commercial toluene based scintillant is used in a 12.5ml silica cell for the detection of ^{14}C disintegrations. The background count-rate varies inversely with the barometric pressure (ca 2.6% $cm^{-1}Hg$). The background is ca 3.4cpm, and the detection efficiency is ca 60% and excludes the tritium spectrum.

Acetylene is synthesized using the lithium method (Barker, 1953), and is trimerized on a commercial vanadium catalyst (Noakes *et al,* 1965). Peat is pretreated by degassing the sample (acidified with 5% HCl), followed by washing in de-ionized water.

Dates are reported in conventional radiocarbon years (using the 5570 half-life), with 1950 as the reference year. The modern reference standard is 95% of the measured activity of the NBS oxalic acid standard. Age limits quoted are derived from 1σ counting statistics of background, modern, and sample counts. $\delta^{13}C$ measurements are made on CO_2 produced in sample combustion, and results are given relative to the PDB standard.

All samples are from Ireland.

ACKNOWLEDGMENTS

We gratefully acknowledge financial support from the National Science Council of Ireland. We thank A G Smith and G W Pearson for providing check samples. We are indebted to T J Fitzgerald for making the $\delta^{13}C$ determinations.

SAMPLE DESCRIPTIONS

I. CHECK SAMPLES

D-131. 1850 to 1860 wood **103 ± 62** **AD 1848**

Oak wood. Rings grown 1850 to 1860 of tree felled 1970 at Townley Hall, Co Louth (53° 43′ N, 6° 27′ W, alt 30m, Irish Grid Ref O 035765) 5.5km W of Drogheda. Coll 1971 by J Hood. *Comment*: no pretreatment. Result is mean of 2 determinations (163 ± 76 and 44 ± 72).

D-123. Cushendun check sample **7270 ± 135**
5320 BC
$\delta^{13}C = -29.9‰$

Wood. Check sample dated by Belfast Lab (G W Pearson, written commun) as UB-689; 7395 ± 65. Further details to be pub by Belfast Lab. Sample pretreated and charred in Belfast Lab.

D-124. Fallahogy Bog Pine **5545 ± 95**
3595 BC
$\delta^{13}C = -25.4‰$

Bog Pine from S side of Bog in Fallahogy Townland, Co Derry (54° 54′ N, 6° 35′ W, Irish Grid Ref C 933073). Sample dated by Belfast Lab (R, 1973, v 15, p 610) UB-722; 5565 ± 50. Sample pretreated and charred in Belfast Lab.

II. PALAEOECOLOGIC SAMPLES

Coolteen series II, Co Wexford

Samples are from a marsh in Coolteen Townland, Co Wexford (52° 21′ N, 6° 35′ W, alt 40m, Irish Grid Ref S 9523) 9.5km W of Wexford. Samples from several cores obtained using a modified 5cm Livingstone corer. Coll 1971 by W A Watts, A Berti, and A J Craig. Subm 1971 by AJC.

D-107. Coolteen 12, 140 to 150cm, Core 1971A **9055 ± 95**
7105 BC

Fen- and wood-peat. *Comment* (AJC): dates appearance of *Corylus* pollen in significant amounts in early postglacial.

D-108. Coolteen 13, 180 to 190cm, Core 1971A **10,210 ± 110**
8260 BC
$\delta^{13}C = -23.7‰$

Gyttja. *Comment* (AJC): dates peak of *Juniperus* pollen at late Weichselian/postglacial transition.

D-109. Coolteen 14, 725 to 735cm, Core 1971E **12,470 ± 155**
10,520 BC
$\delta^{13}C = -28.2‰$

Detritus-gyttja. *Comment* (AJC): dates initiation of highly organic sedimentation, of type not found at other late-Weichselian sites.

Belle lake series, Co Waterford

Samples from a lake underlain by late-Weichselian and Flandrian sediments, at Belle lake, Co Waterford (52° 11′ N, 7° 2′ W, alt 40m, Irish Grid Ref S 6604) 5km NW of Dunmore East. Samples from adjacent cores. Coll 1969 by W A Watts, G F Mitchell, and A J Craig. Subm by AJC.

D-110. Belle 1, 564 to 574cm **12,235 ± 260**
10,285 BC

Black gyttja. *Comment* (AJC): dates basal organic sedimentation in which a peak of *Rumex* pollen is followed by a *Juniperus* peak.

D-111. Belle 2, 514 to 524cm — **10,590 ± 185 / 8640 BC**

Black gyttja. *Comment* (AJC): dates top of organic layer between 2 clay layers. Probably end of Zone II.

D-112. Belle 3, 396 to 406cm — **9600 ± 135 / 7650 BC**

Brown gyttja. *Comment* (AJC): dates succession of peak in *Juniperus* pollen by a *Betula* peak, immediately before appearance of significant amounts of *Corylus* pollen.

D-113. Belle 4, 380 to 390cm — **9100 ± 130 / 7150 BC** / $\delta^{13}C = -28.2‰$

Brown detritus-gyttja. *Comment* (AJC): dates appearance of *Quercus* and *Ulmus* pollen in significant amounts shortly after appearance of *Corylus* pollen.

D-114. Belle 5, 290 to 300cm — **7375 ± 105 / 5425 BC** / $\delta^{13}C = -27.3‰$

Brown detritus-gyttja. *Comment* (AJC): immediately pre-dates diatomite horizon and marks end of abundant *Quercus, Corylus, Pinus,* and *Ulmus* pollen.

D-115. Belle 6, 265 to 275cm — **6315 ± 110 / 4365 BC**

Peaty gyttja. *Comment* (AJC): immediately post-dates diatomite horizon and dates sharp rise in *Alnus* pollen.

D-116. Belle 7, 220 to 230cm — **5720 ± 90 / 3770 BC** / $\delta^{13}C = -27.9‰$

Peaty gyttja. *Comment* (AJC): dates top of sediments indicating limnic conditions.

D-117. Belle 8, 180 to 190cm — **5490 ± 95 / 3540 BC** / $\delta^{13}C = -28.4‰$

Wood peat.

III. GEOLOGIC SAMPLE

D-122. Castlepook 1 — **33,500 ± 1200 / 31,550 BC** / $\delta^{13}C = -22.5‰$

Head of femur of *Elephas primigenius* from sediments in Castlepook cave, Castlepook South Townland, Co Cork (52° 14′ N, 8° 34′ W, alt 100m, Irish Grid Ref R 1262) 13km N of Mallow. Sample from

disturbed sediments containing bones of at least 18 other spp, probably contemporary with sample (Scharff *et al,* 1918). Coll 1905 by R J Ussher and R F Scharff. Subm 1972 by G F Mitchell. *Comment*: only collagen dated; this oxidized to CO_2 using potassium permanganate.

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[RADIOCARBON, VOL. 16, NO. 1, 1974, P. 10-14]

FLORENCE RADIOCARBON DATES II

C M AZZI
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This list comprises age measurements carried out from October 1972 to July 1973. Samples dated are all of archaeologic interest and come from Italian territory. Pretreatment of samples, production of purest CO_2 and counting techniques have been described elsewhere (Azzi, 1972; Azzi *et al,* 1973).

We have set up a chemical bench to produce CO_2 directly from a sample without $CaCO_3$ precipitation (Broecker *et al,* 1959); we checked this new method with two samples, F-17 and F-45, below. Ages obtained by both methods agree satisfactorily, but we will continue to check the new bench.

Activity of our "modern standard" wood grown near Florence between 1850 and 1870, was checked with 95% of NBS oxalic acid counting rate and measurements were found coincident within 1σ. Age of samples is calculated using the conventional half-life of 5568 ± 30 yr and is referred to the standard year, 1950. Errors are stated in terms of one standard deviation of counting statistics.

ACKNOWLEDGMENTS

We thank the Consiglio Nazionale delle Ricerche for providing financial support.

SAMPLE DESCRIPTIONS

I. ARCHAEOLOGIC AND HISTORIC SAMPLES

A. Italy

Grotta Paglicci series

Charcoal and burnt bones from Grotta Paglicci on left side of Settepenne V on S side of Gargano promontory near Rignano Garganico, 15km E S Severo, prov Foggia, Apulia (41° 39′ 8″ N, 15° 36′ 51″ E). Coll 1971 and subm 1972 by A Palma di Cesnola, Ist Preist e Protostoria, Firenze, and F Mezzena, Museo Civ di Storia Nat, Verona.

Depth of deposit is, at this point of excavation, nearly 8m; 21 layers were distinguished. Grotta Paglicci consists in an atrium and a large internal hall, 6m × 20m.

Samples dated belong to Layers 18-21. Layers 10 to 16 can be related to Grotta del Romito, Layer 34: 18,750 ± 350 (R, 1967, v 9, p 358); Ugento, Layer 4 to 7: 14,170 ± 170; 13,870 ± 110 (*ibid,* p 359); Riparo Tagliente (R, 1970, v 12, p 599-601).

F-43. Grotta Paglicci 18, b2 a **14,260 ± 280 / 12,310 BC**

Charcoal from Layer 18, b2. Final Gravettian industry.

20,200 ± 305

F-44. Grotta Paglicci 18, b2 b **18,250 BC**

Burnt bones from Layer 18, b2, together with charcoal of F-43. Layer contained Final Gravettian industry like Mochi shelter industry, Layer C, and Monte Longo (F-28) industry (R, 1973, v 15, p 483). *Comment*: F-44 date agrees with stratigraphy; F-43 sample appears contaminated; chemical treatment for 1st sample was: HCl 10%—NaOH O.1N—HCl 10%; for the 2nd: HCl 10% for a 1st washing, afterwards a strong HCl leaching till destruction of organic fraction.

20,160 ± 310

F-45. Grotta Paglicci 18, b3 **18,210 BC**

Charcoal from Layer 18, b3, Final Gravettian type industry. F-45 was given only standard pretreatment. Date for this sample, with new direct line for CO_2 production: 20,380 ± 350 confirms other date.

20,730 ± 290

F-46. Grotta Paglicci 19, a **18,780 BC**

Charcoal from Layer 19, a. Layer 19 is named "transition layer" because upper part is similar to deepest part of Layer 18, and lower part resembles top of Layer 20, linking Final Gravettian to Evolute Gravettian age.

21,260 ± 340

F-47. Grotta Paglicci 20, b **19,310 BC**

Charcoal from Layer 20, b. Evolute Gravettian type industry. Layer 20 is typologically parallel with Perigordian V, 2 of W Europe.

22,220 ± 360

F-48. Grotta Paglicci 20, ca **20,270 BC**

Charcoal from Layer 20, c.

22,110 ± 330

F-49. Grotta Paglicci 20, cb **20,160 BC**

Burnt bones from Layer 20, c, together with charcoal F-48. Evolute Gravettian age; both samples had standard pretreatment. Difference between 2 ages is not very significant.

22,630 ± 390

F-50. Grotta Paglicci 20, de **20,680 BC**

Charcoal from Layer 20, de. Evolute Gravettian type industry.

23,040 ± 380

F-51. Grotta Paglicci 21, a **21,090 BC**

Charcoal from Layer 21, a. Evolute Gravettian type industry with blade of "La Font Robert". Typologically parallel with Perigordian V, 1 in W Europe.

23,470 ± 370

F-52. Grotta Paglicci 21, b **21,520 BC**

Charcoal from Layer 21, b. Same industry as F-51.

F-53. Grotta Paglicci 21, c — **24,210 ± 410 / 22,260 BC**

Burnt bones from Layer 21, c. Evolute Gravettian age.

F-54. Grotta Paglicci 21, c — **23,750 ± 390 / 21,800 BC**

Charcoal from Layer 21, c, together with charcoal F-53. Difference between ages not very significant.

F-55. Grotta Paglicci 21, d — **24,720 ± 420 / 22,770 BC**

Charcoal from Layer 21, d. Evolute Gravettian industry.

S Reparata series (inside)

Six more samples of charcoal and wood coll and subm 1972 by F Toker, archaeologist of S Reparata excavation. S Reparata is an Early Christian church beneath the present day Cathedral of Florence, Italy. They form a sequel to Samples F-10 to F-16 (Azzi *et al,* 1973). Samples were dated to clarify 3 major points about chronology of site: construction date of a large Roman house preceding church, destruction date of house, and foundation date of Early Christian church. The latter was dated stylistically at ca 6th century (Toker, 1972).

F-56. S Reparata, Q N 3 — **1660 ± 80 / AD 290**

Charcoal from a deep stratum very close to foundation of best preserved room of N side of Roman house. Date in 3rd or 4th century for expansion of N side is confirmed by other findings.

F-57. S Reparata, H 266, H N I — **1495 ± 85 / AD 455**

This charcoal sample was especially significant, having been found below level of mosaic floor and above intact floor of atrium of Roman house. Date could well indicate a period in which house was no longer functioning but before church was built. This date and that of F-58, point to 5th century for this intermediate period. This has already been suggested by presence of many crude groves on the site, which, in all probability, were erected by the barbarian invaders of Florence ca AD 410 to 490.

F-58. S Reparata, Q N 5 — **1460 ± 85 / AD 490**

Charcoal, from level −2.61m, from ruins at NW corner of Roman house. The 5th century ruins can be explained by hypothesis outlined above for F-57.

F-59. S Reparata, Zone R_2 — **1405 ± 85 / AD 545**

Charcoal from below mosaic level in S side of Early Christian

church. Date indicates last possible moment for laying of mosaic floor of church, and accords with stylistically proposed date of early 6th century, but a mid- or late 6th century date is also possible.

1805 ± 95

F-60. S Reparata, J 75, J S I **AD 145**

Charcoal from a low stratum, —2.40m, in very disturbed zone just E of atrium of Roman house in its final stage. Coin and ceramic dating indicate that house was begun in or near Augustus reign, but was evidently enlarged several times. Possibly, this area lay outside the original small house.

880 ± 80

F-61. S Reparata, Piazza S Giovanni **AD 1070**

Large charcoal chunk extracted by the Government Archaeol Service in Florence from a lime preparation pit directly W of site of S Reparata, during excavation between Cathedral and Baptistery of Florence in 1971. Pit was probably not used during construction of Early Christian church and was, instead, part of reconstruction of S Reparata in Early Romanesque style. Documents refer to rebuilding of church in mid-11th century, so that carbon sample is highly relevant.

705 ± 75

F-17. S Reparata, Tomb 42 (remeasured) **AD 1245**

Wood from coffin of Giovanni di Alamanno de'Medici, who died in 1353, was previously ^{14}C dated, almost a century too late (Azzi *et al,* 1973). Second date falls slightly short of date of death but agrees with age of wood. The age obtained by CO_2 direct preparation is: 725 ± 75 and agrees very well with radiocarbon date.

940 ± 75

F-62. Monate I, piroge **AD 1010**

Wood from pirogue discovered in Monate Lake, Varese, Lombardy (45° 48′ N, 16° 14′ E), from a one-piece pirogue (type monoxile), 2.58m long, named Monate I. Coll 1971 by Castelletti and subm 1972 by M Mirabella Roberti, Sopr Antichità della Lombardia, Milano. Sample was dated (unpub, awaiting confirmation of date by submitter). First date: 970 ± 105, agrees with 2nd date: 940 ± 75. *Comment*: to extract humic acids from unpub sample, 3% NH_4OH was used, and for F-62, 0.1N NaOH extending treatment until total extraction.

1580 ± 105

F-63. Monate 2, piroge **AD 370**

Wood from pirogue discovered in Monate Lake, Varese, Lombardy (45° 48′ N, 16° 14′ E). Sample came from a 1-piece pirogue, 3.85m long, named Monate 2. Coll 1971 and subm 1972 by M Mirabella Roberti.

General Comment on pirogues: the submitter has not furnished any further documented evidence on pirogues. Therefore, we have no other information about depth of discovery and typology of pirogues.

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GIF NATURAL RADIOCARBON MEASUREMENTS VIII

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

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

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

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I. ARCHAEOLOGIC SAMPLES

A. France

1. W France

650 ± 90

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

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

5150 ± 130

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

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

1350 ± 90

Gif-1817. Fermanville, Manche **AD 600**

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

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

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

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

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

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

La Motte series, Morannes, Maine et Loire

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

Gif-2181. La Motte 1 **1150 ± 100 AD 800**

Comment: within expected range 10 to 12th centuries.

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

Comment: dates a more recent hearth.

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

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

Gif-1568. Doué, 1969-4 **1200 ± 100 AD 750**

From burnt remains of a nearby building.

Gif-1820. Doué, 1970-CA-2 **1350 ± 100 AD 600**

From carbonized board covering cistern.

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

360 ± 90

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

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

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

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

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

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

2420 ± 110

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

Charcoal from 1st Iron age sepulture, La Besizais, Trébry (48° 20′ N, 2° 34′ W), Côtes du Nord. Coll by C T Le Roux and subm 1970 by P R Giot (Le Roux *et al*, 1972). *Comment*: fits very well with expected age of this miniature barrow.

4160 ± 140

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

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

Plussulien series, Côtes-du-Nord

Charcoal from a Neolithic factory for roughed-out axes of dolerite, at Sélédin, Plussulien (48° 13′ N, 3° 03′ W), Côtes-du-Nord. Coll and subm 1969 to 1971 by C T Le Roux, Fac Sci Rennes. Study of origin and diffusion of polished axes of "Dolérite A" (Le Roux, 1971) in France and W Europe.

4930 ± 130

Gif-1542. Plussulien, 00 SE **2980 BC**

4950 ± 140

Gif-1871. Plussulien, 00 SE **3000 BC**

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

Gif-1538. Plussulien, N1 SW **4550 ± 140 / 2600 BC**
Upper level of the main quarry; probable contamination by late crumblings from Gif-1871 area.

Gif-1539. Plussulien, N1 SW **4050 ± 130 / 2100 BC**
Huge hearth, Late Neolithic quarry.

Gif-1540. Plussulien, N1 SW **4700 ± 150 / 2750 BC**

Gif-1541. Plussulien, N1 SW **4500 ± 130 / 2550 BC**

Gif-2328. Plussulien, N1 SE **4790 ± 110 / 2840 BC**
Hearths in mass of flaking refuse; stratigraphically just under Soil 3 which marks interruption between Middle and Late Neolithic activities.

Gif-1875. Plussulien, N1 SW **4960 ± 140 / 3010 BC**

Gif-2329. Plussulien, N1 SE **4960 ± 110 / 3010 BC**
Scattered charcoal, with imported flint tools and some potsherds.

Gif-2330. Plussulien, N1 SE **4960 ± 110 / 3010 BC**
Hearth; quarry phase closely connected with Gif-1875 and Gif-2329.

Gif-1872. Plussulien, N1 SW **5100 ± 140 / 3150 BC**

Gif-1873. Plussulien, N1 SW **5150 ± 140 / 3200 BC**

Gif-1874. Plussulien, N1 SW **5075 ± 140 / 3125 BC**
Two hearths and scattered charcoal closely connected with 2 large bench-stones resting on Soil 4 (Middle Neolithic floor of quarry).

Gif-1876. Plussulien, 01 NW **5150 ± 140 / 3200 BC**
Hearth in Soil 4.

Gif-1877. Plussulien, N2 SW **5270 ± 140 / 3320 BC**
Ashy area assoc with working structure, apart from the main quarry but likely to be paralleled with Soil 4; oldest dated level.

4360 ± 130

Gif-1543. Plussulien, 04 SE **2410 BC**

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

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

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

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

1530 ± 100

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

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

Kéradennec, Saint-Fregant series, Finistère

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

1780 ± 100

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

Under soil of ancient mortar.

1800 ± 100

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

From hearth or carbonized beam.

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

2180 ± 110

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

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

2350 ± 100

Gif-2175. Kermoysan, Plabennec, Finistère **400 BC**

Charcoal from Iron age souterrain, at Kermoysan Plabennec (48° 28′ N, 4° 23′ W), Finistère. Coll and subm 1971 by C T Le Roux. *Comment*: agrees well with age of ceramics (Leroux and Lecerf, 1971).

2420 ± 110

Gif-1682. Toul-Louarn, Guisseny, Finistère **470 BC**

Charcoal in filling of ditches around habitation structure of 2nd Iron age, Toul-Louarn, Guisseny (48° 37′ N, 4° 25′ W), Finistère. Coll and subm by P R Giot. *Comment*: agrees with date of ceramics.

2540 ± 110

Gif-1969. Keravel, Plouguerneau, Finistère **590 BC**

Charcoal from Iron age souterrain, Keravel, Plouguerneau (48° 36′ N, 4° 42′ W), Finistère (Giot and Le Roux, 1971). Coll and subm 1970 by P R Giot. *Comment*: good date for this type of souterrain.

2580 ± 110

Gif-1868. Lamphily, Concarneau, Finistère **630 BC**

Charcoal from souterrain from late Hallstatt age, at Lamphily (47° 55′ N, 3° 55′ W) Concarneau, Finistère. Coll and subm 1970 by P R Giot. *Comment*: confirms antiquity of this structure (Giot and Lecerf, 1971).

2220 ± 110

Gif-1869. Litiez, La Feuillée, Finistère **270 BC**

Charcoal from bottom of entrance pit to souterrain at Litiez, La Feuillée (48° 23′ N, 3° 50′ W), Finistère. Coll and subm 1970 by P R Giot. *Comment*: good age for this type of souterrain.

Landeda, Ile Gaignog series, Finistère

Charcoal from Passage-grave IIIc of Cairn III, at Ile Gaignog, Landeda (48° 35′ N, 4° 35′ W), Finistère. Coll and subm 1970 by P R Giot.

3600 ± 110

Gif-1477. Ile Gaignog, Passage IIIc **1650 BC**

Lower level. *Comment*: contaminated by recent carbon.

5075 ± 140

Gif-1870. Ile Gaignog, Chambre IIIc **3125 BC**

From filling of chamber. *Comment*: good date for passage grave, though oldest date obtained for monument is 5800 BP (Gif-165, R, 1966, v 8, p 76).

3500 ± 130

Gif-1866. Ligollenec, Berrien, Finistère **1550 BC**

Charcoal from an Early Bronze age barrow at Ligollenec (48° 23′ N, 3° 43′ W), Berrien, Finistère. Coll and subm 1970 by J Briard. *Comment*: agrees well with expected age.

3550 ± 120

Gif-2177. Pendreo, Lennon, Finistère **1600 BC**

Charcoal from flat tomb of Pendreo, Lennon (48° 12′ N, 3° 55′ W), Finistère. Coll and subm 1971 by C T Le Roux. *Comment*: Bronze age, as expected despite atypical ceramics (Le Roux, 1972).

Juno Bella, Berrien series, Finistère

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

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

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

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

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

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

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

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

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

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

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

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

Pen-er-Malo series, Guidel, Morbihan

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

Gif-1964. Pen-er-Malo, Guidel **880 ± 100** **AD 1070**

In hearth and food remains.

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

From House A.

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

4390 ± 140

Gif-1966. Kermené, Guidel, Morbihan **2440 BC**

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

1930 ± 110

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

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

3350 ± 120

Gif-1968. Kervellerin, Cleguer, Morbihan **1400 BC**

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

3400 ± 120

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

Charcoal under flat tomb of Bronze age, Saint-Ouarno, Langoelan (48° 03′ N, 3° 13′ W), Morbihan. Coll and subm 1971 by C T Le Roux. *Comment*: fits very well with expected age (Le Roux, 1971).

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

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

Fay-de-Bretagne series, Loire-Atlantique

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

1900 ± 90

Gif-1700. Fay-de-Bretagne, H-160, 2 a **AD 50**

Wood from stake of frame.

1980 ± 90

Gif-1701. Fay-de-Bretagne, H160, 2 b **30 BC**

Wood from another stake.

3300 ± 110

Gif-1465. Fay-de-Bretagne, H-160 **1350 BC**

Charcoal layer under ceramics depot.

5180 ± 200

Gif-1699. Fay-de-Bretagne, H-160, I **3230 BC**

Charcoal in peat, in ceramics depot.

General Comment: Gif-1700-1701 fit well with age of roughly-made ceramics and presence of debris of amphora. The 2 other dates suggest an older site under ceramics as confirmed by palynologic study of peat.

2170 ± 110

Gif-1827. Potonnier, Loubillé, Deux Sèvres **220 BC**

Wood from timber, Gallo-Roman site of Potonnier, Loubillé (46° 02′ N, 0° 02′ W), Deux Sèvres. Coll and subm 1970 by R Proust, Chef-Boutonne, Deux Sèvres. *Comment*: too old for site; may be explained by age of wood at time of use.

2280 ± 110

Gif-1730. Pierre-Folle, Thiré, Vendée **330 BC**

Charcoal from occupation at Iron age of dolmen Pierre-Folle, Thiré (46° 33′ N, 0° 59′ W) Vendée. Coll by R Jousseaume and subm 1970 by J L'Helgouach.

Gif-1589. Anse de la République, St Hilaire-de-Talmont, Vendée **4350 ± 130** **2400 BC**

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

Grotte des Duffaits series, La Rochette, Charente

Charcoal from sepulchral Grotte des Duffaits, La Rochette (45° 48′ N, 0° 09′ E), Charente. Coll by J Gomez and subm 1971 by Y Guillien, Antiquités Préhist Région Poitou-Charente, Paris.

3160 ± 100

Gif-2263. Grotte des Duffaits, hearth **1210 BC**

Bottom of gallery.

1900 ± 90

Gif-2264. Grotte des Duffaits, S **AD 50**

In clay, S part.

2050 ± 90

Gif-2265. Grotte des Duffaits, entrance room **100 BC**

In clay.

2860 ± 100

Gif-2266. Grotte des Duffaits, N **910 BC**

In clay, N part.

2970 ± 100

Gif-2344. Grotte des Duffaits **1020 BC**

Hearth under calcite, in N gallery.

General Comment: only 1st and last dates fit this late Bronze age cave;

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

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

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

La Sauzaie series, Soubise, Charente-Maritime

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

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

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

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

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

"Chez Reine" series, Sémussac, Charente-Maritime

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

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

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

Gif-1719. "Chez Reine", S X **4070 ± 110 / 2120 BC**

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

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

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

2. SW France

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

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

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

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

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

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

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

4250 ± 140
Gif-1733. Fontaine de la Demoiselle, Level B_1 2300 BC

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

4210 ± 140
Gif-1734. Fontaine de la Demoiselle, Level B_2 2260 BC

From 1.70 to 2m, base level.

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

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

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

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

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

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

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

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

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

9450 ± 190

Gif-1807. Grotte des Fieux, Miers, Lot **7500 BC**

Charcoal from base Sauveterrian level D_3 from Grotte des Fieux (44° 51′ N, 1° 40′ E), Lot (Champagne and Espitalié, 1972). Coll and subm 1970 by F Champagne, Paris. *Comment*: correct age if compared to date for low level of Sauveterrian grotte de Rouffignac: 9150 BP (GrN-5514: R, 1972, v 14, p 59).

2450 ± 70

Gif-1880. Le Treboulou, Arcambal, Lot **500 BC**

Charcoal from La Tène site of Le Treboulou, Hut IV, Arcambal (44° 27′ N, 1° 30′ E), Lot. Coll 1969 and subm 1970 by M Lorblanchet, CNRS, Thémines, Lot. *Comment*: agrees well with expected age.

2690 ± 70

Gif-1881. Cahors, Lot **740 BC**

Charcoal in pit from site of 3rd phase of Urnfield civilization, Cahors (44° 28′ N, 1° 42′ E), Lot. Coll 1966 and subm 1970 by M Lorblanchet. *Comment*: ca 200 yr too old for this civilization in Quercy.

2800 ± 70

Gif-1882. Igue Blanche, Sauliac, Lot **850 BC**

Charcoal in debris of Late Bronze III age in a cave, Igue Blanche, Sauliac (44° 38′ N, 1° 42′ E), Lot. Coll and subm 1970 by M Lorblanchet. *Comment*: agrees well with industry.

2550 ± 110

Gif-1512. Puy d'Issolu, Vayrac, Lot **600 BC**

Charcoal from 1st Iron age site, at Puy d'Issolu (44° 57′ N, 1° 42′ E), Vayrac, Lot. Coll and subm 1969 by M Lorblanchet. *Comment*: agrees well with expected age.

Grotte de Saint Eulalie series, Lot

Broken bones (fauna) from Grotte de Sainte Eulalie (44° 35′ N, 1° 52′ E), Lot. Coll and subm 1970-1971 by M Lorblanchet. Decorated cave with Magdalenian industry.

10,400 ± 300

Gif-2193. Grotte de Sainte Eulalie, Layer 1 **8450 BC**

Bones from fauna, from Level 1, Magdalenian VI, *ie*, late Magdalenian.

10,830 ± 200

Gif-1697. Grotte de Sainte Eulalie, Layer I **8880 BC**

Broken bones from fauna, from same level as Gif-2193. *Comment*: confirms age of Magdalenian VI may be somewhat younger than expected.

15,100 ± 270

Gif-1745. Grotte de Sainte Eulalie, Layer III **13,150 BC**

From Layer III, Middle Magdalenian, probably Magdalenian II. *Comment*: dates mural paintings of cave.

15,200 ± 300

Gif-2194. Grotte de Sainte Eulalie, Layer C **13,250 BC**

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

720 ± 90

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

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

Grotte de Niaux series, Ariège

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

5650 ± 200

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

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

9850 ± 230

Gif-1937. Grotte de Niaux **7900 BC**

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

10,100 ± 250

Gif-1939. Grotte de Niaux, 2 **8150 BC**

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

10,150 ± 200

Gif-1940. Grotte de Niaux, 3 **8200 BC**

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

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

Roquefort sites series, Lugasson, Gironde

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

Gif-1731. Roquefort O 7, Level C **4800 ± 140 / 2850 BC**

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

Gif-1732. Roquefort Q 7, Level C_2 **5000 ± 140 / 3050 BC**

Lower part of Level C, lying on clay. Industry slightly different from remainder of Level C. Corresponds to initial phase of Middle Neolithic. *General Comment*: agrees well with typologic and palynologic studies.

Gif-2105. Le Morin, Gensac, Gironde **10,480 ± 200 / 8530 BC**

Reindeer bones from Magdalenian VI site at Le Morin rock shelter, Gensac (44° 41′ N, 0° 12′ E), Gironde. Coll and subm 1971 by J Lahilhanne, Comm Energie Atomique, Le Barp, Gironde.

Gif-1412. Dayres, Gironde **2300 ± 100 / 350 BC**

Charcoal from hearth in Barrow of Dayres (44° 23′ N, 0° 13′ E), Gironde. Coll 1968 and subm 1969 by Y Marcadal, Nérac, Lot-et-Garonne. *Comment*: Barrow of Dayres is reputed to be from Hallstatt period and its ceramics are dated from early 4th century BC. Age seems therefore too young. Contamination is not excluded, as penetration of site by roots of a pine was indicated by submitter. It is noteworthy that correction from dendrochronologic calibration carries the date within limits of statistical probability.

3. SE and S France

Gif-1883. Chaos de Targasonne, Cerdagne, Pyrénées Orientales **2450 ± 700 / 500 BC**

Charcoal from late Bronze site of Chaos de Targasonne (42° 29′ N, 1° 58′ E), alt 1680m, Pyrénées Orientales. Coll 1969 and subm 1970 by Campmajo, Cabestany, Pyrénées Orientales. *Comment*: absence of metal tools suggests older age. Persistence of this archaic civilization, also characterized by its ceramics, can be explained by difficult access to site, causing it to stay apart from main Mediterranean culture (Campmajo and Guilaine, 1971).

Grotte de La Balme de Montbolo series, Pyrénées Orientales

Charcoal from habitat and sepulchral cave of La Balme (42° 30′ N, 2° 38′ E), Pyrénées Orientales. Coll and subm 1970 by J Guilaine, CNRS, Carcassonne, Aude.

Gif-1709. Grotte de La Balme de Montbolo **6450 ± 170 / 4500 BC**

Upper gallery.

Gif-1710. Grotte de La Balme de Montbolo **4100 ± 140 / 2150 BC**

Lower gallery.

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

5380 ± 150

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

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

730 ± 90

Gif-1716. Agde, Hérault **AD 1220**

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

1750 ± 100

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

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

4410 ± 140

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

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

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

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

4640 ± 140

Gif-1923. Les Serpents, 2 A **2690 BC**

Upper level.

4300 ± 140

Gif-1924. Les Serpents, 3 A **2350 BC**

Middle level.

4500 ± 140

Gif-1925. Les Serpents, 4 A **2550 BC**

Lower level.

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

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

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

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

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

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

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

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

Upper level of stratigraphy.

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

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

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

Pont d'Avignon series, Vaucluse

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

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

From Pile 14.

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

From Pile 15.

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

From Pile 15.

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

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

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

Gif-1793. Grotte d'Unang, Level 3 — **5840 ± 130 / 3890 BC**

Gif-1794. Grotte d'Unang, Level 6 — **5900 ± 130 / 3950 BC**

Gif-1795. Grotte d'Unang, C_3, Pit 7 — **5770 ± 130 / 3820 BC**

Gif-1796. Grotte d'Unang, hearth — **5950 ± 130 / 4000 BC**

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

Gif-1855. Courthezon, Vaucluse — **6600 ± 140 / 4650 BC**

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

Gif-1910. Grotte de Prével, Montclus, Gard — **2650 ± 110 / 700 BC**

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

Gif-1909. Grotte du Traves, Montclus, Gard — **4260 ± 140 / 2310 BC**

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

Escanin series, Les Baux, Bouches du Rhône

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

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

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

Gif-1994. Escanin, Sq GH — **2400 ± 100 / 450 BC**

Intrusion at La Tène period into Chassean level.

Gif-1995. Escanin, scree **5160 ± 120**
3210 BC

Chassean level.

General Comment: lowest level corresponds to level dated 5000 ± 250: Gif-450 (R, 1970, v 12, p 426) and is Chassean but upper parts of site are reworked.

Gif-1613. Dolmen of Saint-Marc, Aix-en-Provence, Bouches du Rhône **3950 ± 140**
2000 BC

Human bones from Dolmen of Saint-Marc (43° 31′ N, 5° 27′ E), Aix-en-Provence, Bouches du Rhône (Saurin, 1931). Coll 1930 and subm 1969 by E Saurin, Fac Sci Saigon. *Comment*: fits very well with early Bronze—late Neolithic age, as expected from industry.

Baume Fontbregoua series, Salernes, Var

Charcoal from 3 layers selected in 4m-thick strata preserving remains that represent all the evolution of Neolithic in S France, at Baume Fontbregoua (43° 33′ N, 6 °14′ E), Var. Coll and subm 1970-1971 by J Courtin.

Gif-2100. Baume Fontbregoua, Layer 8 **3670 ± 110**
1720 BC

Late Chalcolithic.

Gif-2101. Baume Fontbregoua, Layer 11 **5050 ± 120**
3100 BC

Late Chassean.

Gif-2102. Baume Fontbregoua, Layer 14 **3850 ± 110**
1900 BC

General Comment: Gif-2100 and -2101 agree fairly well with expected ages. However, Gif-2102, being deeper, should be much older, and may have been contaminated by rodents (Courtin, 1972).

Gif-1690. Pepet, Traize, Savoie **150 ± 90**
AD 1800

Wood from site expected to be Gallo-Roman at Pepet, Traize (45° 44′ N, 3° 47′ E), Savoie. Coll and subm 1970 by L Lagier-Bruno, Yenne, Savoie. *Comment*: does not confirm antiquity of site.

Gif-1862. Bon-Porté Bay, Mediterranean, MP2 **2520 ± 100**
570 BC

Wood from Roman wreckage, 35m deep in Bon-Porté Bay, 500m off Taillat Cap (43° 11′ N, 6° 40′ E), Mediterranean. Coll by P Mazerolles and subm 1970 by F Cambou, Centre d'Etudes Spatiales Rayonnements, Toulouse. *Comment*: amphora remains assoc.

Basi, Serra-di-Ferro, series, Corsica

Basi, Serro-di-Ferro, near Filitosa (41° 45′ N, 8° 47′ E), SW Corsica, is a defensive site with abundant archaeologic remains from Torrean to Cardial periods (Bailloud, 1969). Charcoal coll and subm 1970 by G Bailloud, CNRS, Paris.

3350 ± 110

Gif-1846. Basi, Level III_a **1400 BC**

Abundant ceramics of classic Torrean type with large flat lips and plates; lithic industry very sparse. Upper levels I and II not dated, belong to an evolved Torrean of Bronze age.

3570 ± 110

Gif-1847. Basi, Level III_b **1620 BC**

Lower part of Level III. Classic Torrean ceramics, but much lower than in Level III_a with some obsidian.

5200 ± 120

Gif-1848. Basi, Level 5 b_1 **3250 BC**

Abundant obsidian industry with lamella and ceramic.

5250 ± 120

Gif-1849. Basi, Level 5 e_6 **3300 BC**

Lower part of Level 5 which belongs to original culture of Chalcolithic.

5200 ± 120

Gif-1850. Basi, Level 5 b_5 **3250 BC**

Lower part of Level 5.

7700 ± 150

Gif-1851. Basi, Level 7 **5750 BC**

Ceramics similar to Level 5 assoc with shell (*Cardium*) printed ceramics, and flint industry. Only level with fauna: domestic sheep; agriculture is almost absent while well attested in upper levels, belongs to typical "Cardial".

General Comment: the 3 different occupations of site are well separated in time though there was no sterile layer between levels. Fits well with other dates for Torrean in Corsica and for early Neolithic, called here "Basien". Beginning of Torrean settlement in Basi at late Bronze period (Bailloud, 1972).

Curacchiaghiu series, Lévie, Corsica

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

2610 ± 110

Gif-1958. Curacchiaghiu, Layer 2 **660 BC**

Hearth F 1, 0.27m deep. *Comment*: end of occupation of site. Iron age industry assoc.

3230 ± 130

Gif-1959. Curacchiaghiu, Layer 3 **1280 BC**

Upper structured hearth, 0.33m deep. *Comment*: Bronze age ceramics assoc.

Gif-1960. Curacchiaghiu, Layer 5 **4930 ± 140 / 2980 BC**

0.70m deep. *Comment*: stabbed ceramics and lithic industry in obsidian assoc Late Neolithic.

Gif-1961. Curacchiaghiu, Layer 6 **7310 ± 170 / 5360 BC**

0.74m deep. *Comment*: stabbed ceramics, obsidian industry, and assoc flint correspond to 2 different facies of Early Neolithic.

Gif-1962. Curacchiaghiu, Layer 6_c **7600 ± 180 / 5650 BC**

0.94m deep. *Comment*: Cardial ceramics assoc.

Gif-1963. Curacchiaghiu, Layer 7 **8300 ± 130 / 6350 BC**

1.20m deep. *Comment*: with preceramic lithic industry assoc.

General Comment: other levels already dated: 0.80m deep: 7300 ± 160 BP; 1.17m deep: 8560 ± 170 BP (Gif-796 and -797, R, 1971, v 13, p 221). Fits very well with Early Neolithic dated at Basi (this list) (de Lanfranchi, 1972). Dates of appearance of ceramics in Corsica are very similar to dates obtained in Central Mediterranean and Ionian seas, in Corfu Is (between 5870 and 5720 BC) and at Knossos in Crete (between 5790 and 5620 BC) (Bailloud, 1972).

Filitosa series, Sollacaro, Corsica

Charcoal from hearths in circular Torrean monument of complex site of Filitosa (41° 44′ N, 8° 52′ E), Corsica. Coll and subm 1971 by R Grosjean, CNRS, Paris.

Gif-2398. Filitosa, Level II **3080 ± 110 / 1130 BC**

Comment: corresponds to end of Torrean period, *ie*, Torrean III.

Gif-2399. Filitosa, Level III **3380 ± 110 / 1430 BC**

Comment: corresponds to apex of Torrean period, *ie*, Torrean II; fits well with Level 3 at Basi, 3350 BP: Gif-1846 (this list).

Gif-2103. Stantare, Sartène, Corsica **2080 ± 110 / 130 BC**

Charcoal in packing stones of monolith from menhir alignment, Stantare (41° 31′ N, 8° 53′ E), Sartène, Corsica. Coll and subm 1971 by R Grosjean. *Comment*: does not date erection of menhir, but probably more recent burning of vegetation.

Gif-2104. Tappa, Sartène, Corsica **5650 ± 150 / 3700 BC**

Charcoal from hearth, Level VI, base of Torrean levels, in Rock Shelter E A_1, inside Torrean complex of Tappa (41° 32′ N, 9° 13′ E),

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

4. E and Central France

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

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

Oppidum of Myard series, Vitteaux, Côte d'Or

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

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

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

Gif-1560. Oppidum of Myard, Layer V **4350 ± 130 2400 BC**

Charcoal from hearth on base-level of site occupation.

Gif-2343. Oppidum of Myard, 467 **4700 ± 135 2750 BC**

Charcoal from hearth in settlement level.

Gif-2341. Oppidum of Myard, 527 **4880 ± 135 2930 BC**

Burnt wood from fortification structure of oppidum.

Gif-2342. Oppidum of Myard, 490 a **5175 ± 135 3225 BC**

Burnt wood from another structure of fortifications.

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

Beaume-les-Creancey, Côte d'Or

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

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

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

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

Peat, 2.30m deep.

General Comment: confirms chronologic sequence established by malacology.

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

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

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

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

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

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

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

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

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

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

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

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

8150 ± 190

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

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

670 ± 90

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

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

Clairvaux series, Jura

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

3800 ± 110

Gif-1844. Clairvaux 105-106 I **1850 BC**

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

3660 ± 110

Gif-2297. Clairvaux, CZ 64 **1710 BC**

Lake coring. Hearth with potsherds of Late Neolithic.

3880 ± 110

Gif-2299. Clairvaux, Station 3 **1930 BC**

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

4740 ± 110

Gif-2298. Clairvaux, Point 68 **2790 BC**

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

1620 ± 90

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

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

5. N France

Gif-1986. "Chambre des Fées", Coincy-en-Tardenois, Aisne **5210 ± 120 / 3260 BC**

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

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

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

Vanault-le-Châtel series, Marne

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

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

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

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

General Comment: dates occupation and destruction of castle.

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

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

Etaples series, Pas de Calais

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

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

Halstattian level.

3200 ± 110

Gif-1603. Etaples 6 **1250 BC**

Bronze age level.

General Comment: agrees well with expected ages.

16,000 ± 300

Gif-1712. Hallines, Pas de Calais **14,050 BC**

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

B. Africa

Gif-1724. Djorf Torba, S Oran, Algeria **Modern**

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

800 ± 90

Gif-1696. Aït Raouna, Algeria **AD 1150**

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

2270 ± 110

Gif-1671. Medracen, Ain Yagout, Batna, Algeria **320 BC**

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

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

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

5380 ± 140

Gif-1385. K S M T 144 **3430 BC**

Neolithic industry.

5400 ± 140

Gif-1384. K S M T 141 **3450 BC**

Neolithic industry.

5740 ± 140

Gif-1383. K S M T 140bis **3790 BC**

Neolithic industry of Capsian tradition.

5900 ± 150

Gif-1386. K S M T 145 **3950 BC**

Neolithic industry of Capsian tradition.

General Comment: agrees well with industry in each level.

Djebel El Outed site series, Algeria

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

7850 ± 170

Gif-1591. Djebel El Outed, DE 01 **5900 BC**

Typical Capsian.

7850 ± 170

Gif-1590. Djebel El Outed, DE 02 **5900 BC**

Typical Capsian.

7400 ± 170

Gif-1592. Djebel El Outed, DE 03 **5450 BC**

Typical Capsian.

6700 ± 150

Gif-1593. Djebel El Outed, DE 04 **4750 BC**

Typical Capsian.

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

Rabah series, Ouled-Djellal, Batna, Algeria

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

7850 ± 170

Gif-1379. Rabah, RAB 10 **5900 BC**

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

6540 ± 300

Gif-1381. Rabah, RAB 13 **4590 BC**

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

6300 ± 150

Gif-1382. Rabah, RAB 14 **4350 BC**

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

General Comment: agrees well with archaeologic data.

5320 ± 130

Gif-1380. Adrar Tioueiine, Oasis **3370 BC**

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

4850 ± 110

Gif-2222. Iheren, Tassili, Sahara **2900 BC**

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

Relilaï series, Cheria, Bône, Algeria

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

7300 ± 140

Gif-1899. Relilaï, REL 9 **5350 BC**

End of Upper Capsian.

7800 ± 140

Gif-1900. Relilaï, REL 10 **5850 BC**

Beginning of Upper Capsian.

7760 ± 180

Gif-1714. Relilaï, REL I **5810 BC**

Typical Capsian.

7850 ± 150

Gif-1896. Relilaï, REL 6 **5900 BC**

Typical Capsian, Phase IV.

7950 ± 150

Gif-1898. Relilaï, REL 8 **6000 BC**

Middle of typical Capsian, Phase IV.

7700 ± 150

Gif-2119. Relilaï, REL 3 **5750 BC**

8100 ± 150

Gif-1901. Relilaï, REL II **6150 BC**

End of typical Capsian, Phase IV.

8180 ± 180

Gif-1715. Relilaï, REL 2 **6230 BC**

Typical Capsian, Phase III.

8350 ± 150

Gif-1902. Relilaï, REL 12 **6400 BC**

End of typical Capsian, Phase III.

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

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

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

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

Grotte de la Madeleine series, Taza, Sétif, Algeria

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

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

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

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

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

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

Zmeilet Barka series, Saoura, Sahara

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

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

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

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

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

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

7250 ± 100

Gif-1931. El Bayed, Sahara **5300 BC**

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

6750 ± 130

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

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

Ancient mines of Morocco series

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

700 ± 90

Gif-1453. Vein of Signal, Jbel Aouam, I **AD 1250**

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

770 ± 90

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

Wood from same mine, as Gif-1453.

1020 ± 90

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

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

1250 ± 90

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

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

520 ± 75

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

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

General Comment: dates working period in these ancient mines.

2350 ± 100

Gif-1482. Diakhité, Thiès, Senegal **400 BC**

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

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

Arlit series, Aïr, Niger

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

2640 ± 100

Gif-1797. Arlit, Somair 2 **690 BC**

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

4030 ± 110

Gif-1798. Arlit, Somair 4 **2080 BC**

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

4530 ± 110

Gif-2289. Arlit **2580 BC**

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

5200 ± 140

Gif-1725. Arlit, 2 **3250 BC**

Charcoal. Coll and subm 1970 by H Lhote.

5030 ± 140

Gif-2159. Arlit, 4 **3080 BC**

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

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

4080 ± 110

Gif-1727. Taferjit, Niger **2130 BC**

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

9350 ± 170

Gif-1728. Tamaya Mellet, Niger **7400 BC**

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

800 ± 100

Gif-2156. Azelik, Agadez, Niger **AD 1150**

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

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

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

Marandet series, Agadez, Niger

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

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

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

1m deep.

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

0.20m deep.

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

Bouar series, République Centrafricaine

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

7440 ± 170
Gif-1636. Beforo I, Tajunu **5490 BC**

(5° 57′ N, 15° 35′ E).

1920 ± 100
Gif-1637. Tia I, Tajunu **AD 30**

(5° 55′ N, 15° 36′ E).

2560 ± 110
Gif-1887. Tajunu Be Yole, I **610 BC**

(5° 58′ N, 15° 33′ E). 70cm depth.

2200 ± 110
Gif-1888. Tajunu Be Yole, 2 **250 BC**

90 to 100cm depth. *Comment*: probably slightly contaminated; younger than upper level.

2400 ± 110
Gif-1889. Tajunu Zupaya, 3 **450 BC**

(5° 58′ N, 15° 34′ E). 60cm depth.

6700 ± 140

Gif-1890. Tajunu Zupaya, 4 **4750 BC**

70 to 80cm depth.

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

Kamoa series, Katanga, Zaïre

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

1850 ± 100

Gif-2223. Kamoa, K 70, C 14-15 **AD 100**

Depth, 65cm. *Comment*: assoc microlithic industry of Late Stone age.

1850 ± 100

Gif-2224. Kamoa, K 70, C 14-12 **AD 100**

Depth, 70cm. *Comment*: similar to Gif-2223.

3840 ± 110

Gif-2225. Kamoa, K 70, C 14-14 **1890 BC**

Depth, 125cm. Just under Gif-2224. *Comment*: belongs to Late Stone age.

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

Gif-2294. Ruzizi, Burundi, Congo, Level 5 **⩽100**

Charcoal from late occupation of Iron age site, in sandy mound 1.40 to 1.75m high on band of Ruzizi R, Burundi (3° 00′ S, 20° 10′ E), Congo. Coll by Starosvietsky and subm 1971 by D Cahen.

250 ± 90

Gif-2295. Cyirima Rujugira, Gaseke, Congo **AD 1700**

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

Grotte Biala series, Congo

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

1310 ± 100

Gif-1688. Grotte Biala 1 **AD 640**

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

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

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

6600 ± 130

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

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

C. America

Diana I series, Diana Bay, Nouveau Québec

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

920 ± 90

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

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

1090 ± 90

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

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

1450 ± 90

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

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

1860 ± 90

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

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

2080 ± 90

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

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

UNG series, Ungava Bay, Nouveau Québec

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

Gif-1949. UNG II D 70, II — **430 ± 80** / **AD 1520**

Charcoal from House D.

Gif-1953. UNG II, D 70, 17 — **530 ± 80** / **AD 1420**

Charcoal from House D, 10cm deep, between large stone flags.

Gif-1950. UNG II, D 70, 13 — **680 ± 90** / **AD 1270**

Charcoal in square, sunken box, bottom and side of which were protected by stones in House D: this type of box is typical of interior arrangement of the "long houses". *Comment*: sample is very probably contemporary with occupation of House D.

Gif-1948. UNG II, D 70, 10 — **750 ± 90** / **AD 1200**

Charcoal in the floor of House D. *Comment*: these 4 1st dates suggest late occupation, after desertion of site, possibly by Eskimos of Thule tradition.

Gif-1951. UNG II, D 70, 14 — **1420 ± 90** / **AD 530**

Charred fat adhering to a paving stone, in House D.

Gif-1952. UNG II, D 70, 16 — **1380 ±90** / **AD 570**

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

Gif-1947. UNG II, B 70, 4 — **1540 ± 90** / **AD 410**

Charred fat adhering to paving stone in House B. *Comment*: dates 1st occupation of site.

Gif-1946. UNG II, B 70, 3 b — **1680 ± 90** / **AD 270**

Charred fat under paving stone, in House B. *Comment*: dates 1st occupation of House B.

Gif-1945. UNG II, C 70, 2 — **1470 ± 90** / **AD 480**

Charred fat mixed with sand, 10cm deep in Structure C, a dwelling demarcated by erected flat stones.

1130 ± 90

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

Charred fat with charcoal, 10cm deep in Structure A, similar to C.

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

3300 ± 110

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

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

1100 ± 95

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

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

1500 ± 100

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

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

1560 ± 100

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

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

1930 ± 110

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

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

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

Utcubamba Valley series, Amazonas, N Peru

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

Gif-1415. Revash 1, Utcubamba Valley, 00140 — **750 ± 90 AD 1200**

Wood from a roof beam.

Gif-1416. Revash 1, Utcubamba Valley, 00142 — **900 ± 90 AD 1050**

Charcoal in clay mortar from wall.

Gif-1533. Puente-Utcubamba, Utcubamba Valley, 00130 — **630 ± 90 AD 1320**

Charcoal under 1m thick spoil.

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

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

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

Gif-1536. Cerro Santa Apolonia, Bellavista, Jaen Prov, N Peru, 0012 — **3850 ± 110 1900 BC**

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

Cave of Pumurco series, Cerro Callajloma, Cajamarca, Peru

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

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

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

7400 ± 170

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

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

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

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

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

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

Nasca series, S Peru

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

400 ± 90

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

Charcoal in shell mound on actual shore.

3700 ± 100

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

Wood stem in low marine terrace.

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

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

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

Caleta Abtao series, Peninsula de Mejillones, Antofagosta, Chile

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

4950 ± 110

Gif-1657. Caleta Abtao, No. 2 **3000 BC**

Site 1, NE angle. Depth 1.30m.

4700 ± 110

Gif-1661. Caleta Abtao, No. 12 **2750 BC**

Site 1, E wall. Depth 0.70m.

3550 ± 100

Gif-1658. Caleta Abtao, No. 3 **1600 BC**

Site 1, E wall. Depth 0.85m.

4550 ± 110

Gif-1660. Caleta Abtao, No. 10 **2600 BC**

Site 1, E wall. Depth 1m.

5350 ± 120

Gif-1659. Caleta Abtao, No. 5 **3400 BC**

Site 1, E wall. Depth 2.10m. First cultural level.

General Comment: whole site presumably belonged to Anzuelo de Concha culture, in fact, only the deepest level is concerned. Site occupation lasted from 3500 to 5300 BP, but given levels do not seem to correspond to a very well established stratigraphy.

200 ± 90

Gif-1254. Guipe, Bahia, Salvador, Brazil, Cut A **AD 1750**

Charcoal from dwelling and cemetery site, of Aratu phase, near Guipe R (12° 50′ S, 38° 31′ W), Bahia, Salvador. Coll and subm 1968 by V Calderon, Inst Ciencias Sociais, Univ Bahia, Brazil. *Comment*: for unknown reasons, 200 yr younger than indigenous occupation of site and 400 yr too young for culture to which site belongs.

250 ± 90

Gif-1628. Caverna do Caboclo, Pernambuco, Brazil **AD 1700**

Charcoal from Caverna do Caboclo, Pernambuco (7° 47′ S, 35° 35′ W). Coll and subm 1970 by V Calderon. *Comment*: does not exactly correspond to expectation but archaeologic data are missing in area.

1050 ± 250

Gif-1440. Sâo Desiderio, Bahia, Brazil **AD 900**

Bones from large funerary urns of Aratu phase in terrace parallel to Sâo Desiderio R, tributary of Grande R (12° 55′ S, 45° 00′ W), Bahia. Coll and subm 1968 by V Calderon. *Comment*: fits well with expected age for this archaeologic base.

Gif-1627. Caverna da Padra Acai, Pernambuco, Brazil **1880 ± 100** **AD 70**

Charcoal from Caverna da Pedra Acai, Pernambuco (8° 07′ S, 37° 41′ W). Coll and subm 1970 by V Calderon. *Comment*: abundant remains of human occupation, lithic, and shell artifacts. Date as expected.

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

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

D. Miscellaneous Countries

Grotte d'Ojo Guarena series, Burgos Prov, Spain

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

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

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

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

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

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

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

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

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

Dikili Tash series, E Macedonia, Greece

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

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

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

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

From same destruction level.

5750 ± 140
Gif-1424. Dikili Tash, 6 **3800 BC**
From same destruction level.

5600 ± 150
Gif-1738. Dikili Tash, 9 **3650 BC**
Burning layer from same destruction level.

5850 ± 160
Gif-1736. Dikili Tash, G, Soil 12 **3990 BC**
First level of Late Neolithic.

6400 ± 160
Gif-1737. Dikili Tash, G, under Soil 12 **4450 BC**
Destruction level of Middle Neolithic.

6450 ± 160
Gif-1740. Dikili Tash, H, top burnt zone **4500 BC**
Destruction level of Middle Neolithic marking a total rupture in civilization between Late and Middle Neolithic.

6170 ± 160
Gif-1735. Dikili Tash, G, Soil 13 **4220 BC**
In pit of Soil 13. Late level of Middle Neolithic.

6800 ± 160
Gif-1426. Dikili Tash, II **4850 BC**
Middle Neolithic. *Comment*: evokes both corresponding periods in Beograd and Early Middle Neolithic in Central Greece.

Grotte de Kitsos series, Laurion, Greece

Neolithic Grotte de Kitsos (37° 44′ N, 21° 41′ E), Laurion, Greece. Coll and subm 1968-1971 by N Lambert, CNRS, Athens.

1900 ± 140
Gif-1283. Kitsos 730, Layer 1b **AD 50**
Charcoal and ash from sepulchral cave near surface. *Comment*: layer reworked by introduction of late ritual hearths, of 5th to 4th centuries BC.

5470 ± 150
Gif-1280. Kitsos 335, Layer 3a, Sounding I **3520 BC**
Charcoal in dwelling level, with seashell, burnt bones (goat, hare), Early Neolithic.

5350 ± 200
Gif-1610. Kitsos 1610, Layer 3, Sounding 2 **3400 BC**
Charcoal from hearth in homogeneous ashy layer corresponding to a dwelling level with assoc Neolithic potsherds.

5650 ± 130
Gif-1832. Kitsos 2/540 Layer 4 **3700 BC**
Charcoal from fireplace with human and animal bones, potsherds, stone and bony tools.

5550 ± 150

Gif-1670. Kitsos 1830-31 Layer 4, Hearth Φ 3 **3600 BC**

Charcoal from rich dwelling level with Neolithic potsherds, burnt bones (goat, hare, wild boar, hart), and tools in stone, bone, and antler.

5750 ± 130

Gif-1729. Kitsos 1826 Layer 4, Sounding 2 **3800 BC**

Charcoal.

Gif-1612. Kitsos 1733, Layer 4, Sounding 2, Hearth Φ 2 **5700 ± 140** **3750 BC**

Charcoal from hearth in dwelling level.

6800 ± 170

Gif-2125. Kitsos SE O11 exterior, Layer 2 **4850 BC**

Broken and burnt bones (deer, horse, wolf, lynx) in open pit outside cave, in consolidated levels well before Neolithic period, 0.40 to 1.20m from surface. *Comment*: incorrect result obtained on total carbon from bone, collagen being insufficient. Discordance between fauna and date indicates important pollution.

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

Antre Corycien series, Greece

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

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

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

5230 ± 290

Gif-2122. Antre Corycien, 70/02 Layer 2 **3280 BC**

Charcoal.

6250 ± 90

Gif-2123. Antre Corycien, 70/01, Layer 3 **4300 BC**

Charcoal. *Comment*: no archaeologic clues.

6380 ± 90

Gif-2124. Antre Corycien, 71/03, Layer 3 b **4430 BC**

Charcoal. Neolithic black and painted potsherds, remains of polished stone tools and fauna (goat, sheep) assoc.

7370 ± 170

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

Charcoal.

Gif-2340. Antre Corycien, 71/35, Layer 5 a **⩾40,000**

Unidentified broken and burnt animal bones without archaeologic clues in consolidated layer. *Comment*: total thickness of Layer 5 is 60cm. Layers 4 and 5 clearly show discontinuity in stratigraphy at this spot, but study of this site is just beginning.

Porsuk-Ulukisla series, Turkey

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

2000 ± 100

Gif-1672. Porsuk-Ulukisla, 01 **50 BC**

Quarry III, 1.50m deep.

1900 ± 100

Gif-1673. Porsuk-Ulukisla, 02 **AD 50**

Quarry II, 2m deep.

2020 ± 100

Gif-1674. Porsuk-Ulukisla, 03 **70 BC**

Quarry II, 2.85m deep.

Gif-1510. Desert of Lut, Iran **⩾40,000**

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

Gif-1845. Zvartnots, Armenia **$\delta^{14}C = -583‰$**

Mortar from Basilica of Zvartnots (40° 15′ N, 44° 30′ E), Armenia, USSR. Coll and subm 1970 by J Labeyrie. *Comment*: basilica was built from AD 628 to 643: valid date is not obtainable with this mortar, which very probably contains calcareous sand.

3040 ± 140

Gif-1997. Ben-Do, Vietnam **1090 BC**

Organic remains in black ceramics from Neolithic site at Bên-Do (10° 58′ N, 106° 50′ E), Vietnam. Coll and subm 1971 by H Fontaine, Serv Géol, Saigon. *Comment*: within expected age range.

Xnâm-Loc series, Vietnam

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

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

Charcoal from Jars 11 and 13.

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

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

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

Maré I series, Iles Loyauté, New Caledonia

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

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

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

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

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

II. GEOLOGIC SAMPLES

A. France

1. Palynologic and climatic problems

La Fère-en-Tardenois series, Aisne

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

Gif-1524. Fère-en-Tardenois, C I — **500 ± 90** / **AD 1450**

Depth 5cm.

Gif-1525. Fère-en-Tardenois, C 5 — **4150 ± 120** / **2200 BC**

Depth 25cm.

Gif-1526. Fère-en-Tardenois, C 9 — **7350 ± 160** / **5400 BC**

Depth 45cm.

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

7950 ± 190

Gif-1839. Aber-Ildut, Finistère **6000 BC**

Peat from Aber-Ildut, —22m related to msl (48° 29′ N, 4° 44′ W). Coll and subm 1970 by M T Morzadec. Agrees well with pollen analysis, indicating Boreal age (Zone VI_c).

6900 ± 140

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

Peat from foreshore, at lowest sea level in Rance estuary, Saint-Servan (48° 38′ N, 2° 00′ W), Ille-et-Vilaine. Coll and subm 1971 by M T Morzadec. *Comment*: confirms pollen analysis: Early Atlantic VIIa.

3600 ± 105

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

Peat from core 17.5m deep, in modern sediments of Vilaine Valley, 5km S Redon (47° 39′ N, 2° 05′ W, Ille-et-Vilaine. Coll 1961 and subm 1971 by M T Morzadec. *Comment*: corresponds to transition zone between Sub-Boreal and Sub-Atlantic, Transition VIIb-VIII.

6850 ± 170

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

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

6900 ± 170

Gif-1860. Mazerolles, Loire Atlantique **4950 BC**

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

2200 ± 110

Gif-1800. Marais Poitevin, Vendée **250 BC**

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

600 ± 100

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

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

2650 ± 110

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

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

3850 ± 130

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

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

Core II series, Loire Estuary

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

6210 ± 160

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

6270 ± 160

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

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

7800 ± 180

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

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

13,000 ± 180

Gif-1812. Core X, Loire Estuary **11,050 BC**

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

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

650 ± 100

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

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

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

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

Gif-1784. Salvanère, Aude **Modern**

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

Pla de Salinas, Cerdagne series, Pyrénées Orientales

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

Gif-1885. Cerdagne, 29 **1150 ± 100 AD 800**

0.20m deep.

Gif-1886. Cerdagne, 30 **1950 ± 100 0**

0.70m deep.

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

Le Bousquet series, Aude

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

Gif-1783. Le Bousquet, 21 **450 ± 100 AD 1500**

0.65 to 0.75m. *Comment*: abundant cereal pollens.

Gif-1782. Le Bousquet, 22 **1130 ± 100 AD 820**

1.30 to 1.40m.

Gif-1781. Le Bousquet, 23 **4300 ± 180 2350 BC**

2.00 to 2.10m. *Comment*: Sub-Boreal.

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

La Moulinasse, I, Col de Jau series, Aude

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

1620 ± 110

Gif-1780. Col de Jau, 15 **AD 330**

1.40 to 1.50m deep. *Comment*: level marked by important human influence.

2000 ± 100

Gif-1779. Col de Jau, 16 **50 BC**

1.75 to 1.85m deep. *Comment*: human influence.

2500 ± 110

Gif-1778. Col de Jau, 17 **550 BC**

2.10 to 2.20m deep. *Comment*: beginning of human influence; these 3 dates indicate rapid peat formation during Sub-Atlantic.

3350 ± 120

Gif-1777. Col de Jau, 18 **1400 BC**

2.45 to 2.55m deep. *Comment*: belongs to Sub-Boreal.

9150 ± 210

Gif-1776. Col de Jau, 19 **7200 BC**

2.95 to 3.05m deep. *Comment*: belongs to Pre-Boreal.

13,600 ± 350

Gif-1775. Col de Jau, 20 **11,650 BC**

3.25 to 3.35m deep. *Comment*: belongs to end of Early Dryas.

General Comment: oldest peat bog studied till now in Pyrénées.

1240 ± 120

Gif-257. "Plan du Carrelet", La Bérarde, Isère **AD 710**

Wood (*Pinus uncinata* Ramon), ca 0.50m diam found after a flood over junction of Vénéon R and Chardon torrent, at 1900m alt, at "Plan du Carrelet", La Bérarde (44° 55′ N, 1° 38′ E), Isère. Coll 1958 and subm 1963 by H Huchon, Admin Eaux et Forêts, Grenoble. *Comment*: date indicates "Plan du Carrelet" was covered by big trees in AD 1240, whereas 50 yr ago it was completely denuded. It is now being reforested.

6800 ± 140

Gif-1792. Isère R alluvium **4850 BC**

Wood from big Oak trunks under 5m deep gravel in alluvium of Isère R, on right bank, near Barreaux (45° 26′ N, 6° 00′ E). Coll and subm 1970 by E Baccard, Grenoble. *Comment*: trees probably come from large forest of Coise, frontier between Savoy and Dauphiné.

Alluvial plain of Durance R series

Wood (*Pinus silvestris*) from tree trunks still rooted *in situ* from alluvial plain of middle Durance R. Trees are exhumed by recent gully erosion of "Badlands" on slope of glacis (Archambault, 1969). Coll and subm 1971 by M Archambault, CNRS, Paris.

8260 ± 190

Gif-2217. Les Rois, 3 **6310 BC**

From top of steep bank of a tributary of Buech R (44° 19′ N, 5° 46′ E).

8500 ± 190

Gif-2215. Le Tronquet, I **6550 BC**

From top of steep bank of a sub-tributary of Durance R (44° 19′ N, 5° 53′ E).

10,750 ± 250

Gif-2216. Le Mardaric, 2 **8800 BC**

From bottom of bank of a sub-tributary of Durance R, Le Mardaric (44° 19′ N, 5° 53′ E).

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

Alluvial plain of Garonne R series

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

9170 ± 110

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

8900 ± 160

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

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

11,150 ± 250

Gif-2218. Les Condamines, Drôme Valley **9200 BC**

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

21,000 ± 600

Gif-1421. Saint-Pierre-les-Elboeuf, Seine Maritime **19,050 BC**

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

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

Gif-1840. Montmorency, Val d'Oise **$\geqslant$35,000**

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

Stalagmite series, Orgnac, Ardèche

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

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

Pure white calcite, length 1.70m.

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

Pure white calcite, length 2.07m.

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

Pure white calcite, length 1.60m.

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

Calcite with red clay, length 1.20m.

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

2. Sea-level variations

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

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

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

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

Brouage Marsh series, Charente

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

610 ± 90

Gif-2129. Brouage Marsh, A **AD 1340**

Wood from a water main, ca 2m above msl.

850 ± 90

Gif-2128. Brouage Marsh, B **AD 1100**

Cardium, from high water mark, ca 2.20m above msl.

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

1730 ± 100

Gif-1356. Saint-Firmin, Le Crotoy, Somme **AD 220**

Cardium edule shells from a conchiferous deposit underlying dune 6m high, Le Crotoy (50° 10′ N, 1° 37′ E), Bay of Somme. Coll and subm 1969 by M Ters, Inst Géog, Paris. *Comment* (M.T.): this deposit, at +2m, also corresponds to highest Flandrian transgression in region (Dunkirquian II) and to storm formation.

3380 ± 110

Gif-2244. Maritime Plain of La Charente R **1430 BC**

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

Bréhec series, near Plouha, Côtes du Nord

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

450 ± 90

Gif-1355. Bréhec I **AD 1500**

Oyster shells from littoral sediment along cliff at +6.5m. Probably a storm deposit.

2950 ± 110

Gif-2526. Bréhec 12 R **1000 BC**

Black clay, overlying fluvial gravel and underlying brackish gray silt at mouth of river, +5.90m (0.10m beneath present highest-tide level).

5300 ± 140

Gif-1358. Bréhec 2 **3350 BC**

Wood from log in freshwater peat, on beach, at −2m.

General Comment (M.T.): peat overlies brackish sand rich in ostracodes

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

Camiers series, Pas-de-Calais

Shells lying on beach, 300m from cliff, Camiers (50° 33′ N, 1° 35′ E), Pas-de-Calais.

3400 ± 130
Gif-1639. Camiers 2 **1450 BC**

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

3550 ± 130
Gif-1638. Camiers I **1600 BC**

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

5700 ± 135
Gif-1601. Camiers 4 **3750 BC**

Freshwater peat at −1m. Coll and subm 1969 by H Mariette, Samer, Pas-de-Calais.

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

Brétignolles series, Vendée

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

3170 ± 130
Gif-1640. Brétignolles I **1220 BC**

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

3600 ± 110
Gif-1992. Brétignolles 3 **1650 BC**

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

4910 ± 120
Gif-2108. Brétignolles 2 **2960 BC**

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

4990 ± 120
Gif-2109. Brétignolles 4 **3040 BC**

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

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

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

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

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

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

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

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

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

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

Le Havre series, Seine-Maritime

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

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

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

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

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

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

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

7820 ± 170

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

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

2250 ± 100

Gif-1405. Le Havre II, −12m **300 BC**

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

1400 ± 100

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

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

6500 ± 130

Gif-1808. Hauteville, Manche **4550 BC**

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

Avranches series, Manche

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

1260 ± 100

Gif-1144. Avranches, 1 **AD 690**

Muddy calcareous sand, +3.70 to +3.75m.

6200 ± 100

Gif-1142. Avranches, 2 **4250 BC**

Peaty horizon, −1.05m to −1.00m.

6200 ± 100

Gif-1143. Avranches, 3 **4250 BC**

Peaty level bottom, −0.90 to −0.85m.

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

Continental shelf series, Bay of Biscay, off La Rochelle

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3. Volcanism

Saint-Saturnin diatomite series, Puy-de-Dôme

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

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

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

Brézet II section series, Puy-de-Dôme

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

5230 ± 120

Gif-2353. Brézet II 2 **3280 BC**

Lower part of peaty clay horizon, in contact with basaltic ejecta. *Comment*: age is minimum for basaltic ejecta, origin of which is unknown in Chaine des Puys.

2570 ± 95

Gif-2354. Brézet II 3 **620 BC**

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

2030 ± 95

Gif-2355. Brézet III section, Puy-de-Dôme **80 BC**

Wood in peaty clay overlying black and white ash, at Brézet III, 100m from Brézet II (45° 47′ N, 3° 05′ E), Puy-de-Dôme. Coll and subm 1971 by R Brousse. Covered by clay horizon containing ash and Gallo-Roman artifacts. *Comment*: source of ash in Chaîne des Puys is unknown. Date agrees with industry in upper horizon.

Gerzat—La Combaude section series, Puy-de-Dôme

Succession of ancient soil and basaltic ejecta, 4m thick, at Gerzat-La Combaude (48° 59′ N, 3° 08′ E), in Limagne Plain. Coll and subm 1971 by R Brousse.

10,600 ± 180

Gif-2357. Gerzat 1 **8650 BC**

Organic horizon immediately beneath fine black ash, Level S_1, 20m thick, 3.37m deep.

5350 ± 120

Gif-2358. Gerzat 2 **3400 BC**

Peaty horizon 33cm thick, upper Level S_1 and coarse black ash (Level S_2), 17cm thick, 2.80 deep. *Comment*: date is unacceptable. Either samples are confused or were contaminated on collection.

10,300 ± 180

Gif-2359. Gerzat 3 **8350 BC**

Peaty horizon, 2cm thick, between Level S_2 and fine black-and-white ash, S_3, 36cm thick, 2.50m deep.

9380 ± 170

Gif-2360. Gerzat 4 **7430 BC**

Peaty horizon, 25cm thick, overlying Level S_3 and covered with fine black and white ash Level S_4, 19cm thick, 2.30m deep. Ashy Level S_4 is overlain by thin white clay, 3cm thick.

9900 ± 170

Gif-2361. Gerzat 5 **7950 BC**

Thin peaty horizon between 2 white clay layers, 2.04m deep. Upper clay horizon is covered with thick black Level S_5, 90cm thick, most recent one from this section. Whole sequence is covered with debris, 1m

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

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

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

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

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

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

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

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

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

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

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

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

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

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

11,070 ± 200

Gif-2255. La Tiretaine flow, Royat, Puy-de-Dôme **9120 BC**

Soil beneath basalt flow of La Tiretaine, Royat (45° 45′ N, 3° 03′ E), Puy-de-Dôme. Coll and subm 1971 by G Camus.

3890 ± 110

Gif-2349. Pond of Fung, La Gardette, Puy-de-Dôme **1940 BC**

Carbonized wood between volcanic ash and lacustrine sediments at Fung Pond, near La Gardette (45° 46′ N, 2° 52′ E), Puy-de-Dôme. Coll by D Baudry and subm 1971 by G Camus.

6760 ± 130

Gif-2350. South West Pavin Lake, Puy-de-Dôme **4810 BC**

Soil underlying ejecta from the small maar "Les Costes", ca 1.5km SW Lake Pavin (45° 29′ N, 2° 54′ E), Puy-de-Dôme. Coll and subm 1971 by G Camus. *Comment*: conformably overlain by trachytic ejecta from Lake Pavin. Thus, lake should have been formed after 6760 BP which agrees with age of lake sediments.

10,000 ± 200

Gif-1624. Chamalières, Puy-de-Dôme **8050 BC**

Upper part of peaty horizon. 10cm thick, underlying ash, near Chamalières (45° 47′ N, 3° 03′ E), Puy-de-Dôme. Coll by M Montpeyroux and subm 1970 by R Brousse. *Comment*: agrees with other dates on last main period of volcanism in Chaîne des Puys (this list and R, 1972, v 14, p 304).

1920 ± 110

Gif-1927. Jussac, Cantal **AD 30**

Bone from skeleton of dog in moraine of Jussac (45° 00′ N, 2° 21′ E), Cantal. Coll and subm 1970 by Vuittenez and R Brousse. *Comment*: is unrelated to glacial phenomena to date.

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

Alluvium underlying upper lava flow of Ray Pic near Burzet (44° 44′ N, 4° 15′ E), Ardèche. Coll by E Berger and subm 1970 by R Brousse. *Comment*: diluted for measurement.

B. Africa

1. Samples with climatic implications

Sebkha Mellala series, Algerian Sahara

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

9550 ± 130

Gif-1853. Sebka Mellala, lower layer **7600 BC**

Overlying evaporite deposit.

7900 ± 110

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

Between 2 evaporite deposits.

General Comment: dates alternation of dry and moist periods.

Bahr-El-Ghazal series, Chad Lake

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

3000 ± 110

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

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

8670 ± 220

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

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

27,000 ± 900

Gif-1584. Bahr-El-Ghazal, S-2049 **25,050 BC**

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

22,400 ± 600

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

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

25,600 ± 800

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

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

28,800 ± 1000

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

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

28,800 ± 1000

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

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

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

Agadem series, Niger

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

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

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

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

In eolian sand partly indurated, overlying lacustrine sediments. *Comment*: dates sanding up of Agadem massif after main lacustrine period of 9000 B.P.

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

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

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

Bilma series, Niger

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

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

Calcareous sandy tufa with reeds, Bilma (18° 44′ N, 12° 55′ E). *Comment*: dates marshy sedimentation phase in valleys of Bilma Cliff, contemporary with numerous Neolithic sites in region.

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

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

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

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

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

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

33,400 ± 2500
Gif-1788. Bilma, S-4032 **31,450 BC**

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

Mayo Wodeo terraces series, Banyo, Cameroun

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

1600 ± 100
Gif-1398. Banyo B 1 **AD 350**

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

18,000 ± 500
Gif-1399. Banyo B 2 **16,050 BC**

Peat from Level B 2. Level is either at base of terrace or 1m high; it is discontinuous and difficult to locate relative to Level B 1. *Comment*: same horizon was dated 24,550 ± 900 BP by Isotopes, Inc (I-3603, pers commun), but this sample should be more representative.

General Comment: dated climatic periods may correspond to modification in vegetation, eg, disappearance of forests in favor of savanna, following appreciable decrease of precipitation; vegetational changes led to streaming and gullying. For Level B 1, dated 1600 BP, climatic explanation is difficult to support.

Afrera Lake series, Afar, Ethiopia

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

6900 ± 150
Gif-1438. West Afrera Lake, 158 **4950 BC**

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

Gif-1437. Afrera Lake, Cutting N W, 175 **7300 ± 160 5350 BC**

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

Gif-1436. Afrera Lake, Cutting N W, 170 **7000 ± 150 5050 BC**

Calcareous diatomite with *Melania*; level ca 19m. Coll and subm 1970 by H Faure.

Gif-1435. Afrera Lake, Cutting N W, 163 **8750 ± 190 6800 BC**

Calcareous diatomite with *Melania*; level ca 18m. Coll and subm 1970 by H Faure.

Gif-1439. North West Afrera Lake, 159 **9800 ± 190 7850 BC**

Calcareous diatomite with *Melania*, base level, ca 10m. Coll and subm 1970 by H Faure.

Gif-1151. Afrera Lake, T B I **8230 ± 170 6280 BC**

Gasteropods, level ca 30m, 3km W Afrera Lake. Coll and subm 1968 by J Varet and H Tazieff, Fac Sci Orsay, Essonne.

General Comment: highest lake level occurred from 9800 BP until ca 7300 BP. It was followed by a short accident shown by important modifications in flora, a notable increase of water depth and salinity possibly caused by a tectonic phenomenon. The lake then dried up and diatoms disappeared progressively (Gasse, 1971). Studies are continuing.

Gif-1196. Gurgusson, near Massawa, Ethiopa **3900 ± 140 1950 BC**

Consumed shell (*Arca senilis*) assoc with obsidian industry, on littoral bar, at Gurgusson, near Massawa (15° 37′ N, 39° 28′ E), Ethiopia. Coll and subm 1968 by H Faure. *Comment*: corresponds to a sea level similar to present.

Gif-1441. Afar, N K 328 **31,600 ± 2000 29,650 BC**

Madrepore from an exonded submarine volcano, NE Afrera Lake, Afar (13° 21′ N, 41° 02′ E), Ethiopia. Coll 1968 by H Faure and dated to confirm date, I-2771: 31,050 $^{+1400}_{-1250}$; however, U-Th method gave age ca 100,000 yr BP which is much more suitable; unexplained discrepancy exists between the 2 methods. Sample is last evidence of Red Sea advance into Afar region. A possible interpretation of discrepancy is that very ancient porous calcareous stones collected some modern carbon compounds from atmosphere fallout during long exposure on the ground, producing some ^{14}C activity.

Senegal delta series

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

Gif-1450. Senegal delta, VD 31, 40cm **4750 ± 130 / 2800 BC**

Under fluviatile silt, 40cm deep (16° 06′ N, 16° 15′ W).

Gif-1451. Senegal delta, VD 31, 80cm **7050 ± 150 / 5100 BC**

80cm deep (16° 06′ N, 16° 15′ W).

Gif-1452. Senegal delta, VD 65, 55cm **7050 ± 150 / 5100 BC**

55cm deep (16° 03′ N, 16° 18′ W).

General Comment: describes delta formation.

2. Sea level variations

Ivory Continental shelf series

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

Gif-1619. Core C 55 **10,700 ± 200 / 8750 BC**

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

Gif-1616. Core B 29 **10,800 ± 200 / 8850 BC**

Peat, 2m underlying sand (4° 56′ N, 5° 53′ W). Depth –62m. *Comment*: comes from stable basal zone.

Gif-1618. Core C 57 **11,500 ± 250 / 9550 BC**

Mangrove peat, 0.60m deep in core, underlying silty sand (4° 50′ N, 5° 55′ W). Depth –62m. *Comment*: comes from stable basal zone.

Gif-1146. Core A 10-I **11,900 ± 250 / 9950 BC**

Mangrove peat, 2.60m deep in core, overlain by shell and Foraminiferae (5° 07′ N, 4° 20′ W). Depth –60m. *Comment*: corresponds to a transgression.

Gif-1147. Core B 5 **23,000 ± 1000 / 21,050 BC**

Fresh water peat underlying 2m silty sand, overlying a littoral sediment. Depth –60m (5° 08′ N, 4° 15′ W). *Comment*: must correspond to a regression.

Gif-2146. Core C 39 **11,100 ± 200**
9150 BC

Small nodules of calcareous algae underlying 0.50m sand (4° 32′ N, 6° 40′ W). Depth −82m. *Comment*: from stable basal zone.

Gif-2140. Core C II **11,500 ± 200**
9550 BC

Small nodules of calcareous algae underlying 0.20m organic muddy sand (4° 52′ N, 3° 10′ W). Depth −80m.

Gif-1509. Dredging DR, 2 **12,900 ± 250**
10,950 BC

Small nodule of calcareous algae, diam 3cm, from same place. *Comment*: whole nodule used for dating except outer part, removed by acid treatment.

Gif-1449. Dredging DR, I **13,000 ± 250**
11,050 BC

Center of nodule of calcareous algae, diam ca 15cm, dredged on Continental shelf (5° 02′ N, 4° 27′ W). Depth −100m. *Comment*: from stable part of sedimentary basin.

Gif-2138. Core C 43 **13,100 ± 250**
11,150 BC

Small nodules of calcareous algae, 0.20m beneath organic sandy silt (4° 36′ N, 6° 30′ W). Depth −82m. *Comment*: from stable basal zone.

Gif-2135. Core C 8 **13,300 ± 250**
11,350 BC

Nodules of calcareous algae, 1m beneath organic sandy silt and gray silt (5° 03′ N, 3° 55′ W). Depth −100m. *Comment*: from part of sedimentary basin, may be subsident.

Gif-2137. Core C 2 **13,900 ± 250**
11,950 BC

Nodules of calcareous algae, 0.10m beneath organic sandy silt (4° 29′ N, 6° 50′ W). Depth −89m. *Comment*: from stable basal zone.

Gif-2139. Core C 48 **14,700 ± 250**
12,750 BC

Nodules of calcareous algae, 0.20m under organic silty sand (4° 38′ N, 6° 20′ W). Depth −82m. From stable part of basal zone.

Gif-2136. Core C I **15,100 ± 260**
13,150 BC

Nodules of calcareous algae, 3.50m beneath silt and gray silt (5° 10′ N, 4° 02′ W). Depth −99m. *Comment*: comes from comparatively stable part of basal zone.

22,840 ± 250

Gif-2144. Core D 12 **20,890 BC**

Nodules of calcareous algae, 1.00m beneath silty and sandy organic silt (4° 12′ N, 7° 30′ W). Depth −80m. *Comment*: from stable part of basal zone.

Gif-2141. Core C 24 **⩾35,000**

Nodules of calcareous algae, underlying 3.00m gray silt (5° 01′ N, 3° 40′ W). Depth −80m. *Comment*: probably formed during earlier regression.

Gif-2145. Core D 17 **⩾35,000**

Nodules of calcareous algae, underlying more or less silty sand (4° 23′ N, 7° 15′ W). Depth −63m.

General Comment: nodules of calcareous algae indicate sea levels fairly well; although they live between 0 to −30m, they have a greater probability of formation in shallow water. These points fit well with eustatic curve of sea level (Martin and Delibrias, 1972).

Cape Verde Is series

Samples from fossil horizons from coast of volcanic Cape Verde Is. Coll and subm 1970 by J Laborel.

Gif-2196. Sao Vicente I. Baïa das Gatas, 1 **Modern**

Vermetid limestone (16° 52′ N, 23° 00′ W), alt ca +0.5m.

700 ± 90

Gif-2197. Boa Vista I., Sal Rei Bay, 3 **AD 1250**

Vermetid limestone from a well-defined horizon (16° 11′ N, 23° 06′ W), alt +1m.

2040 ± 100

Gif-2195. Sao Vicente I., Baïa das Gatas, 2 **90 BC**

Melobesiees block (16° 52′ N, 23° 00′ W), on the platform, alt +3m.

General Comment: preliminary results, proving existence on these little volcanic islands of one elevated horizon +3m, similar to that dated for Brazilian coast.

530 ± 90

Gif-2198. Pointe de Bereby, Ivory Coast **AD 1420**

Vermetid limestone, Pointe de Bereby (4° 37′ N, 7° 00′ W), Ivory Coast, well characterized horizon, alt +1m. Coll and subm 1971 by J Laborel.

1630 ± 90

Gif-1675. Paradise beach, W Tema, Ghana, AF-70-1 **AD 320**

Limestone with *Petaloconchus* from a well-defined horizon, ca +3m related to msl, on Paradise beach, 3km W Tema (5° 41′ N, 0° 00′ W), Ghana. Coll and subm 1970 by J Laborel.

Gif-1676. Paradise beach, W Tema, Ghana, AF 70-2 **2050 ± 90 / 100 BC**

Similar to Gif-1675, but coll and subm 1970 by J Laborel in a drainage digging.

Gandiol core series, S L 392, Saint-Louis, Senegal

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

Gif-1249. Gandiol core, 10 to 11m **2000 ± 100 / 50 BC**

Old shell debris from beach sand horizon.

Gif-1250. Gandiol core, 12 to 13m **16,000 ± 400 / 14,050 BC**

Oyster from gray-bridge shell debris horizon, indurated in places, underlying a layer of mud from 11.40 to 12m. *Comment*: reworked material.

Gif-1251. Gandiol core, 15.10 to 15.80m **31,300 ± 2500 / 29,350 BC**

Shell (*Cardium*) from sandstone-like beach rock. *Comment*: dates Inchirian in that subsided region of delta of Senegal R.

Gif-1252. Gandiol core, 21.20 to 23.50m **34,300 ± 3000 / 32,350 BC**

Oyster from *lumachella* with gray calcareous cement; ancient beach sediment. *Comment*: similar to Gif-1251.

Pointe Noire series, Congo

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

Gif-2210. Pointe Noire, P G 30 **Modern**

Ostrea denticulata outcrop in 1st sandy offshore bar (4° 48′ S, 11° 50′ E), alt +2.7m.

Gif-2212. Pointe Noire, P G 838 **Modern**

Arca senilis outcrop in 2nd sandy offshore bar (4° 48′ S, 11° 51′ E), alt +13.5m.

Gif-2211. Pointe Noire, P G 617 **800 ± 90 / AD 1150**

Ostrea denticulata outcrop in 2nd sandy offshore bar (4° 55′ S, 11° 56′ E).

Gif-2206. Pointe Noire, P G 47 **3860 ± 130 / 1910 BC**

Silty peat, in Core S 5, −16.7 to 16.9m (4° 47′ S, 11° 50′ E).

4920 ± 140
Gif-2209. Pointe Noire, P G 79 **2970 BC**

Arca and *ostrea* shells, from Core S 7, −5.55 to 7.75m (4° 47′ S, 11° 59′ E).

7200 ± 180
Gif-2205. Pointe Noire, P G 89 **5250 BC**

Silty peat, in Core S 8, −18.85 to 19.05m (4° 47′ S, 11° 49′ E).

7650 ± 180
Gif-2207. Pointe Noire, P G 88 **5700 BC**

Silty peat, in Core S 8, −13.55 to −13.75m (4° 47′ S, 11° 49′ E).

7650 ± 180
Gif-2204. Pointe Noire, PNFI **5700 BC**

Silty peat, in core, −21.56 to −21.71m (4° 47′ S, 11° 50′ E).

8200 ± 190
Gif-2208. Pointe Noire, PG 71 **6250 BC**

Silty peat, in Core S 12, −10.2 to −11.7m (4° 47′ S, 11° 50′ E).

8550 ± 200
Gif-2202. Pointe Noire, PE 874 **6600 BC**

Wood, in Core S F, −28.1 to 28.9m (4° 47′ S, 11° 49′ E).

8920 ± 200
Gif-2203. Pointe Noire, PG 885 **6970 BC**

Wood and peat, in Core S C, −24.9m (4° 47′ S, 11° 49′ E).

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

C. Pacific Ocean

Sea-level variations

Hao atoll series, Tuamotou archipelago

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

3300 ± 100
Gif-1667. Core ST 3, 3 B **1350 BC**

Top of a hard compact coral formation, 4.50m thick (17° 54′ N, 141° 04′ W), +1.32m related to msl.

3800 ± 120
Gif-1801. Core ST 3, 4 D **1850 BC**

Approx msl.

5800 ± 140
Gif-1802. Core ST 3, 4 N **3850 BC**

−1.20m related to msl.

6150 ± 140

Gif-1803. Core ST 3, 4 R **4200 BC**

–2.10m related to msl.

6100 ± 140

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

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

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

Tenia core series, New Caledonia

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

960 ± 90

Gif-1522. Tenia, G C I, 3.70m **AD 990**

0.70m related to msl. From non-consolidated horizon 0 to 11m deep, with sand and coral, calcareous algae, marine organisms.

920 ± 90

Gif-1523. Tenia, G C 2, 5.80m **AD 1030**

–2.80m related to msl. From same horizon as Gif-1522.

Gif-1629. Tenia, G C 5, 8m **⩾40,000**

–5m related to msl.

Gif-1582. Tenia, G C 6, 11m **⩾40,000**

–8m related to msl. Upper part of consolidated coral horizon, from 11 to 66m.

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

W Coast of New Caledonia series

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

5600 ± 150

Gif-1578. Dumbea delta, NAT 17 E **3650 BC**

(22° 10′ S, 166° E). –0.10m related to msl.

7300 ± 170

Gif-1580. Dumbea delta, NAT 18 H **5350 BC**

(22° 10′ S, 166° E). –4.76m related to msl.

5750 ± 150

Gif-1577. Marais de Mara, Moindou, MT 24 D **3800 BC**

(21° 50′ S, 165° 45′ E). −0.14m related to msl.

6800 ± 165

Gif-1579. Marais de Mara, Moindou, MT 27 E **4850 BC**

(21° 50′ S, 165° 45′ E). −2.96m related to msl.

General Comment: dates on these mangrove peat bogs agree with those for reef sediments on same coast (Baltzer, 1970).

SW Coast of New Caledonia series

Samples from recent marine terraces and from fringing reef of SW coast of New Caledonia. Coll and subm 1969 by J Coudray (1968).

770 ± 90

Gif-1979. Rivière des pirogues, 69-119 **1180 BC**

Oyster from a well-defined oyster horizon, +0.70m above present oyster horizon (22° 18′ S, 166° 40° E).

1140 ± 90

Gif-1978. Rivière des Pirogues, 69-118 **AD 810**

Reworked coral consolidated in beachrock, approx msl.

2250 ± 100

Gif-1983. Foué I., 69-60 **300 BC**

Marine shells consumed on shore, alt +2.10m; assoc with archaeol material, at Foué I. (21° 06′ S, 164° 49′ E). *Comment*: indicates that sea was under this level.

3040 ± 100

Gif-1981. Foué I., 69-56 **1090 BC**

Shells in bedrock, alt +1.50m, Foué I.

3370 ± 105

Gif-1982. Le Hedour I., 69-LP5 **1420 BC**

Oyster from bedrock, +1.10m above present oyster horizon, Le Hedour I. (21° 58′ S, 165° 58′ E).

3970 ± 110

Gif-1976. Touaourou, 69 TOU-15 **2020 BC**

Coral *in situ*, alt +1.10m, in marine slot in ancient reef Touaourou (22° 11′ S, 166° 57′ E).

4380 ± 100

Gif-1975. Touaourou, 69 TOU-10 **2430 BC**

Coral *in situ*, alt +0.8m, on marine abrasion horizon in ancient reef.

5400 ± 120

Gif-1974. Touho, 69-T_1 **3450 BC**

Coral *in situ*, approx msl, Touho (20° 47′ S, 165° 13′ E).

1800 ± 95

Gif-1980. Puen, 69-P$_2$ **AD 150**

Giant clam remains in beach rock from reworked terrace, alt +1.5m.

5960 ± 130

Gif-1984. Nepoui R., 66-FN **4010 BC**

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

6100 ± 130

Gif-1985. Nepoui FN$_2$b **4150 BC**

Lamellibranch from same core as Gif-1984, same horizon.

Gif-1977. Grimault I., 69-G6 **⩾35,000**

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

Gif-1973. Isie I., 69-ISIE 5-2 **⩾35,000**

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

Gif-2257. Isi I., 69-ISIE 6-1 **⩾35,000**

Terrestrial gasteropods from lower part of same paleosol as Gif-1973, alt +1.20m, Isie I.

Gif-2256. Nouméa, Ricandy reef, RIC 2-13a **⩾35,000**

Lamellibranch, −14m from fringing reef off Nouméa, Ricandy reef (22° 19′ S, 166° 27′ E).

General Comment: 1st 8 measurements agree and retrace recent variations of sea level on SW coast of New Caledonia. They show a level 1 to 1.50m above msl ca 3300 to 4000 BP.

Gif-1998. Long-Haï, Vietnam **Modern**

Shells from top of shore, +2m above msl, at Long-Haï, Vietnam. Coll and subm 1971 by H Fontaine, Service Géol, Saigon.

Mekong delta series, Vietnam

Shells from emerged horizons, remains of ancient shore line in Mekong delta. Coll and subm 1971 by H Fontaine.

2500 ± 100

Gif-2220. Ban-Tân-Dinh **550 BC**

Very large oysters, on bank of a canal at Ban-Tân-Dinh, 20km SE Rach-Gia (9° 53′ N, 105° 15′ E), Kiên-Giang.

3430 ± 110

Gif-2219. Giong-Da **1480 BC**

Shelly, hard sediment, 30km SE Rach-Gia (9° 53′ N, 105° 15′ E), ca high tide level, *ie*, ca +2m above msl.

4870 ± 120

Gif-2154. Rice plantation Canal **2920 BC**

Oyster *in situ*, beneath clay, near Nui-Choc (10° 15′ N, 105° 12′ E), SW Long Xuyèn, 28km from the sea. Ca high tide level.

5570 ± 120

Gif-2153. Cho-So **3620 BC**

Oyster, *in situ,* beneath clay, at Cho-So near Nui-Choc (10° 15′ N, 105° 12′ E). Ca high tide level.

5680 ± 120

Gif-2152. Nui-Choc **3730 BC**

Oyster *in situ,* beneath clay, at Nui-Choc (10° 15′ N, 105° 12′ E). Ca high tide level.

General Comment: confirms recent high levels in Mekong delta.

D. Miscellaneous Countries

1. Sea-level variations

Brazil coast series

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

2400 ± 95

Gif-1935. Enseada do Forno, Cabo Frio **450 BC**

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

2450 ± 95

Gif-1933. Salvador, Ilha de Itiparica **500 BC**

Vermetids limestone (13° S, 38° 38′ W), alt 2.0 ± 0.5m.

3900 ± 110

Gif-1934. Punta do Pai Vitorio, Cabo Frio **1950 BC**

Vermetids limestone (22° 51′ S, 42° 03′ W), alt 3.0 ± 0.5m.

4480 ± 140

Gif-2147. Ilha do Santo Amaro **2530 BC**

Vermetids limestone (23° 55′ S, 46° 14′ W), N Guaruga, alt 3.0 ± 0.5m.

5050 ± 115

Gif-1932. Vitoria **3100 BC**

Oysters (20° 19′ S, 40° 21′ W), alt 1.0 ± 1m. *Comment*: reference to msl is particularly inadequate for oysters.

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

27,400 ± 1500

Gif-1576. Yauca, Peru **25,450 BC**

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

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

Chilean Coast series

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

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

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

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

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

Gif-1446. La Serena, 7 **⩾35,000**

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

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

Oka hills series, Champlain Sea, Canada

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

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

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

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

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

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

Puvirnituq series, Hudson sea, Quebec, Canada

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

Gif-1818. "Crête des Coquilles", W Puvirnituq **3400 ± 80**
1450 BC

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

Gif-1819. E Puvirnituq **500 ± 80**
AD 1250

Beluga bones on ancient littoral bar, 10m alt 300m E Puvirnituq (66° 02′ N, 77° 12′ E). *Comment*: usually Beluga are sliced and partially consumed ashore by Eskimos. Date could indicate a recent uplift of coast of 2m per century.

Gif-1645. Falasarna, Kriti, Greece **2050 ± 100**
100 BC

Calcareous encrusting with algae and Vermetids from well marked platform, in different region of Kriti, alt +6.5m at Falaso (35° 30′ N, 28° 33′ E), Kriti. Coll and subm 1970 by B Keraudren, Fac Sci, Paris.

Gif-1943. "Faraglioni", Aci Trezza, Sicily, Etna 70-2 **5900 ± 120**
3950 BC

Oyster remains in calcareous encrusting going up to 8m on "Faraglioni", small islands, some hundred m off Aci Trezza (37° 27′ N, 15° 11′ E), Sicily. Coll and subm 1971 by G Kieffer, Inst. Géog, Clermont-Ferrand, Puy-de-Dôme.

2. Volcanism

La Soufrière series, Guadeloupe

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

Gif-225. La Soufrière, No. 1 **370 ± 120**
AD 1580

On left bank of Galion R, 600m alt.

Gif-226. La Soufrière, No. 2 **⩽120**

Under volcanic breccia layer, 50cm thick, 1120m alt. *Comment*: supposedly from last reported volcanic event of La Soufrière, on Dec 3 and 4, 1836.

E. Marine Sedimentation

E Mediterranean sea cores

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

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

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

Core Mo 24 series

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

4950 ± 130
Gif-1444. Core Mo 24, 17 to 24cm **3000 BC**

Upper part of sapropelitic horizon.

7900 ± 170
Gif-1430. Core Mo 24, 60 to 64cm **5950 BC**

Lower part of same sapropelitic horizon as Gif-1444.

General Comment: shows very rapid accumulation of sapropelitic sediments, ca 15cm/1000 yr, while mean rate of sediment in upper part of core is ca 3.6cm/1000 yr. Sapropelitic horizons indicate last episodes of anoxic conditions near bottom of E Mediterranean.

Core Mo 36 series

Core Mo 36 (35° 58′ N, 24° 27′ E), N Kriti, 100km SW Santorini, depth 780m, length 570cm. Eight ash or pumice layers identified along the core.

23,100 ± 1000
Gif-1468. Core Mo 36, 70 to 80cm **21,150 BC**

Coarse fraction of sediment >50μ, overlying tephra layer 80 to 100cm. *Comment*: diluted for measurement.

27,400 ± 2400
Gif-1469. Core Mo 36, 100 to 110cm **25,450 BC**

Coarse fraction of sediment, > 50μ. *Comment*: diluted for measurement.

General Comment: sedimentation rate of 3.5cm/1000 yr can be calculated for upper part of core. Date is ca 25,000 BP for one of major prehistoric eruptions of Santorini.

Core Mo 44 series

Core Mo 44 (35° 46′ N, 23° 28′ E) between Kriti I. and Peloponnesus, 200km SW Santorini, depth 910m, length 340cm. Three ash layers were found: 0 to 20cm, 30 to 40cm and deeper in core, ca 250cm.

5800 ± 140
Gif-1506. Core Mo 44, 25 to 31cm **3850 BC**

Sapropelitic mud, between 2 upper tephra horizons.

Gif-1826. Core Mo 44, 100 to 120cm **30,800 ± 1500 / 28,850 BC**

Sediment, coarse fraction, > 50μ, underlying very thick ash. *Comment*: diluted for measurement.

General Comment: mean sedimentation rate in upper part of core is: 4.8cm/1000 yr and from surface to 120cm: 3.6cm/1000 yr. This core indicates a very large eruption of Santorini ca 4800 BP.

Core Mo 45 series

Core Mo 45 (35° 53′ N, 22° 21 E), in Matapan deep, S Peloponnesus, 250km WSW Santorini, depth 4420m, length 415cm. One tephra layer between 20 to 30cm.

Gif-1350. Core Mo 45, 0 to 10cm **3380 ± 110 / 1430 BC**

Fine fraction ⩽ 50μ.

Gif-1351. Core Mo 45, 0 to 10cm **1950 ± 170 / 0**

Coarse fraction > 50μ. *Comment*: difference between coarse and fine fraction confirms impossibility of dating total sediment because of detritic carbon. Diluted for measurement.

Gif-1495. Core Mo 45, 30 to 40cm **⩾25,000**

Coarse fraction ⩽ 50μ. Underlies upper tephra layer. *Comment*: diluted for measurement.

General Comment: based on refractive index and stratigraphic sequence, 2 tephra layers can be distinguished in upper part of almost all cores: one before 5000 BP which should correspond to Minoan eruption of Santorini, and another ca 25,000 BP. Results very similar to those obtained by Ninkovich and Heezen (1965) in a similar study.

Cap Mele series, Ligurian sea

Calcareous encrustings, on continental shelf, off Cap Mele in Ligurian sea. Coll and subm 1907 by J P Rehault and C Grazzini, Sta Géodynamique sous-marine, Villefranche-sur-Mer, Alpes Maritimes.

Gif-1562. Cap Mele, FOM, P 22 **22,000 ± 1000 / 20,250 BC**

Encrusting with *Lithothamniae* and mollusk shells, from bottom of Core P 22, 4.50m long and 135m deep (43° 50′ N, 8° E).

Gif-1563. Cap Mele, FOM, P 23 B **10,200 ± 200 / 8250 BC**

Encrusting with *Lithothamniae*, from bottom of Core P 23, 2m in sediment and 100m deep (43° 50′ N, 8° E).

Gif-1564. Cap Mele, FOM, P 24 **23,600 ± 1000 / 21,650 BC**

Encrusting with *Lithothamniae* and mollusk shells from bottom of Core P 24, 1.20m long and 75m deep (43° 50′ N, 8° E).

24,100 ± 1000

Gif-1565. Cap Mele, FOM, P 25 b **22,150 BC**

Encrusting with mollusk shells from bottom of Core P 25, 2m long and 49m deep (43° 50′ N, 8° E).

10,700 ± 200

Gif-1566. Cap Mele, FOM, P 87 A **8750 BC**

Encrusting debris from bottom of Core P 87, 1m long and 80m deep (43° 50′ N, 8° 03′ E).

General Comment: 3 last encrustings were obtained from Quaternary rocks to which they were attached, which suggests they were *in situ* and related to a low sea level. The 2 others: Gif-1562 and -1563, on the contrary, may have been reworked.

Seamount samples, Atlantic Ocean

Sediment samples from one of Biscay seamounts, the Charcot (45° 22′ N, 10° 45′ W), NW Spain, in Atlantic Ocean. Coll by *OS J Charcot* dredging cruise 1969 and by coring in 1970, by R Chesselet.

Dredging samples series

Two distinct kinds of sediments were dredged: on seamount 3500m deep a gray-beige sediment more or less solid with very high concentration of Foraminiferae and a white compact sediment, almost pure $CaCO_3$, with Foraminiferae still extant in upper part only. When possible, Foraminiferae were separated for dating.

1720 ± 140

Gif-671. Charcot G, surface **AD 230**

Foraminiferae from liquid gray ooze, representative of 5cm surface sediment.

9100 ± 350

Gif-646. Charcot D, gray **7150 BC**

Foraminiferae from compact gray sediment, under liquid sediment.

26,800 ± 2000

Gif-648. Charcot D, White I **24,850 BC**

Foraminiferae from white sediment underlying Gif-646.

28,600 ± 2000

Gif-649. Charcot D, White 2 **26,650 BC**

Fine fraction without Foraminiferae, from same white sediment as Gif-648. This sediment contains 95% $CaCO_3$.

Gif-670. Charcot E_2 **⩾35,000**

Foraminiferae, 4cm deep in white sediment dredged at Point E_2.

General Comment: results show difficulty of obtaining valid dates on dredged material. Sediments from Point D were dredged on the sea-

mount but on an abrupt wall; because of very different consistency of gray and white sediments, it is not certain that sedimentation was not perturbed on the slope and that stratigraphy was preserved during dredging. Moreover, numerous cracks in the compact white sediment enabled the fluid recent gray sediment to penetrate and pollute the white sediment. This explains young ages for these sediments; fauna of Foraminiferae and Coccolithophoridae is Tertiary. Only Gif-671 and -670 are valuable.

Core C_I series

Because of previous results, a core 80cm long was coll in flat area on top of Charcot seamount (45° 19′ N, 10° 31′ W), depth 2665m, but this coring did not penetrate deep enough to reach the white sediment and contains only Quaternary sediments.

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

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

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

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

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

Gif-1373. Core C_I, 64.50 to 69cm — **⩾35,000**
Coarse fraction > 80μ.

General Comment: presence of turbidite layers ca 25cm and 40cm deep in core made it necessary to eliminate coarse fraction > 250μ. Moreover, in 40cm deep turbidite layer, there is 10% gravel > 5mm. It is difficult for such stones to climb a 17% slope and reach top of seamount; so their presence cannot yet be explained unless one admits a very fast rise of this seamount (at least 2000m during last 20,000 yr). Mean sedimentation rate of 1.8cm/yr in upper part of core above turbidite layers was determined from dates Gif-1374 and -1419.

CORRECTION

Gif-1090 and Gif-1109 listed in v 14, p 290 were accidentally repeated. They should be listed only for v 13, p 222.

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[RADIOCARBON, VOL. 16, NO. 1, 1974, P. 95-104]

INSTITUTE OF GEOLOGICAL SCIENCES RADIOCARBON DATES V

E WELIN, L ENGSTRAND, and S VACZY

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This date list was compiled by the Institute of Geological Sciences (UK) incorporating data supplied under contract by E Welin, Radioactive Dating Laboratory, Stockholm. Unless otherwise stated, age figures are in ^{14}C years before AD 1950. The half-life of ^{14}C is taken as 5568 years and the error, based on counting statistics of sample, background, and modern, is given as one standard deviation. Correction for $^{13}C/^{12}C$ fractionation has been made.

IGS-C14/88. (St 3853) Isle of Grain, Kent

8250 ± 100
6300 BC
$\delta^{13}C = -31.0‰$

Peat from −26.36m OD in borehole in Medway estuary (51° 26′ N, 0° 43′ E, Grid Ref TQ 8850 7410). Peat 3m thick, overlain by 19m estuarine clays and resting on gravel, in buried channel in London Clay. Coll 1971 and subm by G J Penney, Inst Geol Sci. *Comment* (GJP): date suggests channel was infilled during Holocene rise in sea-level.

IGS-C14/90. (St 3778) Toome, Co Londonderry

4485 ± 100
2535 BC
$\delta^{13}C = -25.3‰$

Wood 0.5m below top of diatomite bed 1m thick forming part of terrace 2m above Lough Neagh (54° 45′ N, 6° 28′ W, Irish Grid Ref H 984 907). Coll 1971 and subm by R A Old, Inst Geol Sci. *Comment* (RAO): determination gives age of Neolithic 'Bann Culture' in diatomite assigned to Zone VIIb by Jessen (1949).

Bingley series

IGS-C14/91. (St 3850) Airedale, Yorkshire

11,135 ± 110
9185 BC
$\delta^{13}C = -31.0‰$

Peat ca 0.15m thick at 2m depth from trial trench near Bingley (53° 51′ N, 1° 51′ W, Grid Ref SE 101 390). Peat lies on laminated clay in hollow at rear of rotational landslip involving till and soliflucted till and is overlain by ca 0.5m laminated clay and a solifluction mantle ca 1.5m thick. Coll 1971 and subm by J N Hutchinson, Imperial College, London. *Comment* (JNH): confirms pollen analysis which suggested Zone II age (J Turner, Univ Durham) and limiting date for landslip.

* Published by permission of the Director, Institute of Geological Sciences, Exhibition Road, London SW7. The Institute is a contracting agency, not a dating laboratory, yet IGS at London is the "author" when needed for inter-laboratory communication.

IGS-C14/92. (St 3870) Airedale, Yorkshire **<250**
$\delta^{13}C = -28.5‰$

Stems of *Alnus glutinosa*, id by K L Alvin, Imperial College, in growth position from top of peat referred to in IGS-C14/91.

IGS-C14/93. (St 3871) Trafalgar Square, London **>40,000**
$\delta^{13}C = -30.7‰$

Plant stem fragments from peat 150mm thick at 0.6m OD in Flood Plain Terrace deposits, Carlton House Terrace Redevelopment site (51° 30′ N, 0° 8′ W, Grid Ref TQ 2981 8033). Coll 1971 and subm by B C Worssam, Inst Geol Sci. *Comment* (BCW): date accords with Ipswichian age deduced from flora and fauna from previous excavations in vicinity (Franks *et al*, 1958; Franks, 1960).

IGS-C14/94. (St 3846) Stanway By-pass, Essex **28,170 ± 700**
26,220 BC
$\delta^{13}C = -29.2‰$

IGS-C14/95. (St 3864) Stanway By-pass, Essex **+1240 32,500 −1080**
30,550 BC
$\delta^{13}C = -25.5‰$

Peat from cutting (51° 53′ N, 0° 48′ E, Grid Ref TL 9257 2425). Coll 1971 and subm by C R Bristow, Inst Geol Sci. *Comment* (F C Cox): stratigraphic and palynologic evidence favors correlation with the Hoxnian. Samples were not treated with NaOH to dissolve humic matter. The stratigraphically younger specimen (IGS-C14/95) yielded older date; thus, samples must have been contaminated by humic solutions.

IGS-C14/96. (St 3903) Brantingham, Yorkshire **21,835 ± 1660**
19,885 BC
$\delta^{13}C = -32.8‰$

Bone fragment from temporary excavation in sand and gravel SW of Brantingham (53° 45′ N, 0° 35′ W, Grid Ref SE 9385 2918). Depth 3.05m below surface. Coll 1970 and subm by G D Gaunt, Inst Geol Sci. *Comment*: bone occurred within or at base of littoral sediments attributed to maximum elevation phase of 'Lake Humber'. Date indicates an upper Devensian age for this phase and supports stratigrahic evidence that it was approx contemporaneous with the maximum Devensian ice advance into the Vale of York.

Stoneferry series, Yorkshire

Peat and shells from excavation at Stoneferry, Hull (53° 46′ N, 0° 20′ W, Grid Ref TA 1036 3214). Coll 1971 and subm by G D Gaunt, Inst Geol Sci.

IGS-C14/97. (St 3812) **5240 ± 100**
3290 BC
$\delta^{13}C = -28.6‰$

Peat from 5.7m below surface.

IGS-C14/98 I. (St 3803) **3775 ± 100**
1825 BC
$\delta^{13}C = -4.3‰$

Shells (*Cerastoderma edule*) from base of estuarine sediments in same excavation as /97 at 5.5m below surface.

IGS-C14/98 II. (St 3804) **3435 ± 200**
1485 BC
$\delta^{13}C = -5.8‰$

Shells (*Macoma balthica*) from base of estuarine sediments in same excavation as /97 and at same depth as /98 I.

Hull series, Yorkshire

Peat from borehole at Market Place, Hull (53° 44′ N, 0° 20′ W, Grid Ref TA 1003 2851). Coll 1971 by J Bartlett, Hull Mus, and subm by G D Gaunt, Inst Geol Sci.

IGS-C14/99. (St 3845) **6970 ± 100**
5020 BC
$\delta^{13}C = -29.5‰$

Sample from base of peat bed, 16.15m below surface, in borehole.

IGS-C14/100. (St 3825) **6890 ± 100**
4940 BC
$\delta^{13}C = -28.8‰$

Sample from upper part of peat bed in same borehole as /99.

General Comment on IGS-C14/97-100 (GDG): dates help determine relative rise of Flandrian sea level in Humber region. Dates for /98I and 98II show extent of variation between two species of shells from same horizon; date from *M balthica*, the thinner-shelled species is younger and has a wider margin of uncertainty.

IGS-C14/101. (St 3805, outer fraction) **+910**
28,720
−820
Ballykelly, Co Londonderry **26,770 BC**
$\delta^{13}C = +5.5‰$

(St 3806, inner fraction) **>40,000**
Ballykelly, Co Londonderry
$\delta^{13}C = +0.3‰$

Shells from deeply cut Londonderry Lower Till exposed in stream sec at Thorny Hill, Northern Ireland (55° 02′ N, 7° 02′ W, Irish Grid Ref C 627 210). Coll 1971 and subm by R A B Bazley, Inst Geol Sci. *Comment*: shells derived from marine sediments of Lough Foyle or North Channel. Age >40,000 BP does not confirm theory that widespread lower shelly till of area belongs to an early stage of main Midlandian (Weichsel) glaciation. Present popular theory that this till is Munsterian (Saale) age remains likely.

Uwchygarreg series, Montgomeryshire

Samples from lower 1.22m of hill-top peat, Ochr Lygnant, Uwchygarreg, Machynlleth (52° 31′ N, 3° 46′ W, Grid Ref SN 8001 9163). Total thickness of peat 2.44m weathered into vertical face and resting on weathered surface of mudstones.

IGS-C14/103. (St 3834) **5570 ± 100**
3620 BC
$\delta^{13}C = -28.9‰$

From basal 0.08m of sediment.

IGS-C14/104. (St 3827) **4065 ± 100**
2115 BC
$\delta^{13}C = -27.3‰$

0.84m above base.

IGS-C14/105. (St 3818) **3640 ± 100**
1690 BC
$\delta^{13}C = -26.2‰$

1.22m above base.
Coll 1971 and subm by R Cave, Inst Geol Sci.

IGS-C14/107. (St 3815) Swanscombe, Kent **>40,000**
$\delta^{13}C = -11.1‰$

Shells from a life assemblage of *Potomida littoralis* Cuvier from sand lens in Lower Loam 0.10m above junction with Lower Gravel, NW face of Trench B33 (51° 26′ N, 0° 18′ E, Grid Ref TQ 5986 7428), 1971 excavations at Barnfield Pit (Conway, 1972). Coll 1971 and subm by B W Conway, Inst Geol Sci. *Comment* (BWC): Lower Loam widely accepted as Hoxnian (Ovey, 1964) and specifically correlated with early temperate sub-stage of Hoxnian interglacial (Kerney, 1971) occurring within insolation half-cycle 6W to which an age of 200,000 to 220,000 yr BP has been assigned (Evans, 1971). As expected, the infinite date is consistent with this.

IGS-C14/108. (St 3830) Hoxne Brick Pit, Suffolk **26,930 ± 975**
24,980 BC
$\delta^{13}C = -26.4‰$

Peat from Main Cutting, Layer 2, archaeologic excavation (52° 21′ N, 1° 12′ E, Grid Ref TM 175 767). Coll 1971 and subm. by C R Bristow. *Comment* (F C Cox): radiometric age much younger than expected. Stratigraphy and other ^{14}C dates (Bristow and Cox, 1973) suggest sample should be >40,000 yr and thus must have been contaminated by humic solutions. Sample was not treated with NaOH.

Woodhall Spa series, Lincolnshire

IGS-C14/109. (St 3831) **3945 ± 100**
1995 BC
$\delta^{13}C = -27.6‰$

Upper layer of peat overlain by blue gray clay and overlying coarse sand containing Humic Gley soil, 2.60 to 2.64m below surface at Kirk-

stead Bridge (53° 08′ N, 0° 15′ W, Grid Ref TF 172 619). Coll 1971 and subm by K W G Valentine, Reading Univ.

IGS-C14/110. (St 3823) **4155 ± 100**
2205 BC
$\delta^{13}C = -27.9‰$

Basal layer of peat in IGS C14/109, immediately overlying the Humic Gley soil in coarse sand, 2.80 to 2.84m below surface. Coll 1971 and subm by K W G Valentine.

IGS-C14/111. (St 3819) **3980 ± 100**
2030 BC
$\delta^{13}C = -25.5‰$

Basal layer of peat overlain by blue gray clay and immediately overlying Humic Gley soil in coarse sand and clay, 2.31 to 2.36m below surface at Timberland Dales (53° 08′ N, 0° 14′ W, Grid Ref TF 179 602). Coll 1971 and subm by K W G Valentine.

IGS-C14/112. (St 3838) **4130 ± 100**
2180 BC
$\delta^{13}C = -26.7‰$

Basal layer of peat overlain by blue gray clay and immediately overlying Humic Podzol soil in coarse sand and gravel, 2.48 to 2.52m below surface at Tattershall Bridge (53° 05′ N, 0° 13′ W, Grid Ref TF 186 557). Coll 1971 and subm by K W G Valentine.

General Comment (KWGV): date is latest for development of a Podzol to Gley sequence of paleosols in coarse sands and clay exposed for ca 10 km along a gas pipeline trench. IGS-C14/109 and 110 show peat developed quickly over paleosols. All dates are corroborated by pollen analyses, made by B Seddon and S Page, Reading Univ, that gave a consistent spectrum from Zone VII b. Stratigraphically, peat is tentatively correlated with Lower Fen Peat of S fens, but dates are a little later.

St. Ouen's Bay series, Jersey

IGS-C14/113. (St 3911) **3890 ± 100**
1940 BC
$\delta^{13}C = -27.6‰$

Peat from 6.1 to 6.6m below surface in a borehole (49° 14′ N, 2° 14′ W, Grid Ref 3 SW 1742 0388) at Les Laveurs. Coll 1971 and subm by R G Thurrell, Inst Geol Sci. *Comment* (RGT): 0.5m peat with sand, interbedded in beach sand sediments of coastal plain, is based at +2m OD.

IGS-C14/114. (St 3837) **1925 ± 240**
AD 25
$\delta^{13}C = -27.6‰$

Peat from 5.9 to 6.1m below surface in a borehole (49° 14′ N, 2° 14′ W, Grid Ref 3 SW 2103 0172) 400m SE of IGS-C14/113. Coll 1971 and subm by R G Thurrell. *Comment* (RGT): 0.2m peat with sand based at +5.6m OD is overlain by sandy beach deposits of St Ouen's coastal plain

and underlain by predominantly clayey silts and gravelly sands, apparently derived from hinterland.

IGS-C14/115. (St 3833) Sandwich, Kent **5315 ± 100 3365 BC**

$\delta^{13}C = -27.9‰$

Peat from site investigation borehole for Sandwich By-pass (51° 17′ N, 1° 20′ E, Grid Ref TR 3229 5915) in reclaimed estuarine marshland. Coll 1971 by Kent County Council Highways Department and subm by E R Shephard-Thorn, Inst Geol Sci. *Comment* (ERS-T): borehole commenced at +3.5m OD and proved 3.8m fill, overlying 5m estuarine silts on solid Thanet Beds; peat occurs as thin bed within silts between −4.0 and −4.3m OD. Date closely compares with those from submerged forest of Pett Level, Sussex (Welin *et al,* 1972, p 332-333).

IGS-C14/116. (St 3835) Tilling Green, Rye, Sussex **9565 ± 120 7615 BC**

$\delta^{13}C = -29.4‰$

Peat from site investigation borehole (50° 57′ N, 0° 44′ E, Grid Ref TQ 9145 2060) in estuarine alluvium of flood plain of R Tillingham. Coll 1971 by A G Weeks and subm by E R Shephard-Thorn. *Comment* (ERS-T): borehole, surface ca +3.5m OD, proved 28.80m sequence of alluvial silts, sands and clays with organic horizons, overlying Wealden strata. Sample from bed of laminated silty peat between 25.5 and 26.5m below surface, just above base of channel. Date compares closely with that from a similar sediment in Cuckmere Valley at Arlington (Welin *et al,* 1971, p 28) and probably represents same pause early in Flandrian transgression.

Spalding series, Lincolnshire

Plant fragments and peat from borehole Spalding 1, (52° 45′ N, 0° 10′ W, Grid Ref TF 2368 1923). Coll 1971 and subm by A Horton, Inst Geol Sci.

IGS-C14/117. (St 3851) **3570 ± 100 1620 BC**

$\delta^{13}C = -27.6‰$

Reed rootlets *in situ* in Fen Clay at depth 3.96 to 4.11m.

IGS-C14/118. (St 3817) **4445 ± 100 2495 BC**

$\delta^{13}C = -27.7‰$

Top of peat seam within Fen Clay at depth 4.54 to 4.57m.

IGS-C14/119. (St 3849) **4890 ± 100 2940 BC**

$\delta^{13}C = -28.5‰$

Top of lower peat seam within Fen Clay at depth 7.11 to 7.16m.

IGS-C14/120. (St 3848) **5665 ± 100**
3715 BC
$\delta^{13}C = -28.5‰$

Base of lower peat seam within Fen Clay at depth 7.62 to 7.67m.

Peat from borehole Spalding 2, (52° 45′ N, 0° 9′ W, Grid Ref TF 2427 1919). Coll 1971 and subm by A Horton.

IGS-C14/121. (St 3844) **5175 ± 100**
3225 BC
$\delta^{13}C = -27.1‰$

Top of upper leaf of lower peat within Fen Clay at depth 8.08 to 8.13m.

IGS-C14/122. (St 3841) **5600 ± 100**
3650 BC
$\delta^{13}C = -27.9‰$

Base of upper leaf of lower peat within Fen Clay at depth 8.48 to 8.51m.

IGS-C14/123. (St 3824) **5905 ± 100**
3955 BC
$\delta^{13}C = -24.3‰$

Sample from lower leaf of lower peat within Fen Clay at depth 8.74 to 8.76m.

IGS-C14/124. (St 3847) **1875 ± 100**
AD 75
$\delta^{13}C = -28.6‰$

Phragmites roots at depth 2.1m in borehole Spalding 4, (52° 45′ N, 0° 10′ W, Grid Ref TF 2417 1914). Coll 1971 and subm. by A Horton. *General Comment* (AH): samples provide data on development and relative rates of deposition of Fen Clay sequence of the Fens. Dates indicate that peat growth may not have begun nor ended isochronously throughout area.

IGS-C14/125. (St 3872) Woodston, Peterborough **>40,000**
$\delta^{13}C = -24.9‰$

Wood from gravel bed near base of Woodston series at depth 2.4m in drainage trench at Woodston, Peterborough, (52° 33′ N, 0° 16′ W, Grid Ref TL 1799 9608). Coll 1971 and subm by A Horton. *Comment* (AH): date accords with interglacial age deduced from flora.

Setch series, Norfolk

Peats from Nar Valley 1 Borehole (52° 42′ N, 0° 25′ E, Grid Ref TF 6295 1327). Coll 1971 and subm by R W Gallois, Inst Geol Sci.

IGS-C14/126. (St 3843) **1875 ± 100**
AD 75
$\delta^{13}C = -26.7‰$

Peat from upper part of 1.1m bed, 3.7m below surface.

IGS-C14/127. (St 3868) **3215 ± 100**
1265 BC
$\delta^{13}C = -26.1‰$

Peat from lower part of same bed as /126, 4.7m below surface.

IGS-C14/128. (St 3865) **5440 ± 100**
3490 BC
$\delta^{13}C = -27.6‰$

Peat from near base of 0.69m bed, 7.3m below surface.

General Comment (RWG): /126 and /127 are the upper peats of the Fenland Holocene sequence, and /128 is the lower peat. The difference in date between /126 and /127 appears anomalous for such a thin bed of peat.

IGS-C14/129. (St 3874) Setch, Norfolk **>40,000**
$\delta^{13}C = -31.0‰$

Peat from bed 0.69m thick at 12.8m below surface in Nar Valley 4 Borehole (52° 42′ N, 0° 26′ E, Grid Ref TF 6502 1419). Coll 1971 and subm by R W Gallois. *Comment* (RWG): part of Nar Valley Freshwater Beds; infinite date does not conflict with presumed Hoxnian age of these deposits (Stevens, 1958).

Glaspwll series, Machynlleth, Montgomeryshire

IGS-C14/131. (St 3873) **5345 ± 100**
3395 BC
$\delta^{13}C = -25.8‰$

Ditch, Garthgwinion (52° 34′ N, 3° 52′ W, Grid Ref SN 7359 9803). Sample of wood from bottom of ditch, 0.91m below top of peat. Coll 1971 and subm by R Cave, Inst Geol Sci.

IGS-C14/132. (St 3867) **11,430 ± 160**
9480 BC
$\delta^{13}C = -28.9‰$

Ditch, Garthgwinion (52° 34′ N, 3° 52′ W, Grid Ref SN 7367 9791). Sample of plant remains in diatomaceous silt beneath 1.22m to 1.52m dark peat, the latter probably continuous with 0.91m peat of IGS-131. Coll 1971 and subm by R Cave.

IGS-C14/133. (St 3820) **7515 ± 100**
5565 BC
$\delta^{13}C = -28.2‰$

Ditch, Garthgwinion (52° 34′ N, 3° 52′ W, Grid Ref SN 7355 9803). Sample from 0.08m layer of peat, underlying 0.30m to 0.60m fawn, silty gravel (Head or ditch diggings) and overlying 0.60m fine, solifluction gravel (Head). Coll 1971 and subm by R Cave.

Poulton-le-Fylde series, Lancashire

Coarse detrital mud (53° 50′ N, 3° 1′ W, Grid Ref SD 3312 3867) with skeleton of male elk (*Alces alces,* L.) bearing lesions from two attacks by hunters ca 2-3 weeks apart; two uniserial barbed bone points of Meso-

lithic type were assoc. Level assigned to the Allerød period (Zone II) (Barnes *et al,* 1971; Hallam *et al,* in press). Coll 1970 by B Barnes, subm by B J N Edwards.

IGS-C14/134. (St 3836) **11,665 ± 140**
9715 BC
$\delta^{13}C = -23.7‰$

Sample from +11.97 to +11.95m OD.

IGS-C14/135. (St 3832) **12,200 ± 160**
10,250 BC
$\delta^{13}C = -18.6‰$

Sample from +11.90 to +11.87m OD.

General Comment (BJNE): determinations support Allerød dating and that for a Zone II level at Skitham, Out Rawcliffe (11,170 ± 260 BP GaK-2820).

IGS-C14/136. (St 3801, outer fraction) **4265 ± 100**
Foulness Island, Essex **2315 BC**

(St 3802, inner fraction) **4350 ± 210**
Foulness Island, Essex **2400 BC**
$\delta^{13}C = -1.5‰$

Mixed shells from 7.92m in borehole (51° 36′ N, 0° 55′ E, Grid Ref TM 029 940). Coll 1969 and subm by J T Greensmith, Queen Mary College. *Comment* (JTG): dates initiation of phase of shell accumulation in vicinity of proto-Crouch and proto-Roach river mouths, reaching climax in formation of shell banks and cheniers at 4000 to 3500 BP (Birm-243) (Greensmith and Tucker, 1971).

IGS-C14/137. (St 3799, outer fraction) **800 ± 100**
Dengie Peninsula, Essex **AD 1150**
$\delta^{13}C = -7.9‰$

(St 3800, inner fraction) **645 ± 100**
Dengie Peninsula, Essex **AD 1305**
$\delta^{13}C = -7.6‰$

Shells (*Cardium*) from 1.3m in Dengie No 2 Borehole (51° 39′ N, 0° 54′ E, Grid Ref TM 012 995). Coll 1967 and subm by J T Greensmith. *Comment* (JTG): date indicates that area on W side of Dengie inland chenier zone was open to marine influence long after period when chenier formation ceased.

IGS-C14/138. (St 3807, outer fraction) **1410 ± 100**
Dengie Peninsula, Essex **AD 540**
$\delta^{13}C = -0.6‰$

(St 3808, inner fraction) **1340 ± 100**
Dengie Peninsula, Essex **AD 610**
$\delta^{13}C = -0.6‰$

Shells (*Cardium*) from 0.9m in Dengie No 3 Borehole (51° 41′ N, 0° 56′ E, Grid Ref TM 021 028). Coll 1966 and subm by J T Greensmith.

Comment (JTG): date confirms that Dengie inland chenier zone is post-Roman and, together with Birm-244, suggests a 200-yr phase of chenier formation, probably in conjunction with salt marsh erosion (Greensmith and Tucker, 1969).

IGS-C14/139. (St 3798) Foulness Island, Essex **6620 ± 100**
4670 BC
$\delta^{13}C = +1.5‰$

Shells (*Ostrea*) from 13.72 to 15.24m in Borehole R/11/1 (51° 36′ N, 0° 54′ E, Grid Ref TM 018 943). Coll 1969 and subm by J T Greensmith.

IGS-C14/140. (St 3797) Foulness Sands, Essex **5650 ± 240**
3700 BC
$\delta^{13}C = -3.4‰$

Shells (*Ostrea*) from 12.19 to 13.72m in Borehole R/7/1 (51° 36′ N, 0° 57′ E, Grid Ref TM 050 940). Coll 1969 and subm by J T Greensmith.

General Comment (JTG): both dates represent marked phases of *Ostrea* colonization at mouths of proto-Crouch and proto-Roach rivers.

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[RADIOCARBON, VOL. 16, NO. 1, 1974, P. 105-117]

ILLINOIS STATE GEOLOGICAL SURVEY RADIOCARBON DATES V

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All samples processed from November 1971 through January 1973 at the Illinois State Geological Survey Radiocarbon Dating Laboratory are reported here. The benzene liquid scintillation technique was used. Laboratory procedures used were the same as those reported by Coleman (1973), with the exceptions that bone collagen was separated by the Longin (1970; 1971) technique and acetylene was trimerized to benzene as described by Coleman, *et al* (1972).

All ages are calculated on the basis of a ^{14}C half-life of 5568 years, and the NBS oxalic acid standard is used as reference. Errors (1σ) reported account only for uncertainties in activity measurements of the sample, standard, and backgrounds. Samples with net count rates $< 4\sigma$ are reported as minimum ages, calculated from an activity of 3σ plus the net count rate. No corrections have been made for isotopic fractionation or atmospheric ^{14}C fluctuations.

Chao Li Liu and L R Camp assisted in sample preparation. All requests for analyses were evaluated by a Radiocarbon Dating Committee consisting of J P Kempton (chairman), Charles Collinson, R E Bergstrom, J C Frye, and D D Coleman.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Illinois and Lake Michigan

Sangamon River Valley series

Samples from cores coll 1971 by W H Johnson, Univ Illinois, except where noted; subm by J A Miller.

ISGS-107. No. 36 — **22,020 ± 300 / 20,070 BC**

Silt rich in organic material from Sangamon Co, NW¼ NW¼ NW¼ Sec 23, T 16N, R 4W, 8km E of Springfield, Illinois (39° 49′ 45″ N, 89° 31′ 30″ W). From Robein Silt at 6.1 to 6.6m depth. Coll by J A Miller. *Comment* (JAM): in this locality Robein Silt underlies aeolian sands (part of Peoria Loess) of Woodfordian age. Date establishes maximum age for sand dune migration from Sangamon Valley.

ISGS-108. Boring 10 — **22,150 ± 330 / 20,200 BC**

Silt rich in organic material from Sangamon Co, center NW¼ Sec 9, T 15N, R 4W, 4.8km SE of Springfield, Illinois (39° 46′ 10″ N, 89° 33′ 00″ W). From 7.6 to 7.9m depth. *Comment* (JAM): from buried floodplain sediments underlying Woodfordian backwater silt and sand

(Equality Formation). Date is maximum for beginning of backwater sedimentation in S Fork of Sangamon R.

17,650 ± 450

ISGS-109. Boring 4 **15,700 BC**

Silt rich in organic material from Sangamon Co, SW¼ NE¼ NE¼ Sec 25, T 16N, R 6W, 1.6km W of Springfield, Illinois (39° 48′ 40″ N, 89° 42′ 45″ W). From Equality Formation at 4.3 to 5.6m depth. *Comment* (JAM): dates approximate midpoint for deposition of backwater sediments (Equality Formation) in tributaries of Sangamon R.

20,740 ± 720

ISGS-110. Boring 7 **18,790 BC**

Silt rich in organic material from Menard Co, NE¼ NE¼ NW¼ Sec 9, T 17N, R 6W, 4km W of Athens, Illinois (39° 56′ 40″ N, 89° 46′ 50″ W). From 7.5 to 7.9m depth in buried floodplain deposit overlain by Woodfordian gravel outwash. *Comment* (JAM): dates beginning of valley-train aggradation of Sangamon Valley.

10,770 ± 290

ISGS-111. No. 21 **8820 BC**

Silt with wood fragments, from Sangamon Co, NW¼ SW¼ SE¼ Sec 33, T 17N, R 5W, 6.4km N of Springfield, Illinois (39° 52′ 40″ N, 89° 39′ 45″ W). From interval 4.6 to 5.2m below surface in Cahokia Alluvium. Coll by J A Miller. *Comment* (JAM): sample from near bottom of shallow silt-and clay-filled meander scar of Sangamon R. Dates approximate time river channel in area was abandoned and estimates average rate of infilling (0.45mm/yr) since abandonment.

29,140 ± 270

ISGS-118. Boring 8 **27,190 BC**

Wood fragments from Sangamon Co, NW¼ NE¼ SW¼ Sec 28, T 16N, R 4W, 4km E of Springfield, Illinois (39° 47′ 50″ N, 89° 33′ 00″ W). From gray sand rich in organic material at 17m depth overlying siltstone. *Comment* (JAM): dates start of rapid alluviation of valley floors of Sangamon R drainage system during latest Altonian and Farmdalian time.

12,900 ± 350

ISGS-121. Boring 12 **10,950 BC**

Wood fragments from NE¼ SE¼ NW¼ Sec 31, T 17N, R 4W, 9.7km N of Springfield, Illinois (39° 53′ 00″ N, 89° 35′ 30″ W). From 6.3m depth in top of 6m gray silt with lenses of organic material. Coll by N C Hester, Illinois State Geol Survey. *Comment* (JAM): from buried floodplain sediments that regional stratigraphy and other dates (ISGS-99: 22,700 ± 1100, ISGS-102: 24,640 ± 430 (R, 1973, v 15, p 82), ISGS-108, and ISGS-110) have shown >20,000 yr old. Sample believed contaminated.

General Comment (JAM): rapid alluviation of Sangamon Valley floor began ca 30,000 yr BP and continued until almost 20,000 yr BP. Much of sediment deposited during valley-fill interval was removed by short-lived phase of early Woodfordian channel erosion. Valley-train outwash from Woodfordian glaciers then filled scour channels and aggraded floor of Sangamon Valley with sand and gravel ca 20,000 yr BP. Aggraded valley floor caused damming of tributary systems, and lacustrine silts and clays were deposited in lower reaches of tributary valleys during interval from 20,000 to ca 14,500 yr BP. Ca 14,500 yr BP Woodfordian glaciers withdrew beyond limits of Sangamon R drainage basin, and river returned to meandering channel regime. Floodplain sedimentation in last 14,500 yr has proceeded at slow rate compared to that of other areas.

370 ± 75

ISGS-115. Spartan Supermarket Section **AD 1580**

Wood from Winnebago Co, NW¼ NW¼ SW¼ Sec 29, T 44N, R 2E, at Rockford, Illinois (42° 15′ 49″ N, 89° 02′ 19″ W). From 6m below surface in outwash sand and gravel. Coll 1964 by J C Frye and H B Willman; subm by J C Frye, Illinois State Geol Survey. *Comment* (JCF): sample obviously an old root and not relevant to age of deposit.

Ottawa Silica Pit series

Site in La Salle Co, NW¼ SW¼ NE¼ Sec 16, T 33N, R 3E, 1.6km W of Ottawa, Illinois (41° 20′ 07″ N, 88° 52′ 47″ W). Coll 1971 and subm by N C Hester.

7180 ± 75

ISGS-119. O-1 **5230 BC**

Peat from Grayslake Peat near top of Ottawa Terrace. *Comment* (NCH): date corresponds with beginning of Holocene and demonstrates that >15m mixed sediment filling channel at Ottawa was emplaced late in Wisconsinan.

11,740 ± 90

ISGS-120. O-2 **9790 BC**

Wood from alluvium in channel in Ottawa Terrace, ca 18m below surface. *Comment* (NCH): correlates with Calumet Stage of Lake Chicago and, because wood was from base of channel, indicates channel was cut during development of glacial sluiceway along Illinois Valley.

Cass County series

Wood and plant fragments from Cass Co. Coll 1971 by H J Kleiss and J B Fehrenbacher; subm by H J Kleiss, Univ Illinois.

24,980 ± 420

ISGS-122. Cass A **23,030 BC**

From NE¼ SE¼ NE¼ Sec 24, T 18N, R 11W, 8km NW of Virginia, Illinois (40° 00′ N, 90° 16′ W). From top of Robein Silt. *Comment* (HJK): material from region where basal increment of Peoria Loess

(Zone I by clay-mineral content) can be distinguished from overlying units. Suggests early burial of Robein by initial Peoria Loess increment.

21,080 ± 370

ISGS-123. Cass B **19,130 BC**

From NW¼ NW¼ SW¼ Sec 25, T 17N, R 9W, 5km W of Ashland, Illinois (39° 54′ N, 90° 04′ W). From top of Robein Silt. *Comment* (HJK): from 22km SE of ISGS-122. In this area, distinct basal increment of Peoria Loess (Zone I) not identified by clay minerals. Thus, 1st loess addition was incorporated in Robein, or succeeding increments overlapped 1st increment and were deposited at greater distances from source.

39,900 ± 1300

ISGS-124. Larsen Bros quarry **37,950 BC**

Wood from De Kalb Co, SW¼ SE¼ NW¼ Sec 15, T 40N, R 5E, 4.8km SSW of Sycamore, Illinois (41° 56′ 42″ N, 88° 39′ 10″ W). From Tiskilwa Till Member of Wedron Formation, 4.6m below top, 3m above base. Coll 1972 and subm by R C Flemal, N Illinois Univ, De Kalb. *Comment* (RCF): wood fragment evidently reworked from Altonian (Plano Silt Member) sediments and hence is out of place. Stratigraphic unit is Tiskilwa Till without break at position where wood was located.

22,190 ± 960

ISGS-125. E-W Tollway B-64 D **20,240 BC**

Wood chips from Lee Co, SW¼ SE¼ NW¼ Sec 10, T 21N, R 9E, 1.6km SE of Dixon, Illinois (41° 49′ 30″ N, 89° 27′ 15″ W). From Robein Silt. Coll 1972 by Westenhoff and Novick Co.; subm by J P Kempton, Illinois State Geol Survey. *Comment* (JPK): verifies existence of Robein Silt in area and eliminates existence of Roxana and Plano Silts at this locality.

ISGS-126. Test boring 13-40-7 **>37,900**

Silt rich in organic material from Kane Co, SE¼ NE¼ NW¼ Sec 13, T 40N, R 7E, 7.2km NW of St Charles, Illinois (41° 57′ 10″ N, 88° 23′ 10″ W). From silt at depth of 12.5 to 13.5m. Coll 1972 by P C Reed; subm by J P Kempton. *Comment* (JPK): along with stratigraphic occurrence below Capron Till Member and above Argyle Till Member of Winnebago Formation, date identifies organic-silt unit as Altonian Plano Silt.

25,230 ± 570

ISGS-127. Test boring 13-42-7 **23,280 BC**

Silt rich in organic material from Kane Co, NE¼ NE¼ NE¼ Sec 13, T 42N, R 7E, 8km SE of Huntley, Illinois (42° 07′ 30″ N, 88° 21′ 20″ W). From silt at depth 58 to 59.2m, overlain by sequence of tills. Coll 1972 by P C Reed; subm by J P Kempton. *Comment* (JPK): date and identification of overlying till as Tiskilwa Till indicates silt is Robein Silt, not Plano Silt as interpreted earlier.

Sunset Hills series

Wood chips from Madison Co, NW¼ NE¼ SE¼ Sec 29, T 4N, R 8W, 7km SW of Edwardsville, Illinois (38° 46′ 43″ N, 90° 00′ 25″ W). Coll 1972 by J C Frye, A B Leonard, and H B Willman; subm by H B Willman, Illinois State Geol Survey.

ISGS-128. 7644A — **19,900 ± 1300 / 17,950 BC**

From peat bed at base of Mississippi R bluffs.

ISGS-129. 7646A — **19,750 ± 500 / 17,800 BC**

From peat 1.5m above ISGS-128.

General Comment (HBW): dates relatively high stand of Mississippi R water during early part of Woodfordian glaciation.

Western Jersey County series

Wood from Jersey County, SW¼ NW¼ NE¼ Sec 14, T 7N, R 13W, 6km S of Fieldon, Illinois (39° 03′ 20″ N, 90° 30′ 34″ W). From silty clay unit that could be Robein Silt or late Yarmouthian accretion gley. Coll 1972 and subm by A M Timofeev, S Illinois Univ, Edwardsville.

ISGS-132. Sample B — **>33,500**

ISGS-133. Sample D — **>25,000**

General Comment (AMT): dates suggest material is not Robein; therefore identified as Type II Hard Clay as defined by Rubey (1952); overlain by sediments of Brussels Terrace.

Batavia bog series

Peat from Kane Co, SE¼ SE¼ Sec 24, T 39N, R 7E, 4.8km WSW of Batavia, Illinois (41° 50′ 26″ N, 88° 22′ 42″ W). From hand auger boring in bog deposit overlying Wedron Formation. Depth to sterile clay, 5.2m. Coll 1972 and subm by A B Leonard, Univ Kansas.

ISGS-131. 3.7m depth — **1750 ± 100 / AD 200**

ISGS-134. 1.4m depth — **1870 ± 100 / AD 80**

General Comment (ABL): samples intended to show rate of growth of bog. ISGS-131 may have been contaminated by younger material during boring operation.

Strawn bog series

Organic muck from Livingston Co, SW¼ SW¼ SE¼ Sec 30, T 26N, R 8E, 7km ENE of Strawn, Illinois (40° 12′ 51″ N, 88° 21′ 01″ W). From 4.3m thick bog deposit overlying Wedron Formation. Sampled with hand auger. Coll 1972 and subm by A B Leonard.

[illegible] — **3400 BC**

Mollusk shells from ca 0.6m zone, 0.6m above Jules Soil. *Comment* (JCF, HBW): dates loess immediately below surface solum and above Jules Soil. Indicates loess accumulation along Illinois Valley continued longer than formerly supposed.

ISGS-139A. First 30% — **5030 ± 100 / 3080 BC**

ISGS-139B. 30 to 65% — **5865 ± 80 / 3915 BC**

ISGS-139C. 65 to 100% — **7370 ± 140 / 5420 BC**

ISGS-161. 0.3 to 0.6m depth	**2640 ± 75** **690 BC**
ISGS-162A. 1.5 to 1.8m depth, Split 1	**2330 ± 75** **380 BC**
ISGS-162B. 1.5 to 1.8m depth, Split 2	**2370 ± 100** **420 BC**
ISGS-164. 2.4 to 2.7m depth	**7760 ± 84** **5810 BC**
ISGS-167. 3.7 to 4.3m depth	**8940 ± 80** **6990 BC**

General Comment (ABL): dates give information about rate of growth of bog. Bog probably slightly older than oldest date indicates, as basal segment is largely inorganic.

ISGS-135. Boring 56 **>31,400**

Peat from Macon Co, SE¼ NE¼ NE¼ Sec 34, T 17N, R 1W, 3.6km NW of Niantic, Illinois (39° 53′ 08″ N, 89° 19′ 04″ W). From lower part of 15cm peat overlain by 2.6m Peoria Loess. Coll 1972 by R M Mason; subm by W H Johnson. *Comment* (WHJ): from Robein Silt in depression within valley cut during late Sangamonian or Altonian. Date indicates local accumulation of peat prior to Farmdalian.

ISGS-136. P-7681A **20,320 ± 120**
18,370 BC

Wood fragments from Henderson Co, NW¼ NW¼ NW¼ Sec 13, T 8N, R 6W, 2.8km NE of Lomax, Illinois (40° 41′ 32″ N, 91° 02′ 30″ W). From 0.6m bed of gray sand overlain by gray silt and underlain by peat. Coll 1972 by J C Frye, A B Leonard, and H B Willman; subm by J C Frye. *Comment* (JCF): dates earliest Woodfordian stream sediments after diversion of ancient Mississippi R to present channel. Also shows molluscan faunal zone, once classed as Yarmouthian, is much younger.

Cottonwood School—South Section series

Site in Cass Co, NW¼ NW¼ SW¼ Sec 12, T 18N, R 11W, 10.5km E of Beardstown, Illinois (40° 01′ 35″ N, 90° 17′ 31″ W). Coll 1972 by J C Frye, A B Leonard, and H B Willman; subm. by A B Leonard.

ISGS-137. P-7655 **15,640 ± 580**
13,690 BC

Mollusk shells from ca 0.3m matrix in top of Jules Soil. *Comment* (JCF, HBW): dates start of loess accumulation after formation of Jules Soil. Soil, correlated with glacial withdrawal preceding advance to Bloomington Morainic System, records major hiatus in Woodfordian Substage

ISGS-154. 75 to 80cm core depth	5620 ± 140 3670 BC
ISGS-155. 100 to 105cm core depth	7460 ± 150 5510 BC
ISGS-158. 25 to 40cm core depth	3390 ± 150 1440 BC

Fraction soluble in hot 1N NaOH. *Comment*: agreement with other dates suggests absence of contaminating materials.

General Comment (DLG): dates used to determine sedimentation rate for bottomset beds of Waukegan Member and top of underlying Lake Forest Member of Lake Michigan Formation in S Lake Michigan. On depth vs age plot, points approximate straight line with slope of 19cm/

10,410 ± 650
ISGS-138. P-7656 **8460 BC**

Mollusk shells from ca 0.6m zone, 0.6m above Jules Soil. *Comment* (JCF, HBW): dates loess immediately below surface solum and above Jules Soil. Indicates loess accumulation along Illinois Valley continued longer than formerly supposed.

5030 ± 100
ISGS-139A. First 30% **3080 BC**

5865 ± 80
ISGS-139B. 30 to 65% **3915 BC**

7370 ± 140
ISGS-139C. 65 to 100% **5420 BC**

Calcium-carbonate concretions from same position as ISGS-137. As CO_2 was released with acid, 3 fractions were collected. ISGS-139A should represent outer rims of concretions and ISGS-139C should correspond to cores. *Comment* (JCF, HBW): although concretions are from Cca position of Jules Soil, deposits above Jules Soil gave older age (ISGS-137). Concretions started growth during formation of Jules Soil, but continued to grow during development of surface soil 3m above this zone. Rate of growth was slow.

2890 ± 75
ISGS-143. Illinois River flood plain **940 BC**

Clam shells from Greene Co, NW cor Sec 29, T 9N, R 13W, 6.4km NE of Hardin, Illinois (39° 12′ 17″ N, 90° 34′ 42″ W). From Cahokia Alluvium. Coll 1972 by J C Frye and H B Willman; subm by J C Frye. *Comment* (HBW): dates upper portion of alluvium in this part of Illinois Valley.

Lake Michigan Core 800-5 series

Silty clay rich in organic material from core in Lake Michigan bottom sediments 53km E of Zion, Illinois (42° 25′ 00″ N, 87° 09′ 18″ W). From top of core to 85cm is Waukegan Member and from 85 to 162cm (bottom of core) is Lake Forest Member, both from Lake Michigan Formation. Coll 1971 by D L Gross and J A Lineback; subm by D L Gross, Illinois State Geol Survey.

2770 ± 230
ISGS-159. 5 to 10cm core depth 820 BC

2243 ± 76
ISGS-156. 10 to 15cm core depth 293 BC

3050 ± 120
ISGS-153. 20 to 25cm core depth 1100 BC

3890 ± 120
ISGS-152. 40 to 45 cm core depth 1940 BC

15′ 39″ W). From Unit 3, below till of Fayette Stade and above loess of Illinoian Glaciation. Coll 1971 and subm by R P Goldthwait. *Comment* (RPG): pollen from this zone suggests cold "early" Wisconsinan climate preceding deposition of overlying till. Date neither supports nor denies this interpretation.

New Mexico series

ISGS-154. 75 to 80cm core depth	5620 ± 140 3670 BC
ISGS-155. 100 to 105cm core depth	7460 ± 150 5510 BC
ISGS-158. 25 to 40cm core depth	3390 ± 150 1440 BC

Fraction soluble in hot 1N NaOH. *Comment*: agreement with other dates suggests absence of contaminating materials.

General Comment (DLG): dates used to determine sedimentation rate for bottomset beds of Waukegan Member and top of underlying Lake Forest Member of Lake Michigan Formation in S Lake Michigan. On depth vs age plot, points approximate straight line with slope of 19cm/1000 yr.

ISGS-157. French Village **35,750 ± 760**
33,800 BC

Snail shells from St Clair Co, SE¼ SW¼ SW¼ Sec 24, T 2N, R 9W, in French Village, Illinois (38° 36′ 07″ N, 90° 03′ 03″ W). From McDonough Member of Roxana Silt. X-ray diffraction showed small amount of calcite that could not be removed by acid leaching. *Comment* (JCF): younger age than expected could be result of partial recrystallization in solutions containing younger carbon. Establishes minimum date for upper part of McDonough Member of Roxana Silt and supplements earlier dates from overlying Meadow Loess Member (W-729: 35,200 ± 1000, and W-869: 37,000 ± 1500; R, 1960, v 2, p 137-139).

B. Other Localities

ISGS-114. Sao Paulo City site, RP-3 **>50,000**

Charcoal from within Sao Paulo City, Brazil (23° 35′ S, 47° 42′ W). From alluvial river channel sediments formed by braided-pattern paleodrainage. Coll 1972 and subm by Kenitiro Suguoi, Univ Sao Paulo. *Comment* (KS): date is minimum for deposits, whose sedimentation occurred under conditions different from those actually found in assoc rivers. Pinheiros R, which flows near these deposits, at present can carry only silt- and clay-size particles.

ISGS-116. Eaton-Frederick Section **21,940 ± 130**
19,990 BC

Wood from Preble Co, Ohio, NW¼ SE¼ Sec 3, T 7N, R 2E, at Eaton, Ohio (39° 44′ 45″ N, 84° 30′ 30″ W). From till 60cm above Sangamon Soil. Coll 1971 and subm by R P Goldthwait, Ohio State Univ. *Comment* (RPG): indicates till correlated as Fayette is indeed early Woodfordian and correlates closely with Boston Till of Scioto Lobe.

ISGS-117. Commins Farm Section **>46,900**

Organic litter from Fayette Co, Indiana, NW¼ NW¼ NW¼ Sec 13, T 14N, R 11E, 3.6km ESE of Fairview, Indiana (39° 40′ 13″ N, 85°

ISGS-149. De Baca County, 127 **16,490 ± 120**
14,540 BC

Snail shells from Sec 23, T 3N, R 25E, 3km W of Ft Sumner, New Mexico (34° 28′ N, 104° 18′ W). From pond sediment on Pleistocene terrace.

13,820 ± 270

15′ 39″ W). From Unit 3, below till of Fayette Stade and above loess of Illinoian Glaciation. Coll 1971 and subm by R P Goldthwait. *Comment* (RPG): pollen from this zone suggests cold "early" Wisconsinan climate preceding deposition of overlying till. Date neither supports nor denies this interpretation.

New Mexico series

Coll 1972 by J C Frye and A B Leonard; subm by J C Frye.

5865 ± 90

ISGS-144. Chaves County, 197 **3915 BC**

Clam shell from Sec. 26, T 15S, R 26E, 5.3km ESE of Lake Arthur, New Mexico (32° 59′ N, 104° 18′ 30″ W). From sand and silt with some gypsum at base of low terrace of Pecos R. *Comment* (JCF): dates base (on Permian) of youngest terrace in this segment of Pecos R Valley and assoc fauna.

14,310 ± 230

ISGS-145. Roosevelt County, 216 **12,360 BC**

Clam shells from Sec 12, T 3S, R 36E, 24km SE of Portales, New Mexico (34° 04′ 30″ N, 103° 07′ 30″ W). From light gray bedded silt and sand of Pleistocene lake beds in large subsidence area. *Comment* (JCF): dates upper part of lacustrine fill in large solution-subsidence basin, below level of earlier Pleistocene sediments, which are much below level of Ogallala Formation.

15,280 ± 210

ISGS-151. Roosevelt County, 169 **13,330 BC**

Snail shells from Sec 6, T 2N, R 30E, 10.5km ESE of Tolar, New Mexico (34° 26′ 30″ N, 103° 49′ 30″ W). From pond sediments on surface of abandoned Pleistocene Portales Valley. *Comment* (JCF): dates last episode of pond sediments and faunas on surface of alluvium in floor of abandoned Portales Valley.

13,690 ± 160

ISGS-147. Lea County, 204 **11,740 BC**

Snail shells from Sec 15, T 10S, R 37E, 18km ESE of Crossroads, New Mexico (33° 27′ N, 103° 09′ 30″ W). From Pleistocene pond deposit. *Comment* (JCF): dates youngest pond fill and fauna in floor of minor abandoned valley and below stabilized dune sand.

16,010 ± 180

ISGS-148. Lea County, 205 **14,060 BC**

Soil caliche from Sec 25, T 9S, R37E, 21km E of Crossroads, New Mexico (33° 30′ N, 103° 06′ 30″ W). From lower of 2 soils developed in calcareous and fossiliferous pond sediment. *Comment* (JCF): caliche formed in pond deposits dated by ISGS-147. Caliche nodules probably contained significant amount of older carbonate.

16,490 ± 120

ISGS-149. De Baca County, 127 **14,540 BC**

Snail shells from Sec 23, T 3N, R 25E, 3km W of Ft Sumner, New Mexico (34° 28′ N, 104° 18′ W). From pond sediment on Pleistocene terrace.

13,820 ± 270

ISGS-150. De Baca County, 129 **11,870 BC**

Snail shells from Sec 23, T 3N, R 25E, 1.8km W of Ft Sumner, New Mexico (34° 28′ N, 104° 16′ W). From upper level of low Pleistocene terrace. *Comment* (JCF): dates terrace horizon adjacent to but ca 6m below that dated by ISGS-149 and ISGS-91 (17,180 ± 140; R, 1973, v 15, p 84). Lower terrace is, in turn, 4.5 to 6m above distinct floodplain terrace, 2.5 to 3m above active flood plain of Pecos R. Dates Wisconsinan terraces in this segment of Pecos Valley.

II. ARCHAEOLOGIC SAMPLES

A. Illinois

Collins site series

Wood charcoal from Vermilion Co, SW¼ NW¼ SE¼ Sec 8, T 20N, R 12W, 9.7km NW of Danville, Illinois (40° 12′ 30″ N, 87° 44′ 30″ W). Subm by J G Douglas, Univ Illinois.

930 ± 140

ISGS-112. Feature 12 **AD 1020**

From Late Woodland refuse pit containing cord-impressed and incised pottery, other cultural debris, maize kernels, unidentified seeds, animal bones, and mollusk shells. Coll 1971 by R L Griffin.

853 ± 75

ISGS-113. Feature 31 **AD 1097**

From refuse pit containing Late Woodland and Mississippian pottery and stone tools, maize, and great quantities of other plant and animal food debris. Coll 1971 by J G Douglas and E R Pearlman.

General Comment (JGD): dates support interpretation that Collins site represents two-component Late Woodland occupation history, concluded from intrasite and extrasite ceramic associations. Earlier component, ca AD 1000, is noted for pottery decorated by single-cord impressions (cf Canton Ware, Madison Cord-Impressed, etc), and general lack of shell-tempered pottery. Later component, ca AD 1100, shows decline in cord-impressing, and increase in rim thickening, or collaring (cf Starved Rock Collared, Aztalan Collared, Albee Cordmarked). Shell-tempered "Mississippian" sherds are common. Maize apparently more abundant in features relating to second component. Cultural continuity is suggested in spite of apparent temporal discontinuity.

Powell Tract series

Site in Madison Co, NW¼ SE¼ NW¼ Sec 34, T 3N, R 9W, 1.6km N of Fairmont City, Illinois (38° 39′ 43″ N, 90° 05′ 17″ W). Coll 1960 and subm by D W Lathrap, Univ Illinois.

950 ± 75

ISGS-130. Feature 331, #1 **AD 1000**

Hickory nut shells from refuse pit containing other organic materials and large quantities of potsherds. Pit penetrated into sterile alluvial soil, and fill extended up to plow zone. *Comment* (DWL): six-period sequence of occupation has been established for Powell tract of Cahokia site. Refuse pit (Feature 331) contained rich and homogeneous ceramic assemblage that is typically Period III, as defined by O'Brien (1969). This is the period of densest urban occupation on the Powell tract.

1000 ± 75

ISGS-140. Feature 331, #2 **AD 950**

Squash seeds from same refuse pit as ISGS-130.

780 ± 150

ISGS-141. Feature 331, #3 **AD 1170**

Maize assoc with ISGS-130 and -140.

General Comment (DWL): all 3 dates agree when correction is made for known peculiarities of maize. Dates indicate that Phase III on Powell tract was extant at AD 1000.

1170 ± 80

ISGS-163. House #13 **AD 780**

Wood charcoal from refuse pit of House #13 assoc with pottery typical of Phase V of O'Brien's sequence. *Comment* (DWL): from layer of refuse deposited shortly after Phase V house abandoned. Refuse contained Phase V pottery and abundant remains of distinctive microdrill industry. This date insures that Phase V precedes Phase II at Powell tract and that sequence should be Phase I, V, II, III, IV, VI. Present date reinforced by earlier date of AD 825 ± 75 (M-1294; R, 1963, v 5, p 236) on Phase V structure and by presence of trade ware from Lower Mississippi Valley (Coles Creek), which has been repeatedly dated there in AD 800 to 1000 range.

B. Other Localities

Loma Alta site series

Wood charcoal from vicinity of village of Loma Alta, Ecuador, ca 19km up road from mouth of Valdivia R (01° 54′ S, 80° 38′ W). Coll 1972 by Presley Norton; subm by D W Lathrap.

5000 ± 190

ISGS-142. Stone cairn No. 6 **3050 BC**

From within stone cairn No. 6, assoc with Cranium #3, covered by 2.1m of midden.

4750 ± 120

ISGS-146. Stone cairn No. 1 **2800 BC**

From within stone cairn No. 1, covered by 1.9m refuse.

General Comment (DWL): dates assoc with distinct ceramic assemblage characterized by 2 forms of elaborately decorated pots with flaring rims and by red slipped, gourd-shaped bowls. Assemblage is 2 definable phases earlier than earliest phase defined for Valdivia site, ca 19km downstream at mouth of Valdivia R. Relevant dates on pottery at Valdivia site range from 4620 ± 140 to 4100 ± 140 (M-1322 and M-1321; R, 1964, v 6, p 18). See Meggers *et al* (1965, Table G). Recently, a distinctive ceramic complex called San Pedro, that is not represented at Loma Alta, and a nonceramic complex, were defined at base of Valdivia site. Chronologic relation between 2 new complexes defined at Valdivia and basal occupation at Loma Alta, dated here, should be clarified by ^{14}C age determinations now in progress at various labs.

5520 ± 270

ISGS-160. Puna 03 **3570 BC**

Collagen fraction of bone from 150km NW of Jujuy City, Argentina (23° 17′ S, 65° 42′ W). From Holocene fluvial terrace with a stratum containing lithic artifacts. Coll 1971 and subm by Jorge Fernández, Mina Aguilar-Provincia de Jujuy, Argentina. *Comment* (JF): date is 1st for Puna Argentina related to settlements of early man, at 4000m alt. Analysis on bones of camellids permits temporal placement of posthumous phase of monofacial lithic industry known as Saladillense.

Brynjulfson Cave series

Bone from Boone Co, Missouri, SW¼ NE¼ SW¼ Sec 16, T 47N, R 12W, ca 19km S of Columbia, Missouri (38° 51′ 07″ N, 92° 16′ 50″ W). Subm by P W Parmalee, Illinois State Mus, Springfield, Illinois.

15,220 ± 360

ISGS-166A. Cave #1, Collagen #1 **13,270 BC**

4130 ± 110

ISGS-166B. Cave #1, carbonate **2180 BC**

16,650 ± 320

ISGS-166C. Cave #1, Collagen #2 **14,700 BC**

21,150 ± 430

ISGS-166D. Cave #1, Collagen #3 **19,200 BC**

Bones coll randomly throughout cave fill for ca 12m. Coll by M G Mehl. *Comment*: previously dated at 9440 ± 760 (ISGS-70; R, 1973, v 15, p 84). Dates indicate cave material consists of bones of many different ages. Progressive increase in age of collagen fraction is result of bias towards less altered materials in choosing fragments for analysis.

ISGS-165. Cave #2, Collagen **2400 ± 100**
450 BC

Bone from darker of 2 horizontal soil layers, ca 1m above cave floor. Coll 1969 by P W Parmalee and R D Oesch. *Comment*: agrees well with previous date of 2460 ± 230 (ISGS-66, R, 1973, v 15, p 84).

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NANCY NATURAL RADIOCARBON MEASUREMENTS III

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This list includes results of measurements made from 1969 to 1972 in the Natural Radiocarbon Laboratory of the Centre de Recherches Radiogéologiques de Nancy (CRR).

From samples Ny-128 to Ny-169, measurements were performed with a gas proportional counter. This method, counting technique, and equipment are described in Nancy I (R, 1968, v 10, p 119-120). From samples Ny-170 and on the laboratory used liquid scintillation counting following the method of Scharpenseel and Pietig (1968). Chemical synthesis of benzene from the original carbon sample is made in the CRR. Samples are converted to CO_2 by combustion or acidification and evolved CO_2 is collected in ammonium hydroxide. Strontium carbonate is precipitated from carbonate solution upon addition of strontium chloride and can be stored. Carbon dioxide is generated by acidification of the carbonate and reduced to carbide by reaction with molten Li metal at 650°C. Acetylene is produced by reacting the carbide with fossil water and converted to benzene by a catalytic process using chromium activated silica-aluminium catalyst.

All measurements of ^{14}C activity of synthesized benzene were made on a Tri-Carb Packard M-3003 liquid scintillation spectrometer in the Centre de Pédologie Biologique. Background of the counting vial is 9.84 ± 0.01 cpm and the figure of merit ca 470. The counting solution consists of 4ml benzene (3.25g carbon), plus 1ml scintillation PPO (0.5%) and POPOP (0.02%) in solution with toluene.

Samples are counted for 24 hr. Radiocarbon ages are calculated using ^{14}C half-life of 5568 years, 95% activity of NBS oxalic acid is used as the modern standard. The counting errors are expressed at 1σ confidence level.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

Sainte Hélène series, Vosges

Carex and *Sphagnum* peat developed on coarse sands in the Sainte Hélène forest near Rambervillers, Vosges (48° 18′ 34″ N, 6° 40′ 15″ E). Coll and subm 1969 by B Guillet.

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Ny-250. Sainte Hélène, 40cm **2190 ± 90**
240 BC
Humified peat with pollens of *Alnus, Quercus, Fagus,* without *Abies.*

Ny-251. Sainte Hélène, 65cm **2360 ± 60**
410 BC
Sphagnum peat, decline of *Tilia* and *Abies* pollens.

Ny-252. Sainte Hélène, 90cm **2750 ± 70**
800 BC
Carpinus arises continuously and dates beginning of Sub-Atlantic period. Sharp occurrence of *Abies* pollens, > 5% of AP.

Ny-253. Sainte Hélène, 110cm **3780 ± 80**
1830 BC
Pollen spectrum with *Alnus, Quercus, Fagus. Abies* reaches only 1% of AP.

General Comment: pollen was analyzed to determine W limit of *Abies* during Sub-Boreal and Sub-Atlantic periods in the Vosges (Guillet *et al,* 1972). The decline of *Abies,* present in the Sub-Boreal period and beginning of Sub-Atlantic is assumed due to anthropic practices more than to climatic changes. Correlations between the fall of *Abies* and the development of synanthropic weeds become obvious from 410 BC.

Beaumont sur Vesle series, Marne

Two peat layers separated by loamy alluvium 70cm thick in the Vesle Valley at Beaumont sur Vesle (49° 10′ 31″ N, 1° 51′ 12″ E). These alluvions are supposedly relatively recent. Coll and subm 1972 by R Durand, Sta agron de Châlons-sur-Marne.

Ny-318. Beaumont sur Vesle, 30cm **940 ± 50**
AD 1010
Upper layer overlying alluvial loam.

Ny-319. Beaumont sur Vesle, 100cm **8580 ± 100**
6630 BC
Comment: date of lower layer seems to indicate that alluvial process began by an important erosional phase of the peat, because there *is a* large gap between age of lower peat and age of alluvium in which Gallo-Roman pottery was discovered.

Ny-312. Fontainebleau, Seine et Marne **1200 ± 60**
AD 750
Charcoal of *Quercus, Corylus, Carpinus* at 50cm depth, beneath surface of sandy soil in Fontainebleau-Tillaie forest (48° 25′ 24″ N, 2° 39′ 29″ E). Coll and subm 1972 by A M Robin, Univ Paris VI. *Comment*: charcoal of tree species except *Fagus* indicates recent (post-medieval) immigration of this tree, already established by pollen analysis of iron-humus podsol in the same forest (Guillet and Robin, 1972).

Razès series, Haute Vienne

Wood buried under sandy alluvium overlying bedrock at bottom of small valley in Razès, Haute Vienne (46° 02′ N, 0° 59′ E). Coll and subm 1969 by R Magne, CEA Nancy.

Ny-129. Razès, 125cm — **1480 ± 150** / **AD 470**

Ny-130. Razès, 120cm — **1470 ± 100** / **AD 480**

General Comment: ages date beginning of an alluvial period after an erosional local phase. Alluvium was expected to be from glacial period.

Ny-180. Saint Priest-Taurion, Haute Vienne — **2390 ± 70** / **440 BC**

Charcoal from buried fireplace beneath clayey and sandy alluvium, 150cm depth (45° 53′ N, 0° 56′ E). Coll and subm 1971 by R Magne, CEA Nancy. *Comment*: date indicates the beginning of an important alluvial phase.

Ny-181. Compreignac, Haute Vienne — **1960 ± 50** / **10 BC**

Slightly charred wood at bottom of organic loamy soil in valley of Vincou streamlet in dist of Compreignac (45° 59′ 30″ N, 1° 03′ 30″ E). Coll and subm by R Magne, CEA Nancy. *Comment*: organic hydromorphous soil is 2000 yr old.

Ny-142. Gumenil, Vosges — **7970 ± 230** / **6020 BC**

Peat with birch bark at 50cm present surface at Gumenil, Vosges (48° 07′ N, 6° 29′ E). Coll and subm 1971 by D Magron, CRR Nancy. *Comment*: date agrees with Boreal period.

Lake Jura series, France

Charcoal in lacustral lime muds in various Jura lakes. Coll and subm 1969 by P Petrequin, Antiquités Préhist Franche-Comté, Besançon.

Ny-143. Chalain — **5850 ± 180** / **3900 BC**

Ilot des Roseaux, Level 4 (46° 41′ N, 3° 29′ E).

Ny-144. Chalain — **5790 ± 220** / **3840 BC**

Ilot des Roseaux, Level 1 (46° 41′ N, 3° 29′ E).

Ny-145. Clairvaux — **4960 ± 140** / **3010 BC**

Sta lacustre N°3 (46° 35′ N, 3° 25′ E).

General Comment: dates agree with expected age according to Neolithic artifacts found with charcoals.

Ny-137. Diou, Allier **>32,000**

Partly charred wood from disturbed clay paleosol with predominant kaolinite under 15m Pliocene sand (sables de Chagny) at Diou, Allier (46° 32′ N, 1° 25′ E). Coll 1968 by J de la Comble, Conservateur Mus Hist Nat d'Autun; subm 1970 by H G Carrat, CEA Nancy. *Comment*: expected age.

Auvergne Puys series, Massif Central

Charcoal, small boughs, from domitic projection. Coll and subm 1969 by J Babkine, Univ Nancy.

Ny-166. Puy de Tunisset CB3 **8000 ± 200**
(45° 51′ 25″ N, 2° 57′ 52″ E) **6050 BC**

Ny-167. Puy de Laschamp CB2 **7580 ± 360**
(45° 44′ 16″ N, 2° 57′ 18″ E) **5630 BC**

Ny-168. Puy de Lantegy CB1 **8560 ± 100**
(45° 49′ 05″ N, 2° 56′ 38″ E) **6610 BC**

General Comment: expected dates of these 3 samples, ca 8000 BP, agree with last volcanic eruptions of "Chaîne des Puys" in Massif Central.

Bamyan series, Afghanistan

Two travertine and 2 calcareous crusts from Quaternary soil horizons in Bamyan Bassin, Central Afghanistan (34° 00′ N, 66° 00′ E). Coll and subm 1972 by J Lang, Lab Géol Univ Paris.

Ny-190. Travertin 320 **+1500 32,890 −1200**
30,940 BC

Ny-191. Travertin 344 **+550 24,300 −500**
22,350 BC

Ny-153. Calcareous crust 418 **>40,000**

Ny-154. Calcareous crust 407 **>40,000**

General Comment: isotopic $^{13}C/^{12}C$ corrections have not been made.

Herbillon series, Algeria

Charcoal and shells probably neotyrrhenian from coastal sand, dist Herbillon, Baie W, E Constantinois (Algeria) (37° 06′ N, 7° 20′ E). Coll and subm 1970 by J Hilly, Univ Nancy.

Ny-170. Shells **+800 27,870 −700 25,920 BC**

(*Pectonculus, Patella,* rolled up *Conus*) at bottom of offshore bar.

Ny-172. Charcoal **+1870 30,330 −1520 28,380 BC**

General Comment: in sandy deposit, with shells and charcoal, mousteroaterian tools, were found.

II. ARCHAEOLOGIC SAMPLES

Ny-285. Saint Mihiel, Meuse **4170 ± 70 2220 BC**

Charcoal from a Neolithic fireplace near a winning and flint-chipping zone at Saint Mihiel, Meuse, France. Coll and subm 1971 by Ch Guillaume, Antiq Prehist, Nancy. *Comment*: date agrees well with environmental artifacts of late Neolithic age in Lorraine.

Ny-284. Etival, Vosges **2010 ± 50 60 BC**

Charcoal of *Abies* from fences of a pre-Roman oppidium near Saint Dié, Vosges, at Pierre d'Appel site (48° 22′ 35″ N, 6° 52′ 01″ E). Coll and subm 1971 by A Deyber, Fac Lettres, Nancy. *Comment*: expected age from 125 to 50 BC (La Tène D/2) according to archaeologic material and silver coins found in the pre-Roman dwellings (Deyber, 1972).

Chaudeney sur Moselle, Meurthe et Moselle series

Wood from 3 buried boats under 400 to 500cm coarse gravels of the Moselle alluvions at Chaudeney (48° 40′ 16″ N, 5° 53′ 52″ E) near Toul. Coll 1960 and subm 1972 by A Lieger, Toul.

Ny-313. Wood from monoxylous boat, 400cm **1850 ± 60 AD 100**

Boat in *Quercus* wood, 650cm long.

Ny-314. Wood from monoxylous boat, 500cm **1750 ± 70 AD 200**

Ny-313 and -314 are separated from each other by 10m.

Ny-315. Wood from boat **840 ± 50 AD 1110**

Comment: boat of Ny-315, not made from a single timber-tree appears more recent and seems to belong to Medieval times. Ny-313 and -314 agree with expected age of Gallo-Roman civilization; most finds date back to that age (Lieger and Marguet, 1973).

1420 ± 90

Ny-163. Mazeroy plateau, Meuse, France **AD 540**

Charcoal found during excavations of a supposed Gallo-Roman temple. Mazeroy plateau, dist Saint Amand sur Ornain, 9km from Ligny en Barrois, Meuse (48° 38′ N, 3° 04′ E) was part of ancient Nasium. Coll 1970 by J Colette Rodange, Luxembourg; subm 1970 by G Durand, IUT Nancy. *Comment*: too recent.

12,490 ± 270

Ny-128. Fantas cave, Pyrénées, France **10,540 BC**

Thigh bone of bison from Fantas cave in Plantaurel range in Pyrénées, France (43° 00′ N, 0° 46′ E). Coll and subm 1969 by P Blazy, INP Nancy. *Comment*: expected age of Magdalenian culture according to environmental stratigraphy.

2530 ± 130

Ny-169. Memphis, Egypt **580 BC**

Sarcophagus head of cedar tree from Memphis was dated to check its authenticity. Bronze eyes are set in wood and the lips are painted red (29° 50′ N, 31° 12′ E). Coll and subm 1971 by Dr Brouant, Nancy. *Comment*: date of wood indicates late archaic age.

3320 ± 130

Ny-158. (V 2929) Acari Valley, Peru **1370 BC**

Charcoal from Site 16b, VI-55, Layer 100 in Acari Valley in S Peru (15° 28′ S, 74° 37′ W). Coll and subm 1970 by F Engel and B Ojeda, Miss archéol française au Peru.

5490 ± 140

Ny-159. (V 2871) Colorado Pampa, Peru **3540 BC**

Charcoal from barrow mound of large site of Colorado Pampa, S Peru, Site 17c, VIII.500, Layer 100 (16° 27′ 28″ S, 72° 57′ 58″ W). Coll and subm 1970 by F Engel. *Comment*: artifact typology indicates presence of camps of Meso-Indian hunters.

1220 ± 100

Ny-160. (V 2880) Chala, Peru **AD 730**

Indian corn from storage pit in large fortified town of Quebrada-Honda in coastal S Peru, Site 16c, x. 125, Layer 200 (15° 53′ S, 74° 18′ W). Coll and subm 1970 by F Engel. *Comment*: expected age.

III. SOIL SAMPLES

Soil samples were freed of roots and organic cell debris following an original method. Non-humified organic debris are released by soft blowing of small quantities of soil vibrating on an inclined plane. Results are very good for samples of spodic horizons of podsols, not so good for upper horizons. All soil samples were coll, pretreated, and subm 1970 and 1971 by B Guillet. The present list includes measurements made with spodic horizons of various podsols previously pollen-analyzed.

Pollen analysis of the podsols establish 2 main groups of podsols following their own phytoecologic history. Iron-humus podsols (humods)

are linked to historical heather landscapes while for iron-podsols (orthods), the forest has remained unchanged in the past. Mean residence time of carbon in the spodic horizons of the podsol profiles was tested and results compared with data of pollen analysis (Guillet, 1972).

A. Iron-humus podsols (humods)

Lowland podsols, alt 135m, in the forest of Fontainebleau (48° 25′ 27″ N, 2° 39′ 36″ E), 70km S of Paris. Podsol profile was developed on stampien sand and is presently covered with a pine forest.

2100 ± 50

Ny-292. Fontainebleau, 3.3% C, Bh, 45 to 50cm 150 BC

Comment: the only Bh horizon, dark colored, was analyzed. This podsol is an old podsol formed during the Atlantic period but the Bh horizon developed since the beginning of Sub-Boreal period, ca 4500 yr BP under anthropic heather landscape. Pines were grown on the heather landscape in the last century.

Lowland podsols in the Sainte Hélène forest, alt 320m, near Rambervillers, Vosges, (48° 19′ 26″ N, 6° 44′ 14″ E) developed on coarse sands of early Pleistocene alluvions. Present forest is mainly composed of *Fagus* and *Quercus*.

1050 ± 50

Ny-254. Saint Gorgon, 5.4% C, Bh, 63 to 70cm AD 900

1410 ± 50

Ny-255. Saint Gorgon, 1.1% C, B_{2ir}, 70 to 80cm AD 540

Comment: very thick and rich in humus, the Bh horizon was developed under an open landscape with dominant *Calluna*. Beginning of heathland arose after anthropic degradation of a *Quercus-Tilia* forest, ca 2000 to 2200 yr ago (see also Ny-250, -251).

Highland podsols on triassic sandstones in the W Vosges mts, near Saint Dié, Vosges. Present forest is a *Pinetum* (*Pinus silvestris*) with *Calluna vulgaris* and *vaccinium myrtillus*. Pollen analysis of these podsols clearly shows *Pinus silvestris* was emplanted on heathlands in the last century. Profiles of iron-humus podsols are strongly developed with well-differentiated Bh horizons.

Belmont I podsol, alt 610m (48° 13′ 20″ N, 6° 47′ 31″ E).

430 ± 60

Ny-286. Belmont I, 6.5% C, Bh, 45 to 50cm AD 1520

850 ± 50

Ny-287. Belmont I, 3.7% C, Bhir, 50 to 60cm AD 1100

Comment: heather landscape appeared after destruction by man of climatic *Abieto-fagetum*, ca 5 or 6 centuries ago.

Belmont I bis podsol, alt 610m (same location as Belmont I).

Ny-300. Belmont I bis, 5.5% C, Bh, 63 to 67cm — **470 ± 50 AD 1480**

Ny-301. Belmont I bis, 5% C, Bhir, 70 to 80cm — **820 ± 50 AD 1130**

Ny-302. Belmont I bis, 2.8% C, Bs, 80 to 100cm — **990 ± 50 AD 960**

Comment: profile 5m from Belmont I. Same phytoecologic history as Belmont I, pollen-analyzed and study was made to compare and test results of measurements of 2 adjacent profiles.

Belmont II podsol, alt 650m (48° 12′ 28″ N, 6° 46′ 27″ E).

Ny-288. Belmont II, 6.2% C, Bh, 70 to 78cm — **600 ± 50 AD 1350**

Ny-289. Belmont II, 1.2% C, Bs, 80 to 95cm — **830 ± 50 AD 1120**

Comment: *Callunetum* (with *Betula)* appeared ca 8 to 10 centuries ago.

Ormont podsol, alt 640m (48° 18′ 33″ N, 6° 59′ 13″ E).

Ny-261. Ormont, 4.1% C, Bh, 60 to 65cm — **720 ± 70 AD 1230**

Ny-262. Ormont, 2.9% C, Bhir, 65 to 70cm — **800 ± 60 AD 1150**

Ny-263. Ormont, 2.6% C, Bs, 70 to 80cm — **1260 ± 70 AD 690**

Comment: by human degradation of climatic forest, a heather landscape appeared ca 15 centures ago.

Taintrux podsol, alt 530m (48° 16′ 27″ N, 6° 52′ 44″ E).

Ny-256. Taintrux, 4% C, Bh, 51 to 56cm — **1270 ± 50 AD 680**

Ny-257. Traintrux, 1.9% C, Bs, 56 to 65cm — **1520 ± 60 AD 430**

Biffontaine podsol, alt 520m (48° 12′ 46″ N, 6° 48′ 32″ E).

Ny-258. Biffontaine, 2.2% C, Bh, 70 to 75cm — **1300 ± 60 AD 650**

Ny-259. Biffontaine, 1.5% C, Bs, 75 to 85cm — **2230 ± 60 280 BC**

Ny-260. Biffontaine, 0.7% C, BsC, 85 to 100cm — **1860 ± 60 AD 90**

Comment: for Taintrux and Biffontaine stas, degradation of climatic forest and appearance of the *Calluna* landscape are oldest con-

firmed by pollen analysis. These events were probably linked to the 1st important human occupation of Vosges ca 2 to 3 centuries BC.

B. Iron-podsols (orthods)

Lowland podsol, alt 138m, in the Fontainebleau forest (48° 25′ 31″ N, 2° 39′ 50″ E) on eolian sandy parent material blown up from next stampian sand surface.

Ny-290.	**Fontainebleau-Tillaie, 0.5% C, Bh, 60 to 65cm**	**180 ± 50 AD 1770**
Ny-291.	**Fontainebleau-Tillaie, 0.3% C, Bs, 70 to 75cm**	**210 ± 50 AD 1740**

Comment: podsol developed under deciduous forest first of *Quercus* and later of *Fagus* for at least 5000 yr. Low mean residence time of humus-C in Bh horizon contrasts with that of iron-humus podsol of Fontainebleau (Ny-292) developed under heather vegetation though at the same time (Guillet and Robin, 1972).

Lowland podsol, alt 295m, on rhetian sand of Lorraine Plateau, 30km NE of Nancy, in Bezange forest (48° 44′ 52″ N, 6° 31′ 36″ E).

Ny-316.	**Bezange, 1.2% C, Bh, 30 to 35cm**	**610 ± 50 AD 1340**
Ny-317.	**Bezange, 0.6% C, Bs, 40 to 50cm**	**140 ± 50 AD 1810**

Comment: exceptional inversion of mean residence time *vs* depth may be explained, bearing in mind that the Ae horizon of the present profile has been lately differentiated. Eluviation of old organic matter bleached down from the upper horizon and its insolubilization in the Bh horizon may be the cause of inverse gradient of radiocarbon ages.

Highland podsol, on triassic sand in the W Vosges mts. Present forest is a climax *Abietum,* not destroyed by man. Since at least the beginning of the Sub-Boreal period, these podsols have been in a steady state equilibrium with forest vegetation of *Abies* and *Fagus.*

Raon-Pierre d'Appel podsol, alt 410m (48° 22′ 38″ N, 6° 51′ 55″ E).

Ny-276.	**Raon-Pierre d'Appel, 1.8% C, Bh, 56 to 58cm**	**600 ± 50 AD 1350**
Ny-277.	**Raon-Pierre d'Appel, 1.7% C, Bs_1, 63 to 70cm**	**800 ± 50 AD 1150**
Ny-278.	**Raon-Pierre d'Appel, 1.4% C, Bs_2, 70 to 80 cm**	**970 ± 50 AD 980**
Ny-279.	**Raon-Pierre d'Appel, 0.8% C, BsC, 85 to 90cm**	**980 ± 50 AD 970**

Raon-Venival podsol, alt 460m (48° 24′ 16″ N, 6° 53′ 19″ E).

Ny-293.	**Raon-Venival, 1.8% C, Bh, 40 to 43cm**	**440 ± 50 AD 1510**
Ny-294.	**Raon-Venival, 1.1% C, Bs_1, 45 to 55cm**	**420 ± 50 AD 1530**
Ny-295.	**Raon-Venival, 0.8% C, Bs_2, 60 to 73cm**	**830 ± 50 AD 1130**

Corcieux-Croisette podsol, alt 600m (48° 13′ 14″ N, 6° 50′ 29″ E).

Ny-280.	**Corcieux-Croisette, 0.9% C, Bh, 65 to 67cm**	**510 ± 50 AD 1440**
Ny-281.	**Corcieux-Croisette, 1.1% C, Bs_1, 70 to 75cm**	**480 ± 50 AD 1470**
Ny-282.	**Corcieux-Croisette, 1.4% C, Bs_2, 75 to 85cm**	**710 ± 50 AD 1240**
Ny-283.	**Corcieux-Croisette, 0.6% C, BsC, 90 to 100cm**	**1260 ± 50 AD 690**

Corcieux-Vanemont podsol, alt 590m (48° 13′ 26″ N, 6° 50′ 56″ E).

Ny-296.	**Corcieux-Vanemont, 0.6% C, Bh, 60 to 63cm**	**450 ± 50 AD 1600**
Ny-297.	**Corcieux-Vanemont, 1.2% C, Bs_1, 63 to 70cm**	**540 ± 50 AD 1410**
Ny-298.	**Corcieux-Vanemont, 0.8% C, Bs_2, 80 to 90cm**	**860 ± 50 AD 1090**
Ny-299.	**Corcieux-Vanemont, 1.0% C, BsC, 110 to 120cm**	**1040 ± 50 AD 910**

Comment: low humus-C content in the spodic horizons of these 4 iron podsols is the main difference between iron-humus podsols partly formed under heather landscape and iron podsols developed under climatic forest. In comparison with the antiquity of podsolization, at least Sub-Boreal, mean residence time of humus-C in Bh horizons of iron podsols indicates a rapid turn-over cycle of ca 0.2%/yr, and suggests good biologic activity.

Highland podsol on hercynian granitic arenaceous sand, high central mts in Vosges. Forest (*Abieto-Fagetum*) was not destroyed in the past. Podsols were entirely developed under forest cover. Climatic conditions (mean annual rainfall 1800mm, mean annual temperature 7°C) prevent total decomposition of forest litter and reduce breakdown rate of organic matter, so that profiles are then rich in humus-C (Duchaufour, 1972).

Klingenthal podsol, alt 750m (48° 26′ 07″ N, 7° 20′ 47″ E).

Ny-272. Klingenthal, 2.6% C, Ae/Bh_1, 38 to 41cm — **470 ± 60 / AD 1480**

Non-compact horizon, thin layer of Ae horizon.

Ny-273. Klingenthal, 5.0% C, Bh_{2ir}, 41 to 46cm — **870 ± 50 / AD 1080**

Alios horizon.

Ny-274. Klingenthal, 1.1% C, Bs, 50 to 60cm — **1190 ± 60 / AD 760**

Ny-275. Klingenthal, 0.6% C, BsC, 75 to 80cm — **1230 ± 50 / AD 720**

Barembach podsol, alt 570m (48° 27′ 49″ N, 7° 15′ 45″ E); see also Ny-77; R, 1969, v 11, p 465.

Ny-267. Barembach, 1.6% C, Ae/Bh_1, 37 to 40cm — **610 ± 50 / AD 1340**

Non-compact horizon, thin lower layer of A_2 horizon.

Ny-268. Barembach, 3.1%, Bh_{2ir}, 40 to 47cm — **1020 ± 50 / AD 930**

Alios horizon, upper layer.

Ny-269. Barembach, 2.5% C, Bh_{2ir}, 52 to 63cm — **1140 ± 50 / AD 810**

Alios horizon, lower layer.

Ny-270. Barembach, 1.5% C, Bs, 65 to 75cm — **1200 ± 50 / AD 750**

Ny-271. Barembach, 0.7% C, BsC, 75 to 85cm — **1310 ± 50 / AD 640**

Vieilles Charrieres podsol, alt 880m (48° 08′ 52″ N, 7° 02′ 58″ E).

Ny-303. Vieilles Charrieres, 4.6% C, Bh_1, 24 to 34cm — **930 ± 50 / AD 1020**

Ny-304. Vieilles Charrieres, 3.4% C, Bh_{2ir}, 34 to 45cm — **1580 ± 50 / AD 370**

Compact horizon.

Ny-305. Vieilles Charrieres, 2.3% C, Bs, 50 to 60cm — **1860 ± 50 / AD 90**

Ny-306. Vieilles Charrieres, 0.5% C, BsC, 60 to 70cm — **2080 ± 50 / 130 BC**

Belbriette podsol, alt 930m (48° 04′ 55″ N, 6° 59′ 21″ E).

Ny-307.	**Belbriette, 4.3% C, Bh, 37 to 42cm**	**870 ± 50** **AD 1080**
Ny-308.	**Belbriette, 6% C, B_{2ir}, 45 to 55cm**	**1390 ± 50** **AD 660**
Ny-309.	**Belbriette, 3.4% C, Bs_1, 60 to 70cm**	**1520 ± 50** **AD 430**
Ny-310.	**Belbriette, 1.6%, Bs_2, 75 to 85cm**	**1670 ± 50** **AD 280**
Ny-311.	**Belbriette, 1.2% C, BsC, 90 to 100cm**	**1950 ± 50** **0**

Gérardmer-de Liaucourt podsol, alt 920m (48° 03′ 05″ N, 6° 52′ 52″ E).

Ny-264.	**Gérardmer, 5.1% C, Bh, 43 to 53cm**	**1120 ± 50** **AD 830**
Ny-265.	**Gérardmer, 3.2% C, Bs, 60 to 70 cm**	**1780 ± 50** **AD 170**
Ny-266.	**Gérardmer, 1.1% C, BsC, 85 to 95cm**	**2220 ± 60** **270 BC**

Comment: in these old podsols in steady-state equilibrium with climatic forest vegetation, mean residence time of humus-C decreases with depth. Mean residence time of Carbon in Bh horizons, suggests slower organic matter turn-over than in iron-podsols developed on triassic sandy parent material. Alt of these stations and more severe climate of high mts may decrease breakdown and rejuvenate speed of organic matter in spodic horizons.

General Comment on podsols: dates on Bh of iron-humus podsols developed under heather *(Calluna vulgaris)* correlate ages of appearance of heather landscape and radiocarbon ages. Radiocarbon ages are ca ½ the *Callunetum* ages, which may be interpreted as a lack of organic matter breakdown due to nature and structure of *Calluna's* polymers precipitated in Bh horizons. These organic polymers which are not very labile (Handley, 1961), have a very slow turn-over time and tend to accumulate in Bh horizons. Dates on Bh of iron-podsols developed under forest climax are of ages young in comparison with the podsolization process time. This may be a reflection of the more or less rapid turn-over rate of polymers descending from forest litter and precipitated in Bh horizons. Organic polymers apparently seem more labile than those of *Calluna*.

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[RADIOCARBON, VOL. 16, NO. 1, 1974, P. 131-141]

UNIVERSITY OF GEORGIA RADIOCARBON DATES III

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The following list of dates is of archaeologic samples submitted in 1971-2, using the counting equipment described in R, 1971, v 13, p 468. Ages are quoted with a 1σ counting error which includes statistical variation of the sample, background, and standard count. The reference year is AD 1950 and 0.95% NBS oxalic acid for ^{14}C dating is the standard. The half-life used is 5570 years.

Sample descriptions were prepared in collaboration with collectors and submitters.

ACKNOWLEDGMENTS

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SAMPLE DESCRIPTIONS

ARCHAEOLOGIC SAMPLES

Alabama

1575 ± 75

UGa-399. Morgan County **AD 375**

Charred bark and wood from 1-Mg-62a-53, Morgan Co, Alabama (34° 32′ 28″ N, 86° 48′ W), assoc with primary burial pit. Dates initial stage of Copena mound construction. Burial lay in small pit near base of mound. It was either a tightly flexed burial or a re-burial. The skull had been covered with a layer of blue clay. Pit also contained 2 green stone celts. Site excavated by Univ Alabama Museums.

1630 ± 65

UGa-400. Marshall County **AD 320**

Charred bark and wood from 1-Ms-134a-78, Marshall Co, Alabama (34° 22′ 35″ N, 86° 21′ W). Sample is from primary rectangular burial pit in Copena complex, middle Woodland culture and should date initial stage of mound construction. Site excavated during archaeol salvage project of Guntersville Basin (c1938) (Webb and Wilder, 1951). Alabama samples subm by J A Walthall, Dept Anthropol, Univ Alabama.

Alaska

3465 ± 120

UGa-253. Teklanika River **1515 BC**

Charcoal from site (West, 1965; 1967) on Teklanika R, Mount McKinley Park, Alaska (63° 40′ 35″ N, 149° 45′ 20″ W), depth 68cm. Sample overlies zone of concentration of artifacts and is apparently not cultural, but may represent a forest fire serving as a stop-date on

the cultural material. Coll, subm, and comment by F H West, Dept Anthropol, Alaska Methodist Univ, Anchorage.

Georgia

Little Egypt site series

Little Egypt site 9-Mu-102, Carters Dam, Murray Co, (34° 36′ 7″ N, 84° 41′ 55″ W).

500 ± 70

UGa-205. Charcoal, Structure 1, Mound A AD 1450

Charred roof and/or wall members lying on floor of temple structure 1, NE quad of Mound A.

425 ± 55

UGa-208. Charcoal AD 1525

Same location as UGa-205.

50 ± 75

UGa-204. Charcoal AD 1900

Same location as UGa-205, but seems to have been a modern intrusion, possible a fence post.

395 ± 65

UGa-210. Charcoal AD 1555

Charred roof and/or wall members lying on floor of temple structure in SW quad of Mound A. Structure should be contemporaneous with Structure 1 (UGa-204, -205, -208). Samples subm by D J Hally, Dept Anthropol, Univ Georgia.

Plant Hammond site series

Plant Hammond Site 9-Fl-100, Floyd Co, Georgia (34° 15′ 0″ N, 85° 20′ 55″ W).

830 ± 70

UGa-142. Wood charcoal, Structure 1 AD 1120

From log on floor of house at SE corner of site mound.

660 ± 70

UGa-143. Charcoal bits, Structure 3 AD 1290

From structure of 12 by 15m.

945 ± 140

UGa-328. Charcoal from Feature 20 AD 1005

Charcoal from sub-mound midden.

3320 ± 75

UGa-141. Shell from Feature 20 1370 BC

Shell from same area as UGa-328, both assoc with Swift Creek and Candy Creek sherds. *Comment*: charcoal date is expected, shell date is much too old. Subm and comment by A C Smith, Georgia Power Co.

Potts Tract series

Potts Tract 9-Mu-103, Murray Co, Georgia (34° 35′ 30″ N, 84° 40′ 25″ W).

1022 ± 40

UGa-55. Charred wood from Feature #133 **AD 928**

Date agrees with estimated date, AD 1000, for Woodstock period.

286 ± 45

UGa-56. Charred wood for Structure 1B **AD 1664**

Sample represents Barnett phase with estimated date of AD 1500. Potts Tract samples subm by D J Hally.

Sapelo Shell Ring series

Shell rings on N Sapelo I., McIntosh Co, Georgia (31° 30′ 47″ N, 81° 14′ 45″ W).

3430 ± 65

UGa-73. Oyster, 1m depth **1480 BC**

3430 ± 70

UGa-74. Oyster, 2m depth **1480 BC**

3545 ± 65

UGa-75. Oyster, 2m depth **1595 BC**

Several shell ring middens exist on Sapelo. UGa-73, -74 are from a relatively undisturbed ring of ca 50m diam and 2 to 3m high. UGa-75 is from remnant of one of neighboring rings that were partially quarried. Samples subm by V J Henry, Skidaway Inst Oceanog. Earlier dates, 3600 ± 350 and 3800 ± 350 (M-39), from same location are discussed by Crane (1956) and Williams (1965).

1736 ± 60

UGa-65. Great Southwest Atlanta site, 9-Fu-14 **AD 214**

Charred wood from Feature 65, Site 9-Fu-14, Fulton Co, Georgia (33° 47′ 15″ N, 84° 33′ 50″ W). Date agrees with estimated AD 300 for Cartersville period. Subm by J R Caldwell, Dept Archaeol, Univ Georgia.

666 ± 55

UGa-68. Sandtown, 9-Fu-1 **AD 1284**

Charred wood in direct assoc with a Savannah Complicated Stamped vessel from Site 9-Fu-1, Fulton Co, Georgia (33° 47′ 0″ N, 84° 33′ 50″ W). Date agrees with estimated AD 1300 for "North Georgia Savannah". Subm by J R Caldwell.

905 ± 50

UGa-70. Sixtoe, XUH, 9-Mu-100 **AD 1045**

Freshwater periwinkle shell from Pit A, Feature 18, Site 9-Mu-100 (excavation Unit H), Murray Co, Georgia (84° 45′ 50″ N, 34° 36′ 40″ W). Date agrees with estimated AD 1100 for Etowah III materials. Subm by J R Caldwell.

306 ± 50

UGa-72. 9-Mu-100 **AD 1644**

Charred wood from Structure 1, Site 9-Mu-100 (excavation Unit A), Murray Co, Georgia (84° 45′ 39″ N, 34° 36′ 51″ W). Date is later than estimated AD 1400 for "Early Dallamar". Subm by J R Caldwell.

Singer Moye site series

Singer-Moye Site 9-Sw-2, Stewart Co, Georgia (31° 57′ 50″ N, 84° 45′ 10″ W).

UGa-356. Mound D charcoal **680 ± 80** **AD 1270**

Recovered from refuse pit cut through floor of square earth lodge on NW corner of ceremonial area. Structure was not burned, but collapsed.

UGa-357. Mound A charcoal **550 ± 60** **AD 1400**

From main roof support of uppermost structure. Assoc ceramics include Lamar Complicated Stamped and fragment of a negative painted water bottle with a high relief human face modeled on the side. Sample dates last major occupation of site. Both dates agree with expectations. Subm and commented on by F T Schnell, Columbus Mus Arts and Crafts, Columbus, Georgia.

UGa-307. Foster's Bend, Floyd Co **540 ± 55** **AD 1410**

Charcoal timber fragments from possibly pallisaded village in NW segment of Foster's Bend, Coosa R (34° 11′ 52″ N, 85° 23′ 50″ W). Nearby, small plowed area is littered with sherds, shell, chipped stone, and human bone fragments. There is a small (5%) Dallamar component and a much larger Lamar (95%) occurrence. Date is consistent with archaeologic evidence. Battey (1922) describes sites. Coll and subm by P H Garrow, Dept Soc and Anthropol, Shorter College, Rome, Georgia.

Indiana

Reid site series

Reid site, Floyd Co, Indiana (85° 52′ 7″ N, 38° 13′ 00″ W).

UGa-267. Charcoal from shell hash **4555 ± 70** **2605 BC**

Level 7, Test Pit 1.

UGa-266. Charcoal **4585 ± 80** **2635 BC**

Levels 23-24, Test Pit 1.

UGa-309. Charcoal **5480 ± 90** **3530 BC**

Levels 21-24, Test Pit 1.

UGa-267 is terminal date of shell hash in Archaic site. UGa-309 represents initial habitation of site and is oldest charcoal date in state of Indiana. Coll and subm 1971; comment by D E Janzen, Centre College Kentucky, Danville.

905 ± 70

UGa-308. Prather site charcoal **AD 1045**

Area C, Level 10, Prather site, Clark Co, Indiana (85° 41′ 45″ N, 38° 22′ 38″ W). Charcoal assoc with wall-trench house at basal level of site. Coll and subm 1971; comment by D E Janzen.

1315 ± 105

UGa-299. Commissary site, Henry Co **AD 635**

Charcoal from pit, 33cm depth (40° 47′ 30″ N, 85° 21′ W). Assoc with early Late Woodland vessel (Griffin, 1972, pers commun). Date is expected (Swartz, 1972; 1973). JBG suggests that closest parallels are at Lewis site (Cole, 1951). Coll and subm 1972 by J B Swartz, Jr, Ball State Univ, Muncie, Indiana.

Kentucky

Dedmon site series

Dedmon site is in NE sec of Marshall Co, SW bank Tennessee R (37° 2′ N, 88° 17′ 30″ W).

905 ± 85

UGa-247. Charcoal, M1-68-530 **AD 1045**

From Feature 7, a large shallow refuse midden.

910 ± 75

UGa-251. Charcoal, M1-68-900 **AD 1040**

From same feature as UGa-247.

690 ± 90

UGa-249. Charcoal, M1-68-718 **AD 1260**

From Feature 38, an oval pit. *Comment* (POD): no significant vertical stratigraphy in this site.

Owen site series

Owen site is in NE sec Marshall Co, near Dedmon site.

2040 ± 80

UGa-255. Charcoal, M1-69-9 **90 BC**

From Feature 2, a circular flat-bottomed pit.

1875 ± 185

UGa-256. Charcoal, M1-69-37 **AD 75**

From Feature 9, a circular flat-bottomed pit.

Owen and Dedmon site samples were coll 1969 by Univ Kentucky I-24 salvage program and subm by Phillip Drucker, Dept Anthropol.

Horning site series

Horning site, Jefferson Co (38° 00′ 2″ N, 85° 56′ 20″ W). Coll and subm by D E Janzen.

4240 ± 95

UGa-261. Charred nut hulls **2290 BC**

Level 4, 23 to 30cm, Unit 13.

4315 ± 60

UGa-262. Charred nut hulls and wood **2365 BC**

Level 5, 30 to 38cm, Unit 13.

5085 ± 85

UGa-390. Charcoal **3135 BC**

Level 3, 15 to 23cm, Unit 18, small fire pit.

5100 ± 75

UGa-401. Charcoal **3150 BC**

Level 6, 38 to 46cm, Unit 20, from general midden deposit. *Comment* (DEJ): UGa-261 and -262 represent terminal Archaic occupancy. Some intrusion of Early Woodland ceramic. Dates on Levels 10 (M-2460, 2950 BC) and 13 (M-2461, 3270 BC) (Crane and Griffin, 1972), from same site fit into stratigraphy very well. UGa-401 dates almost earliest occupation of site.

4450 ± 90

UGa-290. Charcoal, 15-Ch-302 **2500 BC**

Feature 3 of Archaic site, 15-Ch-302, near Hopkinsville (36° 45′ 46″ N, 87° 32′ 35″ N). Coll and subm by J M Schock, Dept Soc Anthropol, Western Kentucky Univ, Bowling Green.

Louisiana

Pierre Clement site series

The Pierre Clement site CM-47 is in Cameron Parish (29° 50′ N, 92° 52′ W).

585 ± 60

UGa-332. Charcoal **AD 1365**

665 ± 65

UGa-351. *Rangia* **AD 1285**

Comment (JS): both shell and charcoal, are from pit 27 to 40cm below surface of topmost level of site that contains shell-tempered and Palaquemine pottery.

Bruly St Martin site series

Bruly St Martin (or Grand Bayou) site, Iberville Parish (30° 3′ N, 91° 8′ W).

1240 ± 65

UGa-329. Charcoal **AD 710**

43 to 50 cm bd.

1275 ± 60

UGa-335. Charcoal **AD 675**

110 to 120cm bd.

1380 ± 185

UGa-331. Charcoal **AD 570**

60 to 67cm bd.

1555 ± 70

UGa-330. Charcoal **AD 395**

95 to 105cm bd.

General Comment (JS): samples were contained in a natural levee deposit. Datum is ca 15cm above surface. Assoc cultural material is of Troyville period. Coll and subm by James Springer, Yale Univ, New Haven, Connecticut.

Massachusetts

3435 ± 85

UGa-393. Wapanucket #8 site **1485 BC**

Charcoal of small twigs from 52cm (33cm below plow line) below present surface in refuse pit, Feature 349, dug in reworked glacial till of Wapanucket #8 site, Middleboro, Plymouth Co, Massachusetts (41° 51′ 46″ N, 70° 51′ 16″ W). *Comment*: date provides minimum inhabitation date for this Archaic site (Robbins, 1968). Coll, subm, and comment by Maurice Robbins, Bronson Mus, Attleboro, Massachusetts.

Mississippi

Wilford site series

Wilford site in Coahoma Co, Mississippi (34° 23′ 33″ N, 90° 29′ 40″ W).

720 ± 55

UGa-285. Charcoal **AD 1230**

From large center pit in House #1 where center support post was located.

485 ± 55

UGa-283. Charcoal **AD 1465**

From postmold of support post inside pattern of House #1. Rootlets hand picked.

525 ± 60

UGa-281. Charcoal **AD 1425**

From burned post in NE Wall trench of House #2. *Comment*: AD 1400 dates are as expected. House #1 is 1st recognized platform type house known to us. It consisted of a large platform type house built on 144 pilings arranged in rows of 12, with center support post that went through platform and supported roof. House was at least 11m on 1 side with overhanging roof or porch around exterior and a stairway on the SE side. Superimposed Houses 2, 3, and 4 were similarly constructed, but much smaller.

245 ± 60

UGa-279. Hays site charcoal **AD 1705**

Hays site 22-Co-612, Coahoma Co, Mississippi (34° 4′ 10″ N, 90° 29′ 35″ W). Charcoal from a large postmold in the center of 2 superimposed house patterns constructed similarly to those of Wilford site. Rootlets hand picked, sample may be intrusive.

1780 ± 100

UGa-488. Dickerson site charcoal **AD 170**

Dickerson site 22-Co-502, Coahoma Co, Mississippi (34° 18′ 48″ N, 90° 36′ 44″ W). Coll by E G Larson.

Expected date: ca AD 300. Assocs: 50% Mulberry Creek Cordmarked, 40% Baytown Plain, and 10% Marksville Incised and Indian Bay Stamped. A small, well fashioned, clay figurine, quite detailed, overlay charcoal sample. Figure, 5cm high, was in a kneeling position wearing breech cloth and belt. Head was missing.

1075 ± 85

UGa-280. Barner site charcoal **AD 875**

Barner site 22-Co-542, Coahoma Co, Mississippi (34° 10′ 30″ N, 90° 28′ 7″ W). Sample from Pit #8 (a bell-shaped refuse pit) and assoc with Baytown Plain, Mulberry Creek Cordmarked, and some Coles Creek Incised. Date is as expected.

Longstreet site series

Longstreet site 22-Qu-253, Quitman Co, Mississippi (34° 6′ 44″ N, 90° 18′ 54″ W).

5000 ± 120

UGa-337. Fecal pellets, worm casts **3050 BC**

0.7 to 0.9m below surface.

4875 ± 145

UGa-336. Fecal pellets, worm casts **2925 BC**

1.0 to 1.1m below surface.

5075 ± 130

UGa-284. Denton site charred nut hulls **3125 BC**

Denton site 22-Qu-522, Quitman Co, Mississippi (34° 9′ 4″ N, 90° 19′ 26″ W). Same as UGa-212 (R, 1972, v 14, p 493) but from 0.5 to 0.7m below surface. Date is in correct range.

Longstreet and Denton site dates are consistent with cultural material. At present they are the oldest radiocarbon-dated sites in Mississippi.

All of the preceding Mississippi samples were coll and subm (except UGa-488) by Sam McGahey and John Connaway, Dept Archives and History, State of Mississippi. Comments by J C, with further discussion of Denton, Hays, and Wilford sites in Connaway and McGahey (1970).

Claiborne site series

Claiborne site 22-HA-35, Mullatto Bayou, Handcock Co, Mississippi (30° 10′ 10″ N, 89° 34′ 30″ W) at mouth of Pearl R.

540 ± 60

UGa-362. Level I charcoal **AD 1410**

570 ± 60

UGa-358. Level II charcoal **AD 1380**

UGa-360. Level II charcoal **1455 ± 85 AD 495**

UGa-359. Level III charcoal **3175 ± 140 1225 BC**

UGa-361. Level III charcoal **>40,000**

UGa-358 apparently belongs in Level I of archaeol unit. Several flint chips assoc with UGa-360. In retrospect, UGa-361 which looked like cannel coal apparently was and it is possible that UGa-359 also contained some peaty material with the wood charcoal and dates older than warranted. Samples subm by Richard Marshall, Mississippi State Univ, State College, Mississippi.

Ohio

UGa-318. Hamilton Co **1785 ± 345 AD 165**

Charcoal from Headquarters site, 33-Ha-65 (39° 8′ 8″ N, 84° 47′ 44″ W). Site discussed by Starr (1960); Lee and Vickery (1972). Sample from midden fill in grave containing extended burial (3) and Middle plain and cordmarked, limestone-tempered pottery. Site is village burial area, and date is satisfactory for assoc Middle Woodland ceramics.

UGa-306. Clermont Co **4065 ± 150 2115 BC**

Charcoal and burned nut hull fragments from Late Archaic Maple Creek site, 33-Ct-52 (38° 49′ 19″ N, 84° 13′ 28″ W). Sample from earth oven (Feature 10) assoc with Horizon III occupation, 0.43m below surface. Appraisal of date is difficult due to lack of dated Archaic sites in SW Ohio, but seems to agree with temporal placement of late Archaic generally in Ohio Valley.

UGa-327. Clermont Co **3260 ± 330 1310 BC**

Charred nut hull fragments from earth oven, Maple Creek site, assoc with Late Archaic, Laurentian-related, Horizon I occupation, 190m below surface. Date in expected range. Comments and description by K D Vickery, Dept Anthropol, Univ Cincinnati.

South Carolina

I.C. Few site series

I.C. Few site 38-Pn-2, on Keowee R at Nimmons bridge, Pickens Co, South Carolina (34° 51′ 39″ N, 82° 52′ 30″ W).

UGa-322. Feature 49, charred timber **1060 ± 60 AD 890**

Assoc with Feature 30, a possible structure. Site is a burial mound.

UGa-323. Feature 24, Cache of charred nuts **725 ± 75 AD 1225**

1065 ± 60

UGa-324. Feature III, charcoal fragments **AD 885**

Assoc with Burial 15.

1175 ± 65

UGa-325. Charred wood from mound fill **AD 775**

General Comment (RTG): date for UGa-323 indicates that nuts are somehow intrusive. Other dates are similar to those from Chauga site across the river in Oconee Co (Kelly and Neitzel, 1961). Chauga is also a Cherokee site and presumably related to the I.C. Few site (Grange, 1971). Excavated 1967 by Inst Archael and Anthropol, Univ South Carolina, Columbia. Site is now inundated by reservoir and was previously designed as 38-Pi-2. Samples subm by R T Grange, Jr, Dept Anthropol, Univ South Florida, Tampa.

Blair Mound site series

Blair Mound site 38-Fa-48, Fairfield Co, South Carolina (34° 27′ N, 81° 26′ W).

755 ± 90

UGa-406. Charcoal **AD 1195**

Level C surface, 0.27m bd.

625 ± 75

UGa-405. Charcoal **AD 1325**

Level C-D contact. Subm by Robert Stephenson and George Teague, Inst Archaeol and Anthropol, Univ South Carolina, Columbia.

450 ± 60

UGa-410. Charles Towne site charcoal **AD 1500**

Charles Towne site 38-Ch-1, Charleston Co, South Carolina (32° 50′ N, 79° 55′ W). From pit (F322) at E corner of ceremonial compound where midden was built up when area was used. Subm by S South and R Stephenson, Inst Archaeol and Anthropol, Univ South Carolina, Columbia.

Colombia, South America

5090 ± 80

UGa-311. Puerto Hormiga oyster **3140 BC**

Comment (DLC): Puerto Horniga, Colombia (10° 8′ N, 75° 29′ W) is earliest known ceramic-bearing shell midden in E South America and represents earliest Formative phase in area. Sample compared with other early dates, pushes "beginning" of fiber tempered pottery-making industry to comparable periods with W South American sand tempered wares. Sample coll by G Reichel-Dolmatoff; subm and commented on by D L Crusoe, Southeast Archeol Center, Tallahassee, Florida.

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Vol. 16, No. 1 Radiocarbon 1974

CONTENTS