

MONACO RADIOCARBON MEASUREMENTS I

J. THOMMERET and J. L. RAPAIRE

Centre Scientifique de Monaco

Created in 1961, the C^{14} dating laboratory of the Centre Scientifique de Monaco (founded by H. S. H. Prince Rainier III in 1960) made its first dating measurements in 1962.

APPARATUS AND PROCEDURE

Procedures and methods of preparation of samples are similar to those used in the Centre d'Etudes Nucléaires de Saclay. C^{14} is measured in a 1.2 L stainless steel proportional counter filled with purified CO_2 to a pressure of 74 cm Hg. The counter is protected by two layers of shielding (bismuth, iron and lead), and by a cylindrical crown of 32 G.M. counters connected in anti-coincidence. Negative voltage (-6000 v) is applied to the shell of the proportional counter. Measurements are made in an air-conditioned room 30 days after preparation of samples. Sample counts (of 1000 min) are repeated several times between counting runs on ancient and modern standards.

The background from a filling of pure CO_2 prepared from anthracite is 3.64 counts/min. The modern C^{14} standard (1950) is obtained from NBS oxalic-acid standard multiplied by 0.95.

The counting error of samples (standard deviation) is given by \sqrt{N}/t (N = counted number of impulses and t = time of measurement). Counting errors for ancient and modern reference standards are combined with this figure to give the age-error as quoted. Dates are calculated on the Libby half-life value ($T^{1/2} = 5570 \pm 30$ yr) and expressed as years before A.D. 1950. In geochemical measurements, C^{13} assays have not been made.

In order to test the linearity of our counter, we measured artificial samples containing variable known percentages of C^{14} and we found expected values. Some measurements on several samples already checked by other laboratories (Saclay, Scripps) are in agreement with ours; two of these are given in this list.

ACKNOWLEDGMENTS

We are grateful to H. S. H. The Prince of Monaco for supporting our laboratory, to H. E. A. Crovetto, President of the Centre Scientifique de Monaco, to Commandant J. Y. Cousteau, Director of the Musée Océanographique, for laboratory facilities, and to J. Labeyrie and G. Delibrias of the C. E. N. Saclay for technical information.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Viet Nam

Ca Na series, South Viet Nam

Shell samples from marine terraces of Ca Na ($11^\circ 21' N$ Lat, $108^\circ 53' E$)

Long) 32 km S of Phan Rang. Coll. by E. Saurin, Univ. of Saigon, to determine age of the marine regression that is obvious on this coast.

MC-1. Ca Na, Viet Nam 1 **4500 ± 250**

Sea shells and corals coll. 1928 on a marine terrace of 4 m alt at 0.50 m under surface.

MC-2. Ca Na, Viet Nam 2 **4500 ± 250**

Sea shells and corals coll. 1960 at the same place as MC-1. *Comment:* sample coll. to check possibility that exposed shells have exchanged carbon with the atmosphere. No obvious alteration was seen and no H-bomb carbon was detected in the checked sample.

MC-3. Ca Na, Viet Nam 3 **150 ± 150**

Modern shells coll. 1960 on the present shore.

MC-4. Ca Na, Viet Nam 4 **18,500 ± 250**

Sea shells and corals coll. 1960 at 15 m alt.

Saigon Delta series, Viet Nam

Two wood samples from a boring in the subsoil of Saigon (10° 46' N Lat, 106° 43' E Long). Coll. by E. Saurin, to evaluate the rate of sedimentation and to define the history of the local Quaternary.

MC-5. Saigon Delta 1 **> 30,000**

Wood coll. at -185 m.

MC-6. Saigon Delta 2 **> 30,000**

Wood coll. at -183.80 m.

Comment: both samples are too old to be very useful.

II. ARCHAEOLOGIC SAMPLES

A. France

Grotte de la Madeleine series

Three samples of charcoal from the Grotte de la Madeleine, Villeneuve les Maguelonne, Hérault (43° 31' N Lat, 3° 56' E Long). Coll. 1958 and subm. by L. Barral, Conservator of the Musée d'Anthropologie de Monaco, to confirm the Neolithic Chasseen and Chalcolithic cultures.

MC-7. Grotte de la Madeleine Layer VII **5100 ± 250**

Neolithic Chasseen culture.

MC-8. Grotte de la Madeleine Layer X **5220 ± 230**

Neolithic Chasseen culture.

MC-9. Grotte de la Madeleine I **2050 ± 200**

Furnace in slumped and disturbed material, supposedly under the Chasseen layers.

Grotte du Pertus II series

Two samples of charcoal coll. in the Grotte du Pertus II, Méailles, Basses Alpes (44° 6' N Lat, 6° 39' E Long). Subm. by L. Barral.

MC-10. Grotte du Pertus II Layer H/I **4450 ± 230**
Neolithic Chasseen culture.

MC-11. Grotte du Pertus II Layer B₆ **4080 ± 250**
Chalcolithic culture.

MC-12. Marchais Castle, Aisne **620 ± 160**

Piece of a human skin from the marshes of the Marchais Castle (49° 25' N Lat, 3° 54' E Long), which belongs to the Prince of Monaco. Subm. by L. Barral. *Comment*: stratigraphic position of find was not clear; the burial is evidently not as old as had been suspected.

III. CHECK SAMPLES

MC-13. Les Portions, Moselle **1080 ± 120**

Fossil wood from a water canalization of a mill. Dated by Saclay as 954 ± 120 (Saclay, unpub.)

MC-14. Jabbaren Tassili, Sahara **5460 ± 300**

Charcoal coll. at 20 to 60 cm depth in a center where the principal neolithic deposit was found in 1956 (24° 29' N Lat, 9° 44' E Long). Coll. in 1956 by H. Lhote. *Comment*: dated by Saclay as SA-66, Jabbaren, 5470 ± 300 (Saclay I).

REFERENCES

Date list:

- Saclay I Labeyrie and Delibrias, 1963
Saurin, E., 1963, Age, d'après le carbone 14, des terrasses marines de Ca Na (Sud Viet Nam): Soc. Géol. de France, Comptes rendus sommaires Jan. 21, 1963, p. 14-15.