

**INSTITUTO VENEZOLANO DE INVESTIGACIONES CIENTIFICAS
NATURAL RADIOCARBON MEASUREMENTS II**

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The dates reported in this list were measured from December, 1964 to November, 1965. The laboratory continues to employ liquid scintillation techniques with synthesized benzene; however, the chemical yield has been improved to the point where it is now between 80 and 100%. For most of the measurements listed here, a 4 cc counting vial was used with 3 cc benzene and 1 cc commercial toluene containing PPO and dimethyl-POPOP scintillators. The counting efficiency is 72%, which gives a net modern count of 23.5 cpm, and the background is 8.2 cpm. The detection limit (48 hours counting, 2σ statistics) with ordinary size samples is 43,000 yr using the 4 cc vial and 52,000 yr with a 20 cc vial. Errors introduced by the laboratory procedure are less than $\frac{1}{2}\%$ (Tamers and Pearson, 1965a). A detailed review of the methods being used has been published recently (Tamers, 1965b).

All calculations of the dates were made on the basis of a C^{14} half-life of 5568 yr with the modern reference taken as 95% of the activity of the NBS oxalic-acid standard. The standard errors in the measurements are given with the dates.

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SAMPLE DESCRIPTIONS

I. GROUND WATER SAMPLES

A program of dating ground water extracted from wells of various aquifers, similar to that undertaken at the Univ. of Texas (Texas II and Texas III), is the principal research effort of the I.V.I.C. laboratory. Water deposits in four arid or semi-arid regions of Venezuela are under study—the unconfined sand aquifer of Maracaibo, the confined limestone formation near Coro, the unconfined sand aquifer of the Peninsula of Paraguaná, and the water basin of the Lake of Valencia. The radio-carbon study of the Maracaibo aquifer is now complete and the interpretation of these results, as well as a description of experimental methods, are given elsewhere (Tamers, 1966). The δC^{13} values are based on

the Craig PDB limestone standard and were done by Isotopes, Inc. The radiocarbon contents are reported as percent of modern without correction for limestone dilution. The corrected ages are given in the detailed report to be published in another journal. Samples coll. 1965 by Juan Navarro (I.V.I.C.), Epifanio Rondón (Instituto Nacional de Obras Sanitarias, Caracas) and Murry Tamers (I.V.I.C.); subm. by Murry Tamers.

Maracaibo Aquifer Wells

		δC^{13} (‰)	C^{14} (% of modern)
IVIC-195	Campo 2, pozo 6 (10° 30' N Lat, 71° 48' W Long)	-17.8 ± 0.1	29.4 ± 1.4
IVIC-196	La Cañada (10° 25' N Lat, 71° 41' W Long)	-17.6 ± 0.1	0.98 ± 0.24
IVIC-197	Hacienda Veritas (10° 25.5' N Lat, 71° 45' W Long)	-16.2 ± 0.1	5.1 ± 0.34
IVIC-198	Hacienda La Palma (10° 22' N Lat, 71° 49' W Long)	-18.7 ± 0.1	2.4 ± 0.3
IVIC-201	Campo 2, pozo 8 (10° 29' N Lat, 71° 48' W Long)	-16.0 ± 0.1	24.2 ± 0.3
IVIC-202	Hacienda Los Palmares (10° 22' N Lat, 71° 47' W Long)	-20.7 ± 0.1	6.85 ± 0.46
IVIC-203	Hacienda Mandalay (10° 15' N Lat, 71° 54' W Long)	----	9.3 ± 0.36
IVIC-205	Potrerito (10° 20' N Lat, 71° 47' W Long)	-18.6 ± 0.1	9.3 ± 0.33
IVIC-207	Caujarito Shell (10° 36' N Lat, 71° 48' W Long)	-19.7 ± 0.1	20.9 ± 0.35
IVIC-208	Campo 1, pozo 21 (10° 32' N Lat, 71° 43' W Long)	-16.6 ± 0.1	26.5 ± 0.3
IVIC-209	Hato Grande (10° 42' N Lat, 71° 43' W Long)	-19.6 ± 0.1	45.4 ± 0.5
IVIC-213	La Rinconada (10° 43' N Lat, 71° 41' W Long)	-17.8 ± 0.1	51.2 ± 0.5
IVIC-215	Campo 1, pozo 28 (10° 33' N Lat, 71° 42.5' W Long)	-17.1 ± 0.1	20.6 ± 0.4
IVIC-216	Campo 3A, pozo 1 (10° 30' N Lat, 71° 43' W Long)	-15.8 ± 0.1	18.9 ± 0.35
IVIC-217	Pozo Viejo, El Rincón (10° 28' N Lat, 71° 41' W Long)	-19.6 ± 0.1	7.5 ± 0.3

Palmar River and Adjacent Wells

IVIC-212	Palmar River Water (10° 17' N Lat, 71° 58.5' W Long)	-15.0 ± 0.1	124.8 ± 0.8
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IVIC-211	Hacienda Alto Viento (10° 14' N Lat, 71° 57' W Long)	-20.0 ± 0.1	69.2 ± 0.6
IVIC-214	Matera Santa Lucia (10° 18' N Lat, 71° 42.5' W Long)	-13.5 ± 0.1	85.6 ± 0.7

Coro Aquifer Wells and Spring

IVIC-218	Meachiche No. 1 (11° 20' N Lat, 69° 34' W Long)	-13.1 ± 0.1	26.3 ± 0.4
IVIC-219	Meachiche No. 2 (11° 20' N Lat, 69° 33' W Long)	-19.4 ± 0.1	25.4 ± 0.4
IVIC-220	Meachiche Spring (11° 19' N Lat, 69° 34' W Long)	-13.0 ± 0.1	109.4 ± 0.74
IVIC-221	Rio Coro Pozo No. 5 (11° 25' N Lat, 69° 38' W Long)	-20.3 ± 0.1	57.1 ± 0.5
IVIC-222	Rio Coro Pozo No. 8 (11° 25' N Lat, 69° 38' W Long)	-14.4 ± 0.1	57.3 ± 0.5
IVIC-223	Rio Coro Pozo No. 10 (11° 25' N Lat, 69° 38' W Long)	-16.8 ± 0.1	59.5 ± 0.4
IVIC-224	Hacienda Los Perozos (11° 24' N Lat, 69° 38' W Long)	-13.1 ± 0.1	70.9 ± 0.4

Peninsula of Paraguaná Well

IVIC-225	Buena Vista, Pozo El Milagro (11° 53' N Lat, 69° 57' W Long)	-8.4 ± 0.1	29.9 ± 0.4
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II. ARCHAEOLOGIC SAMPLES

A. Venezuela

	1300 ± 170
IVIC-179. Miquimú, Carache Area	A.D. 650

Charcoal from trench M, 1.3 m below surface, in bank of Miquimú Creek at Miquimú (9° 35.6' N Lat, 70° 15.2' W Long), ca. 8 km SSW from Carache, state of Trujillo, Venezuela. Associated with crude, plain, and modeled pottery of Miquimú Style and bat wing pendants of metamorphosized chert. Pottery seems to be Dabajuroid. Sample very small, hence large error in date. Coll. 1964 and subm. by Erika Wagner, I.V.I.C. *Comment* (E.W.): date falls within Period III of Cruxent-Rouse chronology (Cruxent and Rouse, 1961), and correlates with tentative date for Guasare style of Rancho Peludo area. It is older than dates for Mirinday and El Chao material of Carache area (IVIC I) and gives an acceptable sequence for region.

	13,010 ± 280
IVIC-191-1. Taima-taima A	11,060 B.C.
	14,440 ± 435
IVIC-191-2. Taima-taima C	12,490 B.C.

Bones from a kill site W of Vela de Coro, state of Falcón, Venezuela (11° 30' N Lat, 69° 30' W Long). Region is presently arid; how-

ever, bones came from animals, now extinct in the country, that could only have lived under much more humid conditions. Main excavations were done by the late Dr. José Royo y Gómez and J. M. Cruxent in 1962. Associated artifacts are primitive stone instruments of a very special type, an industry of "pebble-tools." Taima-taima site is 8 km W of excavation of Muaco, which had a fauna similar in many respects to Taima-taima. A bone date for Muaco gave $14,300 \pm 500$ B.P. (M-1068, Michigan VII). A charcoal (?) date for Taima-taima gave $>41,000$ B.P. (Y-1199, written comm. from I. Rouse to J. M. Cruxent), but it was later decided that material dated could very well have been coal and, therefore, date is not usable (Rouse and Cruxent, 1963). Coll. 1963 and subm. by J. M. Cruxent, I.V.I.C. IVIC-191-1 and IVIC-191-2 dates were obtained on two separate batches of bone, both of which were given a pre-treatment that completely removed carbonate portion. Results of a previous study (Tamers and Pearson, 1965b) suggest that dates be taken as lower limits and that oldest date is probably more correct. *Comment* (J.C.): we would have thought that Taima-taima was older than Muaco. Present results pose a difficult problem as to coexistence of two different complexes in same area. However, material must be studied in more detail and excavations will be continued on the site.

B. Jamaica

IVIC-189. Brazilletto

1920 \pm 100

A.D. 30

Charcoal sample taken 50 cm from surface of Brazilletto site, SW of mouth of Cockpit River, in Portland Bight, Jamaica ($17^{\circ} 52' N$ Lat, $77^{\circ} 10' W$ Long). Tentatively considered to be one of oldest archaeological sites of Jamaica, but within Period IV of the Neo-Indian epoch. Coll. 1964 by Daniel Bruce and J. M. Cruxent, I.V.I.C.; subm. by Cruxent. *Comment* (J.C.): archaeologists of Jamaica consider date too old for island, but we are not of that opinion. Sample age seems to us to be logical and in agreement with our prediction.

IVIC-190. Rio Nuevo

770 \pm 100

A.D. 1180

Charcoal sample excavated 50 cm from surface at mouth of Rio Nueva (right bank), north coast, Jamaica ($18^{\circ} 25' N$ Lat, $76^{\circ} 04' W$ Long). Site is similar to others in Cuba and Dominican Republic, especially with respect to weights used on fishing nets. However, this is first time the artifact has been discovered in Jamaica, despite being very typical for sites in Dominican Republic and other islands. Coll. 1964 by Luis Chanlatte and J. M. Cruxent, I.V.I.C.; subm. by Cruxent. *Comment* (J.C.): we can say nothing against date since we think that site was occupied by Arawaks and that they could have lasted up to time of Spanish Conquistadores.

C. Chile

IVIC-170. Pisagua Viejo 3**5220 ± 170****3270 B.C.**

Wood forming part of stuffing of thorax cavity of mummy of Tomb No. 2, of Indian cemetery "Pisagua Viejo" (19° 33' S Lat, 70° 14' W Long), N of port of Pisagua, province of Tarapaca, Chile. Mummy corresponds to period that Max Uhle called "Aborigines of Arica," based on a complicated preparation consisting of removing interior organs of body and filling with materials such as straw, pieces of wood, cord, etc. Position is always extended. Coll. 1963 and subm. by Lautaro Nuñez Atencio, Museo Arqueológico de la Universidad de Chile, Calama. *Comment* (L.N.A.): date in perfect concordance with cultural content of site.

IVIC-171. Dupont 4**460 ± 100****A.D. 1490**

Cloth from Tomb No. 1 of Dupont site (22° 31' S Lat, 68° 58' W Long), Province of Antofagasta, Chile. Excavated cemetery is placed between period of expansion of Tiahuanaco to the Inca. Cultural contents were defined by flexed mummies, Dupont ceramic (black with polished interior), and other artifacts from Valley of the Loa. Coll. 1964 and subm. by Lautaro Nuñez Atencio. *Comment* (L.N.A.): early part of date is in agreement with pre-Inca situation of Dupont.

IVIC-172. Pica 5**310 ± 110****A.D. 1640****IVIC-173. Pica 6****930 ± 90****A.D. 1020****IVIC-174. Pica 7****220 ± 80****A.D. 1730**

Three samples from Tomb No. 6, sec. A of Pica cemetery (20° 31' S Lat, 69° 23' W Long) in Province of Tarapacá, Chile. These are first dates for cultural complex Pica, which is intermediate between cultures Arica and San Pedro de Atacama. Latter culture was dated at 1650 ± 150 (Sa-109, Saclay I) and 1700 ± 150 (Sa-226, Saclay II). Tomb contained cloth of the type Gentilar and modeled ceramic with human faces. No evidence that site had been previously disturbed. Sample IVIC-173 was cloth and samples IVIC-172 and 174 were maize cobs and other unidentified plants. Coll. 1963 and subm. by Lautaro Nuñez Atencio. *Comment* (L.N.A.): two early dates of maize cobs are not reasonable; however, cloth sample date, IVIC-173, is correct. Field evidence requires that three samples should be contemporary.

IVIC-175. Conanoxa 1**3740 ± 130****1790 B.C.**

Dried excrements of unidentified herbivorous animal located at Level 2 of pre-agricultural site Cxa W,a. Excavation was at Conanoxa, Valley of Camarones, Province of Tarapacá, Chile (19° 02' S Lat, 69° 59' W Long). Cultural materials associated with sample were placed in

Second Pre-agricultural period of N coast of Chile, as defined by Bird (Bird, 1946). Excavation has been described in a previous article (Niemeyer and Schiappacasse, 1963). Coll. and subm. by Hans Niemeyer and Virgilio Schiappacasse, Santiago, Chile. *Comment* (H.N. and V.S.): date obtained is in agreement with archaeologic evidence which suggested that sample should be placed in ca. 2000 B.C.

1150 \pm 95

IVIC-176. Conanoxa 2

A.D. 800

Charcoal from bottom of small underground silo of House A of the excavation Cxa E.I (I) (19° 02' S Lat, 69° 59' W Long). Associated ceramic artifacts place site in first part of Agricultural period, with non-decorated pottery or Pichalo II of Bird (Bird, 1946). Coll. 1962 and subm. by Hans Niemeyer and Virgilio Schiappacasse.

D. Colombia

530 \pm 100

IVIC-158. Boyacá

A.D. 1420

Shavings from wooden statue now in Museo Nacional, Bogotá. From cave near Boyacá, Department of Cundinamarca, Colombia (4° 44' N Lat, 74° 19' W Long). Piece is very characteristic for late phase of Chibcha culture. Coll. ca. 1900 by person now unknown; subm. by Gerardo Reichel-Dolmatoff, Universidad de Los Andes, Bogotá. Colombia. *Comment* (G.R-D.): date coincides with present theories suggesting recent age of Chibcha artifacts in this zone.

765 \pm 85

IVIC-159. Los Santos

A.D. 1185

Cotton cloth covering a mummy (Museo Nacional, Bogotá No. 41-III-2493-2509) from "Cueva de los Indios," Municipality of Los Santos, Dept. of Santander del Sur, Colombia (6° 46' N Lat, 73° 06' W Long). Complex of burials in caves is very typical for this region of Chibcha territory. Cloth was associated with series of other cultural elements, both of ceramic and wood. Coll. 1941 by the late Justus Wolfram Schottelius; subm. by Gerardo Reichel-Dolmatoff. *Comment* (G.R-D.): discoverer of this material had tentatively attributed to it very recent, protohistoric age. C¹⁴ determination puts this hypothesis in doubt. Possibly, it belongs to culture preceding that of Guane and Chibcha del Altiplano.

715 \pm 60

IVIC-160. Restrepo

A.D. 1235

Wood from a canoe (Museo Nacional, Bogotá No. A-62-VIII-1810), associated with Calima culture, found at bottom of dry lake (3° 51' N Lat, 76° 32' W Long). Lake is near town of Darian, Department del Valle, Colombia. Calima culture is one of most advanced of Colombia, but is little known. Many of its characteristics appear to be related to Quimbaya and San Agustín cultures and also to Mesoamerican cultures. Coll. 1962 by Warwick Bray, Cambridge Archaeol. Exped.; subm. by

Gerardo Reichel-Dolmatoff. *Comment* (G.R-D.): a charcoal sample, found by Bray in a burial in same zone, gave date of 700 ± 85 B.P. (NPL-60, NPL II). The two dates determine a late phase of Calima culture.

F. Argentina

IVIC-177. Ampajango **670 \pm 85**
A.D. 1280

Charcoal from Ampajango site, Valley of Santa María, Province of Catamarca, Argentina ($26^{\circ} 55'$ S Lat, $66^{\circ} 05'$ W Long), taken 38 cm below surface of Structure A, Unit I. Associated artifacts include pottery of Santa María and San José styles. Archaeologic investigations of Valley of Santa María have been described in detail in a previous publication (Cigliano *et al.*, 1960). Coll. 1961 and subm. by Eduardo Cigliano, Museo de la Plata, La Plata, Argentina. *Comment* (E.C.): date coincides perfectly with archaeologic evidence.

IVIC-178. Cerro Mendocino **610 \pm 85**
A.D. 1340

Charcoal from Punta de Balasto, Valley of Santa María, Province of Catamarca, Argentina ($27^{\circ} 00'$ S Lat, $66^{\circ} 15'$ W Long), taken 1 m below surface of structure of Núcleo C. Pottery of Santa María style was found on surface. Sample should date the Santamariana culture, typical of Valley of Santa María. Coll. 1959 and subm. by Eduardo Cigliano. *Comment* (E.C.): date is in agreement with archaeologic findings.

IVIC-184. Barranca Larga **1460 \pm 90**
A.D. 490

Cloth, from vicuña wool, in bad condition and intimately mixed with dry earth, from Valley of Abaucán, 7 km NE of town of Tinogasta, Province of Catamarca, Argentina ($28^{\circ} 02'$ S Lat, $67^{\circ} 32'$ W Long). Taken from funeral urn in which was also found a trephined skull. This dates horizon of burial urns of types Sanagasta, San José, Haulfín, and Jachal. Coll. 1963 and subm. by Eduardo Cigliano. *Comment*: in agreement with estimated date.

IVIC-186. Jüella **1320 \pm 90**
A.D. 630

Fragment of a wooden object found in House No. 18 of site Quebrada de Jüella, ca. 4 km W of Humahuaca, Province of Jujuy, Argentina ($23^{\circ} 30'$ S Lat, $65^{\circ} 22'$ W Long). Site corresponds to late pre-Inca period of the black on red horizon of Quebrada de Humahuaca. Ceramic type is Tilcara. Coll. 1958 and subm. by Eduardo Cigliano. *Comment* (E.C.): we would have thought that age was a little greater.

IVIC-187. Punta de Balasto **1300 \pm 60**
A.D. 650

Charcoal from roof of Structure No. 1, Punta de Balasto, Cerro Mendocino, at extreme S of Valley of Santa María, Province of Cata-

marca, Argentina (26° 55' S Lat, 66° 07' W Long). Sample located 60 cm above floor of house, on which were recovered ceramic fragments of a crude type and Santa María Bicolor. Coll. 1959 and subm. by Eduardo Cigliano. *Comment*: in agreement with estimated date.

4760 ± 120

IVIC-188. Palo Blanco 9

2810 B.C.

Mollusk shells from a natural formation at Palo Blanco, Province of Buenos Aires, Argentina, 1 km from present day coast (34° 55' S Lat, 57° 50' W Long). At base of mound was found a rough type of pottery that would predate formation of mound. Coll. 1962 and subm. by Eduardo Cigliano. *Comment* (E.C.): date, on geologic evidence, is more than reasonable. Archaeologically, it is revolutionary and suggests that site merits an intensive investigation.

F. Perú

IVIC-182-A. Pachacamac wood

Modern

1280 ± 85

IVIC-182-B. Pachacamac cloth net

A.D. 670

Two samples, wood from a portal and a fragment of a cloth net (which could have been used as a hair net) from ruins of Pachacamac, Perú (12° 13' S Lat, 76° 53' W Long). Coll. 1964 and subm. by Raimundo Villegas, I.V.I.C. *Comment*: wooden portal is evidently not part of original fortress. Cloth date is reasonable and comparable to another cloth date for Pachacamac, 990 ± 40 B.P. (Hv-351, Hannover III).

G. United States of America

IVIC-151. Ready Bullion Creek

9470 ± 180

7520 B.C.

Wood coll. 1963 by R. E. Becker and L. R. Mayo, U. S. Geol. Survey, 25 ft above base of Wisconsin age frozen silt, 1/2 mi NW of Ester, Alaska (64° 51' N Lat, 148° 02' W Long). Wood was part of sample previously dated Univ. of Texas at 9410 ± 130 B.P. (Tx-158, Texas II) and Packard Instrument Co. at 10,450 ± 150 B.P. (PIC-6, Packard I). Subm. by F. J. Pearson, Univ. of Texas, as check sample. *Comment*: in complete agreement with Texas date and approximate agreement with Packard value.

8800 ± 220

IVIC-180. Eagle Cave A

6850 B.C.

Charcoal from Eagle Cave site (41 VV 167) in Mile Canyon, near Langtry, Texas (29° 49' N Lat, 101° 33' W Long). From Stratum V, Hearth 1, which was earliest occupation of site and contained "Early Barbed" points. Charcoal was part of a sample previously dated by Univ. of Texas at 8760 ± 150 B.P. (Tx-107, Texas III). Coll. 1963 by R. E. Ross, M. L. Parsons, and C. D. Tunnell, Univ. of Texas; subm. by F. J. Pearson as check sample. *Comment*: I.V.I.C. date in complete agreement with Texas measurement.

III. MISCELLANEOUS SAMPLE

IVIC-206. Hojas de Guama 1965 $171 \pm 1\%$ modern

Growing leaves from same Guama tree (*Inga fastuosa*) in Altos de Pipe ($10^{\circ} 23' N$ Lat, $66^{\circ} 58' W$ Long) as IVIC-147 (IVIC I). Sample used to monitor nuclear weapon contamination in area. Coll. May 26, 1965. *Comment*: contamination has increased 9% over the period of exactly 1 yr.

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