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INSTITUTO VENEZOLANO DE INVESTIGACIONES CIENTIFICAS NATURAL RADIOCARBON MEASUREMENTS VII

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The samples reported in this date list were processed during 1970. After preliminary sample treatments including carbonates and rootlet removal, a complete benzene synthesis was made. This liquid serves as the solvent in a liquid scintillation spectrometer, using a modified 4cc counting vessel; 2.42g of carbon are counted with a 64% efficiency. The background is constant at 6.8 cpm.

Ages are calculated for a C^{14} half-life of 5568 years, using 95% of the activity of the NBS oxalic acid as the modern reference and commercial petroleum-derived benzene for background determinations. Errors are the standard deviations based on the random nature of the radioactive disintegration process. The reference year A.D. 1950 is in "Before Present" ages.

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SAMPLE DESCRIPTIONS

I. GROUND WATER SAMPLES

These samples represent the continuation of the annual sampling of deep ground wells S of Maracaibo. This deposit is fossil (Tamers, 1967), but represents the only source of fresh water for the urban center. Radiocarbon dates were run in order to verify that the brackish waters of the Lake of Maracaibo have not begun to infiltrate the major portion of the aquifer. Samples consist of total extracted carbonates. Coll. and subm. by members of Radiocarbon Lab., I.V.I.C.

Maracaibo Wells

		Collection (day/month/yr)	C^{14} (% of modern)
IVIC-836.	Campo 1, Pozo 28 (10° 33′ N Lat, 71° 42.5′ W Long)	2/9/70	26.0 ± 0.4
IVIC-837.	Campo 1, Pozo 23 (10° 32′ N Lat, 71° 43′ W Long)	2/9/70	22.2 ± 0.4
IVIC-838.	Campo 2, Pozo 2 (10° 30′ N Lat, 71° 48′ W Long)	2/9/70	25.3 ± 0.4
IVIC-839.	Campo 2, Pozo 6 (10° 30′ N Lat, 71° 48′ W Long)	2/9/70	28.8 ± 0.4

		Collection (day/month/yr)	C^{14} (% of modern)
IVIC-840.	Campo 3, Pozo 1 (10° 30′ N Lat, 71° 43′ W Long)	2/9/70	31.9 ± 0.45
IVIC-841.	La Cañada (10° 25′ N Lat, 71° 41′ W Long)	2/9/70	6.1 ± 0.3

Comment: the main municipal wells still show no indication of modern water infiltration. Radiocarbon content is essentially the same as in 1966 when the sampling was initiated. The La Cañada radiocarbon concentration is significantly higher in recent years, but seems to be due to an infiltration of slightly younger water from inland deposits rather than lake infiltration.

II. ARCHAEOLOGIC SAMPLES

A. Venezuela

1660 ± 70

IVIC-777. El Cuartel **A.D. 290**

Charcoal, S-1, near naval base of Carupano, Venezuela (10° 4′ N Lat, 63° 45′ W Long), from Cuts 7 and 9, Level 7, 120 to 140cm below surface. Assoc. with pottery and lithic artifacts, related to Ronquín style of Lower Orinoco. Coll. 1969 and subm. by M. Sanoja, Univ. Central de Venezuela, Caracas. Estimated age: A.D. 200 to 200 B.C. *Comment* (M.S.): date correlates well with others obtained by Rouse and Cruxent (1963) for similar sites near Carupano, suggesting that by that time the area was intensively occupied by a homogeneous aboriginal population.

670 ± 70

IVIC-778. El Guamo **A.D. 1280**

Charcoal and wood, T-1, from bank of Zulia R., near Orope Caño, state of Táchira, Venezuela (8° 24′ N Lat, 72° 36′ W Long). From Cut 3, Sec. D, Level 6, 100 to 120cm below surface. Coll. March 1967 and subm. by M. Sanoja. Assoc. with pottery, textile-impressed sherds, and lithic artifacts. Sample should be after Caño Grande period and beginning of red/white painted and incised pottery of the SW bank of Lake Maracaibo. Estimated age A.D. 600 to 1000. *Comment* (M.S.): according to series for SW coast of Lake Maracaibo, date is acceptable.

IVIC-779. Caño Grande **>34,550**

Amorphous material (asphalt ?), Z-5, with high carbon content, from Caño Grande, near village of Encontrados, state of Zulia, Venezuela (9° 2′ N Lat, 72° 46′ W Long). From Cut 2, Level 6, 100 to 120cm below surface. Assoc. with pottery, lithic artifacts, and bones. Site appears to represent one of most ancient of SW coast of Lake Maracaibo. Coll. 1968 and subm. by M. Sanoja. Estimated age: A.D. 400 to 600. *Comment* (M.S.): obviously, date does not belong to Caño Grande phase cultural context and should be discarded.

IVIC-780. El Danto **900 ± 70**
A.D. 1050

Charcoal, Z-23, from El Danto Caño, 8 to 10km from Escalante R., Bolivar Dist., state of Zulia, Venezuela (8° 24′ N Lat, 72° 36′ W Long). From Cut 1, Level 4, 60 to 80cm below surface. Assoc. with pottery, lithic artifacts, animal bones and terrestrial snail shells. Many characteristics of pottery here also occur in that of El Guamo and other sites of SW and NW coasts of Lake Maracaibo. Coll. 1970 and subm. by M. Sanoja. Estimated date: A.D. 400 to 1000. *Comment* (M.S.): according to series for archaeologic sites of area, date is acceptable.

IVIC-882. Muaco tierra **10,490 ± 100**
8540 B.C.

Earth, with carbonates and rootlet removal pretreatment, from ca. 1m below surface of Muaco site, state of Falcón, Venezuela (11° 45′ N Lat, 69° 15′ W Long). Assoc. with Pleistocene animal bones previously dated (non-carbonate fraction) at 9030 ± 240 B.P. (IVIC-488: R., 1969, v. 11, p. 406), and 14,300 ± 500 B.P. (M-1068: R., 1962, v. 4, p. 200), presumably on total bone. Coll. 1970 and subm. by J. Cruxent, I.V.I.C. *Comment* (J.C.): date slightly younger than Taima-taima, 11,000 to 15,000 B.P. (Tamers, 1971), which is possible and agrees with previous I.V.I.C. date of Muaco bones.

B. Trinidad

Banwari Trace series

Charcoal from top of small hill, 2.5km W Penal on S bank of old Oropuche Lagoon, Trinidad (10° 10′ N Lat, 61′ 28′ W Long). Assoc. with bone and stone implements, possibly similar to those of Ortoire complex. Shell tools absent. Samples expected to indicate antiquity of Meso-Indian period in Trinidad. Coll. 1969 (IVIC-783, -784) and 1970 (IVIC-887-891) by P. Harris, Trinidad and Tobago Hist. Soc., Pointe-à-Pièrre. Subm. by J. Cruxent.

IVIC-784. Banwari Trace A-1 **2550 ± 100**
600 B.C.

Excavation A, 0 to 25cm below surface. Sample might be contaminated by modern material due to cultivation in region.

IVIC-783. Banwari Trace A-2 **5650 ± 100**
3700 B.C.

Excavation A, 25 to 50cm below surface.

IVIC-887. Banwari Trace A-3 **6170 ± 90**
4220 B.C.

Excavation A, 50 to 75cm below surface.

IVIC-890. Banwari Trace A-4 **6100 ± 90**
4150 B.C.

Excavation A, 75 to 100cm below surface.

6190 ± 100

IVIC-891. Banwari Trace A-5 **4240 B.C.**

Excavation A, 100 to 125cm below surface.

6780 ± 70

IVIC-889. Banwari Trace A-6 **4830 B.C.**

Excavation A, 125 to 150cm below surface.

7180 ± 80

IVIC-888. Banwari Trace A-8 **5250 B.C.**

Excavation A, 175 to 200cm below surface.

General Comment: these are the oldest dates for man in the Caribbean Is. and supports arguments of Cruxent and Rouse (1969) for early habitation of the West Indies.

1260 ± 100

IVIC-785. Guayaguayare C-1 **A.D. 690**

Charcoal, from 4.5km SW of Guayaguayare, Trinidad (10° 7′ N Lat, 61° 4′ W Long), 0 to 25cm below surface. Assoc. with stones, bones, shells, and pottery. Pottery styles similar to that of Erin (Trinidad) and Caloriguy (Grenada). Coll. 1969 by P. Harris and subm. by J. Cruxent. Estimated age: 1000 to 1300 B.P.

1720 ± 90

IVIC-786. Guayaguayare C-2 **A.D. 230**

Charcoal, same excavation as IVIC-785, 25 to 50cm below surface. Coll. same time and assoc. with similar artifacts. *Comment* (P.H.): dates are reasonable.

C. Chile

Caleta Huelen series

Various cultural materials from pre-Columbian cemetery on bank of mouth of Loa R., dividing Tarapaca and Antofagasta provs. in N Chile (21° 25′ S Lat, 70° 65′ W Long). Coll. 1968 and subm. by L. Nuñez, Univ. Chile, Antofagasta.

2030 ± 80

IVIC-788. Caleta Huelen 7 **80 B.C.**

Coiled basketry and other vegetable fibers, well preserved, from undisturbed Tomb 1 containing flexed adult body covered with marine bird feathers, from 65cm below surface. Assoc. with bottle- and bell-shaped ceramic vessels with polished surfaces, copper ore, basketry, cord, cotton, wool, quartz knives. Artifacts related to 1st agricultural settlements in Tarapaca Valley, Caserones sec. *Comment* (L.N.): estimated date: at least A.D. 100 since sample is from population whose artifacts are old. Date is consistent with archaeologic evidence.

2000 ± 70

IVIC-789. Caleta Huelen 10 **50 B.C.**

Crude wool cloth from Tomb 1 of CaH-10 cemetery, tumulos sec., S bank, covering body of small child. Assoc. with bottle-shaped striated

ceramic vessels, slightly polished, with cucurbitaceous forms. Also present were net sacks of vegetable fibers, wool, coiled basketry, and Quisco fishhooks. This is 1st date for a late agricultural-ceramic settlement with Quisco fishhooks. *Comment* (L.N.): date is reasonable and expected; it confirms IVIC-788.

2320 ± 80

IVIC-790. Caleta Huelen 10A **370 B.C.**

Charred wood, from Tomb 7, Sec. A of CaH-10A cemetery on S bank, 43cm below surface of undisturbed tomb containing flexed adult body. Assoc. with wool bundle covered with vegetable fiber matting, a bone harpoon, coiled basketry, shells, cloth sack, wool cloth, perforated stone. *Comment* (L.N.): date older than expected. This population was buried on side of CaH-10 tomb area. Field evidence must be reexamined in light of radiocarbon result.

1130 ± 80

IVIC-791. Caleta Huelen 43 **A.D. 820**

Human flesh from flexed adult body, naturally mummified by climatic factors; from undisturbed Tomb 10, 63cm depth, on N bank of river. From cemetery of 210 graves of only settlement on N bank of Loa R. Assoc. with a separate style of ceramics, back packs, sticks for agricultural use, crude wool cloth, sack with maize, leather sandals. Population had a balanced agricultural-maritime economy. Estimated date: A.D. 0 to 300. *Comment* (L.N.): date is very unexpected, but possible, due to fact that tomb was on edge of cemetery. Sample from central burial area is needed to determine true age of site. But present sample might date end of occupation.

950 ± 70

IVIC-792. Pica 8 **A.D. 1000**

Human flesh and digested vegetable from adult body, mummified by climatic factors in undisturbed Tomb 7, Sec. G, 76cm depth, in Pica cemetery, San Andres de Pica oasis, Tarapaca prov., Chile (20° 31′ S Lat, 69° 23′ W Long). Assoc. with Charcollo type ceramics with irregular red bands and thick woven textiles with Tiahuanaco designs. Previous dates for site were 310 ± 110 B.P. and 220 ± 80 B.P. on maize cobs (IVIC-172 and IVIC-174: R., 1966, v. 8, p. 208) and 930± 90 B.P. on cloth (IVIC-173: R., 1966, v. 8, p. 208). Maize cob dates were unacceptable, but cloth radiocarbon result was reasonable. Present sample should resolve ambiguity of earlier dates. Sec. G presents conclusive altiplano characteristics. Coll. 1967 and subm. by L. Nuñez. This is 1st date for Tiahuanaco influence in N Chile. *Comment* (L.N.): date confirms that Pica complex is dated ca. A.D. 1000. Maize cob dates are invalidated.

3870 ± 80

IVIC-844. Bellavista A **1920 B.C.**

Charcoal, Bell. I. 70, from Sq. A-3, bottom Level 4, in Bellavista farm, 6km NE Concepción, Chile (36° 47′ S Lat, 73° 2′ W Long). Assoc.

with lithic industry consisting of projectile points, fishing weights, polishers. Coll. 1970 and subm. by Z. Seguel, Univ. Concepción, Chile. This is 1st date for central-S zone of Chile. Estimated age: 3000 to 3500 B.C. *Comment*: see IVIC-845.

3330 ± 80

IVIC-845. Bellavista B **1380 B.C.**

Charcoal, Bell. I. 70, from Sq. B-2, Level 3, of same site as IVIC-844. Assoc. with projectile points, fishing net weights, other lithic artifacts. Settlement of marine fishermen-collectors without ceramics. Coll. 1969 and subm. by Z. Seguel. *Comment* (Z.S.): dates establish existence of this early preceramic society. Site is presently far from actual sea coast and indicates one of last pulsations of sea level in this sector.

810 ± 100

IVIC-846. Tubul 1 **A.D. 1140**

Charcoal, Tub. I. 70, from SE sec., Sq. B-2, Level 3, of excavation NW mouths of Raqui and Tubul R., behind Tubul cove (37° 14′ S Lat, 73° 27′ W Long). Assoc. with ceramics and funerary structures. Estimated date: A.D. 1450 to 1500. *Comment* (Z.S.): date earlier than expected, but it is reasonable to believe that these ceramic techniques were present considerably before Inca penetration into Chile.

4020 ± 110

IVIC-875. Conanoxa 4 **2070 B.C.**

Charcoal, Cxa. W-a No. 4, of fluvial terrace W Conanoxa, Camarones Valley, Tarapaca Prov., Chile (19° 2′ S Lat, 69° 59′ W Long). Assoc. with cultural materials typical of pre-agricultural culture of Conanoxa. Previous dates on dried excrement and charcoal from site were 3740 ± 130 B.P. and 1150 ± 95 B.P., respectively (IVIC-175 and IVIC-176: R., 1966, v. 8, p. 208-209). Material from floor of House 3, S wall, Sq. A. Coll. 1967 and subm. by V. Schiappacasse and H. Niemeyer, Santiago, Chile. *Comment*: see IVIC-876.

3970 ± 120

IVIC-876. Conanoxa 5 **2020 B.C.**

Charcoal, Cxa. W-a No. 5, from same site as IVIC-875. From floor of House 1, S wall, Sq. A. Same cultural material as previous sample. *Comment*: dates confirm antiquity of Conanoxa pre-agricultural settlement and invalidate possible significance of IVIC-176.

D. Mexico

Cueva del Texcal series

Charcoal from +2100m, NW Manuel Avila Camacho dam, on bank of reservoir, Puebla municipality, state of Puebla, Mexico (18° 55′ N Lat, 98° 8′ W Long). Settlement showed both ceramic and preceramic cultures. Coll. by members of Natl. Inst. Archeol. History (INAH) in Mexico City and subm. by J. Lorenzo.

390 ± 70

IVIC-813. Cueva del Texcal 1 **A.D. 1560**

From Sq. A-12, Level II. Coll. 1964 by R. Reyna. Assoc. with ceramic and pre-ceramic cultures. *Comment* (J.L.): assoc. with late postglacial ceramics of Puebla Valley (A.D. 1200 to 1520) and Venta Salada phase of Tehuacan Valley (A.D. 700 to 1520).

580 ± 70

IVIC-814. Cueva del Texcal 2 **A.D. 1370**

From Sq. A-12, Level III. Coll. 1964 by A. Arbide. Assoc. preceramic material. *Comment* (J.L.): see IVIC-813.

210 ± 60

IVIC-815. Cueva del Texcal 3 **A.D. 1740**

From Sq. CC-17, Level III. Coll. 1964 by A. Arbide. Assoc. with preceramic material. *Comment* (J.L.): cultural material found with sample was same type as for Texcal 1 and 2; dates are too recent.

7320 ± 280

IVIC-816. Cueva del Texcal 4 **5370 B.C.**

Very small sample from Sq. A-18, Level VI. Coll. 1965 by L. Mirambell. Assoc. with preceramic material. *Comment* (J.L.): date acceptable since Levels IV and V produced material corresponding to Coxcatlan phase of Tehuacan Valley. In lower levels, artifacts are of El Riego del Valle de Tehuacan phase, oldest of Texcal cave. Coxcatalan dates 5000 to 3500 B.C. and El Riego from 6500 to 5000 B.C.

1980 ± 70

IVIC-818. Cueva del Texcal 6 **30 B.C.**

From Sq. A-19, Level IV. Coll. 1965 by L. Mirambell. Assoc. with preceramic material. *Comment*: intermediate date between Venta Salada and Coxcatlan phases.

2920 ± 80

IVIC-833. Tlatilco 4 **970 B.C.**

Zea maize from Trench 4, Pit 17, Tlatilco site, Naucalpan de Juárez municipality, state of Mexico, Mexico (19° 29′ N Lat, 99° 14′ W Long), +2276m. Coll. 1968 and subm. by R. García Moll, Mus. Nacl. Antropol., INAH. *Comment* (R.G.M.): sample assoc. with ceramics similar to that described by Piña Chán (1958). Date excludes Transitional Tlatilco phase corresponding to Medium Preclassical of central Alitplano of Mexico. This would have dated A.D. 1500 to 900.

E. Ecuador

950 ± 70

IVIC-855. Subibaja **A.D. 1000**

Charcoal from Trench 1, Level 6, in excavation on slope of Chanduy hills, near San Rafael, Santa Elena peninsula, Ecuador (2° 21′ S Lat, 80° 38′ W Long). Assoc. with Guangala ceramics, frogware type, comales, and graters. Sample should determine period of frogware-type ceramics

in Guangala culture. Coll. 1970 and subm. by J. Marcos, Guayaquil, Ecuador. Estimated date: A.D. 500 to 600.

1180 ± 70

IVIC-883. Loma del Guasango Torcido **A.D. 770**

Human bones, with carbonate removal pretreatment, from Tomb 43, on Loma del Guasango Torcido, Chanduy Valley, Santa Elena peninsula, Ecuador (2° 22′ S Lat, 80° 40′ W Long). Assoc. with Chanduy red band, Guasango finger paint, and early frogware-type ceramics. Coll. 1970 and subm. by J. Marcos. Estimated date: A.D. 500.

F. Argentina

1910 ± 60

IVIC-859. Manos Pintadas 1 **A.D. 40**

Charcoal from a rock shelter in Cañadon de las Manos Pintadas, General Sarmiemto municipality, Clubut prov., Argentina (45° 28′ S Lat, 69° 42′ W Long). From Trench 1, 60cm below surface. Coll. 1970 by C. Gradin, Ethnol. Mus. Buenos Aires, and subm. by J. Cruxent, IVIC. Estimated date: 1500 B.P.

3330 ± 70

IVIC-860. Manos Pintadas 2 **1380 B.C.**

Charcoal from same site as IVIC-859. From Trench II, 183cm below surface. Coll. 1970 by C. Gradin and subm. by J. Cruxent. Estimated date: 5000 B.P.

750 ± 70

IVIC-862. Quimili Paso 24 **A.D. 1200**

Charcoal from Site 2, Sq. 1, Level 4, 45 to 60cm below surface, on side of dry bed of Maillín Llanura stream, Santiago del Estero prov., Argentina (28° 45′ S Lat, 63° 10′ W Long). This level presented a concentration of basketry remains and animal bones. Coll. 1968 and subm. by A. Lorandi, Nat. Sci. Mus., La Plata, Argentina. These are 1st dates for Santiago del Estero region. Estimated date: A.D. 1000 to 1400. *Comment* (A.L.): date agrees with archaeol. evidence.

1140 ± 60

IVIC-863. Quimili Paso 31 **A.D. 810**

Charcoal from same site as IVIC-862, Sq. 2, Level 2, 15 to 25cm below surface. Assoc. with ceramic vase, basketry, animal bones, some charred. Coll. same time as previous sample. Estimated date: A.D. 1000 to 1400. *Comment* (A.L.): 390-yr difference between IVIC-862 and -863 is excessive; order of ages is inconsistent with depth. Errors of dates must be considered; an average value for Site 2: ca. 1000 B.P.

450 ± 70

IVIC-864. Quimili Paso 43 **A.D. 1500**

Charcoal from Site 3, Sq. 1, Level 4, 45 to 60cm below surface. On side of Maillín Llanura stream dry bed, Santiago del Estero prov., Argentina (28° 45′ S Lat, 63° 10′ W Long). Assoc. with late period

basketry and animal bones. Site 3 expected to date later than Site 2. Coll. 1968 by M. Klark and subm. by A. Lorandi. *Comment* (A.L.): ages of Sites 2 and 3 should differ by only ca. 100 yr.

III. SOIL SAMPLES

This is a continuation of the program of dating soil materials in Venezuela. The pretreatment method for removal of rootlets and carbonates (Herrera and Tamers, 1971) is a modification of the method developed in Bonn (Scharpenseel *et al.*, 1968).

IVIC-781. Calicata 4 **1810 ± 60** **A.D. 140**

Earth, buried Horizon A_{11}, at 148 to 154cm below surface; 0.44% non-rootlet, non-carbonate carbon content.

IVIC-782. Calicata 5 **1920 ± 70** **A.D. 30**

Earth, buried Horizon A_{11}, at 230 to 260cm below surface, 1.4% non-rootlet, non-carbonate carbon content; soil is Vertisol, covering ancient Ultisol. These 2 samples from pit near Mantecal, state of Apure, Venezuela (7° 34′ N Lat, 69° 9′ W Long). Coll. 1970 by R. Schargel, M.O.P., Guanare, and subm. by R. Herrera, IVIC. Calicata is part of study of rate of soil profile formation under tropical conditions. *Comment*: dates are statistically indistinguishable, which was unexpected due to almost 1m soil separating samples.

Tierra Pipe series

Samples, from A-C horizon type soil, from hill in IVIC, Altos de Pipe, state of Miranda, Venezuela (10° 23′ N Lat, 66° 58′ W Long). Other dates from this series previously published (R., 1970, v. 12, p. 524; R., 1971, v. 13, p. 39-41). Samples at same depth were regularly younger and of higher non-rootlet, non-carbonate carbon content, proceeding down hill. Intense cloud-forest vegetation and steep slope make sampling difficult. Profiles studied cover range in alt. from 1745m to 1450m over horizontal distance of only 800m. A preliminary description of results was published previously (Herrera and Tamers, 1971). Coll. 1970 and subm. by R. Herrera and M. Tamers. Pipe 6 is ca. 200 horizontal m downhill from Pipe 4 and is almost at foot of hill. Pipes 7 and 8, separated by ca. 100m, are ca. 100m downhill from summit. Pipe 9 was taken close to sampling area of Pipe 1, but on opposite side of road.

IVIC-794. Pipe 6, 20 to 35cm **112.7 ± 0.8 % modern**

1.5% non-rootlet, non-carbonate carbon content.

IVIC-795. Pipe 6, 35 to 50cm **107.8 ± 0.8 % modern**

1.2% non-rootlet, non-carbonate carbon content.

IVIC-796. Pipe 6, 50 to 65cm **123.8 ± 0.9 % modern**

0.81% non-rootlet, non-carbonate carbon content.

IVIC-797. Pipe 6, 0.65 to 0.80m **162.8 ± 0.9 % modern**
0.24% non-rootlet, non-carbonate carbon content.

IVIC-798. Pipe 6, 0.80 to 1.00m **114.9 ± 0.8 % modern**
0.14% non-rootlet, non-carbonate carbon content.

IVIC-802. Pipe 7, 0.30 to 0.45m **101.4 ± 0.9 % modern**
2.7% non-rootlet, non-carbonate carbon content.

IVIC-803. Pipe 7, 0.45 to 0.60m **116.2 ± 0.8 % modern**
3.3% non-rootlet, non-carbonate carbon content.

IVIC-804. Pipe 7, 0.60 to 0.75m **135.2 ± 0.8 % modern**
1.1% non-rootlet, non-carbonate carbon content.

IVIC-805. Pipe 7, 0.75 to 0.90m **225.5 ± 1.4 % modern**
0.38% non-rootlet, non-carbonate carbon content.

IVIC-806. Pipe 7, 0.90 to 1.05m **223.9 ± 1.6 % modern**
0.18% non-rootlet, non-carbonate carbon content.

IVIC-809. Pipe 8, 0.50 to 0.65m **111.9 ± 0.3 % modern**
2.2% non-rootlet, non-carbonate carbon content.

IVIC-810. Pipe 8, 0.65 to 0.80m **105.8 ± 0.8 % modern**
1.5% non-rootlet, non-carbonate carbon content.

IVIC-811. Pipe 8, 0.80 to 0.95m **113.6 ± 0.7 % modern**
0.63% non-rootlet, noncarbonate carbon content.

IVIC-866. Pipe 9, 0.20 to 0.35m **2540 ± 80**
590 B.C.
0.87% non-rootlet, non-carbonate carbon content.

IVIC-867. Pipe 9, 0.35 to 0.50m **4090 ± 70**
2140 B.C.
0.60% non-rootlet, non-carbonate carbon content.

IVIC-868. Pipe 9, 0.50 to 0.65m **4860 ± 70**
2910 B.C.
0.46% non-rootlet, non-carbonate carbon content.

IVIC-869. Pipe 9, 0.65 to 0.80m **5220 ± 80**
3270 B.C.
0.33% non-rootlet, non-carbonate carbon content.

IVIC-870. Pipe 9, 0.80 to 0.95m **4750 ± 90**
2800 B.C.
0.36% non-rootlet, non-carbonate carbon content.

IVIC-871. Pipe 9, 0.95 to 1.10m **6450 ± 90**
4500 B.C.
0.35% non-rootlet, non-carbonate carbon content.

6990 ± 90

IVIC-872. Pipe 9, 1.10 to 1.25m **5040 B.C.**

0.33% non-rootlet, non-carbonate carbon content.

General Comment: Pipe 9 series agrees with previous measurements. Pipe 6 profile is modern, but this was expected since general tendency seen for hill slope was decreasing ages as foot was approached. Modern dates for Pipe 7 and Pipe 8 profiles were unexpected. There is no evidence for artificial radiocarbon contamination; in any case, C^{14} contents are all within range of post-1952 nuclear weapon contamination in Venezuela (IVIC-805 and -806 are a little high, but still possible). Most reasonable explanation is that in this area, soil was rejuvenated by infiltration of younger material from surface layers. Bonn lab. (Scharpenseel and Pietig, 1969) showed that samples of a fossil chernozem horizon were composed of equivalent of 50% modern material, at depth ca. 1.4 m. This Scharpenseel-Pietig effect would account for modern Pipe 7 and Pipe 8 samples. But, it is not clear why effect should be so large in this particular area; further study is needed.

IV. GEOLOGIC SAMPLES

14,900 ± 210

IVIC-847. Laguna Brava **12,950 B.C.**

Diatomite-lacustrine sediments, with rootlet, carbonates removal pretreatment, No. MER-40-1, from edge of Laguna Brava, near Páramo de La Negra, between States of Mérida and Tachira, Venezuela (8° 25′ N Lat, 71° 50′ W Long). Coll. 1970, ca. 3m below lake base, and subm. by N. Muñoz, Dept. Geol., Univ. Central Venezuela, Caracas. *Comment* (N.M.): date agrees with pollen analyses on same sample, placing layer in late glacial, when climate began to improve.

+1360

30,740

−1170

IVIC-857. Guanoco 1 **28,790 B.C.**

+1040

27,460

IVIC-858. Guanoco 2 **−920**

Asphalt (IVIC-857 semi-solid and IVIC-858 more liquid) from Guanoco Lake, State of Sucre, Venezuela (10° 11′ N Lat, 62° 54′ W Long). Deposit represents largest surface of asphalt in world (ca. 350h). Coll. 1970 and subm. by D. Raynaud and M. Tamers. *Comment*: ages are statistically indistinguishable. Detection of radiocarbon activity was unexpected, as it is generally believed that asphalt originates completely from petroleum. Real ages might indicate that modern carbon plays a role in asphalt formation. Situation described fully in Raynaud and Tamers, 1971.

Mucubají series

Soil samples, fluvial-glacial, from headwaters of Santo Domingo R.,

in Morrena Victoria Valley, ca. 2.5 km NE Mucubají, State of Mérida, Venezuela (8° 48.7′ N Lat, 70° 48.3′ W Long). Previous date for soil was 5470 ± 80 B.P. (IVIC-722, R., 1971, v. 13, p. 43). Coll. 1970 and subm. by C. Schubert, IVIC. Site described in Schubert and Sifontes (1970). Samples subm. to rootlet, carbonate removal pretreatment.

450 ± 70

IVIC-764. Mucubají CS-29 **A.D. 1500**

0 to 50cm below surface.

3920 ± 90

IVIC-763. Mucubají CS-28 **1970 B.C.**

50 to 75cm below surface.

5800 ± 80

IVIC-762. Mucubají CS-27 **3850 B.C.**

75 to 100cm below surface.

5360 ± 90

IVIC-766. Mucubají CS-31 **3410 B.C.**

Ca. 50cm below surface.

5590 ± 100

IVIC-767. Mucubají CS-32 **3640 B.C.**

Ca. 75cm below surface.

8790 ± 120

IVIC-765. Mucubají CS-30 **6840 B.C.**

Ca. 100cm below surface.

General Comment (C.S.): confirms antiquity of IVIC-722. Older date of IVIC-765 is reasonable.

V. SAMPLES OF KNOWN AGE

IVIC-678.	Hojas de Guama,	29 Dec., 1969	154.2 ± 1.1 % modern
IVIC-703.	"	30 Jan., 1970	156.9 ± 1.1 % modern
IVIC-720.	"	28 Feb., 1970	152.6 ± 1.0 % modern
IVIC-725.	"	31 Mar., 1970	150.6 ± 0.9 % modern
IVIC-747.	"	30 Apr., 1970	151.9 ± 1.1 % modern
IVIC-776.	"	29 May, 1970	153.9 ± 1.0 % modern
IVIC-819.	"	30 June, 1970	150.2 ± 1.0 % modern
IVIC-826.	"	31 July, 1970	150.1 ± 1.0 % modern
IVIC-835.	"	31 Aug., 1970	148.3 ± 1.1 % modern
IVIC-854.	"	30 Sept., 1970	143.3 ± 1.1 % modern
IVIC-873.	"	2 Nov., 1970	145.2 ± 1.0 % modern
IVIC-884.	"	30 Nov., 1970	149.3 ± 1.0 % modern

Green leaves from Guama trees (*Inga Fastuosa*) in Altos de Pipe, state of Miranda, Venezuela (10° 23′ N Lat, 66° 58′ W Long). Modern plant samples have been coll. here since 1964; results are reported in previous IVIC date lists. Coll. and subm. by members of Radiocarbon Lab., IVIC. *Comment*: activity fairly constant throughout year, but a little lower on average from 1969 (R., 1970, v. 12, p. 522).

Oyster shell series

This type of sample is common in Venezuelan archaeologic excavations (Rouse and Cruxent, 1963) and an attempt was made to determine whether errors here would be as large as those found on deep-water marine shells (Taylor and Berger, 1967). Since no pre-nuclear-weapon-testing Venezuelan oyster shells were available, a comparison of the oyster and shell of modern samples should give information at least concerning possible errors caused by isotope effect in shell dates. The oysters were purchased at various locations near Caracas, but came from region of Chichiriviche, State of Falcon, Venezuela (10° 4′ N Lat, 68° 16′ W Long). Coll. and subm. by members of Radiocarbon Lab.

IVIC-822. Oysters, 19 July, 1970 **137.3 ± 0.9 % modern**

IVIC-823. Oyster shells, 19 July, 1970 **142.5 ± 0.9 % modern**

Shells of IVIC-822 oysters.

IVIC-824. Oysters, 24 July, 1970 **139.3 ± 0.9 % modern**

IVIC-825. Oyster shells, 24 July, 1970 **143.8 ± 0.9 % modern**

Shells of IVIC-824 oysters.

IVIC-827. Oysters, 2 August, 1970 **142.1 ± 0.9 % modern**

IVIC-828. Oyster shells, 2 August, 1970 **141.5 ± 0.9 % modern**

Shells of IVIC-827 oysters.

General Comment: radiocarbon concentrations of oyster-shell pairs are statistically indistinguishable, therefore, there would be no isotope-effect error in oyster-shell dates. Absolute values, nevertheless, are lower than contemporary plant material at this time in Venezuela. This could have been caused either by tendency of dilution of contamination in ocean waters coming from S hemisphere, by uncontaminated modern waters near the surface or by dilution by deeper waters of non-modern age. More samples of this kind in future years could clarify this question.

VI. EXTRATERRESTRIAL SAMPLES

IVIC-821. Allende meteorite **71.0 ± 4.2 dpm/kg**

Type III carbonaceous chondrite, fell 1:05 CST, 8 Feb. 1969, near Parral, state of Chihuahua, Mexico (27° 6′ N Lat, 105° 12′ W Long), At least 2 tons were recovered; 149g from surface taken for radiocarbon analysis. Chemical and mineralogic analyses have been pub. (Clarke *et al.*, 1970). Sample sent by R. Clarke, Smithsonian Inst., Washington, D.C. Carbon extracted by heating at ca. 1000°C for 2 days in oxygen stream with polyethylene plastic used as carrier. *Comment*: radiocarbon content is close to average value, 85dpm/kg, of other "fall" stone meteorites measured (Tamers, 1963). This is surprising due to largeness of

Allende. Since it is improbable that sample was exactly on surface of large body, we suspect that Allende reached the earth's atmosphere as colln. of smaller stones more or less uniformly irradiated for a long period by cosmic radiation. Allende represents largest stony meteorite fall in areal extent, pieces spreading over 300km^2.

IVIC-842. Lost City meteorite **40.8 ± 5.1 dpm/kg**

Type H-5 olivine–bronzite chondrite, fell evening of 3 Jan. 1970 near Lost City, Oklahoma (36° 0′ N Lat, 95° 6′ W Long) (Clarke, Jarosewich, and Nelen, 1971). Stony meteorite weighed 17.5kg; 94g from center sent by R. Clarke for radiocarbon analysis. Sample heated at 1000°C for 2 days in oxygen stream with polyethylene plastic carrier. *Comment*: radiocarbon content a little on low side, but still within normal range and reasonable compared with O^{16} (p,3p) C^{14} cross-section data. Low value could be because sample came from inner portion of meteorite.

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